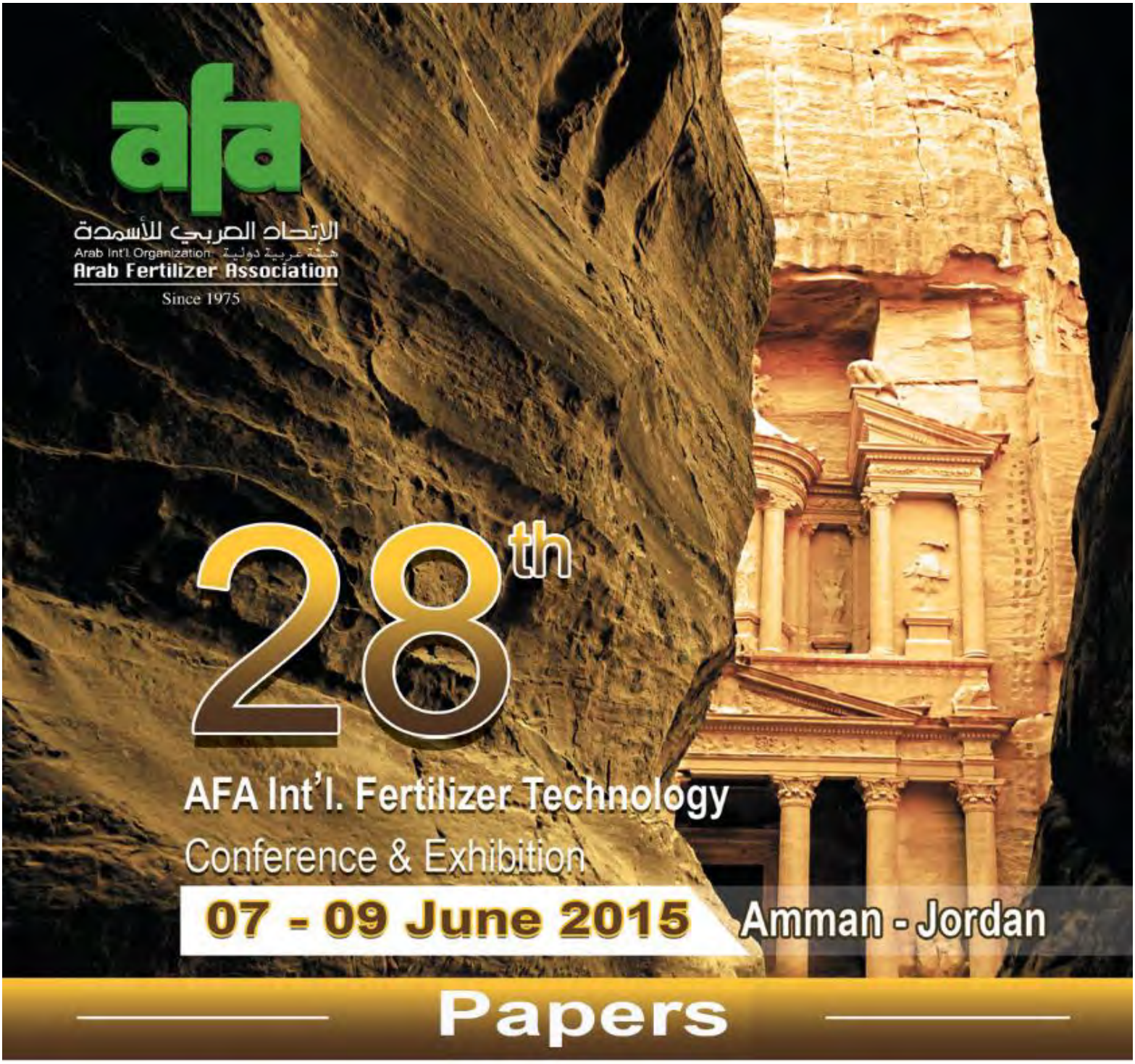


Papers

ARAB FERTILIZER IMPRESSING FUTURE SUSTAINABILITY

شركة البوتاس العربية المساهمة العامة
Arab Potash Company PLC

NJFC

KEMAPCO
Arab Fertilizers and Chemicals Industries Ltd.

الاتحاد العربي للأسمدة
Arab Int'l Organization هيئة عربية دولية
Arab Fertilizer Association
Since 1975

28th AFA Int'l. Fertilizer Technology Conference & Exhibition

07 - 09 June 2015 Amman - Jordan

Program

ARAB FERTILIZER IMPRESSING FUTURE SUSTAINABILITY

شركة البوتاس العربية المساهمة العامة
Arab Potash Company PLC

NJFC

KEMAPCO
Arab Fertilizers and Chemicals Industries Ltd.

DAY 1: Sunday 7th June, 2015

08:00 -10:00 **Registration**

10:00 -11:00 **Conference Inauguration**
Ishtar ballroom

Welcome addresses:

- ***Dr. Shafik ASHKAR***
  CEO, JPMC
  AFA Jordan Fertilizer Industry Representative.
- ***Lord Bill Jordan***
  CBE, President of the Royal Society for the Prevention of Accident (RoSPA), UK
- ***Eng. Mohamed Abdallah Zain***
  AFA Secretary General.

11:00 -12:00 **Exhibition Opening** *Jarasia hall*
Networking Coffee / Tea
Jarasia hall

12:00 – 14:00 Session I

Chairperson: **Yasser Abdulrahim**
Plants Operation Manager
GPIC, Bahrain

1. **How Rigorously Plant Modeling Can Advance your Urea Business**

   Luc Dieltjens
   Senior Urea Process Engineer
   Stamicarbon, The Netherlands

2. AFA Working Groups

2.1. Energy Saving Working Group

Yasser Abdulrahim
AFA (ESWG) Chairman

Energy Saving in Fertilizer Industries

DNV

2.2 Health, Safety and Environment Working Group

Mohamed Masrori
AFA (HSEWG) Chairman

2.3 Communication and Public Affairs Working Group

Mohamed Benzekri
AFA (C&PAWG) Chairman

14:00 Networking Lunch *La Vista Restaurant*

DAY 2: Monday 8th June, 2015

10:00 – 12:00 Session II

Chairperson: **Ahmad AL MULLA**
Technical Services Manager
PIC, Kuwait

1. Successful Ammonia Plant Revamping: A Model For Future Plants Modernization

Iacopo Cerea
Senior Process Engineer
CASALE SA, Switzerland

2. **Enhancement of Urea Production Efficiency Via the Improvement of Existing Automatic Control Systems**

   Kostikov Evgeniy
   Senior Software Engineer of Advanced Process Control Department
   NIIK (R&D Institute of Urea, Russia

3. **Removal of Black Powder and Other Contaminants in Fertilizer Plants Gas Feeds**

   Emmanuelle Biadi
   Fuels & Chemicals Business Development Manager
   Pall, France

4. **Successful Turnaround Planning and Execution by New TA Procedures, Standardization of TA Packages and Best Practices**

   Mohammed Zia
   Turnaround and Central Maintenance department, SAFCO, Saudi Arabia

12:00 - 12:30 Networking Coffee / Tea
Jarasia hall

DAY 2: Monday 8th June, 2015

12:30 - 14:00 Session III

Chairperson: **Jamal AMIRA**
Technical Director, APC, Jordan

1. GPIC's Experience in Managing Turnarounds

Bader Al Mansoori
Planning Superintendent, GPIC, Bahrain

2. Case Studies on APC Energy Management

Hussein Shorman
Power Plant Superintendent, APC, Jordan

3. Oil Degradation in Rotating Equipment

Alain Henrad
Sales Manager, EFC NV, Belgium

4. Failure of Primary Shift Effluent W/H Exchanger (103-C) – A case study of High Temperature Hydrogen Attack

Muhammad Nasir Abbas
Inspection Engineer, Reliability & Inspection Department, AlBayroni, SABIC, Saudi Arabia

14:00 Networking Lunch *La Vista Restaurant*

20:00 Gala Dinner *Ishtar ballroom*

DAY 3: Tuesday 9th June, 2015

10:00 – 12:00 Session IV

Chairperson: **Abdelhak Kababi**
HSE Manager, OCP.SA, Morocco

1. **Phosphogypsum Utilization in China & Economic Analysis**
   Liu Bo
   Senior Project Manager, ECEC, China

2. **CASALE: A New Force in The Nitrate And Phosphate Technology Business**
   Jean François Granger
   CASALE SA, Switzerland

3. **Safety Taskforce as a Tool to Improve Adhesion and Positive Behavior in the Gantour Mining Site.**
   Salaheddine Knouzi
   Washing plant Manager, OCP.SA, Morocco

4. **"HSE Best Practices: Case Studies» Ammonia Release to Atmosphere Due to Ammonia Pre-Heater Tube Rupture**
   Yacoub Abdulla Al-Rayyis
   Head of Urea-6, QAFCO, Qatar

12:00 - 12:30 Networking Coffee / Tea

Jarasia hall

12:30 - 14:00 Session V

Chairperson: **Mohamed Masrori**
HSE Manager, OMIFCO, Oman

1. **Premium Catalyst and Technology Solutions Leading the Way Forward for the Fertilizer Industry**
   Kristina Svennerberg
   Catalyst Marketing Manager
   Haldor Topsoe A/S, Denmark

2. **Carbon Formation in Steam Reforming and Effect of K-promotion**
   Mohammed Bendjana
   Malika Oukhedou
   Johnson Matthey, Bahrain

3. **HSE Best Practices in APC**
   Yousef Al Ma'aytah
   Safety Superintendent
   APC - Jordan

14:00 Networking Lunch

La Vista Restaurant

ARAB FERTILIZER IMPRESSING FUTURE SUSTAINABILITY

شركة مناجم الفوسفات الأردنية المساهمة العامة
JPMC

شركة البوتاس العربية المساهمة العامة
Arab Potash Company PLC

JIC

NJFC

KEMAPCO
Arab Fertilizers and Chemicals Industries Ltd.

How Rigorously Plant Modeling Can Advance Your Urea Business

Luc Dieltjens
Stamicarbon
The Netherlands

How rigorously plant modeling can advance your urea business

Nitrogen + Syngas
Istanbul, February, 2015

Luc Dieltjens

What makes urea plant modeling challenging?

Stamicarbon
pure knowledge

- Presence of an azeotropic ratio
- Feedstock in supercritical conditions
- Inflection points in mathematical functions
- Lots of publications available, but little data for validation

What is the Stamicarbon plant model?

- Rigorous thermodynamic static modeling of urea plant
- This includes the kinetics in the reactor
- Know-how is based on more than 60 years fundamental research + validation
- About 6000 variables are calculated, about 350 process streams
- Model calculation time, typically 2-5 seconds

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 3

Stamicarbon: a Full Life Cycle Philosophy

Create a new plant for sustainable and profitable urea production.

Optimize your plant for increased performance and product quality

Upgrade your plant to increase capacity and to lower energy and emissions

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 4

ADVANCE™ CONSULT

Stamicarbon
pure knowledge

A new service offered by Stamicarbon:

- Process historical plant data (e.g. 1-2 months) through a plant model
- Evaluate performance by means of **KEY VARIABLES**
  - E.g. the urea yield in the reactor is set by:
    - N/C
    - H/C
    - System pressure (Total pressure – Inert pressure)
    - Retention time
  - Only N/C can be measured real time
  - Operator uses **DERIVATIVE VARIABLES** to control the process, like temperature and pressure.
  - DERIVATIVE VARIABLES are subject of interpretation; a high temperature in the reactor might mean high conversion, but could also mean high water content or low inert pressure

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 5

ADVANCE™ CONSULT

Stamicarbon
pure knowledge

- Compare critical model outputs with critical plant data
- Look to the essentials:
  - Overall mass balance
  - Overall energy balance
  - Urea production
- Difference comparison = f(errors measurements, errors models, simplifications, unknown plant streams, non ideal behavior)

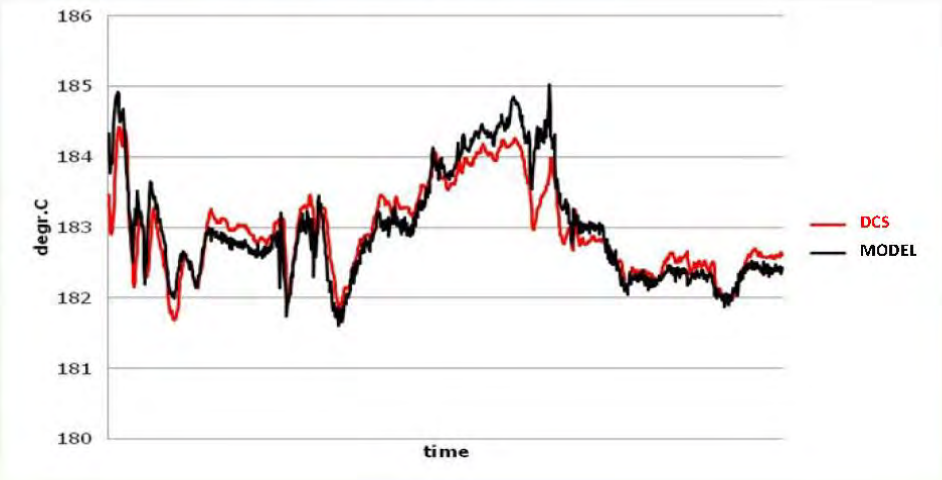
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 6

ADVANCE™ CONSULT

Stamicarbon pure knowledge

Validation reactor outlet temperature:



28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 7

ADVANCE™ CONSULT

Stamicarbon pure knowledge

Analysis on:

- Sensor deviations
- Dynamic stability (plant oscillations)
- Operation towards KEY VARIABLES
- Constraints
- Proposed actions for improvements

And finally…

Your operation can be benchmarked with other urea producers

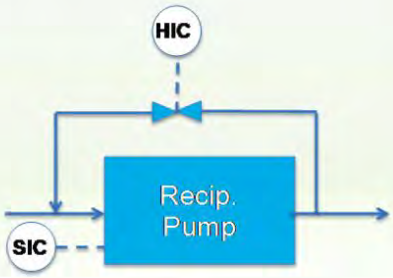
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 8

ADVANCE™ CONSULT *sensor duplication*

Stamicarbon pure knowledge

Carbamate recycle flow to synthesis

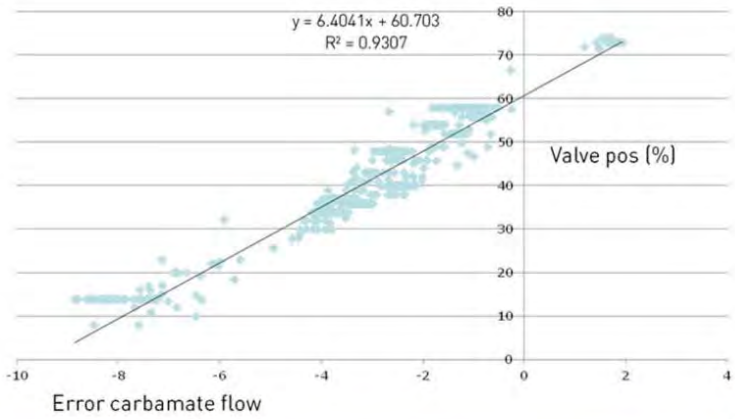


Flow = (speed x K – recycle) x density

Recycle = f (valve position, pressure drop)

ADVANCE™ CONSULT *predictive maintenance*

Stamicarbon pure knowledge

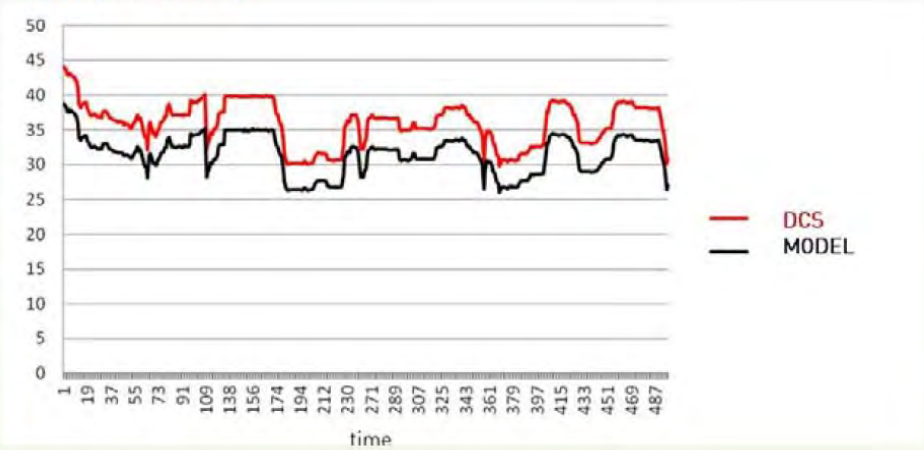


- The error in carbamate flow is caused by the recycle valve
- High correlation coefficient R2 =0.93
- **Cavitation in valve, erosive, trim damaged**

ADVANCE™ CONSULT *at work as troubleshooter*

Stamicarbon pure knowledge

CO_2 to compressor

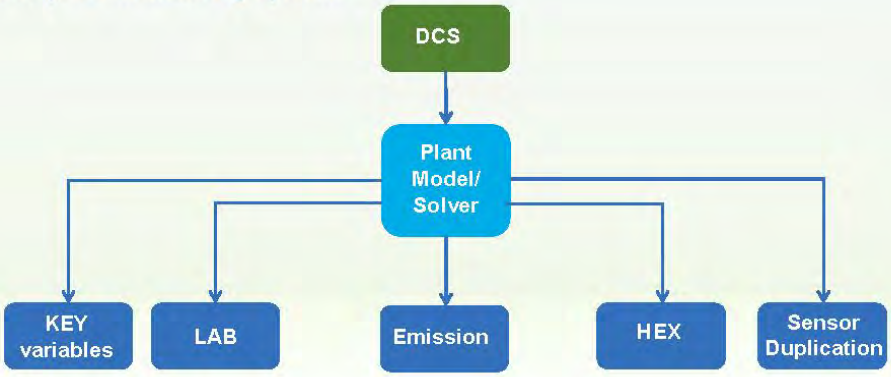


Root cause:
Wrong density compensation for office

ADVANCE™ CONSULT

Stamicarbon pure knowledge

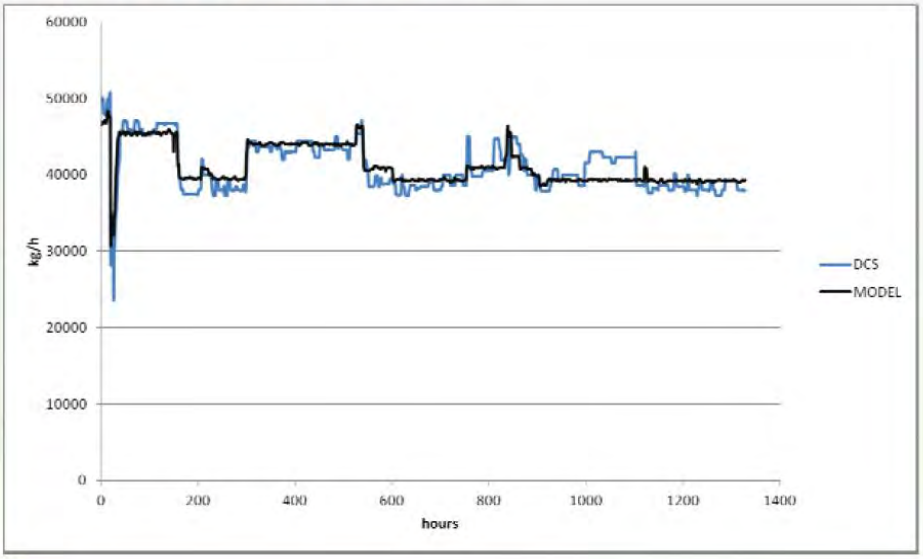
- Online version from plant model used in ADVANCE ™ CONSULT
- Plant model is OPC compatible
- Remote installation in Stamicarbon office is possible
- Total plant monitoring system



ADVANCE™ CONSULT *at work as troubleshooter*

Stamicarbon pure knowledge

Feed stream to the waste water section



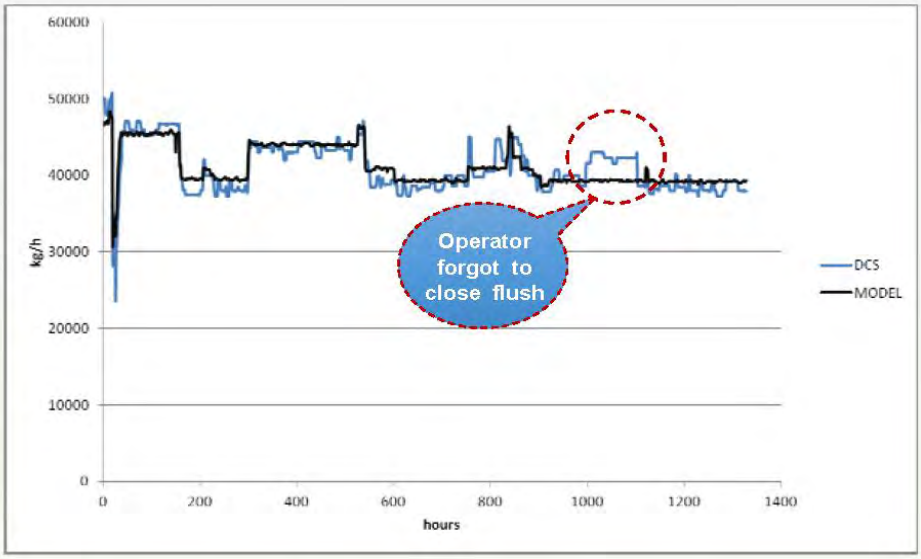
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 13

ADVANCE™ CONSULT *at work as troubleshooter*

Stamicarbon pure knowledge

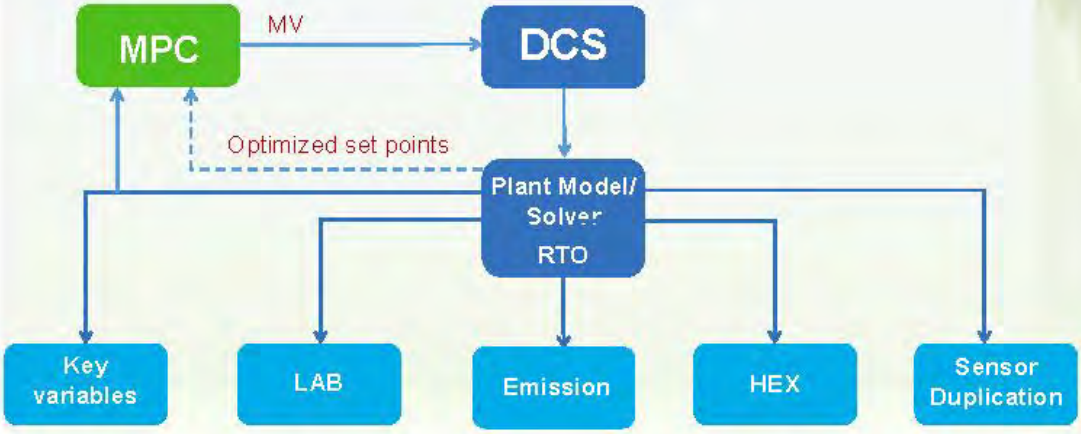
Feed stream to the waste water section



28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 14

EVOLVE™ OPTIMIZER *Our total plant solution*



28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 15

EVOLVE™ OPTIMIZER *Hardware requirements*

- No additional hardware (read field equipment) required for EVOLVE™ OPTIMIZER
- No shutdown required for implementation
- It's only a laptop (desktop) with:
  - MPC software
  - Stamicarbon software (solver + plant model)
- DCS should have an OPC interface.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Page 16

EVOLVE™ OPTIMIZER *Conclusions*

- In operation at OCI urea plant Geleen since 2012
- Advance Consult™ indicated an expected 1 to 2% production increase
- Project delivered an energy reduction and capacity increase in the range of 4-5%
- EVOLVE™ OPTIMIZER is:
  - A revamp tool
  - Predictive maintenance tool (reliability improvement)
  - In dept analysis tool for troubleshooting
  - A sensor duplicator

an Auto-Pilot for your plant
that maximizes efficiency and increases production

Stamicarbon OFFICES

Sittard
Mercator 3
6135 KW Sittard
(The Netherlands)
Ph. +31 46 4237000
Fax +31 46 4237001

Beijing
Room 3503, floor 35th,
Jingcheng Mansion,
No.6 Xin Yuan Nan Road,
Chao Yang District
100004 Beijing
Ph. +86 10 84862886
Fax +86 10 84862836
ying.liao@stamicarbon.com
www.stamicarbon.cn

Moscow
Naberezhnaya Tower, Block B
10, Presnenskaya Naberezhnaya,
8th floor, Office Maire Tecnimont
123317 Moscow
Russian Federation
Ph. +7 495 7306316
Fax +7 495 7306313
semen.evreinov@stamicarbon.com
www.stamicarbon.ru

info@stamicarbon.com – www.stamicarbon.com

مجموعة عمل
" ترشيد الطاقة في مصانع الأسمدة"
Energy Saving Working Group
2015/6/6

Yasser A.Rahim
AFA (ESWG) Chairman

28th AFA International Technology Conference & Exhibition

خطط عمل المجموعة

الرقم المتسلسل	خطة العمل
1	• وضع معايير خاصة بالرصد والإستهداف
2	• وضع نظام معلومات لإدارة الطاقة
3	• ترسيخ ثقافة ترشيد الطاقة فيما بين أعضاء الإتحاد العربي للأسمدة
4	• وضع مصفوفة بالتدريبات والكفاءات الخاصة بترشيد/ إدارة الطاقة
5	• إجراء عمليات مراجعة وتدقيق للطاقة. كيفية إقامة عملية المراجعة والتدقيق الخاصة بأعضاء الأتحاد

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

Energy Saving KPIs

المعايير خاصة بالرصد والإستهداف

28th AFA International Technology Conference & Exhibition

Energy Indicators

Energy			Type of data	UOM	2013	2012	2011	2010
EN3	Direct energy consumption by primary energy source.	Total energy consumption in joules or multiples.	quantitative					
		Total direct energy consumption in joules or multiples by renewable primary	quantitative					
		Total direct energy consumption in joules or multiples by non-renewable	quantitative	GJ				
EN4	Indirect energy consumption by primary source	Total amount of indirect energy used by indirect non-renewable sources and	quantitative	MWH				
		The corresponding primary energy consumed in its production.	quantitative	GJ				
EN5	Energy saved due to conservation and efficiency improvements.	Total energy saved by efforts to reduce energy use and increase energy	quantitative					
		Total amount of energy saved in joules or multiples taking into consideration	quantitative	GJ				
EN6	Initiatives to provide energy-efficient or renewable energy based products and services, and reductions in	Existing initiatives to reduce the energy requirements of major	qualitative					
		Quantified reductions in the energy requirements of products and services	quantitative					
		If use-oriented figures are employed (e.g. energy requirements of a computer)	qualitative					
EN7	Initiatives to reduce indirect energy consumption and reductions achieved.	Initiatives to reduce indirect energy use.	qualitative					
		The extent to which indirect energy use has been reduced during the reporting	quantitative					
		Underlying assumptions and methodologies used to calculate other indirect	qualitative					
Emissions, effluents and waste			**Type of data**	**Reported**	2013	2012	2011	2010
EN16	Total direct and indirect greenhouse gas emissions by weight.	Indicate the standard used, and indicate the methodology associated with the data with reference to: direct measurement; calculation based on site specific	qualitative					
		Total greenhouse gas emissions as the sum of direct and indirect emissions in	quantitative					
		CO2 Emissions from direct energy						
		CO2 Emissions from Imported electricity						
		CO2 Emissions due to Granulation Washing						
		CO2 Emissions due to Urea Shutdown						
		CO2 Emissions due to Diesel burning						
		CO2 Emissions due to Petrol burning						
		CO2 Emissions due to R-22 consumtion						
		CO2 Emissions due to R-404A consumtion						
EN17	Other relevant indirect greenhouse	The sum of indirect GHG emissions identified in tonnes of CO2 equivalent.	quantitative					
EN18	Initiatives to reduce greenhouse gas emissions and reductions achieved.	Initiatives to reduce greenhouse gas emissions, including the areas where the initiatives were implemented.	qualitative					
		The extent of greenhouse gas emissions reductions achieved during the	quantitative					
EN19	Emissions of ozone-depleting	The emissions of specific ozone-depleting substances in tonnes and tonnes of	quantitative					
EN20	NOx, SOx, and other significant air emissions by type and weight.	The weight of significant air emissions (in kilograms or multiples such as	quantitative					
		The weight of significant air emissions (in kilograms or multiples such as	quantitative					
		The weight of significant air emissions (in kilograms or multiples such as	quantitative					
		The weight of significant air emissions (in kilograms or multiples such as	quantitative					
		The weight of significant air emissions (in kilograms or multiples such as	quantitative					
		The weight of significant air emissions (in kilograms or multiples such as	quantitative					
		The weight of significant air emissions (in kilograms or multiples such as	quantitative					

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

Data Base for Listing Energy Saving Project of AFA Members

نظام معلومات لإدارة الطاقة

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

Data Base for Listing Energy Saving Project of AFA Members

Blank Template for company profile:

Name of Company		Country		Location	
Products	1-	Capacity (MT/Year)	1-	Licenses (process type)	1-
	2-	Capacity (MT/Year)	2-	Licenses (process type)	2-

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

Data Base for Listing Energy Saving Project of AFA Members

Blank Template for company profile:

Sr. no.	Year of implementation	Production Unit	Energy Saving Scheme/ Project Short Description	Area of Improvement	Obtained Benefit	Full Description of the Project/ Presentation if available	Cost estimate and /or actual	Pay Back time	ROI	Recommendations
1										
2										
3										
4										

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

Energy Saving Working Group

Page 2

ترسيخ ثقافة ترشيد الطاقة فيما بين أعضاء الإتحاد العربي للأسمدة

Guidelines for Establishing Energy Saving Culture

Arab Fertilizer Association
since 1975
28th AFA International Technology Conference & Exhibition

Action plan for Establishing Energy Saving Culture for AFA members
[Company Name]

Today's Date: 1/14/2015

Project Lead: [Name]
Start Date: 1-Feb-15 Sunday

WBS	Planing for launching energy saving campaign	Task Lead	Start	End	Duration (Days)	% Complete	Working Days	Days Complete	Days Remaining
1	**Energy Team Appointment**	[Name]	1-Mar-15	19-May-15	80	0%	57	0	80
1.1	Appoint a member of the management to champion the energy saving campaign		1-Mar-15	20-Mar-15	20	0%	15	0	20
1.2	Set up an energy team		21-Mar-15	19-Apr-15	30	0%	20	0	30
1.3	Secure a budget for producing and distributing promotional materials and for incentives		20-Apr-15	19-May-15	30	0%	22	0	30
2	**Assess the current situation:**	[Name]	20-May-15	17-Sep-15	121	0%	87	0	121
2.1	Collecting and reporting data on the KPIs		20-May-15	18-Jul-15	60	0%	43	0	60
2.2	Collecting and reporting data on current		20-May-15	18-Jul-15	60	0%	43	0	60
2.3	Collecting and reporting data on the current energy management system (assessment)		20-May-15	18-Jul-15	60	0%	43	0	60
2.4	Identification of the needed Messages and slogans, prepare promotional materials such as posters and stickers and identify the delivery routes		20-Jul-15	17-Sep-15	60	0%	44	0	60
3	**Setting and issuing the organization's**	[Name]	18-Sep-15	26-Dec-15	100	0%	71	0	100
3.1	Setting and issuing the organization's direction through goals, objectives, values and/or missions -Publish targets to the outside world		18-Sep-15	16-Nov-15	60	0%	42	0	60
3.2	Launching the Energy Management System Certification Program		17-Nov-15	26-Dec-15	40	0%	29	0	40

Energy Saving Working Group
Page 2

28th AFA International Technology Conference & Exhibition

Guidelines for Establishing an Energy Saving Culture

- INTRODUCTION
- MILESTONE 1 PLANNING
- MILESTONE 2 IMPLEMENTATION
- MILESTONE 3 REVIEWING AND COMMUNICATING
- MILESTONE 4 MAINTAINING AWARENESS
- Next steps

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

مصفوفة بالتدريبات والكفاءات الخاصة بترشيد/ إدارة الطاقة

Energy Management Competency Matrix Development

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

Energy Management Competency Matrix Development Plan

Task	Time Based Excution Schedule											
	Dec. 2014	Jan. 2015	Feb. 2015	March	April	May	June	July	August	September	October	November
Prepare valid Job Description												
Competency Mapping												
Generate a list of Generic competencies.												
Identify Functional competencies.												
Creating competency profiling for Positions.												
Have the competency analysis done in consultation with departmental heads and a HR specialist.												
Creation of the matrix in final form.												
Perform Gap Analysis	Parts to be executed by the companies that adapt the competency matrix and implement it in its HRM system											
Prepare Developmntal plans												
Perform Gap Closure	Performed after implementing the development plans and continuously improves by feedback strategy the Competency Matrix											

This is where we are till now

Energy Saving Working Group

Page 2

28th AFA International Technology Conference & Exhibition

إجراء عمليات مراجعة وتدقيق للطاقة

Energy Saving Auditing Protocol

Energy Saving Working Group

Page 2

Our Deliverables to AFA (1st Phase)

- DNV GL Business Assurance Middle East & Africa shall provide AFA and its members a customized rating protocol that provides a quantitative insight into and understanding of an energy management system's performance as a whole and in detail within each of its six elements. With its structured, comprehensive and proven approach, the customized Energy Management System Rating Protocol (EnMS Rating Protocol) provides you with insight into and understanding of the performance and the improvement potential of the energy management system of the organization. The tool will be excel based and DNV GL shall provide it to AFA free of cost.

  * It is a requirement that the assessors that will use the EnMS Rating tool have a sound knowledge on ISO 50001.
- Training on the use of the tool.(Free of cost)
- ISO 50001 Internal / Lead auditor training for the AFA members in collaboration with AFA for the assessors that do not possess the required knowledge of ISO 50001.(Special AFA rates shall apply)

مجموعة عمل
" الصحة والسلامة والبيئه"
HSE Working Group
2015/6/6

Mohamed Masrori,
AFA (HSEWG) Chairman

28th AFA International Technology Conference & Exhibition

- **HSEWG Vision:**

To promote the (HSE) Health, Safety and Environment performance levels for all AFA members and disseminate related culture in order to protect the human being and achieve the sustainable development of fertilizer sector

- **رؤية المجموعة:**

الرقي بمستويات الأداء في مجال الصحة والسلامة والبيئة لجميع الشركات الأعضاء بالاتحاد العربي للاسمدة ونشر ثقافتها لحماية العنصر البشري والمساهمة في تحقيق التنمية المستدامة لقطاع الاسمدة.

HSE Working Group

28th AFA International Technology Conference & Exhibition

- **AFA HSEWG Mission:**
- Improving the HSE awareness and culture within AFA.
- Establishing AFA HSE KPIs & reporting matrix & updating the database.
- Listing and reporting the HSE Best Practices applied in AFA Companies

- **تابع...رسالة المجموعة:**
- نشر الوعي والمعرفة في مجالات الصحة والسلامة والبيئة بين اعضاء الاتحاد
- تكوين قاعدة معلوماتية لواقع واداء الصحة والسلامة والبيئة في الشركات اعضاء الاتحاد
- توثيق ونشر أفضل المشاريع والممارسات في مجال الصحة والسلامة والبيئة

HSE Working Group

Page 3

28th AFA International Technology Conference & Exhibition

- AFA HSEWG Mission:

- Establishing HSE benchmarking criteria with similar industries.
- To promote AFA programs and initiatives in international events.
- Share and present AFA-HSE journey in similar HSE International events
- To develop competitiveness criteria by providing AFA HSE Award, developing questionnaires and other forms together with setting incentives

- تابع....رسالة المجموعة

- وضع اسس استرشادية (Benchmarking) لدراسة أوضاع اعضاء الاتحاد في مجالات الصحة والسلامة والبيئة وقياس مدى تطابقها مع المعايير العالمية في مجالات الصحة والسلامة والبيئة
- الإرتقاء بسمعة الاتحاد في مجالات الصحة والسلامة والبيئة من خلال المشاركة في المحافل الدولية المتخصصة
- تطوير المعايير التنافسية بجائزة الإتحاد في مجال الصحة والسلامة والبيئة من خلال الاستبيانات وغيرها ووضع الحوافز .

HSE Working Group

Page 4

28th AFA International Technology Conference & Exhibition

- 2015 Working Plan :

خطة العمل للعام 2015

Listing and reporting the HSE Best Practices applied in AFA Companies	حصر واعداد تقرير يبرز افضل الممارسات في مجال الصحة والسلامة والبيئة التى تم تطبيقها في اعمال الشركات الاعضاء بالاتحاد بهدف توثيقها ونشرها للإستفادة منها	1
Adopting HSE Key Performance Metrics Reporting system for AFA	وضع وتصميم معايير تقييم أداء للتقييم في مجالات الصحة والسلامة والبيئة خاصة بالإتحاد وإصدار تقرير اداء سنوى للشركات الاعضاء	2
Developing guidelines for effective HSE management system for (ATR)	وضع دليل استرشادي شامل لادارة أنشطة الصيانة الدورية من الجوانب المتعلقة بالصحة والسلامة والبيئة	3
Initiating effective awareness program streamlining & helping AFA members to be more involvement in the field of Corporate Social Responsibility certificates.	تعميق مفهوم المسئولية الاجتماعية وإيجابيات تبني الاعضاء لهذا المفهوم عن طريق اعداد خطة لتأهيل الشركات للمشاركه الايجابيه في المسئولية المجتمعية للتوافق مع رؤية الاتحاد المستقبلية.	4
AFA HSE award for 2015 round	متابعة سير الإجراءات التنفيذية لجائزة الإتحاد في مجال الصحة والسلامة والبيئة لعام 2015.	5

HSE Working Group

Page 5

28th AFA International Technology Conference & Exhibition

- Best HSE practices
  - Initiating communicating the form to all AFA members.
  - Review & segregate the applications.
  - Select & short list the recommended schemes for printing & publications.

- أفضل الممارسات في مجال الصحة والسلامة والبيئة
  - إستحداث إستمارة جمع البيانات ومخاطبة الشركات للحصول على البيانات.
  - دراسة ومراجعة البيانات لإختيار أفضلها والمشاركة بها كأوراق عمل في المؤتمرات وورش العمل الدولية بإسم الإتحاد للرقي بسمعة الإتحاد وإنجازات وقدرات أعضاءه.

HSE Working Group

Page 6

28th AFA International Technology Conference & Exhibition

- Best HSE practices
  - Updating AFA database with the received information for wider sharing.
  - Print out and publishing some selected schemes

- أفضل الممارسات في مجال الصحة والسلامة والبيئة
  - تضمين و مراجعة وتحديث البيانات بشكل دوري في قاعدة البيانات الخاصة بالإتحاد بناء على ما يرد من الشركات الأعضاء.
  - طباعة كتيب لأفضل الممارسات يشتمل على مجموعة مختارة من أفضل الممارسات طبقا للخطة المعتمدة.

HSE Working Group

Page 7

28th AFA International Technology Conference & Exhibition

- Best HSE practices
- Main contents of The form:
  - Administrative information
  - Area of practice
  - Description of the adopted practice.
- The added value of the best practice:
  - -Procedural enhancement
  - -Risk control
  - -Minimizing HSE impact
  - -Improving the HSE control.
  - -Positively improving the economical & social impact
- 32 practices Received

- أفضل الممارسات في مجال الصحة والسلامة والبيئة
- أهم عناصر الإستمارة:
  - معلومات تعريفية بالشركة
  - مجال التميز في التطبيق.
  - الوصف التفصيلي للتطبيق.
  - القيمة المضافة للأداء بعد التطبيق.
- عدد المشاركات المستلمة: 32

HSE Working Group

Page 8

28th AFA International Technology Conference & Exhibition

Key Performance Metrics Reporting

- Establish a standard HSE reporting metrics for AFA members.
- Create a sustainable platform on HSE metrics for monitoring and benchmarking.
- Issue an annual performance metrics report for AFA member companies.

معايير تقييم الأداء في مجالات الصحة والسلامة والبيئة

وضع معايير تقييم أداء للتقييم في مجالات الصحة والسلامة والبيئة خاصة بالإتحاد

إصدار تقرير اداء سنوى للشركات الاعضاء في مجالات الصحة والسلامة والبيئة

HSE Working Group

Page 9

28th AFA International Technology Conference & Exhibition

S.No	Metric Name
A.	Occupational Safety
1	Employee Fatalities
2	Lost Time Injury Incident rate for Employees
3	OSHA Recordable Cases Incidence Rate for Employees
4	Contractor Employee Fatalities
5	Lost Time Injury Incidence Rate for Contract Employees
6	OSHA Recordable Cases Incidence Rate for Contract Employees
B.	Process Safety
1	Process Safety Incidents
2	Process Safety Total Incident Rate (PSTIR)
3	Process Safety Total Incident Severity Rate (PSTIR)

HSE Working Group

Page 11

28th AFA International Technology Conference & Exhibition

S.No	Metric Name
C.	Emissions / Discharges to Environment
1	Hazardous Waste for Disposal
2	Non-Hazardous Waste for Disposal
3	Quantity of Waster Water discharged to Environment
4	Discharges to Water - Chemical Oxygen Demand
5	Sulfur Dioxide
6	Nitrogen Oxides (NOX)
7	Total Green House Gas Emissions (GHG)
8	Carbon Dioxide (CO2) Intensity
D.	Resource Utilization
1	Use of Energy (Tons of Fuel oil Equivilant; TOE)
2	Specific Energy Consumption
3	Process Water Consumption
E.	Product Distribution
1	No of Distribution Incidents

HSE Working Group

Page 11

Developing guidelines for effective HSE management system for (ATR)

- To establish the guideline principles upon which ATR are managed whilst maintaining utmost degree of control & commitment toward HSE controls.
- Describing the approaches to establish and maintain a strong ATR HSE culture.
- To achieve ATR Goals by monitoring the activities through following metrics

دليل استرشادي لادارة أنشطة الصيانة الدورية

من الجوانب المتعلقة بالصحة والسلامة والبيئة

- وضع مبادئ توجيهية للحفاظ على أقصى درجه من التحكم والالتزام تجاه ضوابط الصحة والسلامه من خلال رصد كافة الانشطه خلال الصيانةالسنويه

EFFECTIVE HSE MANAGEMENT SYSTEM for ATR

PHASE	AREA	METRICS & FORMULAE
Pre TA	TA EHSS Goals	No. of employees attended Awareness No. of employees & contractor involved in TA
• Setting the HSE objectives • Enhance the team work spirit • Planning the execution plans & schedules	Lesson Learning	No. of Lesson learning session conducted No. of Lesson learning session planned (TA Incidents)
	Formation of EHSS Coordinators	No. of EHSS Coordinator selected No. of Coordinator's required
	Completion of Pre TA activities	• Announcement of TA EHSS Theme • Layout finalization Including traffic plan • Pre TA awareness programs & its Materials • Inspection of plant safety & Fire equipment's readiness • Blind list (Color Coding) & PSV • Availability of all EHSS devices and documents • Rigging plan
	EHSS Training	No. of EHSS Training conducted No. of EHSS Training scheduled
	Critical high risk jobs	No. of JSA prepared No. of Critical High Risk Jobs Identified
	Rigging Plan	No. of Rigging plan prepared No. of Rigging plan required for the lifting

EFFECTIVE HSE MANAGEMENT SYSTEM for ATR

PHASE	AREA	METRICS & FORMULAE
During TA	Management Commitment	No. of management audit conducted / No. of management audit scheduled
▪ Ensuring that all HSE needs are coordinated and in line with intent of the policy. ▪ Ensuring effective communication ▪ Auditing to ensure the commitment ▪ Monitoring the indicators & updating the statistics. ▪ Investigating the accidents	Tool Box Meeting	No. of Tool Box meetings conducted / No. of Tool box meeting scheduled
	Daily EHSS Rep Meeting	No. of EHSS Representatives meetings conducted / No. of EHSS Representatives meeting scheduled
	Compliance Audit Rate (WP, PPE & HK)	Overall average compliance audit rate per day
	EHSS Observation Reporting Rate	Number of EHSS Observation reported / Total manpower engaged in TA
	Waste Recycling	Waste recycled / Waste generated

Corporate Social Responsibility Approach

تعميق مفهوم المسئولية الاجتماعية

- The way Companies manage their business to produce an overall positive impact on society through economic, environmental and social actions
- There is no contradiction between running a profitable business and taking care of the environment and assuming social responsibility.
- Enhance brand image & reputation with the public and business community
- Increases company's ability to attract capital and trading partners.
- Increases ability to attract and retain employees

- نظام ومستوى تعهد المؤسسة لإحداث تأثير إيجابي شامل في المجتمع من خلال أنشطتها الاقتصادية والبيئية والاجتماعية
- إيجابيات تبني هذا المفهوم في إبراز:
  - سمعة المؤسسة مجتمعيا
  - تهيئة ظروف الإستثمار
  - المحافظة على رأس المال البشري

مجموعة عمل
" التواصل والشئون العامه"
Communication & Public Affairs Working Group
2015/6/6

Mohamed Benzakri
AFA (C&PAWG) Chairman

Content

1. **Communication and PA working Group**
2. **Public Affairs**
3. **Vision**
4. **Mission**
5. **Strategy**
6. **Scope of work**
7. **KPIs**

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Communication and PA working Group

Communication

The exchange of thoughts, messages, or informati on, as by speech, signals, writing, or behavior.

Business communication

Is the sharing of information between people within an organization to achieve commercial benefit.

Public Affairs

- Public affairs is a term used to describe an organization's relationship with stakeholders. These are individuals or groups with an interest in the organization's affairs, namely civil servants, customers, local communities, clients, shareholders, trade associations, business groups, charities, unions and the media means.
- Public affairs practitioners can be tasked with a wide range of activities. Some may be specialized in media sources relations and others in campaign management.
- Public affairs work combines government relations, media sources communications, issue management, corporate and social responsibility.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Vision

The main vision of Communication and Public Affairs working group is to improve the image of fertilizers industry through different kinds of media means and strengthen its important role in the economic, agriculture and social development.

Mission

1. Present AFA role and activities to move forward to a new horizon that meets AFA member companies expectations and reflects AFA position.
2. Exchange knowledge and experiences between Arab industry companies .
3. Encounter the challenges facing association member companies in fields of education / awareness responsibility.
4. Communicate with international associations and organizations aiming to eliminate poverty and achieve food security.

Our Strategy

1. Share strategic news & information relevant to fertilizers.
2. Communicate member companies activities to entrench sense of credibility and highlight differences.
3. Raise awareness of member companies efforts in CSR .
4. Establish a unified database of member companies on AFA website including media sources connections.
5. Exchange knowledge and experiences between members companies.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

6. Contribute with research organizations to develop the activities relevant to fertilizers .
7. Extending the scope of audience distribution .
8. Make C&PAWG a source of information to raise awareness of HSE principles and solutions .
9. Educate industry workers on relevant issues by adopting media sources and coordinating between trainers and owners .
10. Communicate AFA efforts on poverty elimination and food security achievement .

Paper Title

Page 7

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Some of our scope of work :

1. Build an Arabic media sources database to facilitate publishing all news and information relevant to fertilizers. (*Join social media : Twitter / You tube /Face book/ Google +*)
2. Build database for agriculture research centers and Ministries to have access to agricultural statistical of Arabic Countries.
3. Publish AFA Magazine regularly (hard copies and soft copies through emails , social media and AFA website)

Page 8

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

4. Develop AFA Website

	January	February	March
2014	8530	2228	1952
2015	10691	4990	3336

Paper Title

Page 14

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

5. Share all collaterals / reports/newsletters / workshops / events and activities of AFA with targeted audiences.
6. Exchange best practices of AFA member companies in regular meetings.
7. Promote all AFA events.

Share our Best Practice : KPIs

Paper Title

Page 15

ARAB FERTILIZER IMPRESSING FUTURE SUSTAINABILITY

شركة مناجم الفوسفات الأردنية المساهمة العامة
JPMC

شركة البوتاس العربية المساهمة العامة
Arab Potash Company PLC

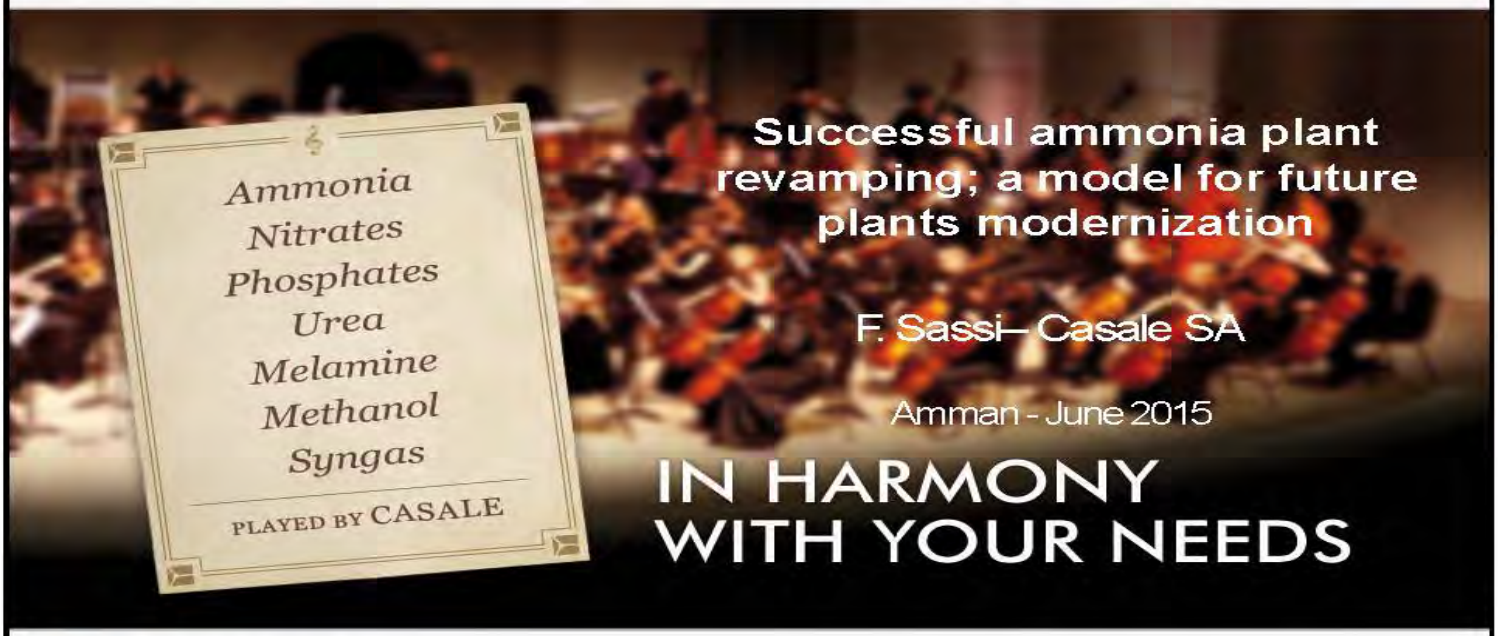
JIC

NJFC

KEMAPCO
Arab Fertilizers and Chemicals Industries Ltd.

Successful ammonia plant revamping; a model for future plants modernization

Sergio Panza
CASALE SA
Switzerland



Successful ammonia plant revamping; a model for future plants modernization

F. Sassi– Casale SA

Amman - June 2015

IN HARMONY WITH YOUR NEEDS

CASALE

CASALE revamping of Nevinnomyssk TEC plant

- ✓ Capacity increase: up to 2000 MTD
- ✓ Energy saving: > 0.7 Gcal/MT;
- ✓ Reliability improvement.

CASALE

Background

The Ammonia Plant is an original TEC 1973 design

The nameplate capacity was 1360 mtpd

Modified in 1989-1991 to 1700 mtpd (usual load 1640-1680MTD)

2014 revamped to 2,000 mtpd

CASALE

Revamp Major Milestones

April 2013 – CASALE selected to perform detail engineering

March 2014 – Detailed engineering completed

April 2014 – Material start to be gathered in field

October 2014 – Plant shut-down to execute revamp

CASALE

Activities sharing

Casale was responsible for:

- Detail engineering;
- Procurement of most of the critical equipment;
- Advisor during construction.

CASALE

Activities sharing

Nevinnomyssky Azot was responsible for:

- Construction;
- Modification of existing equipment;
- Procurement of the foundation/steel structure bulk material.

CASALE

PROJECT SCHEDULE

PROJECT ENGINEERING & REVAMPED CAPACITY REACHED IN

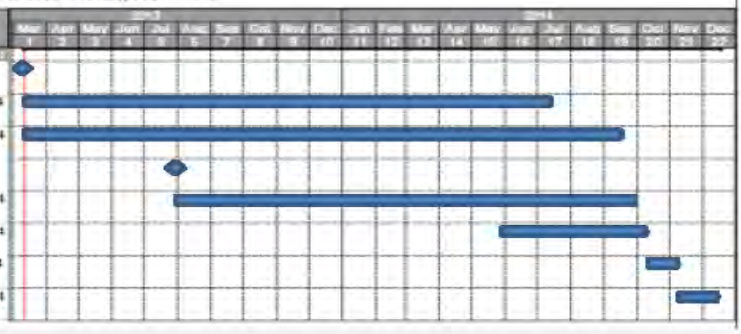
21 MONTHS

CASALE

Revamping of TEC ammonia plant

JSC NEVINNOMYSSKY AZOT, Nevinnomyssk, RUSSIA

Activity Description	Duration	Start	Finish
Revamping of TEC ammonia plant	21m	11-03-2013	18-12-2014
PROJECT START	0m	11-03-2013	
DETAIL ENGINEERING	16m	11-03-2013	11-07-2014
EQUIPMENT SUPPLY	19m	11-03-2013	19-09-2014
BULK MATERIAL CONTRACT AWARD	0m	30-07-2013*	
BULK MATERIAL SUPPLY	14m	30-07-2013	30-09-2014
CONSTRUCTION ACTIVITES BEFORE SHUTDOWN	4m	02-06-2014	13-10-2014
PLANT SHUTDOWN	1m	13-10-2014*	11-11-2014
PLANT RESTART & REVAMPED CAPACITY REACHED	1m	11-11-2014	18-12-2014



CASALE

Main modifications

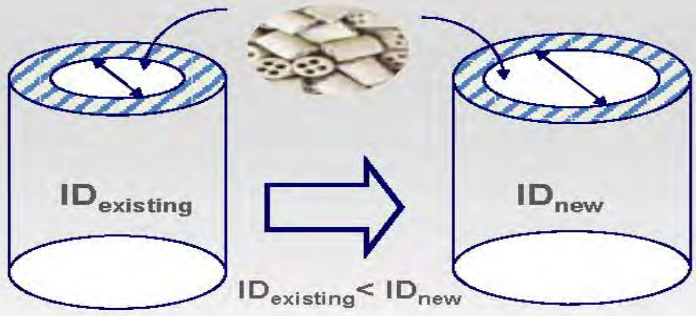
1) Steam reforming capacity;
2) Air compressor section;
3) CO2 removal section;
4) Synthesis compressor;
5) Refrigerant section;
6) Synthesis loop;
7) BFW pumps;

CASALE

1. Steam reforming capability

Capacity increased with bigger ID tubes;

Steam to carbon ratio reduced



OLD ID: 85mm NEW ID: >92mm

CASALE

2. Air compressor section

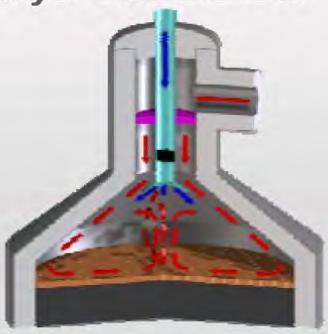
Air compressor train revamping (Entechmach and Alstom).

The compressor internals were replaced with new ones with revamping of interstage coolers and steam condensers replacement. The steam turbine is brand new.

CASALE

2. Air compressor section

New Casale secondary reformer burner. Upper catalyst layer was sieved.

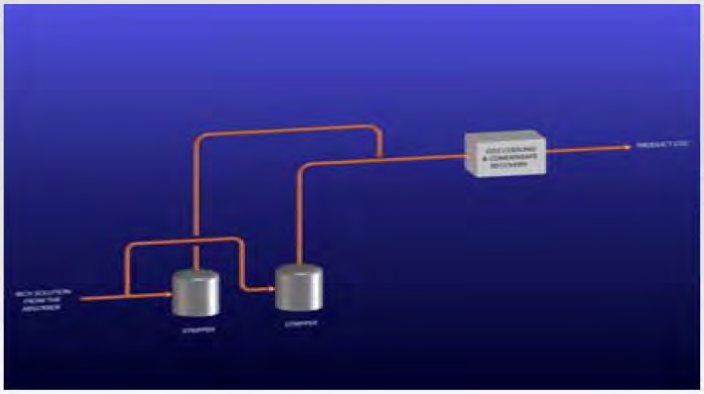


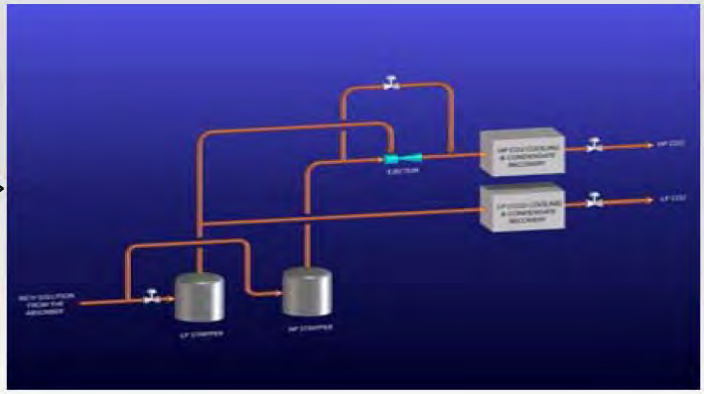
	Plant capacity [MTD]	Pressure drop [kg/cm2]
Base case	1680	1.14
Revamped case	2000	1.0

CASALE

3. CO_2 removal section revamping

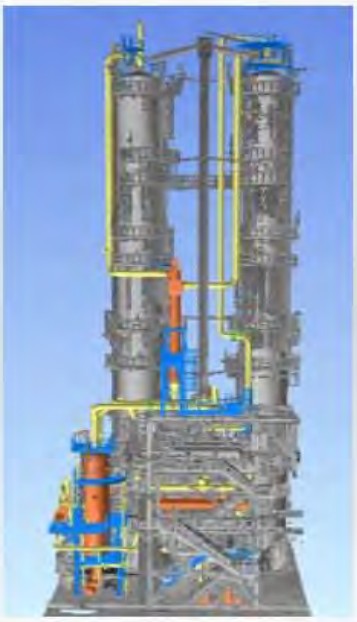
Two regenerators from parallel to series operation (GV low energy scheme).





CASALE

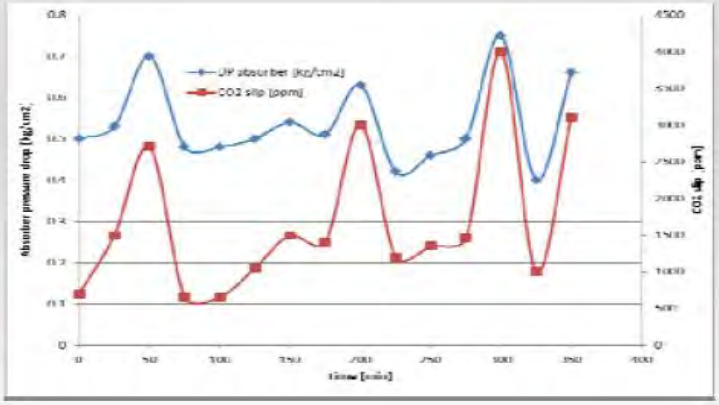
3. CO_2 removal section revamping



CASALE

3B. CO_2 removal section revamping

Foaming phenomena was encountered during start-up, but the addition of antifoam agent and the use of the carbon filter solved the problem.



CASALE

4A. Synthesis gas compressor

Syn-compressor: New upgraded internals (Dresser Rand and Mitsubishi)

And HTS converter: new low DP Casale axial-radial internals instead of old axial and Clariant catalyst.

CASALE

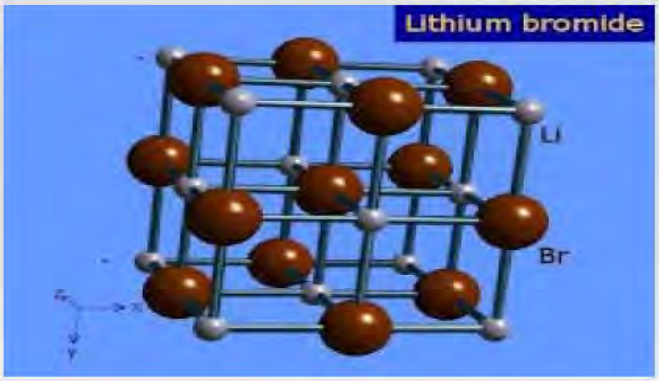
4B. HTS performances

	Plant capacity [MTD]	Pressure drop [kg/cm2]
Base case	1680	0.8
Revamped case	2000	0.47

CASALE

5. Refrigerant compressor

Chillers duty reduction with two new exchangers using chilled water (generated by Li/Br packages).



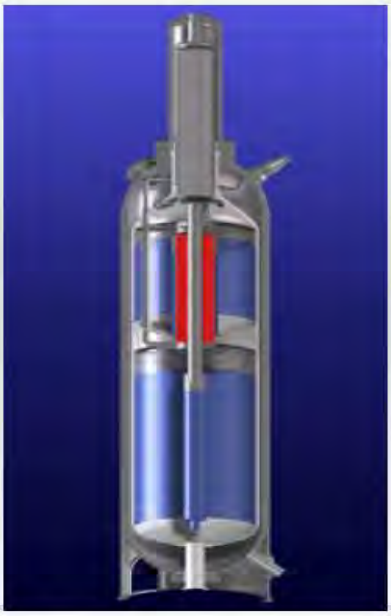
CASALE

6. Synthesis Loop

The synthesis loop has two ammonia converters, Main and "Baby" converter

The main converter was already revamped by Casale.

Also the "baby" converter was revamped by Casale



CASALE

7. BFW pumps

An additional pump electrically motor driven was added.
This pump has same head of the existing pumps.

CASALE

PERFORMANCES

	Pre-revamp	Guarantees	Test run 13-3-2015
Production, MTPD	1650	1950	1982
Energy saving, Gcal/MT		0.62	0.86
Specific energy consumption, Gcal/MT	8.80	8.18	7.94

CASALE

CONCLUSION

Most of the ammonia plant sections were involved in the hardware modifications.

The sections modified have additional spare capacity for a further capacity increase.

Presently the plant is the biggest in operation in Russia and former CSI countries.

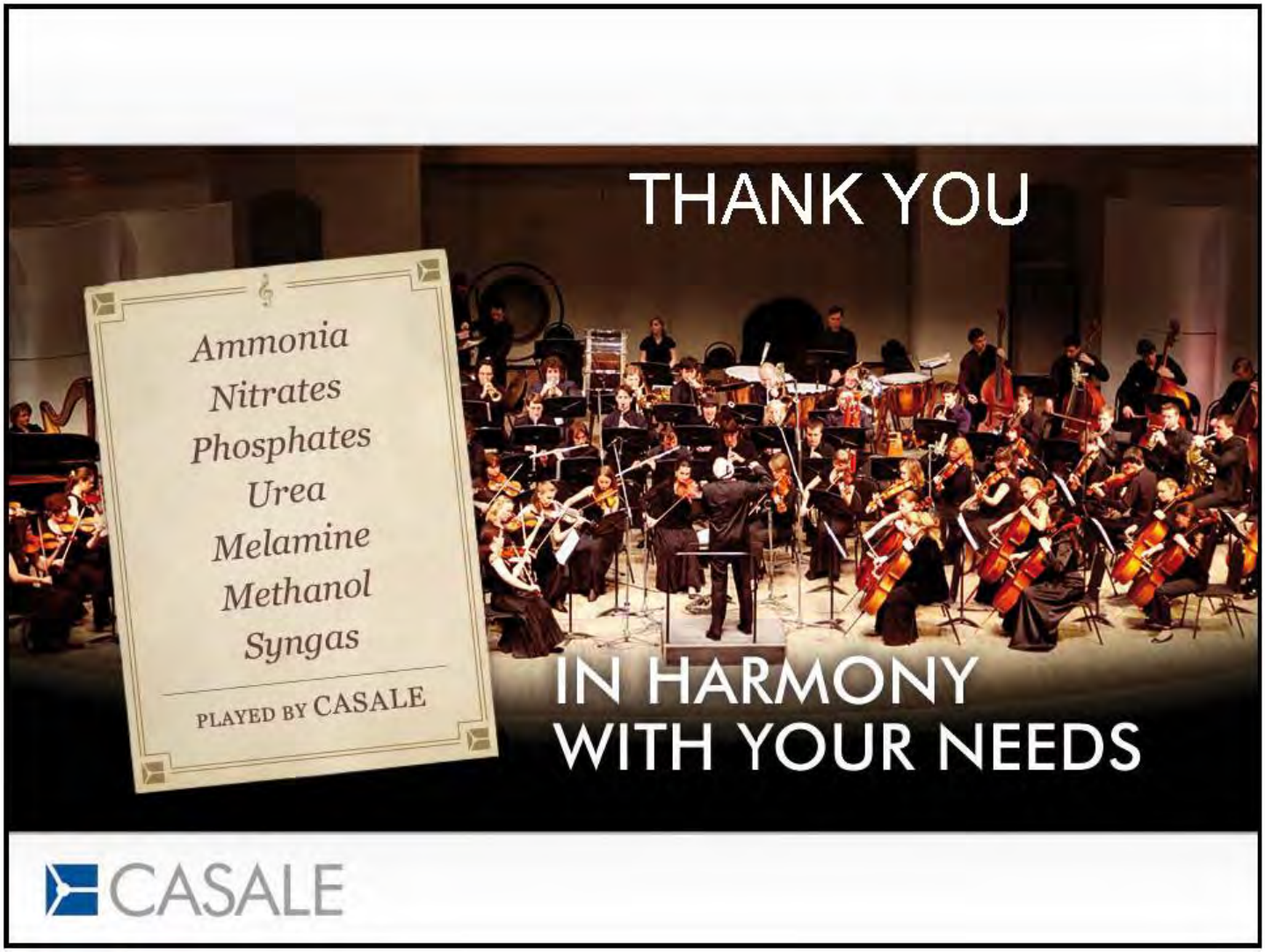
CASALE

CONCLUSION

This plant represent a benchmark for the revamping of old ammonia plant.

Revamping: a viable solution to improve profitability and reliability.

CASALE


THANK YOU
Ammonia
Nitrates
Phosphates
Urea
Melamine
Methanol
Syngas
PLAYED BY CASALE
IN HARMONY
WITH YOUR NEEDS
CASALE

Enhancement of Urea Production Efficiency Via the Improvement of Existing Automatic Control Systems

Kostikov Evgeniy, Senior software engineer of Advanced Process Control department
NIIK
Russia

NIIK, R&D INSTITUTE OF UREA (Russia): vast experience in fertilizer and chemical industry in Russia and overseas

NIIK's services:

1. Engineering and design
2. Technology and revamping concept development
3. Diagnostics and repairs
4. **DCS and process simulators development**
5. Equipment and material procurement

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Basic process functions of DCS

- Data collection, parameter analysis and process visualization
- Control function generation
- Process start-up
- Commissioning
- Maintaining optimum operation mode under the existing processing limits
- Normal and emergency shutdown of the production process
- Technical & Economic Report generation

Enhancement of Urea Production Efficiency via the Improvement of Existing Distributed Control System

Page 3

Disadvantages of existing DCS

- Lack of control and real-time monitoring of the process quality parameters.
- Lack of control loop parameter optimization.
- Modern DCS are normally used to perform only basic tasks related to the automatic production control, while the other powerful advantages of the automation equipment stay out of use.
- The algorithmic structures of modern DCS are not designed to solve the economic issues.

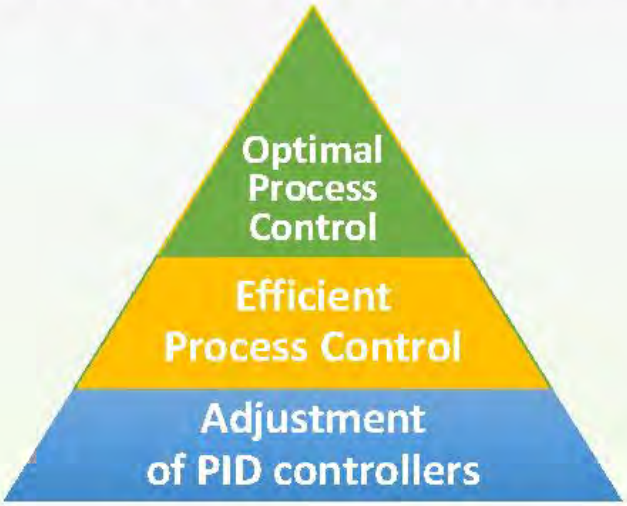
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Required functional capabilities to improve the performance of existing DCS

- Computer-assisted search of the optimal settings for the DCS controllers
- Automatic real-time monitoring of the advanced system parameters for the process quality supervision
- Automatic real-time control of the advanced system parameters
- Automatic criterion analysis of the process quality at various production stages and units of equipment.
- Automatic real-time monitoring of the control loops' settings
- Automatic Advanced Process Control
- Case analysis

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Main stages of the Advance Process Control implementation

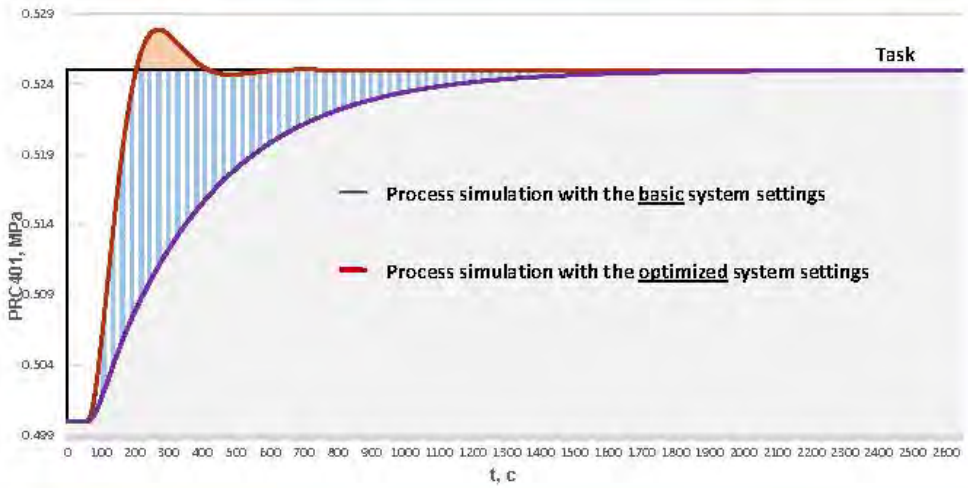


28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Tuning station by NIIK for adjustment of control loops and PID controllers

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Example of the parameter optimization efficiency

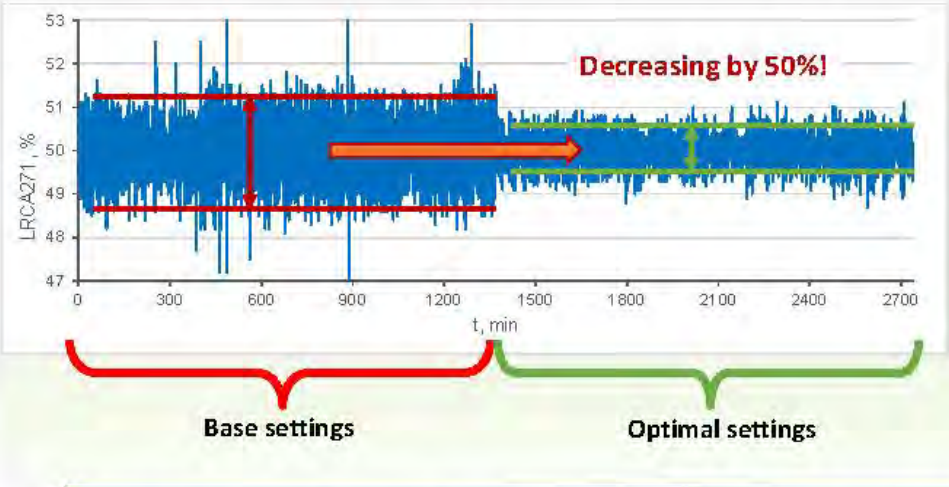


Enhancement of Urea Production Efficiency via the Improvement of Existing Distributed Control System

Page 10

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Due to the implementation of the Tuning station by NIIK the bandwidth of dynamic deviations was substantially reduced



Enhancement of Urea Production Efficiency via the Improvement of Existing Distributed Control System

Page 11

The implementation of the Tuning station by NIIK at JSC NAK AZOT (EuroChem)

- The implementation of the Tuning station by NIIK allowed the parameter optimization of 48 existing control loops at the JSC NAK AZOT Urea plant.
- Following the parameter optimization the independent experts confirmed the performance quality improvement for each control loop.
- Upon the parameter optimization of existing control loops the bandwidth of dynamic deviations is reduced at the average of 30-35% (confidence coefficient is 0,95).

The result achieved is the substantial improvement of the process performance and stability.

Efficient Process Control

- Equipping of the process with the required additional instruments.
- The algorithmic structures are designed with respect to the special characteristics of the object controlled (instability, hysteresis effect, long response time etc.).
- Algorithm design considering the transportation lag and disturbance effects at the input of the object controlled.
- The use of analytical expressions to predict the behavior of the object controlled.
- The performance criteria formulation and analysis of algorithms efficiency of the production process.
- The use of parameter optimization algorithms and mathematical models for the process improvement (active experiment, passive observation etc.)
- System analysis and process trouble signaling.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Optimal Process Control

- Optimal Process Control is based on the Efficient Process Control solutions
- Advanced Process Control system is designed to achieve the following goals:
  - maximum capacity
  - maximum optimization (max optimality criterion)
  - minimum energy requirement

Advanced Process Control effect

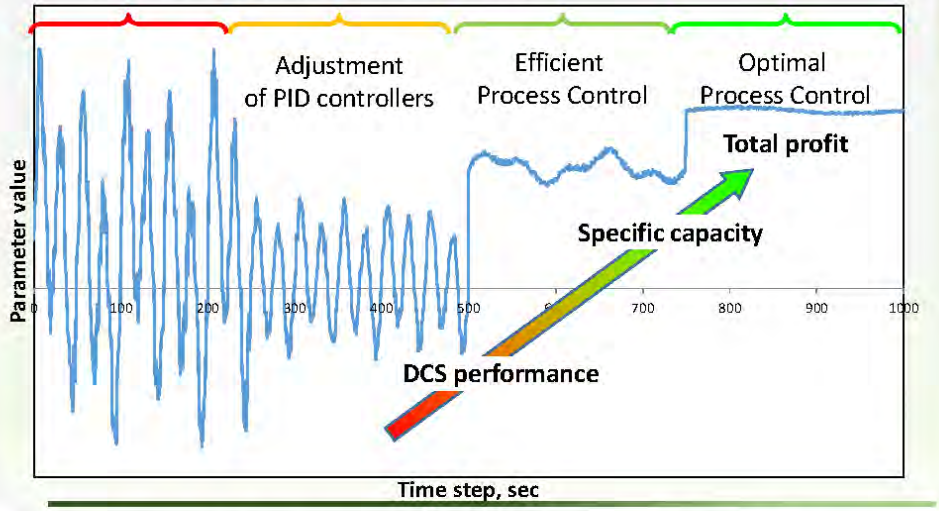
Enhancement of Urea Production Efficiency via the Improvement of Existing Distributed Control System

Page 14

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

DCS improvement results

Without APC (Advanced Process Control)



Enhancement of Urea Production Efficiency via the Improvement of Existing Distributed Control System

Page 15

Cost advantages

- Implementation time — 4 months min.
- Payback period — 1 year max.
- Cost savings — 1-2% (on a case-by-case basis)

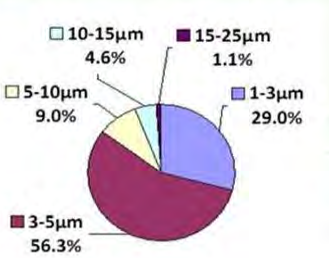
Thank you!

Removal of Black Powder & other Contaminants from Feed Gas to Fertilizer Plants

Emmanuelle BIADI
EMEA Fuels and chemicals downstream business development manager
Pall Corporation

Gas Feed – Black Powder

- Generic term for **corrosion products** (iron sulphide, iron oxide, iron hydroxide, etc.)
- Formation mainly due to **internal corrosion** with pipe steel
- Most chemical related: internal corrosion in the presence of water, acidic components (H_2S / CO_2), oxygen
- Very fine…**1-10 µm in size**



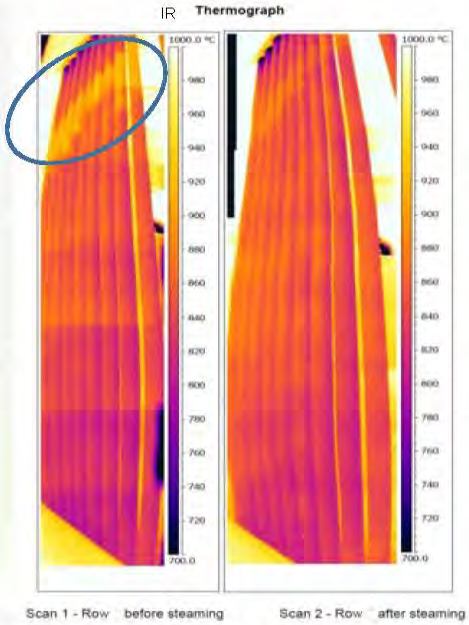
Typical Black Powder Particules Size Distribution In a Middle East Cracker Feed Gas

PALL

2

Typical Impacts of Black Powder in Ammonia plants

- **Fouling & Delta P increase** in catalyst reactors
- **coke formation acceleration** in catalyst pellets & reformer furnaces tubes, leading to :
  - **Pressure drop increase** and **hot spots** in parts of the tubes.
    - **unscheduled shutdown** for Catalyst steaming
    - Partial **replacement of furnace tubes** damaged by hot spots
- Valves **blockage**
- **Failure** of critical instrumentation



PALL

3

Filtration/Separation Technologies for gas feed purification

There are 3 identified product platforms

- **Depth or pleated "absolute" cartridge** filters to remove solid contaminants
- Systems of **cyclonic devices** in combination with cartridge filters
- **Liquid/gas coalescers** to remove liquid contaminants, such as water and condensated hydrocarbons

And different filters & separators designs

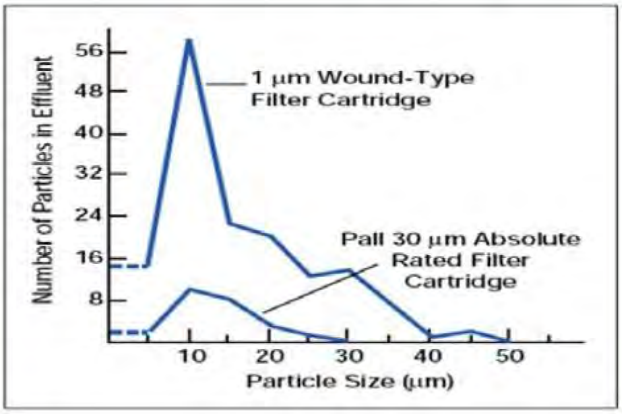
- Pipes internal filter - Simple Coalescer or filter - Complete Cyclonic separation skid

PALL

4

Nominal Versus Absolute Rated Filters

- **Nominal rating:** An **arbitrary** µm value, usually based on weight % removal
- **Absolute rating:** **tested** efficiency, according to industry standards

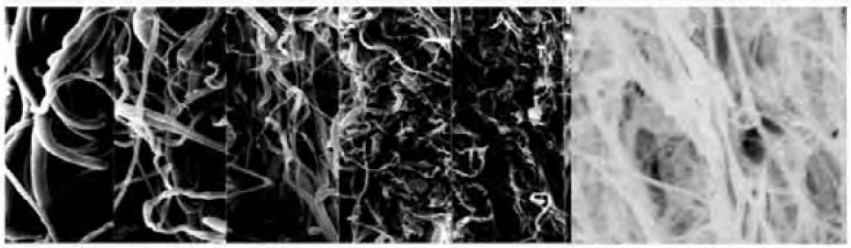


PALL

5

Profile ® Coreless Depth Filter Element

Flow



1. Continuously graded upstream section 2. Downstream section

Continuous graded pore depth filter media captures fine Black Powder particles

Used cartridges Showing Black Powder retention

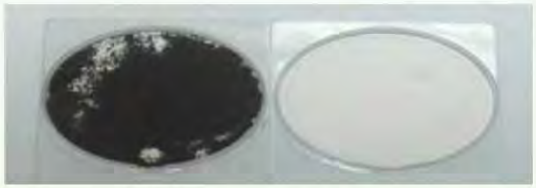
PALL

6

Black Powder removal on a Pall Absolute rated filter cartridge

- Online measurement recorded during Field Testing of newly installed filters :

Total Suspended Solids	Upstream Filter in ppmw	Downstream Filter in ppmw	Total Solids Removal Efficiency Measured
Filter	0.61	<0.01	97.5%



Upstream Profile ® Coreless filter

Downstream Profile ® Coreless filter

Profile ® Coreless filter media examination

Solids collected in the upstream depth zone.

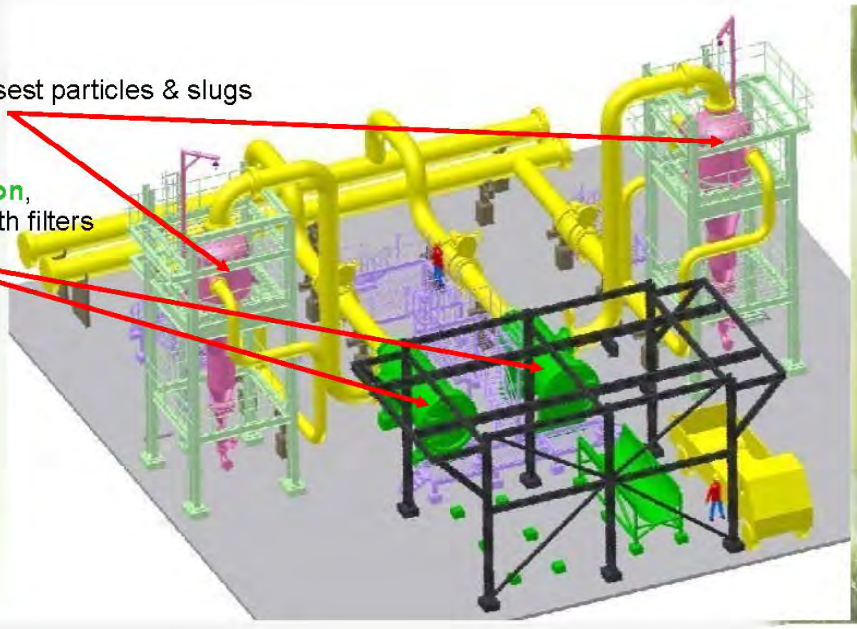
PALL

7

Cyclo-Filter for High Solids Content

1 **Cyclone Section**
Separates the coarsest particles & slugs

2 **Cartridge Filter Section**,
featuring Coreless depth filters



PALL

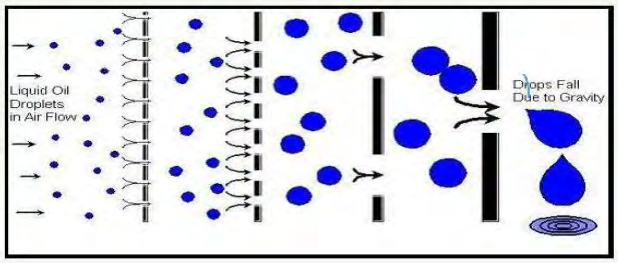
8

Coalescence

- **Coalescence** = Removal of a fine dispersed liquid phase from bulk Phase (either liquid or gas)
  - **Liquid/Gas** coalescers = Removal of liquid **AEROSOLS** from a gas
  - **Liquid/Liquid** coalescers = Removal of liquid **DROPLETS** from a liquid

- **Coalescence principle:** **MECHANICAL** separation based on the ability of the coalescer media to combine the droplets and to separate them

→ No chemicals required
→ No electricity
→ No centrifugal motion



PALL

9

High-Efficiency Liquid/gas Coalescers

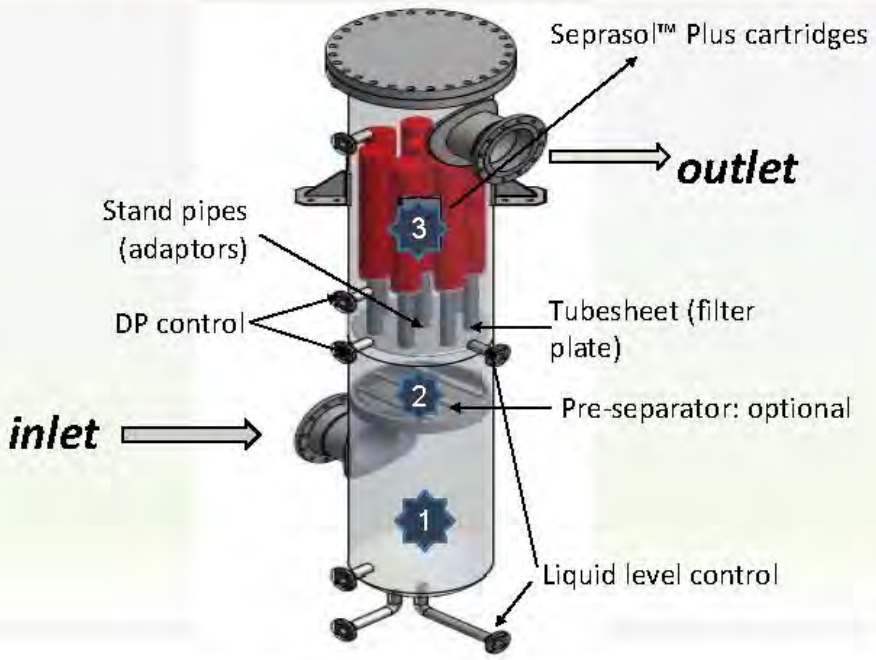
- Conventional separation devices are not fine enough

Separation Equipment	Drop Size Removal	Separation Mechanism	Sensitivity to Flow Rate Variations
Knock Out Drum	> 300 µm	Gravity	Medium
Cyclonic Separator	> 10 µm	Centrifugal	Medium
Vane Pack	> 10 µm	Inertial impaction	Sensitive
Demister Pad	> 5-10 µm	Inertial impaction	Sensitive
High- Efficiency Coalescer	> 0.1 µm	Diffusion & direct interception	low

PALL

10

Typical Layout of Pall Liquid/Gas Coalescers



PALL

Case Study 1 : Natural gas Feed to Middle East Ammonia plant solids & liquids removal

Plant data

- 500 Ktpa ammonia plant
- Flow Rate of Natural Gas:
  4 744 AM^3/h @ 40 Kg/cm^2 & 50°C

Issues

- **Delta P** increase **in the HDS reactor & reformer**
- Failures on compressors

Presence in the feed gas of : - High level of **Black Powder** ,
- Glycol

Consequences

- Unscheduled 3 to 5 days shutdown per event
- Production **losses estimated to 2.6 to 4.4 M$ per shutdown**
- Reformer tubes partial replacement estimation: **150 K$ /shutdown** (5%)

PALL

Case Study 1 : Natural gas Feed to Middle East Ammonia plant *solids & liquids removal*

Solution

- **Installation in 2007 of :**
  - 2 * 30 **Profile ® Coreless cartridges 1µm in gas** absolute rated depth cartridge filters

  - 2 * 12 **Seprasol ™ Plus liquid/gas Coalescer** cartridges

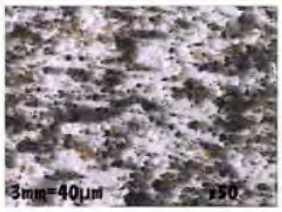
- Recently, feedstock quality has been further improved by treating the feed gas at the inlet of the whole chemical complex with Pall **Cyclo-Filters**.

PALL

case study 1 - Qualitative & quantitative results

- **1µm absolute in gas ,protection** of the reformer against solids

Used cartridge cut with solids upastream retention



- **Excellent protection as well against liquids** with some limitations when the volume of liquid slugs exceeds the liquid handling design capacity of the coalescer
- Full installation of filters & coalescers was paid back by eliminating shutdowns due to feed contamination.
- Cartridges change out frequency 6 - 9 months

PALL

14

Case Study 2 – Natural gas Feed to a Middle east Ammonia plant. *Solids removal*

Plant data

- 540 000 T/y plant
- 3 672 Am3/h of Natural Gas feed

Issues

- **Blockage** of the main plant natural gas (NG) **valve.**
- NG control valve of the metering skid was blocked by black powder .

Consequences

- Unscheduled 2 days **shutdown** per event
- Estimated **production Losses** of 2 400 T or +/- **1.5 M$** per shutdown

PALL

15

Case Study 2 – Natural gas Feed to a Middle east Ammonia plant. Solids removal

Solution

- Installation of a 2 * 9 Profile ® Coreless cartridges filter skid.
- Efficiency of 0.3µm absolute in gas

Results

- **No more Unscheduled shutdowns** due to black powder and main plant natural gas valve blockage.
- Cartridges change out frequency 6 - 9 months
- Total expenditure , including installation cost, was approx. **0.5 M$** and resulted in more than **1.5 M$ of savings** .

PALL

16

Major Conclusions

- In these 2 case studies, main challenges were :
  - **Limitation of delta P increase and coke formation** in HDS and reformer due to gas feed contaminants.
  - **protection of critical equipments** such as valves & compressors
- In the 2 cases studies the key contaminant in the feed gas was **black powder**
- Installation of high efficiency filters and coalescers resulted in:
  - **Elimination of shutdown time** due to gas feed contamination.
  - **Excellent return of investment** due to increased Ammonia production
- More than **30 references** in Black Powder removal installations in Middle east in overall Fuels and Chemical markets.

PALL

17

Thank you for your attention

Emmanuelle BIADI
Pall France SAS
+33 6 08 90 02 80
emmanuelle_biadi@europe.pall.com
www.pall.com

Successful Turnaround Planning and Execution by New TA Procedures, Standardization of TA Packages and Best Practices

V. Mohammed Zia
Saudi Arabian Fertilizer Company

Introduction

Turnarounds are scheduled cyclic events wherein an entire process unit is taken off stream for an extended period for revamp and/or renewal including Inspection & Testing, debottlenecking projects, revamps and catalyst regeneration projects.

They are expensive - both in terms of lost production and in terms of direct costs for labor, tools, heavy equipment and materials used to execute the project.

The main objective of the Turnarounds is to safely complete all the turnaround jobs within the approved duration and approved budget.

In order to achieve all of this, effective Turnaround planning, better TA procedures, progress monitoring software's, audits, etc. are needed and to be complied.

Challenges

- Delays in review and finalizing the TA scope of work
- Preparation of TA Job Packages
- Delays in getting the approved packages for MOC's
- Scheduling of Turnaround activities
- Procurement of spares
- Overrun of TA budget due to Add-on jobs after the cut-off date
- Securing of lump sum contractors
- Selection of manpower and global contractors
- Overrun of the budget due to additional jobs during the turnaround execution
- Extension of turnaround duration
- Turnaround rolling plan
- Turnaround execution and quality control

Turnaround Objective

- ACHIEVE EHSS KPI'S
- ACHIEVE TURNAROUND KPI'S & MILESTONES
- ENSURE QUALITY WORK FOR ALL PHASES OF TURNAORUND
- SAFE & FLAWLESS START-UP, ZERO LEAKS AND RELIABLE RUN
- CONTINUE SAFE AND SUSTAINED OPERATION UNTIL THE NEXT TA

SUCCESSFUL TURNAROUND PLANNING WITH NEW PROCEDURES AND STANDARDIZATION

Page3

Approach

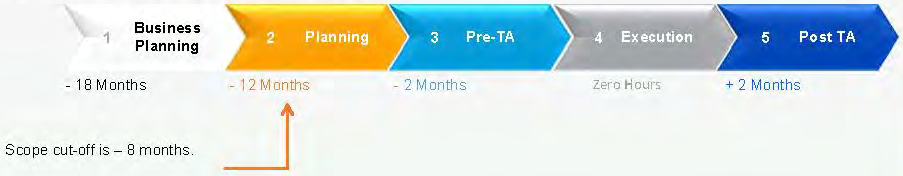
- Turnaround management process was modified by adding 2 more phases
- Standardization of Turnaround packages
- New MOC cycle introduced to match TA frequency
- Primavera software introduced
- Introduced follow up mechanism to expedite material delivery and services
- Developed new Procedure to control Add on jobs after scope freezing and during execution
- Developed 10 year rolling plan
- Specific Qulaity control plan developed for the turnaround

SUCCESSFUL TURNAROUND PLANNING WITH NEW PROCEDURES AND STANDARDIZATION

Page4

Change on Timeline

Previous working process time line



Scope cut-off is – 8 months.

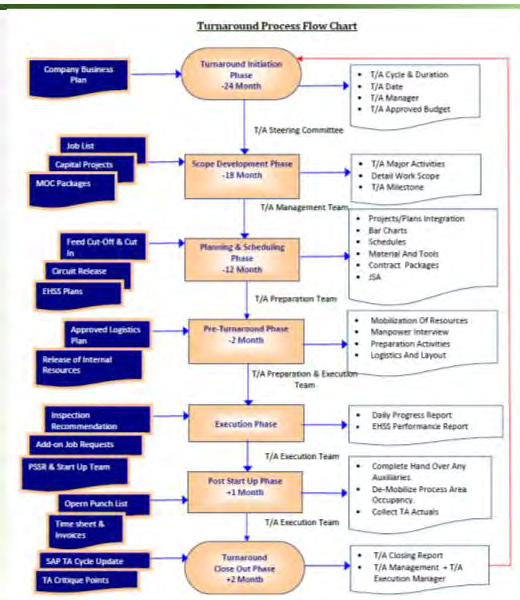
PRESENT WORKING PROCESS TIME LINE

Scope cut-off is – 12 months.

SUCCESSFUL TURNAROUND PLANNING WITH NEW PROCEDURES AND STANDARDIZATION

Page5

Process map



SUCCESSFUL TURNAROUND PLANNING WITH NEW PROCEDURES AND STANDARDIZATION

Page6

Turnaround packages standardization

- Maximize the reliability, safety and quality of the job being planned
- Eliminate the repetitive work by the Planning Engineers up to extent
- Reduce in time for planning.
- Have a common, centralized database for Turnaround jobs

JOB PACKAGE CONTENT	STANDARDIZED FORMATS
Job List	Job Scope
Job Scope	Job List
Material Plan	Material Plan
Blind diagram	Service PR Master List
Bar Charts	Master Plan
JSA	Process Circuit Availability
Technical Documents (Drawings, data sheets)	Bid Document - Master
Inspection Requirements	Bid Document - Manpower supply
Process Requirements	Bid Document - OEM Specialist
Special Tools List	PRIMEVERA Schedule Package
Inter-changeability List for Rotary	Spare parts Inter-changeability List

New MOC cycle introduced

Introducing new software

Primavera latest version introduced for scheduling and TA execution progress monitoring

Primavera software was introduced in order to efficiently schedule, track, monitor the progress and generate the tailor made progress reports as needed.

Expediting Material delivery and services

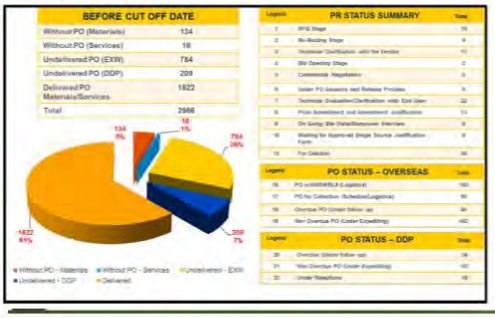
Procurement and logistic are a vital factor and a major challenge for planning and execution of large turnarounds due to delay in delivery, customs clearance, shipping etc.

Securing the best contractors to execute the turnaround was very challenging

Both above issues were overcome by Enhancing personnel follow up mechanism (Working & Management Level) with GPS.

PO's issued well before the Turnaround execution and at optimum prices.

FOLLOW UP MECHANISM WITH GPS



BEFORE CUT OFF DATE	
Without PO (Materials)	134
Without PO (Services)	16
Undelivered PO (EXW)	784
Undelivered PO (DDP)	209
Delivered PO Materials/Services	1822
Total	2966

Legend	PR STATUS SUMMARY	Total
1	RFQ Stage	19
2	Re-Bidding Stage	4
3	Technical Clarification with the Vendor	10
4	Bid Opening Stage	2
5	Commercial Negotiation	3
6	Under PO Issuance and Release Process	5
7	Technical Evaluation/Clarification with End User	22
8	Price Assessment and Government Justification	11
9	On Going Site Visits/Manpower Interview	3
10	Waiting for Approved Single Source Justification Form	9
13	For Collection	34

Legend	PO STATUS – OVERSEAS	Total
16	PO Undeliverable (Logistics)	163
17	PO for Collection (Schedule/Logistics)	60
18	Overdue PO (Under Follow up)	34
19	Non Overdue PO (Under Expediting)	462

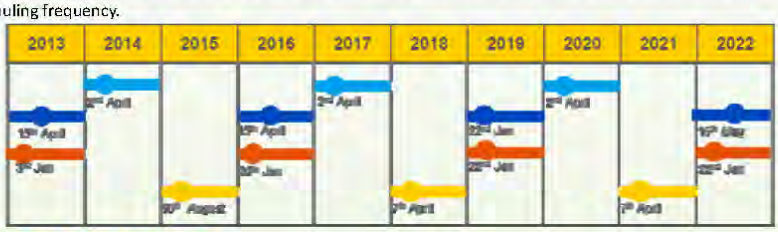
Legend	PO STATUS – DDP	Total
20	Overdue (Under Follow up)	19
21	Non Overdue PO (Under Expediting)	167
22	Under Transitions	18

Revised TA Procedures

Sl.#	Procedure	Changes in revised procedure
1	LEFT OUT JOBS & FOLLOW-UP ACTION PLAN	Existing Procedure revised to assign the responsibility to Operation for following up Next TA long gestation jobs during the period -33 Months to -24 Months of TA cycle.
2	DEVELOPING JOB LIST PROCESS	Inspection and test plans to be provided by Inspection department in the TA initiation period.
3	HANDLING ADD-ON JOBS	TA Execution ADDON form revised to take SMT approval if the requirement can not be accommodated within approved TA window.
4	TA MAINTENANCE ACTIVITY SCHEDULING	Inclusion of SMP procedures and check list in TA Handover package
5	TRACKING OF TA EXECUTION ACTIVITIES	Quality audit check for the compliance of SMP & approved ITP's
6	TA FINDINGS REPORTING & TRACKING	Finding Cell team is included in TA organization chart. Roles and responsibilities of Finding cell team has been defined.
7	TA PROGRESS REPORT	Close out report to be published with Cell team inputs within 1 Month after TA Final close out report with OEM reports to be published within 3 Months after TA. Audit as per revised milestone plan shall be conducted by MCE/Affiliates

Turnaround 10 year rolling plan

- Plan developed considering recommendations from Inspection, Process, Rotary and Operations.
- It is aimed to maximize the reliability, safety and quality of the job.
- To optimize turnaround activities and help in streamlining various turnaround functions.
- Improve Asset Availability by executing the recommendations made by RBI, Latest up gradation, technology improvements.
- Optimize Turnaround process, Turnaround Cost, workload, plant outage duration and time for each turnaround.
- Manage the equipment replacement schedules for each plant turnaround.
- Increase the reliability of the plants.
- Apply periodic overhauling for rotary and other equipment's covered under preventive maintenance and overhauling frequency.



SAFCO 10 YEARS FORECAST MODEL

Indicates in which quarter — BB Plant — SF2 Plant — SF3 Plant — SF4Plant

Quality Management Plan

- Responsibilities – ensuring quality work for all phases of execution
- Quality target – safe & flawless start-up, zero leaks and reliable run length
- Control procedures – external and internal activities
- Material traceability – records
- Marking and labeling – items dismantled and sent to workshop
- Control of critical activities – e.g. flanged joints, pressure tests etc.
- Test – pressure and radiography including hold points
- Audits – non conformance reports and rectification

TA QUALITY ASSURANCE PLAN

Purpose

Turn Around Quality Assurance Plan is to control and practice the standard check list formats from Standard maintenance procedures* to ensure that for each maintenance activity required quality checks are maintained, recorded and accepted by all team members.

Covering

- ✓Stationary Equipment's
- ✓Rotary Equipment's
- ✓Electrical Equipment's
- ✓Instrument Equipment's
- ✓Conveyors
- ✓Pipeline and flanges
- ✓Valves etc.

Turnaround Readiness assessment

The purpose of this Readiness Assessment is to assess the Turnaround preliminary planning activities and work-list basis.

It focuses on the various Turnaround activities that is to be progressed further for detailed planning and scheduling.

Furthermore, the Readiness Assessment confirms the early planning activities and deliverables were timely met, in readiness for detailed planning and scheduling phase.

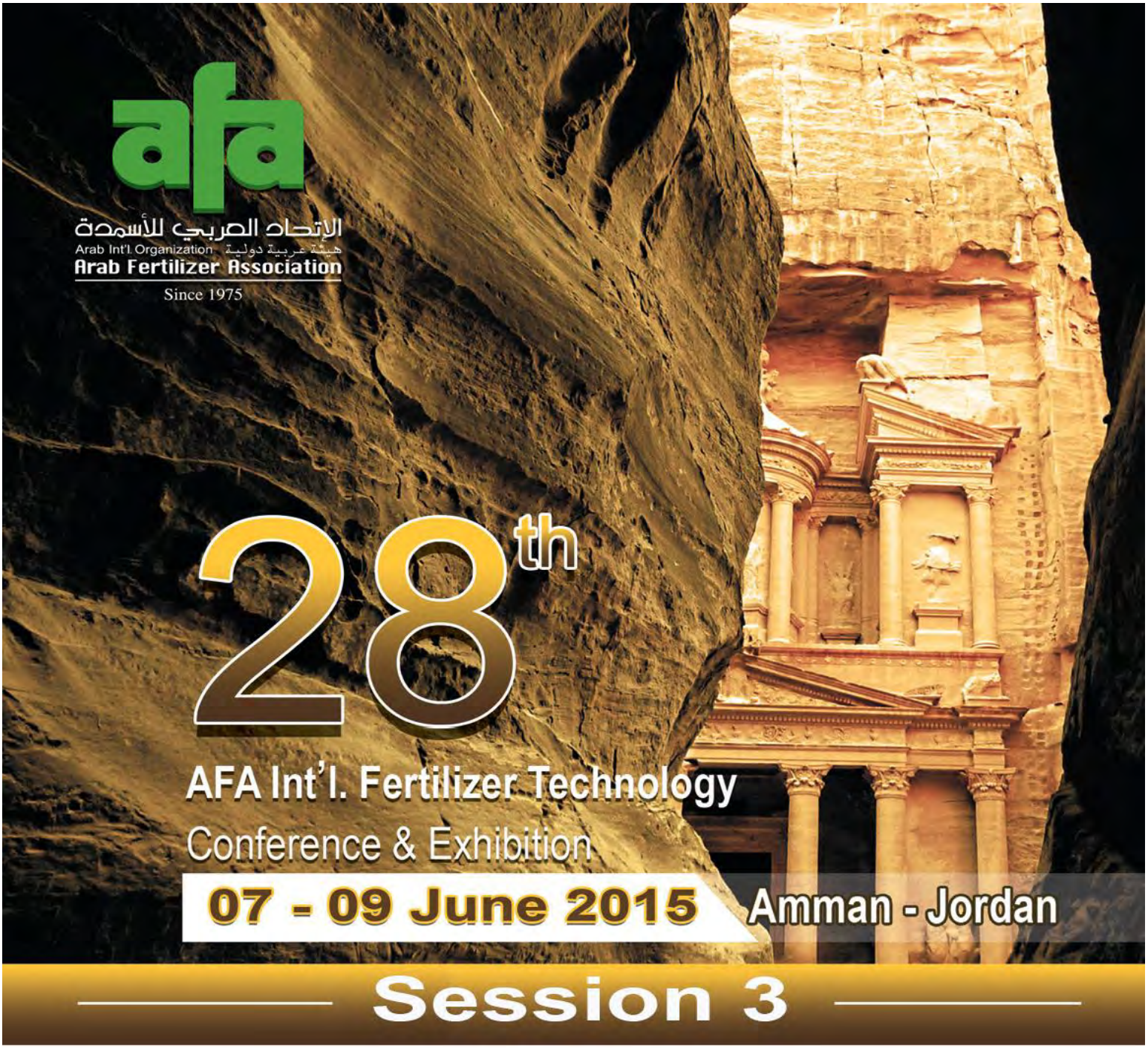
Results

- ✓ Safe and successful completion of Turnarounds.
- ✓ Primavera effectively used
- ✓ Effective and continuous monitoring of Turnaround budget.
- ✓ Proper tracking of materials and service contracts.
- ✓ TA TARA#3 audit conducted by SABIC AMS
- ✓ All Turnaround KPI's like duration and budget were achieved.
- ✓ Leak free start up
- ✓ Increase in the plant production capacities
- ✓ Effective planning and scheduling

Conclusion

With effective planning, best turnaround management procedures and practices , proper scheduling and continuous progress monitoring during all the phases turnarounds, can be successfully completed within the scheduled target dates and within the approved budget at highest quality norms.

Thank you



ARAB FERTILIZER IMPRESSING FUTURE SUSTAINABILITY

شركة البوتاس العربية المساهمة العامة
Arab Potash Company PLC

NJFC

KEMAPCO
Arab Fertilizers and Chemicals Industries Ltd.

Turnaround – Planning and Controls

Jasim Haji
Gulf Petrochemical Industries
Bahrain

Introduction

- Established in December 1979.
- Joint-Venture between NOGA, SABIC & PIC.
- Utilizes Natural Gas as raw material.
- Produce: Ammonia, Methanol and Urea.
- Started production in 1985 & 1998.
- Production Capacity : 1.5 million T/A
- Manpower : 572 Employees.
- 95% are Bahrainis.

2

Introduction

"Your Family Is Expecting you Back..Work Safely"

- Turnaround at GPIC is mainly carried out with an interval of 24 to 30 months.
- Tentatively the next planned Turnaround is to be carried out after 28 months
- Turnaround Objectives:

" Safely, With High Quality, on Time and Within Approved Budget".

3

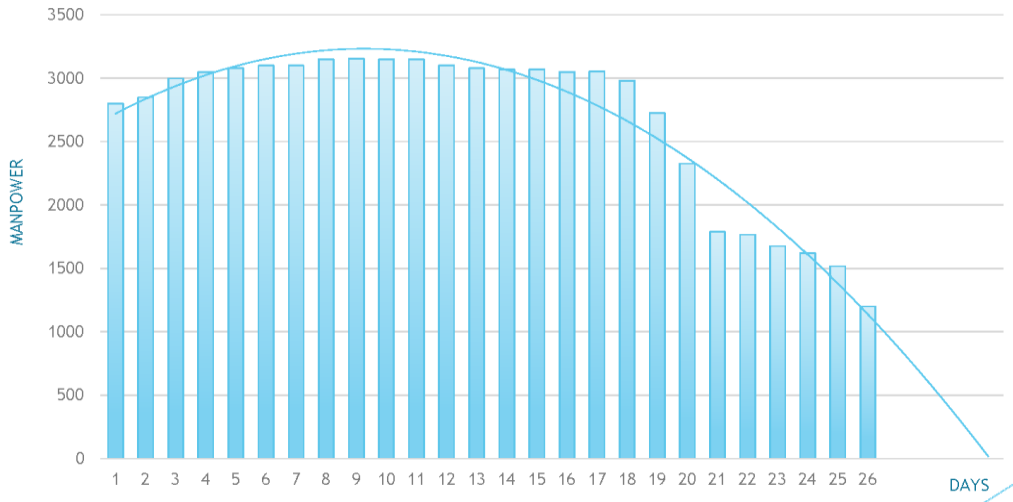
Turnaround 2015

- **3,000+** Jobs were planned & executed during the Turnaround.
- There were **3,100** Contractor personnel available at site during the peak daytime shift of the Turnaround.
- There were **530** Contractor personnel available on site during the peak night shift of the Turnaround.
- The 2015 GPIC turnaround was planned for **24** Days.

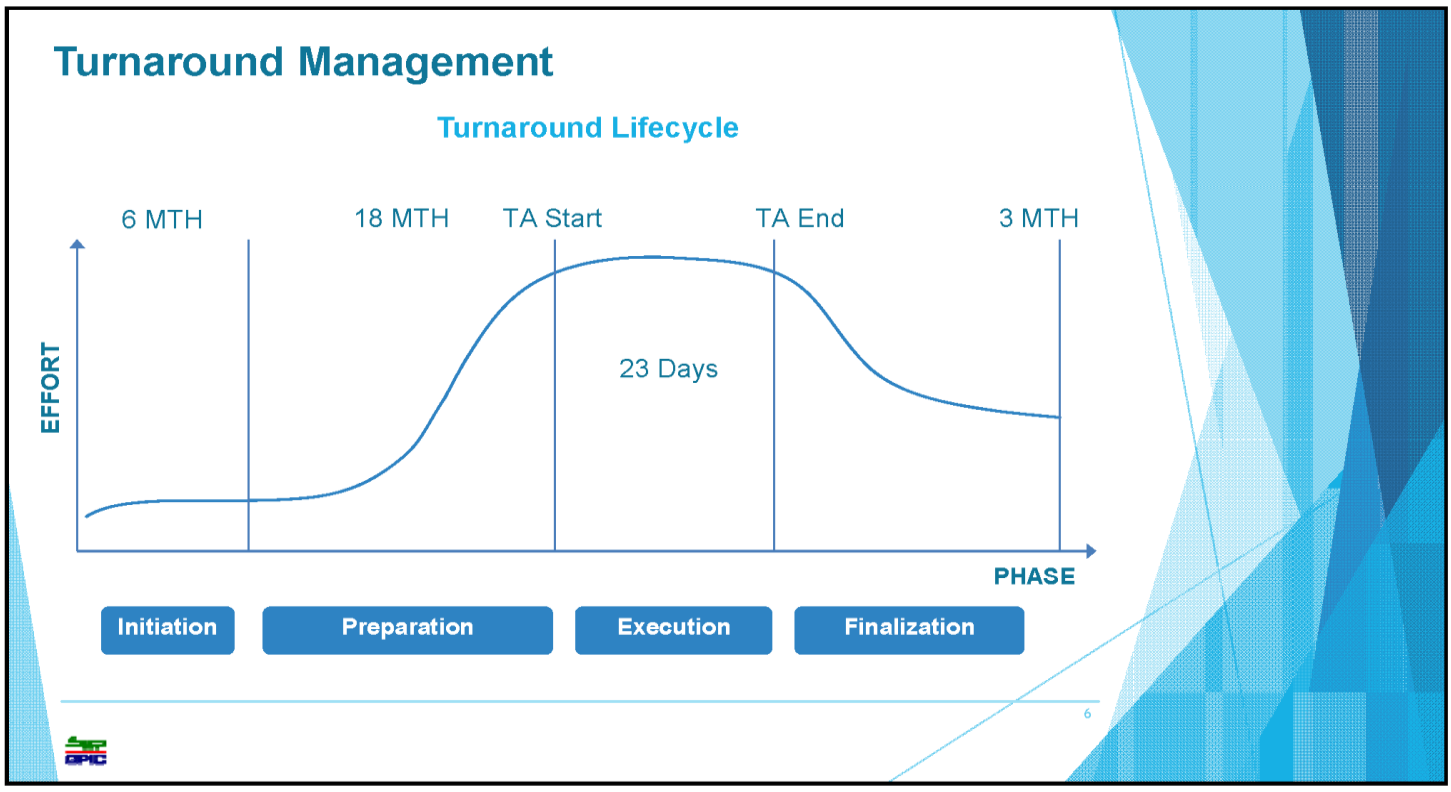
4

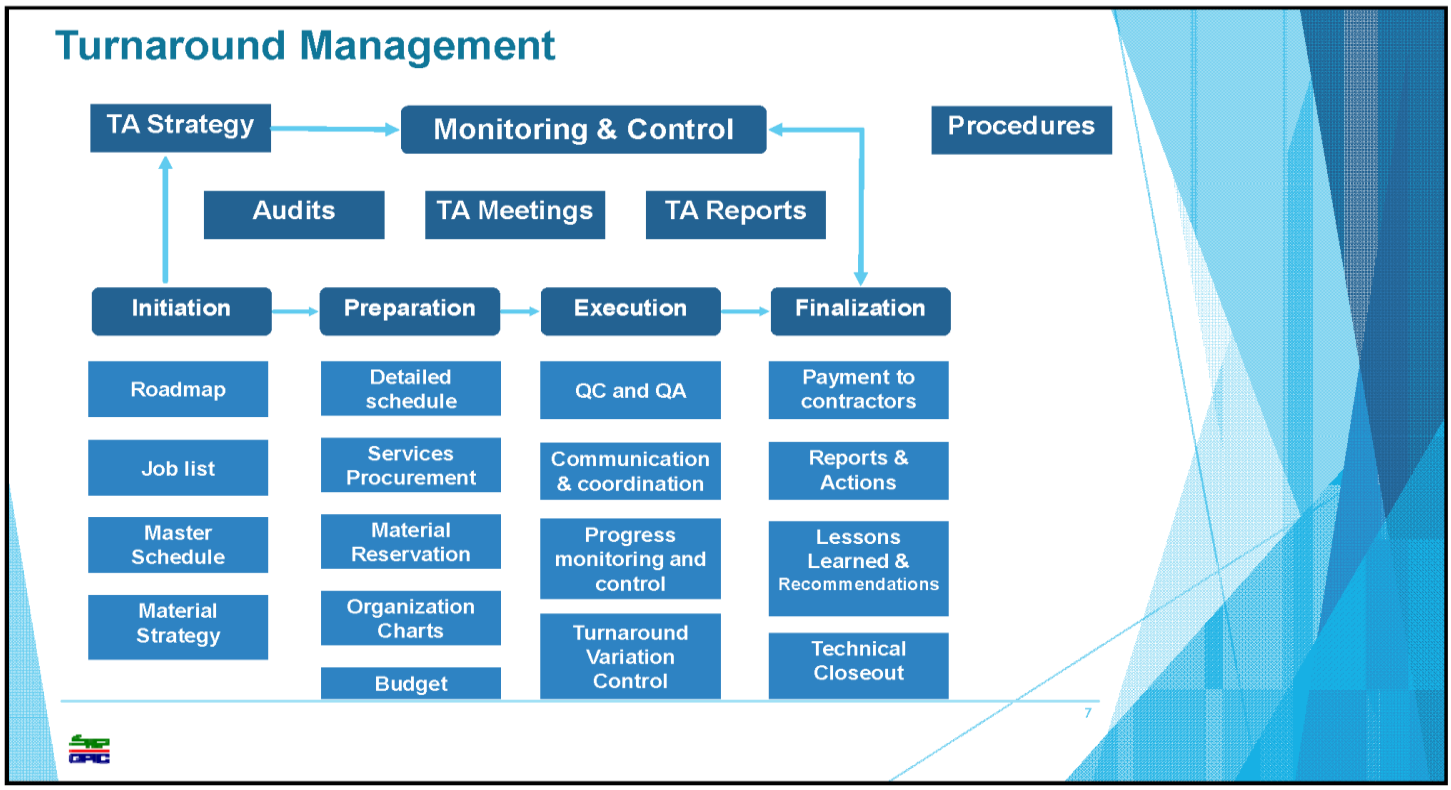
Turnaround 2015

Number of Contractor Personnel in the Complex

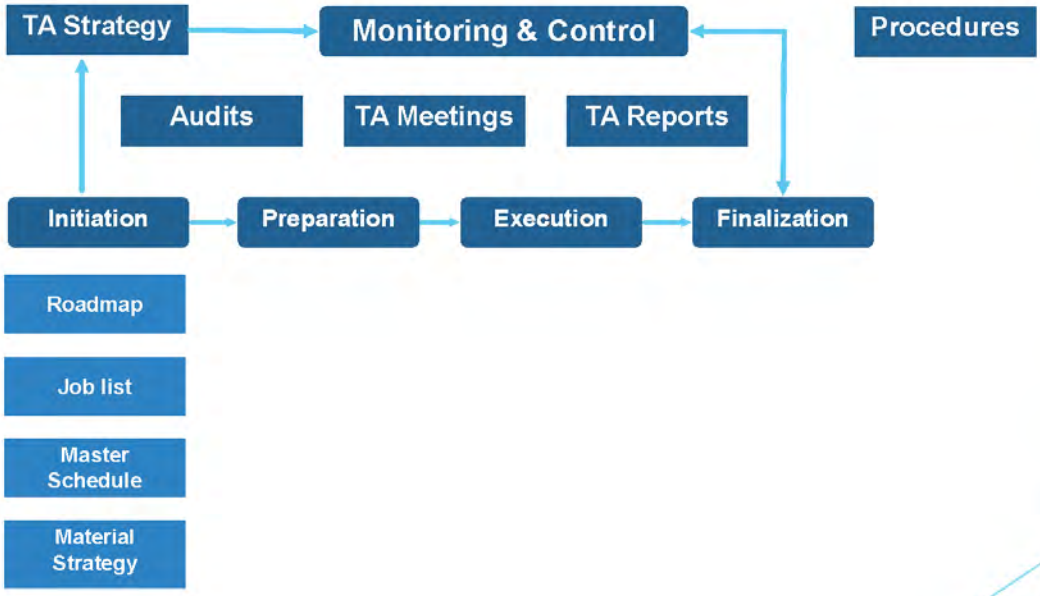


5


Turnaround Management
Turnaround Lifecycle
6 MTH
18 MTH
TA Start
TA End
3 MTH
EFFORT
23 Days
PHASE
Initiation
Preparation
Execution
Finalization
6


Turnaround Management
TA Strategy
Monitoring & Control
Procedures
Audits
TA Meetings
TA Reports
Initiation
Preparation
Execution
Finalization
Roadmap
Job list
Master Schedule
Material Strategy
Detailed schedule
Services Procurement
Material Reservation
Organization Charts
Budget
QC and QA
Communication & coordination
Progress monitoring and control
Turnaround Variation Control
Payment to contractors
Reports & Actions
Lessons Learned & Recommendations
Technical Closeout
7

Initiation



8

Turnaround Planning Roadmap – Initiation

- The Turnaround Roadmap is developed; three (3) months after the completion of previous Turnaround.
- Turnaround Implementation Plan: shows overall Turnaround preparation & Planning programs; in detail, with identified Targets.
- Both the programmes are being updated, periodically against the actual progress status.
- Turnaround Internal Audits, as per Roadmap.

9

Turnaround Workload (Job List) – Initiation

Basis for defining the Workload are :

- Rolling 10 Years Turnaround Plan
- Major Rotary Equipment overhauling Schedules.
- Statutory as well as GPIC Inspection Schedules.
- Preventive/ corrective Maintenance requirements.
- Approved Modifications / Capital Projects.
- Backlog from previous turnarounds

Equivalent to Approximately 90-95% of Our Workload

10

Turnaround Rolling Plan

Scope	2015 Equipment No.	2015 Job Description	Duration (Days)	2017 Equipment No.	2017 Job Description	Duration (Days)	2019 Equipment No.	2019 Job Description	Duration (Days)
Inspection	EB-0302-S	Replacement of Combustion Air Preheater	12	E-0903	Replacement of Steam Condenser		P-0510	Replacement to SS	
	B-0301	Replacement of Inlet pigtails and sub header.	19	B-0301	Stage wise Replacement of Pigtail & Support System		E-1002	Replacement of Wash Water Cooler	
				E-0601	Tube Bundle Replacement		E-0602B	Replacement of Ammonia Condenser	
Main Machines	K-0201	Overhaul of Process Air Compressor LP & HP Casing + IGV Changing	12	K-0701	Syn.Gas Compressor 1st 3rd & 4th Barrels Overhaul		K-0201	Overhaul of HP Compressor & Gear Box	
	K-0701	Overhaul of 1st, 2nd & 4th Barrels	12	K-0901	Overhaul of HP & LP Compressors		K-0701	O/H Syn Gas Compressor 1st, 2nd & 4th Barrels	
	MT-0901	Overhaul of Ammonia Compressor Turbine.	12	P-0501B	Overhaul of HP, LP Pump & Gear Box		MT-0701	Overhaul of Syn. Gas Compressor HP Turbine	
	P-0501A	Overhaul of HP & LP Pump, Gear Box & MT-0501	19	K-0101	Bearings and seal inspection		P-0501A	Overhaul of HP, LP Pump, Gear Box & MT-0501	
	MT-0201	Overhaul of Process Air Compressor Turbine	12				K-0101	Bearings and seal inspection	
Catalyst	R-0101	Catalyst Skimming	6	R-0101	Catalyst Skimming		R-0101	Skim Catalyst	
	R-0301	Catalyst Replacement of Secondary Reformer (PJ/C-05/2014)	6	R-0401	Catalyst Skimming of HT Converter		R-0301	Catalyst skimming of Secondary Reformer	
	R-0401	Catalyst Replacement of HT Converter (PJ/C-01/2014)	6	R-0402	Catalyst Skimming of LT Converter		R-0401	Catalyst skimming of HT Converter	
	R-0402	LT Catalyst replacement.	6	B-0301	Catalyst Replacement.		R-0601	Catalyst replacement of Methanator	
Capital Projects	B-0301	Replacement Primary Reformer Ceramic Fibre Blanket (Radiant Sec.)	16	B-0301	Replacement of Reformer Collecting Exit Headers		LCR HIMA	Up gradation of LCR HIMA System and Cables	
	Critical Control Valves	Replacement of Critical Control Valves - HV-05002 PV-07901 PV-03016 PV-03005 MV-07001/2/3 (PJ/R-05/2014)	6	B-0301	Replacement Primary Reformer Ceramic Fibre Blanket (Radiant Sec.) & Module Lining (Roof + Transition Section)		E-0202	Condenser Replacement	
	Field Instr.	Upgrade of Field Instruments (PJ/R-06/2014)	12	DCS	DCS replacement / upgrade		U-0701, U-0901	Replacement of Vacuum System	
	Motor Cable	Replacement of all 11 KV & 3.3 KV Motor Cables	12	E-0804	Replacement of Exchanger		PV 03001/2	Replacement	
	PV-07007A	Replacement of Let Down Bomafa Valve (PJ/R-10/2014)	10	E-0901	Replacement of Inert Gas Cooler		LV-05007A/B	Replacement	
	Steam Drum/ Deaerator	Replacement/Modify PSVs	12	E-1004	Replacement of Ammonia Condenser		PV-03020A/B	Replacement	
	P-0504 & P-0503 A/B	Benfield solution side stream filtration	6	P-0702D	Replacement of Separator		PV 02020	Replacement	
Plant Outage (Days)		Maintenance	19		Maintenance			Maintenance	
		Production	24		Production			Production	

Issue No.: 6 July 2014

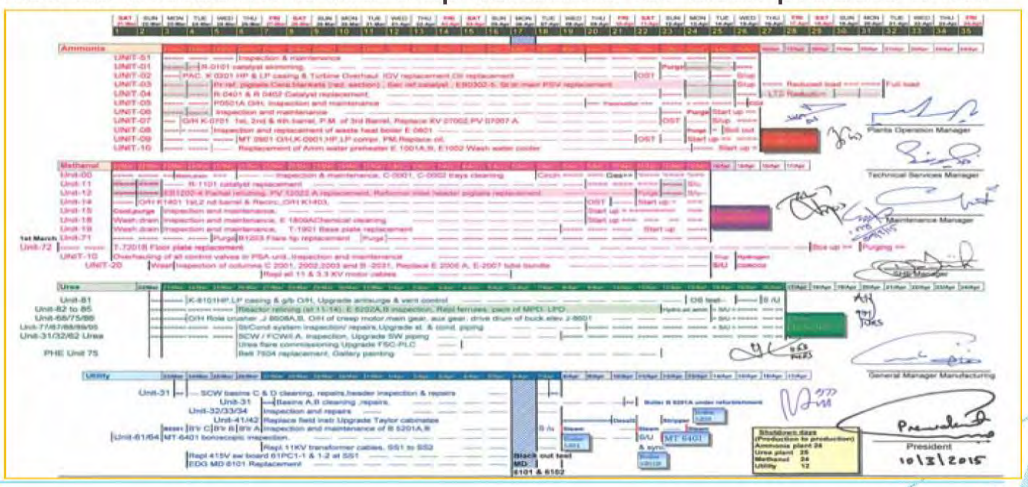
Scope	2021 Equipment No.	2021 Job Description	Duration (Days)	2023 Equipment No.	2023 Job Description	Duration (Days)	2025 Equipment No.	2025 Job Description	Duration (Days)
Inspection	B-1201	Replacement of Methanol Reformer Tubes		E-1404	Replacement		E-1801 A/B	Replacement of crude methanol preheater	
	T-7101A	Inspection		E-1808	Inspection/Retubing of Reboiler		EU-6301-2/2A	Replacementof oil Cooler	
				L.O. Coolers	Replacement of L.O Coolers. EMT 1201-1, EMT 1202-1,EMT 5151-1		U-6302	Replacement of Cold Box	
				T-0010	Inspection		EB-1202-S	Replacement of steam generator	
				T-1902	Tank Inspection		D-1001A-F	Internal inspection	
Main Machines	K-1401	Overhaul of Compressor 1st & 2nd Barrels & Recirculator		K-1401	Overhaul of Compressor 1st & 2nd Barrels & Recirculator		K-1401	Overhaul of Compressor 1st & 2nd Barrels & Recirculator	
	K-1403	Overhaul of CO2 Compressor		K-1403	Overhaul of CO2 Compressor				
Catalyst	R-1501	Catalyst replacement		R-1101	Catalyst Skimming		B-1201	Catalyst Replacement for Reformer	
	B-1201	Catalyst Replacement of Reformer							
	R-1101	Catalyst Skimming							
Capital Projects	E-1201	PG Cooler Replacement.		B-1201	Replacement of Burners & Module Lining of Radiant Section Roof				
				DCS System	Upgradation of DCS				
				E-1501	Replacement Waste Heat Boiler				
				E-1505A/B	Replacement of Water Condensers				
				EB-1202-1A	Replacement of HP Superheater				
				Vibration monitoring system	Upgrade Plant Wide Vibrating Monitoring system(Including TDIO				
Plant Outage (Days)		Maintenance			Maintenance			Maintenance	
		Production			Production			Production	

Issue No.: 6 July 2014

11

Turnaround Master Schedule – Initiation

The turnaround master schedule indicates the maintenance Span as well as Shutdown & Start-up Schedule for each process unit.



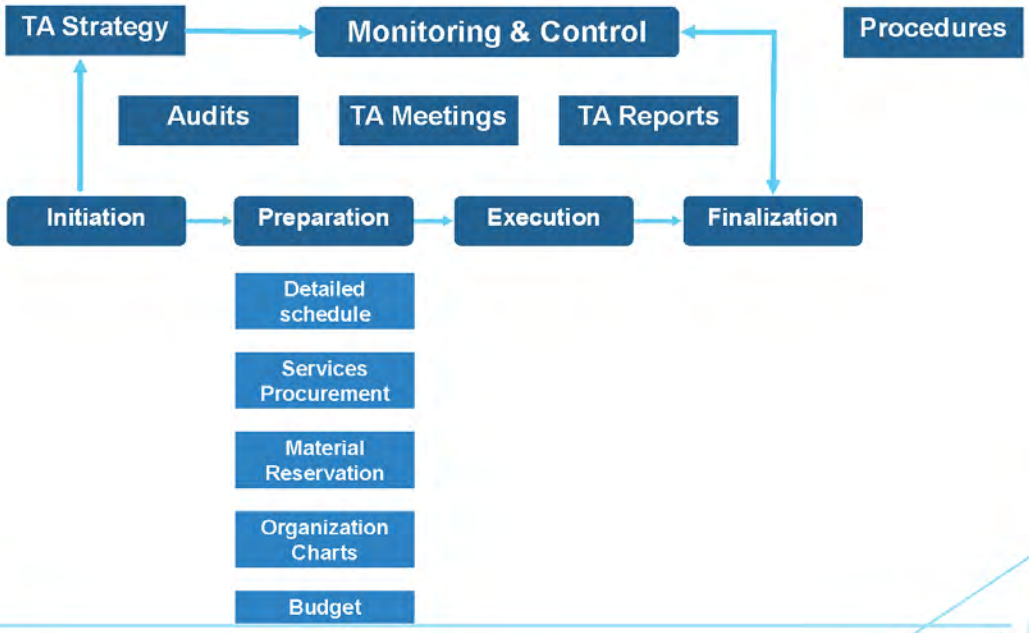
12

Turnaround Material Strategy – Initiation

Item	Class 'A'	Class 'B'
Criteria	Items most likely to be used during Turnaround	Contingency requirement, unanticipated need during the Turnaround
Action	Item is reserved and procurement action taken based on the levels	Items are blocked procurement action only in case required quantities are not available for blocking

13

TA Preparation



14

Turnaround Detailed Schedule - Preparation

- Turnaround Master Schedule
- Critical Path for each Plant
- Activity breakdown schedule for Critical & Major Maintenance Jobs.
- Bar Charts for each job/Equipment
- Schedules submitted by the contractors against Package Contractors or Lump sum Jobs
- Pre-shutdown activities

15

Turnaround Services Procurement - Preparation

- Identify the services requirements (GPIC Vs. Contractor).
- Develop various types of standard contract documents for :
  - Manpower - *Trade test.*
  - Rental Equipment - *physical verification*
  - Package Contracts - *Site Visits & Meetings*
  - Vendor Services - *CV reviews*
- Prepare, get verified (by all concerned) and issue the contract documents with purchase requisitions (SOW/SOS>PRs).
- Float Enquiries [RFQ] to the potential contractors; as listed in each PR attachment.

16

Turnaround Services Procurement - Preparation

- Technical Evaluation of quotations received; as a result of floating enquiries.
- Final Recommendations for the award of the contracts.
- Issuance of Purchase Orders.
- Kick-off Meetings.
- Trade Testing / Equipment Physical Verification.
- Resources Mobilization at site.

17

Turnaround Material Reservation – Preparation

Keeping our materials ready

- Material Reservations for the Long delivery items are done early so that these items are available in Time for Turnaround.
- For Critical Machinery Spares the minimum and the maximum levels are revised in consultation with concerned section. This ensures that one more spare set is available for any contingencies.
- Material Status list is issued, periodically and is updated based on the feedback received from the Stock control section.
- Turnaround Meeting are conducted, issues & concerns are discussed.
- Pre-inspection of critical spares by OEM.

18

Turnaround Organization - Preparation

- List of Turnaround Area Leaders
- Turnaround Organization Charts:
  - Department Level
  - Area Leader Level
  - Each Package Contract
  - Technician Level; including GPIC Seconded Manpower, Contractor Manpower, Equipment & Vendors.
- Temporary Assignment & Role for each Planning Personnel
- Seconded Manpower List

19

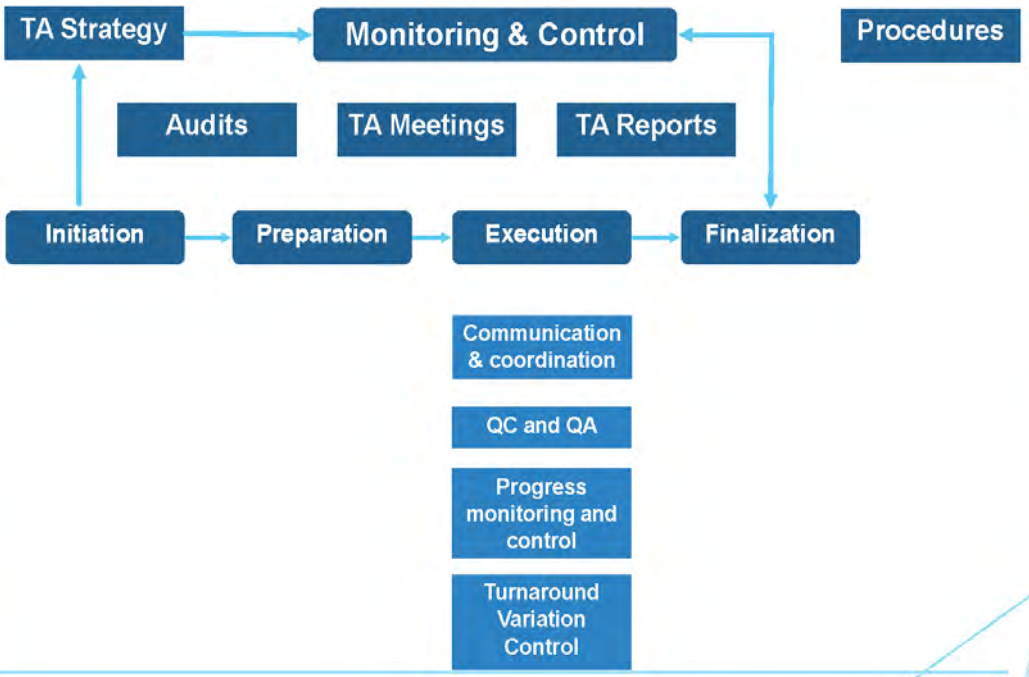
Turnaround Budget and Cost – Preparation

Budget Estimates - Basis:

- Estimated Cost for the proposed Packages, Vendor services, Foreseen Manpower & Equipment.
- Initial cost estimation for Major & Critical jobs.
- Historical cost for previous Turnaround tasks taking into account a conservative escalation factor
- PR/PO Routine values for Manpower, Equipment and Vendors.
- PR/PO values for Package Contracts.
- PR/PO values for Direct Use Material Procurement.
- Material (Stock Items & Consumables) reserved against various Orders.

20

Turnaround Management



21

Turnaround Communication and coordination – Execution

- Turnaround Briefing to GPIC Management as well as to Contractors.
- Turnaround related Memos issuance to various Internal as well as External parties SI-GEN-00-05.
- Assigning extra Supervisors to enhance coordination with contractors and maintenance.
- Turnaround Reports : Daily Progress Report, Executive Summary Report, Detailed Reports, Technical Reports by Vendors/ Contractors.
- Detailed Bar Charts (Schedules) distribution to concerned Area Leaders and Operations.
- Turnaround Rules and Guidelines.
- 72 Hours look-ahead schedule.
- SHE, Audit Reports and others (total 23 daily report).
- Daily Meetings (Management, Technical and SHE).

22

Turnaround Quality Assurance and Control – Execution

- Third (3rd) party Quality Controllers (specialized services) in various disciplines for Critical Equipment.
- Third (3rd) Party Inspectors for Scaffolding activities.
- Special Task Force for Repacking of Critical Valve Glands.
- Included all Critical Joints [Control Valves, PSVs, Flanges and Pumps] in the Critical Joints List.
- Various checklists for Quality control

23

Turnaround Progress Monitoring and Control – Execution

The following are the main techniques utilized for performance analysis

- Effective use of 72 Hours look-ahead schedule.
- Accurate updating of Actual Progress on daily basis (feedback by Area Leaders, Operations as well as by Planning Field coordinators).
- Daily Monitoring of available Budgets.
- Daily Monitoring of Resources Deployment.
- Control of Variation Orders.
- Highlighting anticipated deviations or slippage from the plan and taking corrective actions to rectify the situation.

The Forms being used for Turnaround Progress Monitoring are :

- Daily Progress Report
- The 72 Hours Look-ahead schedule.
- Management of variation Orders.
- Management of Additional jobs and activities (inspection findings).

24

Turnaround Variation Control – Execution

- Predefined Scope of Work; as agreed and specified in POs.
- Deviation from original scope of work/supply.
- Unforeseen activities/Jobs raised as a result of Inspection Findings


GPIC
Maintenance Planning

TURNAROUND, YEAR
Contractors Services
Variation Order

PROJECT / JOB REF.:
PURCHASE ORDER NO.:
SUPPLIER:

A. ADDITIONAL SCOPE OF WORK [By Planning Co-Ordinator]

B. JUSTIFICATION [By Area Leader]

Requesting Area Leader : Signature
Superintendent : Signature
GPIC Turnaround Coordinator Signature

C. NOTES [By Planning]

D. EVALUATION & APPROVAL

Ref. no of quotation and agreement dated:
To carry out additional Work
Authorization to commence executing Additional Work as per above quotation

Signature: Supplier's Representative
Signature: GPIC Representative

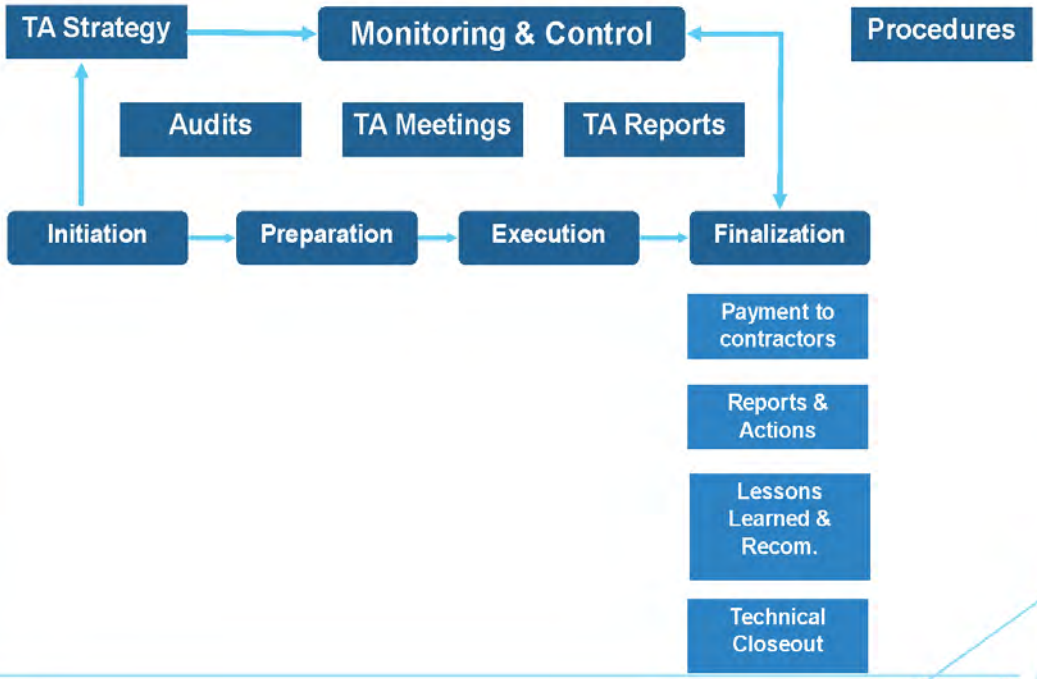
Date
Date

SAMPLE

PRIOR GPIC MUST BE OBTAINED (ref: FR-PLN-70-06) FOR ANY DEVIATION TO THE SCOPE DEFINED IN THE PURCHASE ORDER.(SOP-GEN-00-04)

25

Turnaround Management



26

Turnaround Payments to Contractors – Finalization

- Invoices verification through 3 levels.
- Creation of Service Entry Sheets (SESs) against job done, verified, accepted.
- POs amendment against approved variation Orders.
- Invoice Status Report regarding Payments made and Balance amount.
- Official Standard letters sent to contractors to confirm receipt of full payment against the job carried out.

27

Turnaround Reports – Finalization

- Executive Summary Report
- Detailed Turnaround Report:
  - Operation
  - Maintenance
  - Inspection
  - Engineering
  - Safety, Health and Environment
- Technical Reports by :
  - Vendors
  - Package Contractors

28

Turnaround Recommendations. and Lessons Learned – Finalization

Suggestion to improve the current business practices as well as Technical Recommendations

- Feedback by Contractors & Vendors {Ref: FR-PLN-40-07}
- Suggestions made by GPIC staff
- Evaluation Process:
  - Database
  - Department wise segregation
  - Meeting & Discussions
  - Recommendations changes to Suggestion
  - Follow-up for Implementation
  - Progress status updates

29

Turnaround Technical Closeout – Finalization

Finishing Off

- Return of unused Material to Warehouse.
- Technical Completion [TECO] of all completed Maintenance Orders.
- Process of Final Acceptance Certification [FAC] for completed Modifications and Capital Projects.
- Technical completion [TECO] of all completed WBS and NETWORKS of Capital Projects.
- Disposal of various types of wastes generated during the Turnaround.
- Preserving removed equipment for at least next cycle.

30

Thank You,

31

Case Studies on APC Energy Management

Jasim Haji
Gulf Petrochemical Industries
Bahrain

Contents

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Brief on APC

- One of the world producers of potash (KCl).
- Plants are located in Jordan, about 120 km south-west of Amman, south of the Dead Sea.
- The brine (or the water of the Dead Sea) forms the raw material for producing potash in APC.
- APC produces competitive potash (KCl) with different particle sizes (fine, standard, & granular), and industrial potash via 4 production lines.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

APC Energy Management Committee

Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

APC Energy Management Committee

- Formed in April, 2012.
- Opportunities, technical studies, recommendations for improvement.
- Team members were selected from different work areas and different specialties in APC.
- Training:
  - All team members attended Energy Auditing training course.
  - Team Leader attended the following training courses:
    - Energy Auditing
    - Certified Energy Manager
    - Lean Six Sigma
    - Energy Management System ISO 50001: 2011 Lead Auditor

Case Studies on APC Energy Management

Page 2

APC Energy Management Committee

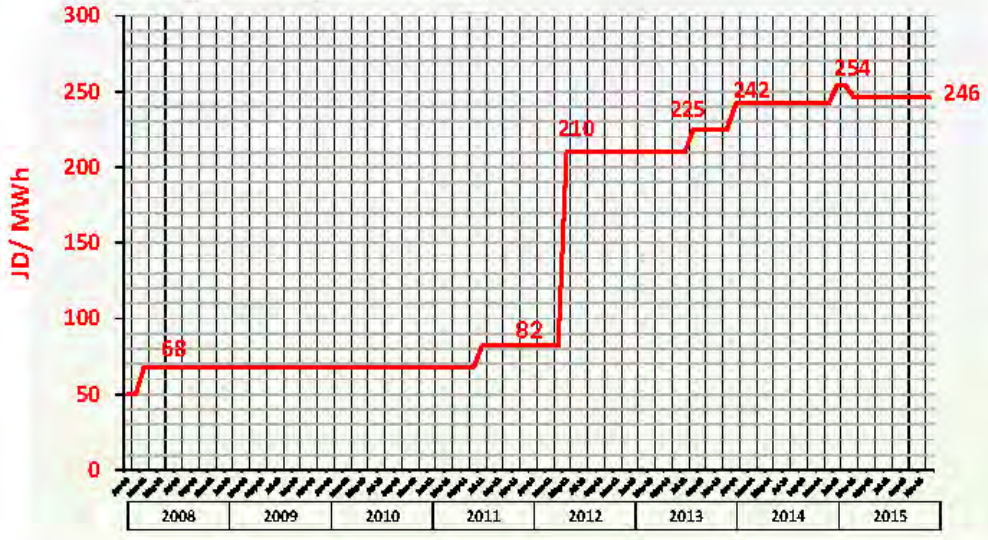
- Partnership between APC Energy Management Committee and AFA Energy Saving Committee:
  - Establishing Energy Saving Culture
  - Establishing Energy Management Information System
  - Establishing Energy Saving Training and Competencies Matrix
  - Establishing Monitoring & Targeting Criteria
  - Establishing own audit and AFA consolidated audit

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Electricity and Fuel Prices

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Average Electricity Price for APC:



Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Electricity Price for APC:

Period		Price (JD/MWh)
Night	11:00 PM – 07:00 AM	197
Day	07:00 AM – 11:00 PM	264
Average Price		246

Peak Period	Penalty (JD/kW)
3 hours/ day	2.98

Peak Period Penalty = 2.98 JD/kW/ month for the maximum monthly load.
The maximum monthly load is the maximum value of the average load per half an hour measured in kW during the peak period.

Case Studies on APC Energy Management

Page 2

Cost Reduction Through Lean Approach:

Lean is defined as set of principles, concepts and techniques aim at continuously eliminating waste in any process.

Lean Principles:

- Identify and focus on value (customer view)
- Identify value stream & eliminate waste
- Get value to flow without interruptions
- Let the customer pull value
- Do it continuously

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Cost Reduction Through Lean Approach:

Types of Waste:

1. Transportation
2. Inventory
3. Motion
4. Waiting
5. Over production
6. Over processing
7. Defects

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Cost Reduction Through Lean Six Sigma:

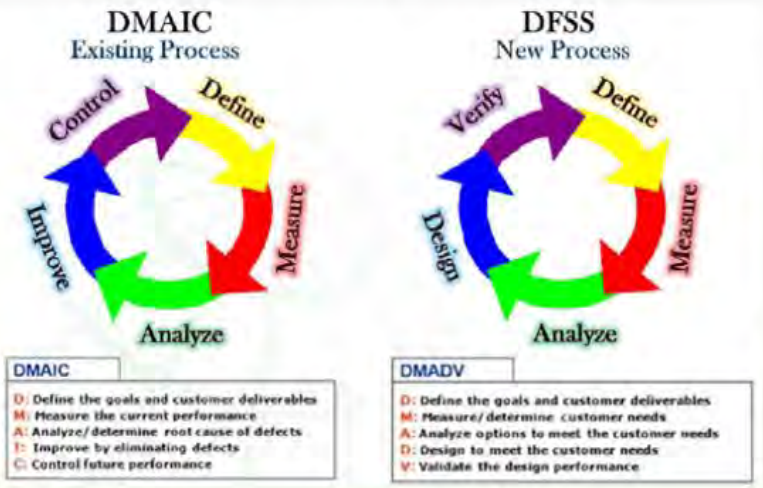
Six Sigma: is a methodology that uses statistical analysis to measure and improve operational performance by identifying and eliminating "defects" in any process.

Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Cost Reduction Through Lean Six Sigma:



Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Cost Reduction Through Lean Six Sigma:

- Process Flow Diagram.
- SIPOC Analysis & Critiques.
- Availability and accuracy of the daily energy & water consumptions.
- Baselines and planned values for the energy & water consumptions.

Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

SIPOC Analysis and Critiques:

Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Cost Reduction Through Lean Six Sigma:

- Process Flow Diagram.
- SIPOC Analysis & Critiques.
- Availability and accuracy of the daily energy & water consumptions.
- Baselines and planned values for the energy & water consumptions.

Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

SIPOC Analysis and Critiques:

Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Energy & Water Meters:

Consumption Instrumentation Audit for Baseline Calculations

Steam Transmission/Conditions					
Gas	Condition	Actual Reading Frequency	Action Required	Notes	Responsible Department/Person
PDI/SKPI-01-1	Working	Daily	None		
HP1 (Main)	Not Working	Daily	Issue a work request to replace/repair the faulty transmitter	The 2 Gen. is working	Maintenance Shop
IPP (Main)	Not Working	Daily	Issue a work request to replace/repair the faulty transmitter		Maintenance Shop

KWH meters assess					
Gas	Condition	Actual Reading Frequency	Action Required	Notes	
HP	Working	Daily	None		
GEF 1	Working	Monthly	Send the readings daily via an SMS or an Excel sheet, Waleed Obeidat, Farah Ali or Ali Bani Khalid		Obeidat, Farah Ali or Bani Khalid
GEF 2	Working	Monthly	Send the readings daily via an SMS or an Excel sheet, Waleed Obeidat, Farah Ali or Ali Bani Khalid		Obeidat, Farah Ali or Bani Khalid
[illegible]	Working	Monthly	Send the readings daily via an SMS or an Excel sheet, Waleed Obeidat, Farah Ali or Ali Bani Khalid	Readings are now being taken, must use Excel sheet moving forward	Bani Khalid
PDI-1	Working	Daily	None		
IPP	Working	Daily	None		
PDI/SKPI-01-1	Working	Daily	None		
Water Tank	Working	Daily	None		
Traffic Building Gate	Working	Daily	None		
Admission Building	Working	Daily	None		
Health Building	Working	Daily	None		
Safe Water PS1	Working	Monthly	Send the readings daily via an SMS or an Excel sheet, Waleed Obeidat, Farah Ali or Ali Bani Khalid		Waleed Obeidah
Safe Water PS2	Working	Monthly	Send the readings daily via an SMS or an Excel sheet, Waleed Obeidat, Farah Ali or Ali Bani Khalid	Readings are taken Over BMS	Waleed Obeidah
1000KVA-IP	Working	Monthly	Send the readings daily via an SMS or an Excel sheet, Waleed Obeidat, Farah Ali or Ali Bani Khalid	Readings are now being taken, must use Excel sheet moving forward	Obeidat, Khalid

Fuel Transmission/Conditions					
Gas	Condition	Actual Reading Frequency	Action Required	Notes	
PDI/SKPI-01-1	Working	Daily	None		
HP	Working	Daily	None		
GEF 1	Working	Daily	None		
GEF 2	Not Working	Daily	Issue a work request to replace/repair the faulty transmitter	Is fed via Fuel Oil on the rear side of GEF 2	Obeidat, Farah Ali or Ali Bani Khalid
IPP	Working	Daily	None		

Water Transmission/Conditions					
Gas	Condition	Actual Reading Frequency	Action Required	Notes	
HP	Working	Daily	None		
IPP	Working	Daily	None		
GEF 1	Working	Daily	None		
GEF 2	Working	Daily	None		
[illegible]	Working	Daily	None		
[illegible]	Working	Daily	None		
[illegible]	Working	Daily	None		
[illegible]	Working	Daily	None		
[illegible]	Working	Daily	None		
[illegible]	Not Working	Daily	Issue a work request to replace/repair the faulty transmitter		Maintenance
[illegible]	Working	Daily	None		

Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Opportunity Log:

OPPORTUNITY LOG

Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Opportunity Log:

Case Studies on APC Energy Management

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Quick Wins:

Ref. #	Area / Process Step	Opportunity Description	Impact JOD
EM-031	All Plants	Modifying the DCS program to stop the unloaded machines in the production lines which are controlled by DCS control systems	100,000
EM-022	HFO storage tank	Storage of HFO at temperatures above 45 °C.	21,000
EM-060	Power Plant	Calibration of medium pressure PRV	663,000
EM-052	Reducing station	Calibration of low pressure PRV	1,334,000
EM-027	HLP & Power Plant	Steam traps are not working properly	41,000
EM-045	HLP	Keeping the brine heater (Falling Film Heat Exchanger) at highest coefficient of heat transfer	979,000
EM-057	HLP	Optimizing the flue gas temperature of the product dryer	100,000
EM-063	Power Plant	Maximizing power generation	3,200,000
EM-004	Warehouse & Workshop	Replacing the existing lighting units with LED lighting units.	131,000
EM-006	Boiler 3	Utilizing the lost condensate from the steam air heater of the Auxiliary Boiler and all condensate of fuel heaters.	63,000
	Boilers	Installing insulation on all hot surfaces to minimize heat losses	23,000
Total Annual Saving = 6.5 mil JOD			

Case Studies on APC Energy Management

Page 2

Next Step: Energy Management System (EnMS ISO 50001:2011)

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Next Step: Energy Management System (EnMS ISO 50001:2011):

This International Standard (ISO 50001: 2011) specifies requirements for establishing, implementing, maintaining and improving an energy management system, whose purpose is to enable an organization to follow a systematic approach in achieving continual improvement of energy performance, including energy efficiency, energy use and consumption.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Next Step: Energy Management System (EnMS ISO 50001:2011):

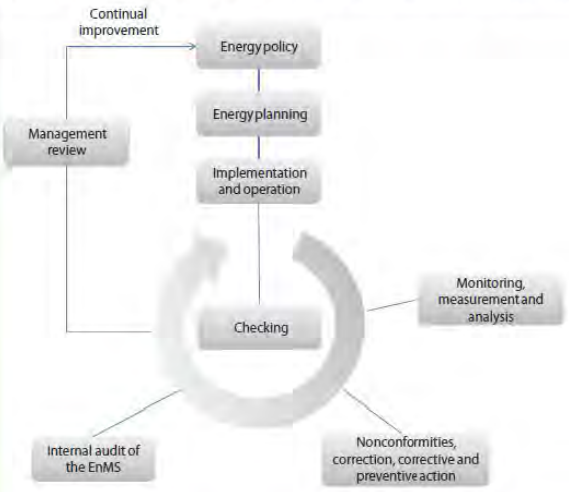


Figure 1 — Energy management system model for this International Standard

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Next Step: Energy Management System (EnMS ISO 50001:2011):

Steps For Implementing EnMS:

Step 1 Discovered.		
1. Provide a Management Commitment.	Issue EnMS Policy	Solvay
2. Identify roles & Duties	Assign EnMS Coordinator. Assign EnMS Assurance Representative	Top Management
3. EnMS Manual.	Determine how to meet EnMS requirements & establish energy performance & documentation.	solvay
	Document Scope and boundaries of the EnMS.	Energy Team
	Include Energy Organizational Chart	Solvay & Hosaian
4. Understand EnMS Documentation.	FMEA Guidelines	Solvay
	Establish Documents and Records Control Procedure	Solvay
5. Identify and evaluate energy-related legal and other requirements.	Establish Procedure	Solvay
6. Identify and evaluate energy-related legal and other requirements.	Establish related legal list	Hosaian
Step 2 Conduct an Energy Review.		
1. Review of the APC activities that affect energy performance.	Establish Energy Evaluation Matrix (EEM)	Energy Team
2. Energy review (or energy audit) Identify, collect, and analyze energy data.	Establish Actual Baseline	Energy Team
3. Determine significant energy uses.	Update EML	Energy Team
4. Identify opportunities to improve energy performance.	Update EML	Energy Team
5. Prioritize opportunities to improve energy performance.	Update EML	Energy Team
Step 3 Plan for Energy Management.		
1. Determine energy performance indicators and establish baselines	Energy review before EnMS implementation.	Energy Team
2. Establish energy objectives and targets.	Need Assess.	Energy Team
3. Formulate energy management action plans.	Update Action Plan	Energy Team
Step 4 Implement Energy Management.		
Manage and control performance	Tailboard, meetings and communication	Energy Team
Determine Operational controls.	(Technical, Procedural & Documented Procedure)	Energy Team
Provide staff and communicate.	Communicate Manual.	Energy Team
Provide staff are trained, aware and coached	Establish training Need.	Energy Team
Define and implement procedures for energy audits.	Establish Energy Review	Energy Team
Implement energy procedures – Design, development, assess	Need to modify or issue new procedure.	
Manage energy procedures – Design, assess	Procurement which is energy-saving procedure.	
Communicate internally.	Meetings, Emails, APC Portal	
Develop communications process.	Identify related parties to APC	
Step 5 Measure Progress and Check Results.		
Monitor, measure, and analyze key characteristics.	Data Management	Energy Team
Calibrate monitoring and measuring equipment	List of all equipment, Process Certificates.	Energy Team

Next Step: Energy Management System (EnMS ISO 50001:2011):

Documented	
Pl	Procedures	Forms
Pl 0	Legal Obligations Procedure	[illegible]
Pl 0	Energy Review	[illegible]
Pl 1	Energy Baseline & KPIs	[illegible]
Pl 4	Energy Objectives, Targets & Action Plans	[illegible]
Pl 3	Competence, Training & Awareness	[illegible]
Pl 3	Communication	[illegible]
Pl 4	Documentation Control	[illegible]
Pl 6	Operational Control	[illegible]
Pl 6	Design Change	[illegible]
Pl 6	Procurement	[illegible]
Pl 3	Monitoring, Measurement &	[illegible]
Pl 3	Internal Audit	[illegible]
Pl 3	Internal Audit	[illegible]
Pl 4	NC/Corrective/Preventive Action	[illegible]
Pl 6	Control of Records	[illegible]
Pl 8	Management Review	[illegible]

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Thank You

Case Studies on APC Energy Management

Page 2

Oil Degradation in Rotating Equipment

Alain Henrad
EFC
Belgium

Content

- Introduction EFC nv
- Factors causing oil degradation
  - Particles
  - Water
  - Temperature
- Solutions for Better Reliability

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc European Filter Corporation

Introduction EFC NV

- Single Source partner for :
  - Air filtration (Air Intake Turbines,…)
  - Liquid filtration (Water, chemicals,…)
  - Gas filtration
  - Mist Eliminators (Atephos Fiber bed)
  - Oil / Hydraulic Filtration (Turbine Lube Oil Systems,…)

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions

efc European Filter Corporation

Importance Oil Management

High capital investment / Turbines,…

Critical applications / Production

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions

efc European Filter Corporation

Sources oil degradation
3 main sources

- 1: PARTICLES (silica, metals,…) : PRESSENCE / QUANTITY (friction rotating equipment,…)
- 2: WATER / MOISTURE (leaks, condensation,…)
- 3: HIGH TEMPERATURES (process hot spots)

OIL OXIDATION

OIL DEGRADATION

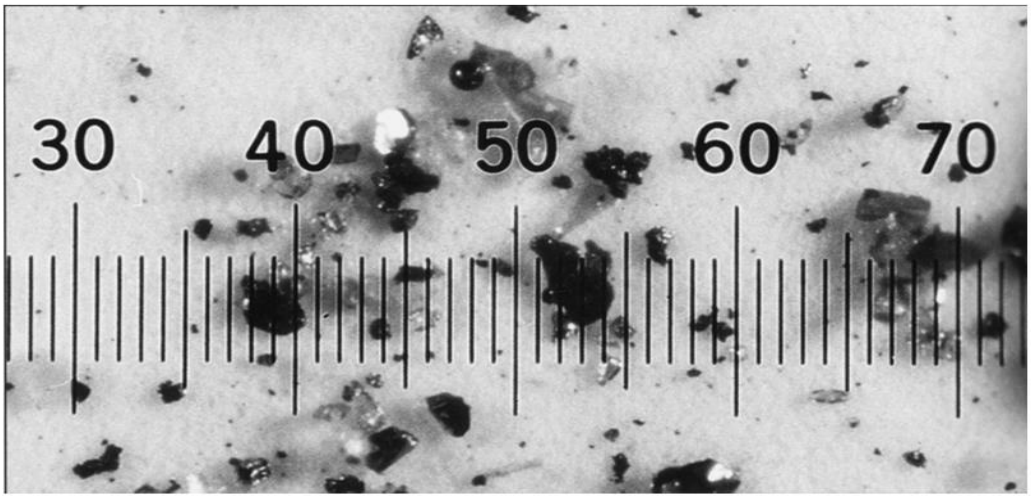
COMPONENT FAILURES

PRODUCTION LOSS…

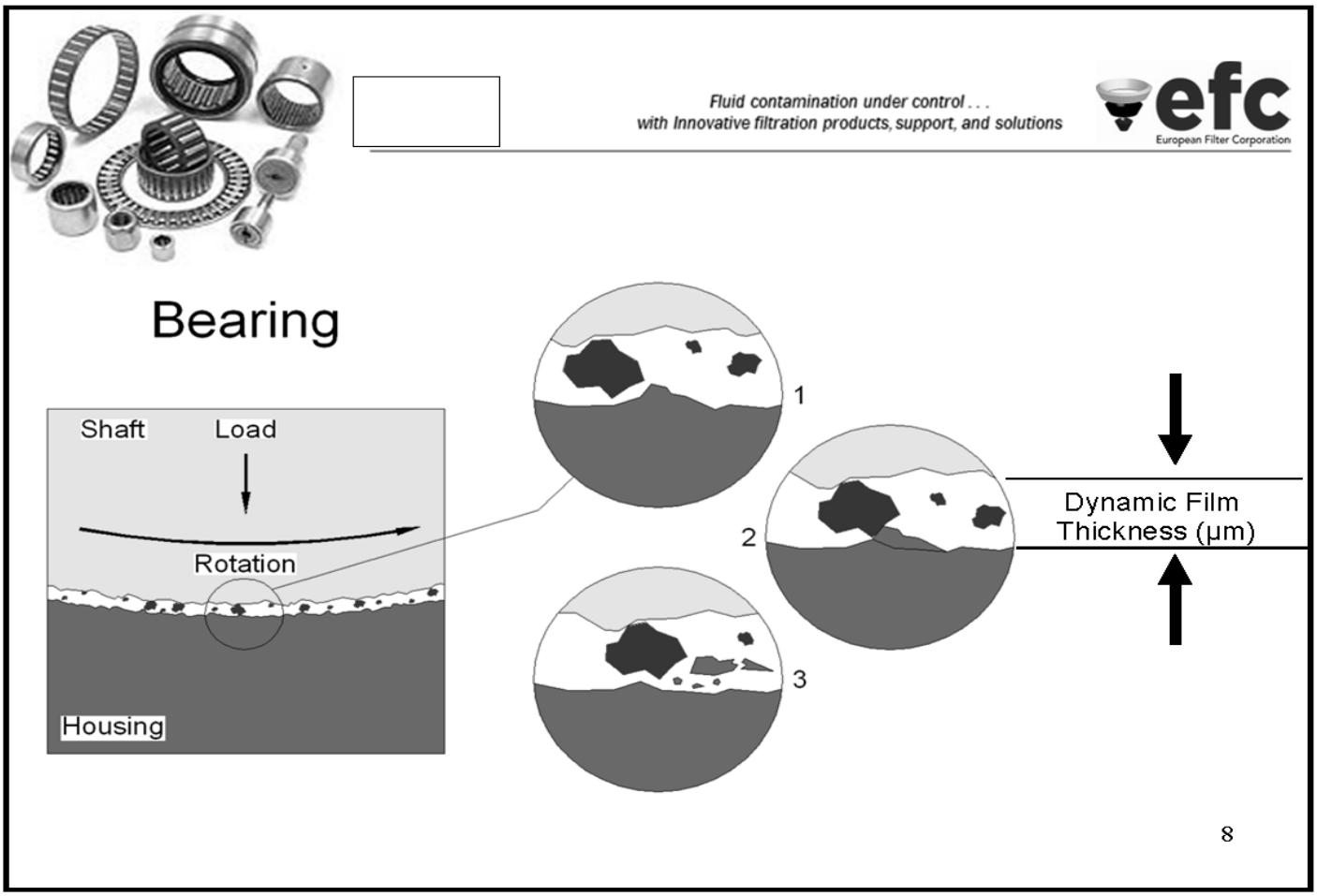
Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc European Filter Corporation

1: PARTICLES

New Oil could look like this …)
(scale : 10µm)



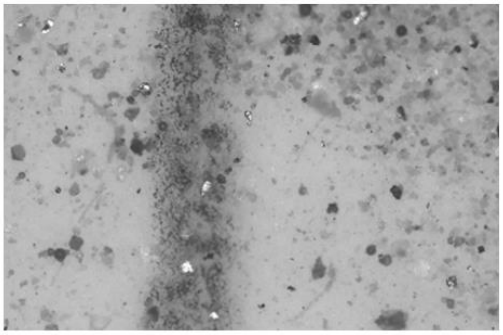
www.efc-belgium.be



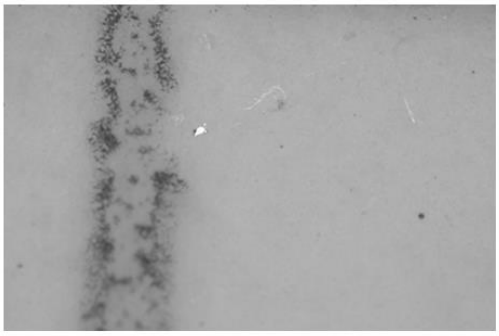
Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc
European Filter Corporation

About Particle Growth

- MPW : Particle Weight, 0,8µm patch < 20mg/kg(ltr)
- ISO : General Cleanliness Codification
- Specifications Cleanliness :
  - Hydraulics servo control : < ISO 14/12/10
  - Lubrication Turbines, Compressors : < ISO 17/15/12
  - => ISO class reduction = Component life increase !



Particle Size	Particles per milliliter	ISO 4406 Code range	ISO Code
$4\mu_{[c]}$	**151773**	**80000~160000**	**24**
$6\mu_{[c]}$	**38363**	**20000~40000**	**22**
$10\mu_{[c]}$	8229		
$14\mu_{[c]}$	**3339**	**2500~5000**	**19**
$21\mu_{[c]}$	1048		
$38\mu_{[c]}$	112		



Particle Size	Particles per milliliter	ISO 4406 Code range	ISO Code
$4\mu_{[c]}$	**492**	**320~640**	**16**
$6\mu_{[c]}$	**149**	**80~160**	**14**
$10\mu_{[c]}$	41		
$14\mu_{[c]}$	**15**	**10~20**	**11**
$21\mu_{[c]}$	5		
$38\mu_{[c]}$	1		

10

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc European Filter Corporation

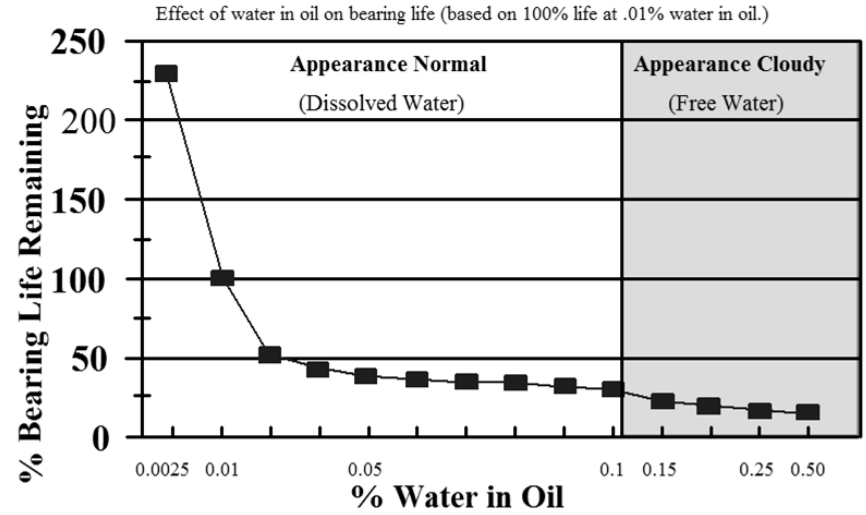
2: Water / Moisture

- Dissolved => Emulsified => Free

- Water level max for system < 200ppm
- Saturation < 30%

Water influence on bearing life

(0,05% = 500ppm)



Reference: "Machine Design" July 86, "How Dirt And Water Effect Bearing Life" by Timken Bearing Co.

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc European Filter Corporation

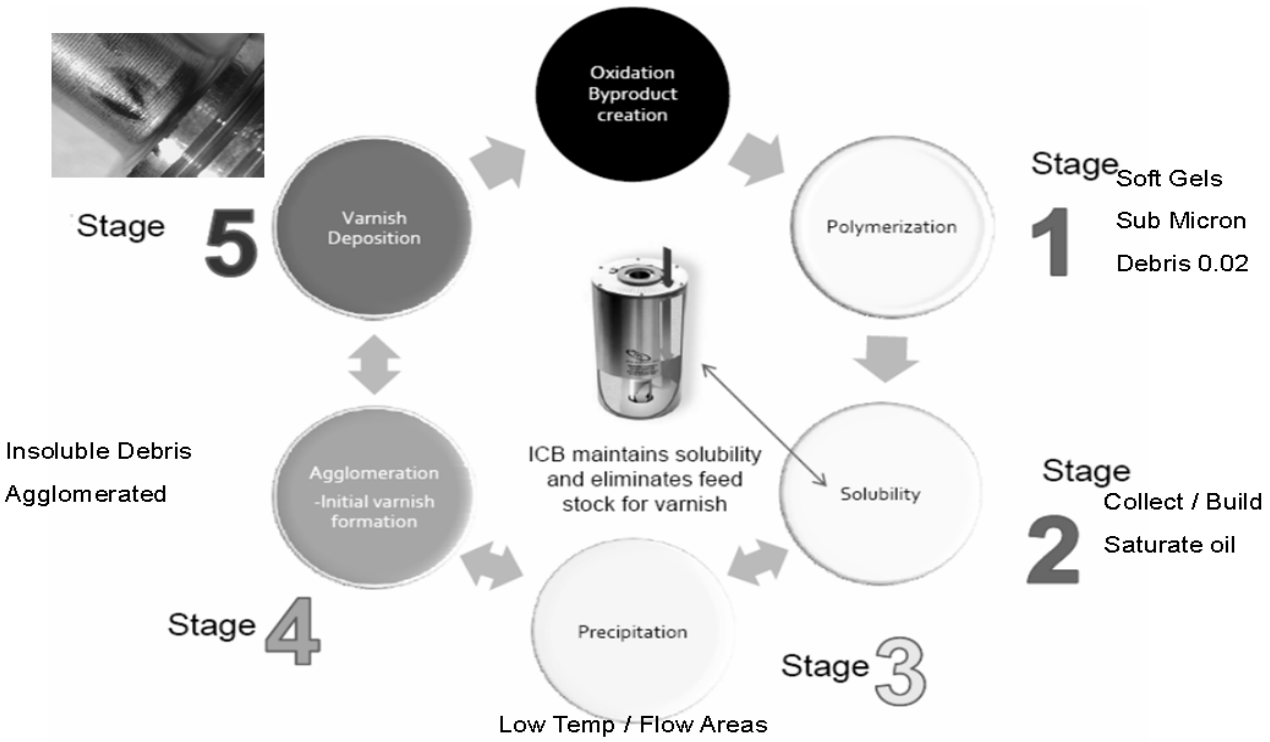
3: High Temperature

- Dependent on installations
- Hot Spots : Turbo compressors > 100°C
- Oil Reservoirs < 60°C

Oil Degradation Effects

- Contamination + T° = Oil Additive Depletion
- Creation of by-products (soluble – insoluble)
- ***Varnish*** deposits
- Productions issues

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc European Filter Corporation



Fluid contamination under control . . .
with Innovative filtration products, support, and solutions

efc European Filter Corporation

SOLUTIONS…

- Oil Analysis => Define actions
- Particle Control => Stress Resistant Elements,…
- Water Control => Vacuum Dehydrators,…
- Varnish Control => Specific Turbine Media + Ion Exchange Bounding = Soluble & Insoluble fractions control.

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions

efc European Filter Corporation

Oil analysis report should contain :

- ISO particle count (APC or visual)
- Comments on particle types : silica, type metals,…
- Water concentration (ppm or %)
- MPC (varnish potential) < 10
- TAN (acid level) < 0,4
- Viscosity

- Technical recommendations, actions to be taken

SOLUTIONS…

- Oil Analysis => Define actions
- Particle Control => Stress Resistant Elements,…
- Water Control => Vacuum Dehydrators,…
- Varnish Control => Specific Turbine Media + Ion Exchange Bounding = Soluble & Insoluble fractions control.

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc European Filter Corporation

Oil analysis report should contain :

- ISO particle count (APC or visual)
- Comments on particle types : silica, type metals,…
- Water concentration (ppm or %)
- MPC (varnish potential) < 10
- TAN (acid level) < 0,4
- Viscosity

- Technical recommendations, actions to be taken

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions

efc European Filter Corporation

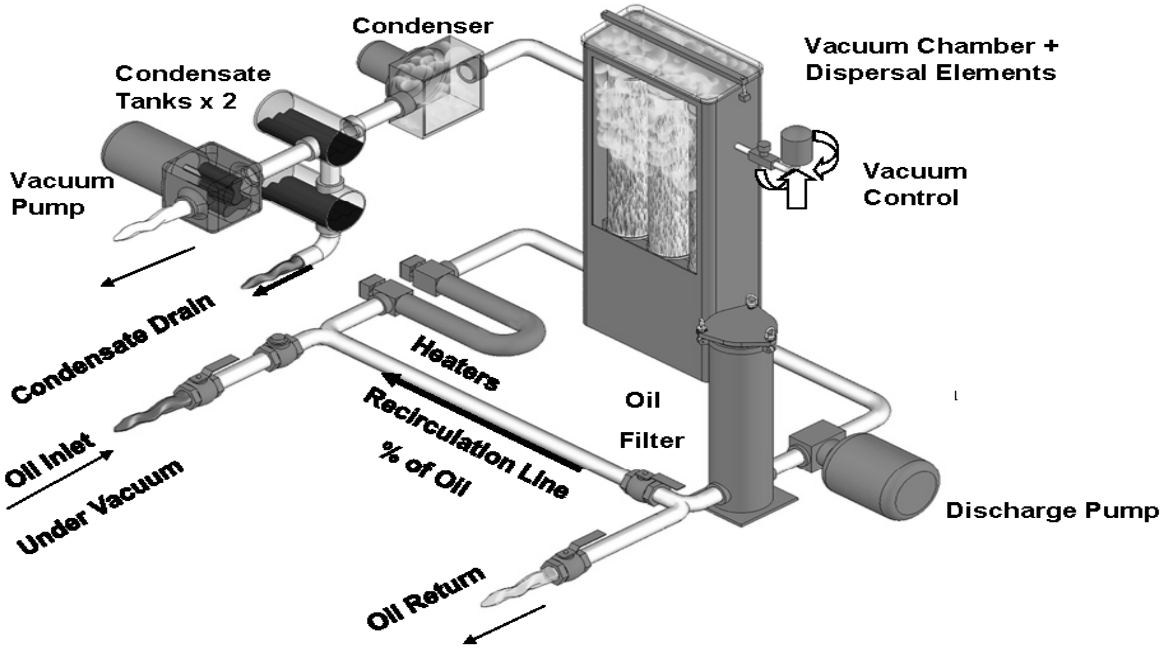
Particle Control

- Designed and tested to outperform original
- Cleaner Oil (better performance)
- DFE rated (high stress resistance)

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions

efc European Filter Corporation

Vacuum Dehydrator Process Diagram



VAC-U-DRY

Mobile or Fixed Skid

Removes Free AND Dissolved water

System Range 6 LPM - 230 LPM

Oil Volume Tank : > 50.000 L

Reduce Water content :

5000 ppm => 100 ppm less 20 hr

ATEX Equipment possible

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc European Filter Corporation

Varnish Control

VTM Removing Insoluble fractions > 0,8 micron

ICB Removing Soluble Oxidation Bi-Products

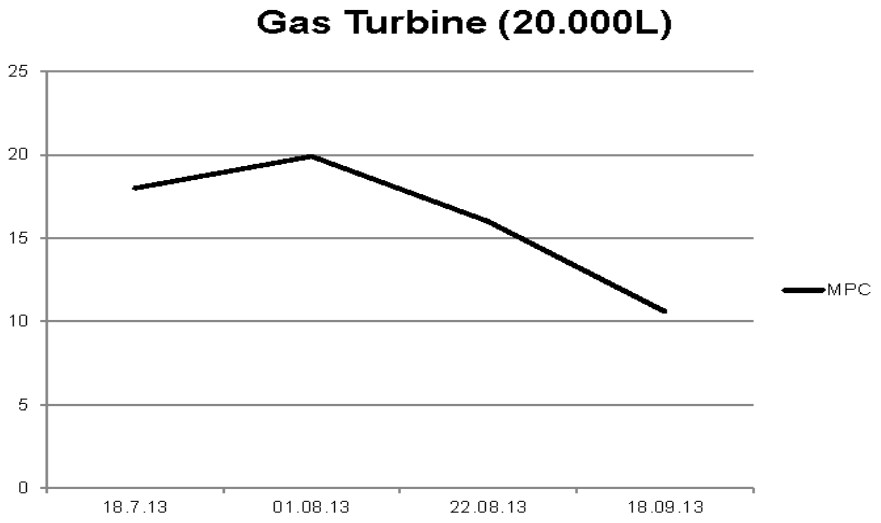
Fluid contamination under control . . .
with Innovative filtration products, support, and solutions

BENEFITS…

- Avoid oil replacement ($10.000 => $100.000…)
- Avoid component replacement ($5.000 => $50.000…)
- Decrease maintenance costs
- Avoid Production lost

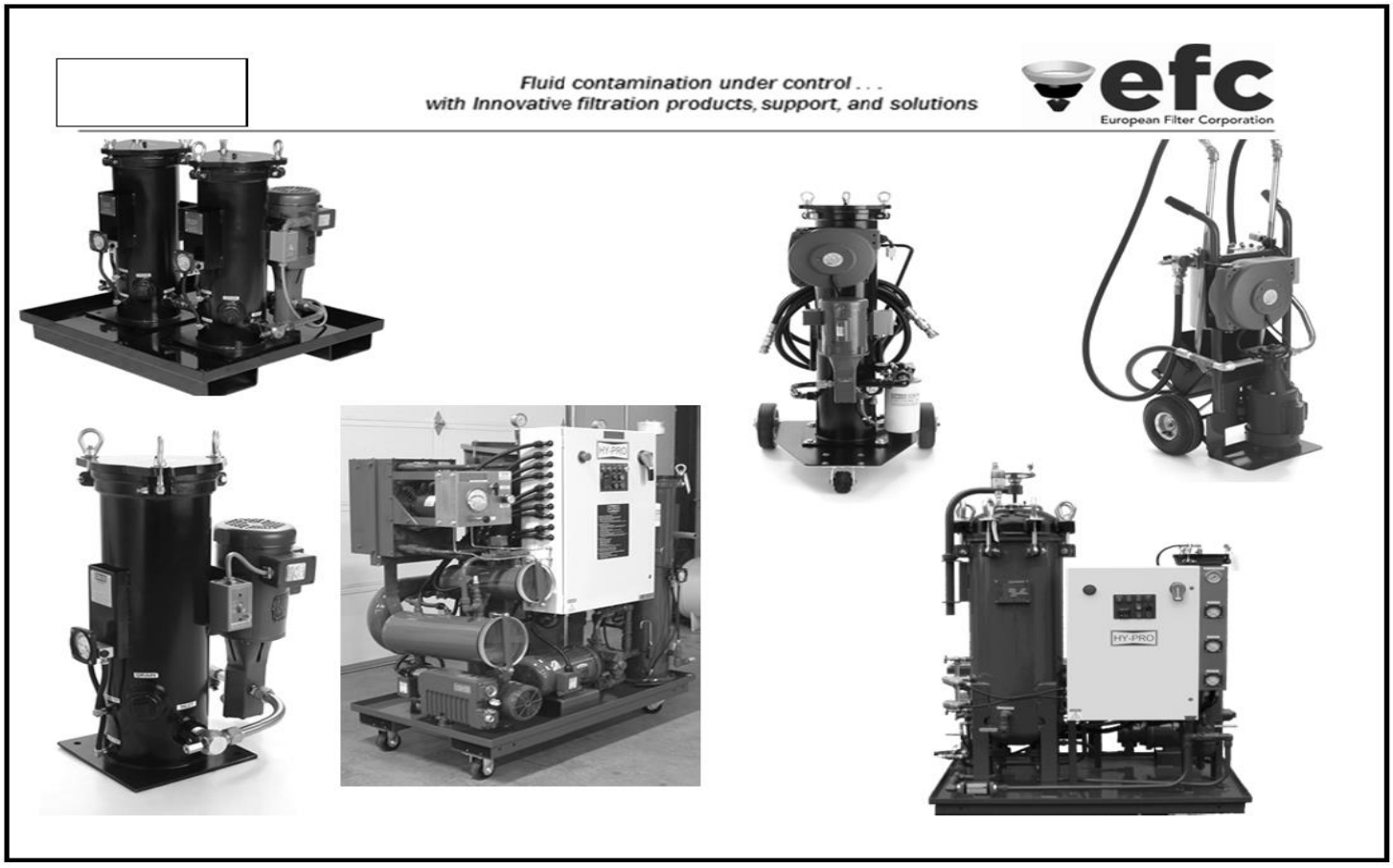
Fluid contamination under control . . .
with Innovative filtration products, support, and solutions

Varnish control = $50.000 Benefit



www.efc-belgium.be

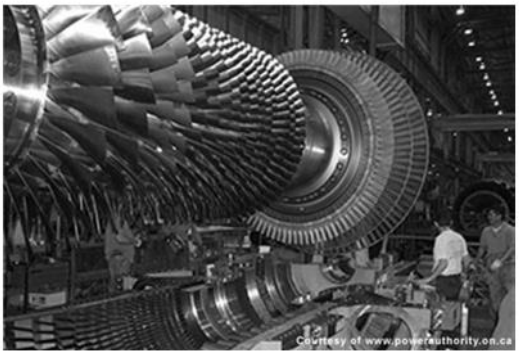

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc
European Filter Corporation
Turbine Lubrication System Package
Water – Particles - Air - Gasses
SVR
Sludge & Acid
Scavenging
Water & Particles
UP Grade Filtration
Non- Spark Anti-static

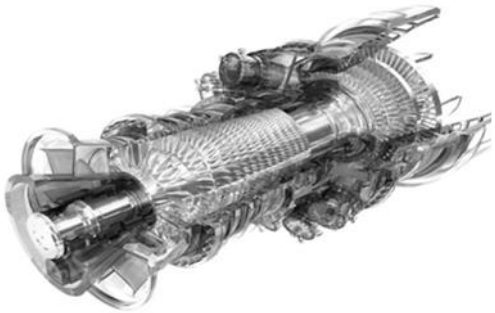

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions
efc
European Filter Corporation

Fluid contamination under control . . .
with Innovative filtration products, support, and solutions

efc
European Filter Corporation

Thank You !





Failure of Primary Shift Effluent W/H Exchanger (103-C) – Case study of HTHA

Muhammad Nasir Abbas
Al-Jubail Fertilizer Company (Al-Bayroni)
Saudi Arabia

Contents

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Facility Introduction

Al-Jubail Fertilizer Company (Al-Bayroni) is SABIC affiliate formed in 1979 by a 50/50 joint venture with Taiwan Fertilizer Company (TFC).

It is situated in the Al-Jubail Industrial City in Eastern Province of Saudi Arabia with coordinates 27°3'54"N 49°33'30"E and comprises of Fertilizer & Petrochemical complexes. Main products are Ammonia, Urea, 2-Ethyl Hexanol (2-EH) & Di-Oxyle Phthalate (DOP).

Fertilizer Complex comprises of Ammonia Plant, Urea Plant and associated utilities. This case study relates to Ammonia Plant, which is Pullman Kellogg design Plant having current rated capacity of 1300 Metric Ton per Day

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Process Description

To convert unwanted CO to CO_2 in Process Gas coming from Reforming Section, Shift Conversion Reactors (High Temperature Shift Converter 104-DA & Low Temperature Shift Converter 104-DB) are installed in series.

As both Shift Reactors operate at different temperatures, Primary Shift Effluent/BFW Heat Exchanger 103-C is installed at outlet of 104-DA to reduce temperature of process gas from 431˚C to 333˚C at 27.8 bar(g). Methanator Feed Heater 104-C receives this process gas & further reduces the temperature to 237˚C before inlet to 104-DA.

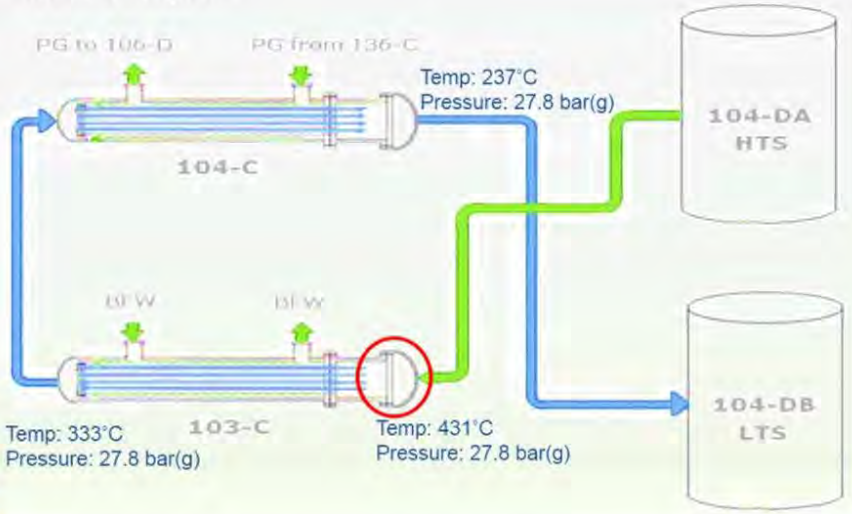
This heat is exchanged by Boiler Feed Water coming from 101-F at 288˚C and exiting at 314˚C at 110 bar(g).

Failure of Primary Shift Effluent W/H Exchanger (103-C) – Case study of HTHA

Page 04

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Process Description



Failure of Primary Shift Effluent W/H Exchanger (103-C) – Case study of HTHA

Page 05

Failure Event

Location : Ammonia Plant, Shift Conversion Section
Primary Shift Effluent Waste Heat Exchanger (103-C)

Date : 18th April, 2012

Description : On 18-April-2012 Night shift; Ammonia Plant Field Operator reported "Fumes/Smoke" from inlet channel of Primary Shift Effluent/BFW Heat Exchanger (103-C).

In Morning shift of 19th April-2012, insulation of the inlet channel was removed & it was confirmed that the leakage was from weld joint of inlet channel (Nozzle T1) reinforcement pad.

Ammonia Plant was shut down at 1400 Hours, due to this leakage.

Inspection Findings - Pictures

Location of the Leaked Gas Inlet Nozzle to Channel

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Inspection Findings - Pictures

Location of the visible Crack

Failure of Primary Shift Effluent W/H Exchanger (103-C) – Case study of HTHA

Page 08

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Inspection Findings - Pictures

Visible crack found along reinforcing pad-to-channel weld

Failure of Primary Shift Effluent W/H Exchanger (103-C) – Case study of HTHA

Page 09

Inspection Findings - Pictures

More than 85 % of Nozzle-to-Channel weld found cracked

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Repairs

Inlet channel was removed and shifted to ASME approved workshop for repairs.

After removal of RF pad, during PT nozzle to channel weld joint was found cracked for more than 85 % circumference. Complete removal & redoing was carried out as per ASME AI & Al-Bayroni Inspector recommendation.

After carrying out repairs & NDT on the inlet channel of 103-C as per ASME code, exchanger was boxed-up and tube side hydrostatic pressure test was conducted at 33 bar(g) and approved by authorized ASME inspector for R-stamp.

The exchanger was then taken in service at Ammonia plant startup.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Repair - Pictures

UT inspection after repair of Reinforcing Pad welding joint

Failure of Primary Shift Effluent W/H Exchanger (103-C) – Case study of HTHA

Page 12

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Repair - Pictures

Inlet Channel Head after repairs & Inspections

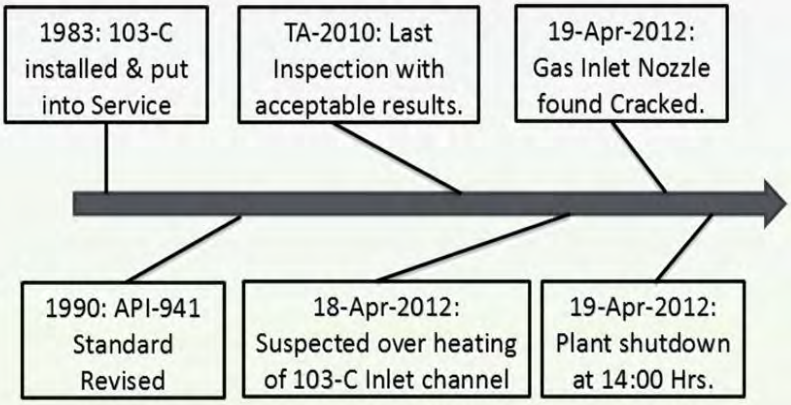
Failure of Primary Shift Effluent W/H Exchanger (103-C) – Case study of HTHA

Page 13

Repair - Pictures

103-C with repaired Inlet Channel, taken in Service

RCA - Timeline



RCA - Possible Failure Causes

Discipline	Possible Causes	Yes	No
Operations / Process	Higher velocities / Vibrations at inlet channel		√
	Higher inlet temperatures than design of 446 °C		√
	Natural gas flow interruption		√
	Under design w r t 2002 debottlenecking		√
Material / Mechanical Design	Unsuitable material of construction, as per API 941 – 1990 & Later Editions	√	
	Design deficiency of TV-10 affecting 103-C		√
	Piping stresses & piping supports	√	
Mechanical / Inspection	Mishandling during maintenance activities		√
	Welding failure		√
	Defective fabrication		√
	Prolonged operation in high temperature hydrogen service	√	
Instrument	Malfunction of FC-1		√

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

RCA Outcome

Following were identified the Root & contributing causes, after extensive data review, evaluation and consultations with subject matter experts.

Root Cause :

Non-suitable material for high temperature hydrogen service

Contributing Cause :

Prolonged exposure to hydrogen service >350 °C

RCA Recommendations

Sr.	Description
1	Replacing the exchanger with upgraded materials and current design details and standards as already in service since 30 year.
2	Ammonia Plant survey need to be done for the equipment/piping in operation for Hydrogen service with material of construction 0.5 Mo Steel and assess for acceptance or replacement and develop plan accordingly.
3	Conduct piping stress analysis for 103-C inlet line from 104-DA and implement the outcome recommendation. Implement all the recommendations of piping stress analysis.

Discussion on High Temperature Hydrogen Attack (HTHA)

Description: High temperature hydrogen attack results from exposure to hydrogen at elevated temperatures and pressures. Hydrogen reacts with carbides in steel to form Methane (CH_4) which cannot diffuse through the steel. The loss of carbide causes an overall loss in strength. Methane pressure builds up, forming bubbles or cavities, micro-fissures and fissures that may combine to form cracks.

Material Selection: Temperature & Hydrogen Partial Pressure

Affected Material: In order of increasing resistance: Carbon Steel, **C-0.5Mo**, Mn-0.5Mo, 1Cr-0.5Mo, 1.25Cr-0.5Mo, 2.25Cr-1Mo, 2.25Cr-1Mo-V, 3Cr-1Mo, 5Cr-0.5Mo and similar steels with variations in chemistry.

Forms: Surface Decarburization
Internal Decarburization and Fissuring

Discussion on High Temperature Hydrogen Attack (HTHA)

Factors Influencing HTHT: Incubation Time, Primary Stresses, Secondary Stresses, Heat Treatment & Stainless Steel Cladding or Weld Overlay

Guidance for C-0.5Mo: "As a result of the problems with the 0.5 Mo alloy steels, its curve has been removed from the main set of curves and the material is not recommended for new construction in hot hydrogen services.

For existing equipment, this concern has prompted an economic review of inspection cost versus replacement with a more suitable alloy.

Inspection is very difficult because problems have occurred in weld heat affected zones as well as base metal away from welds."

API-571 (2nd Ed.); para 5.1.3.1.6 (d)

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Follow-up Actions:

Replacement of 103-C with improved metallurgy, as per API-941.

Improved Action plan with more focus on vulnerable equipment.

Evaluation of all Ammonia Plant Equipment & Piping of CS-0.5%Mo MOC

- No piping found with MOC of CS-0.5%Mo
- Following equipment found with MOC of CS-0.5%Mo and were evaluated based on API-941 latest standard and the results are as follows:

Equipment	H_2 Service	Safe?	Planned?
104-DA, HTS Converter	Yes	No	Yes
106-D, Methanator	Yes	No	Yes
108-D, Zinc Oxide Guard Chamber	Yes	No	Yes
160-D, Hydrotreater	No	Yes	No

Lesson Learned

To keep-up with technology development in the field of Design Changes, Maintenance and Operability.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

References:

1. American Petroleum Institute Recommended Practice 941 7th Edition, August 2008
2. American Petroleum Institute Recommended Practice 571 2nd Edition, April 2011
3. 103-C Root Cause Analysis (RCA) Report by Al-Bayroni
4. 103-C Inspection Reports by Al-Bayroni

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Questions & Answers

البيروني
albayrani

Failure of Primary Shift Effluent W/H Exchanger (103-C) – Case study of HTHA

Page 24

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Thank You

البيروني
albayrani

Failure of Primary Shift Effluent W/H Exchanger (103-C) – Case study of HTHA

Page 25

ARAB FERTILIZER IMPRESSING FUTURE SUSTAINABILITY

شركة مناجم الفوسفات الأردنية المساهمة المحدودة

شركة البوتاس العربية المساهمة العامة
Arab Potash Company PLC

JIC

NJFC

KEMAPCO
Arab Fertilizers and Chemicals Industries Ltd.

Phosphogypsum Utilization In China and Economic Analysis

Liu Bo
ECEC
China

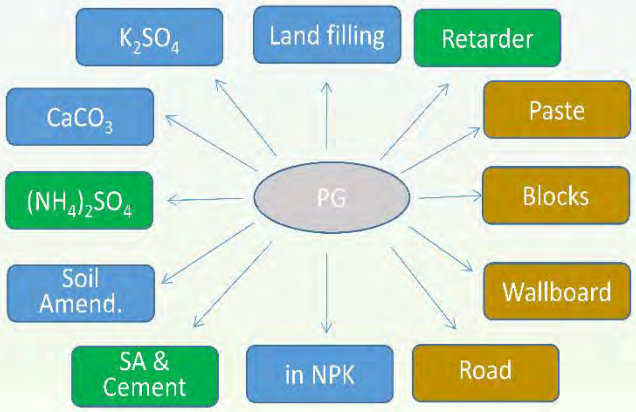
Contents

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

1. PG Stacking in China

Year	Production Capacities of Phosphate Fertilizer ($P_2O_5$100%,Mt)	PG Produced (Mt)	Utilization Rate (%)
2006	8.2	40	
2007	9.92	48	
2008	9.48	45	
2009	10.62	52	20.87
2010	13.02	62	20.32
2011	14.13	68	23.53
2012	14.89	70	24.58
2013	15.0	70	27.40
2014	19.02	90	
	115.3	545	

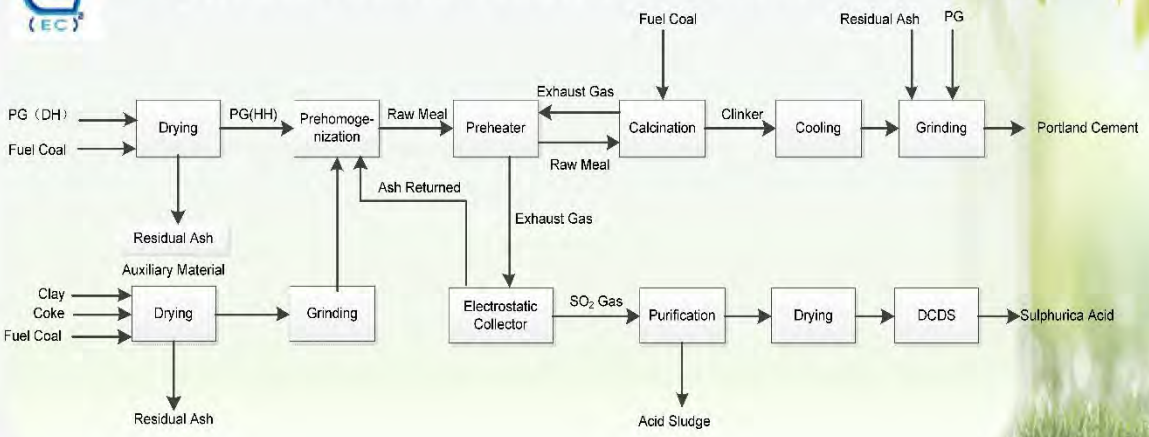
2. PG Applications



28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

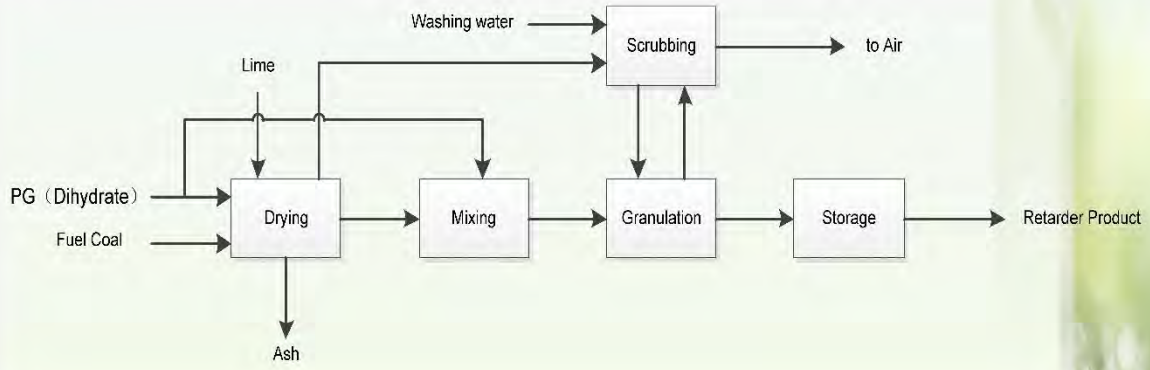
3. Block Process Flow Sheet

Fig.1 Block Process Flow Sheet for Sulfuric Acid and Cement



3. Block Process Flow Sheet

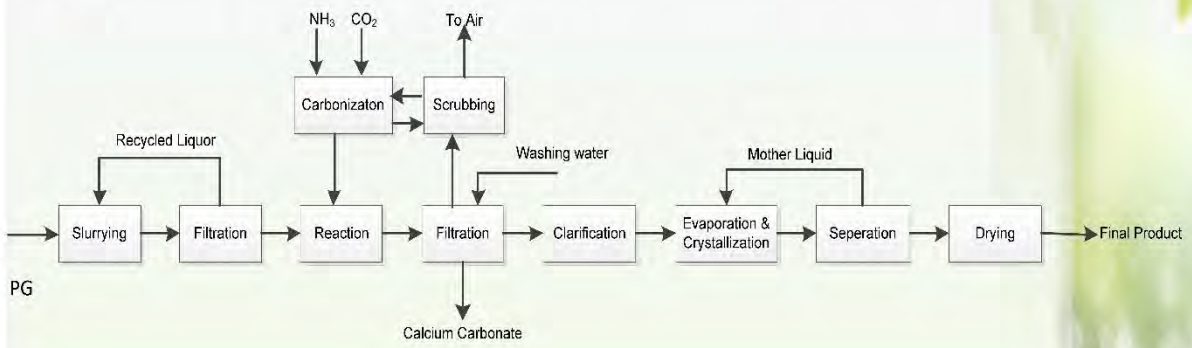
Fig. 2 Block Process Flow Sheet for Cement Retarder



28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

3. Block Process Flow Sheet

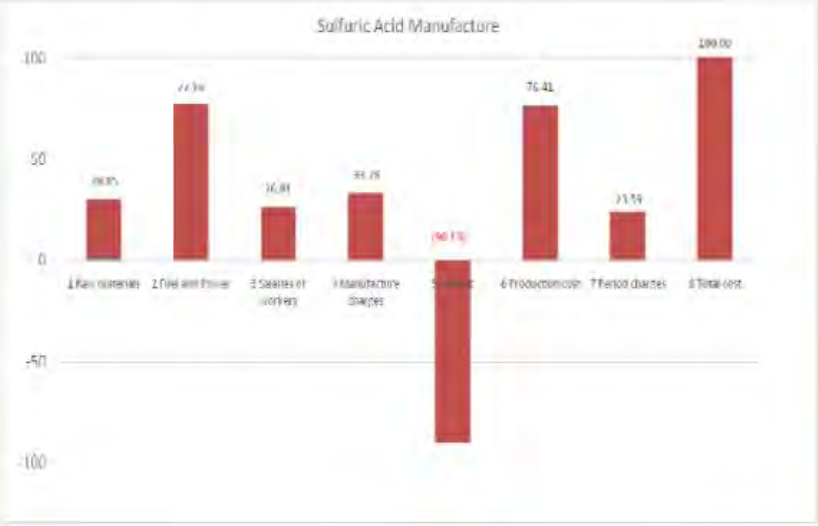
Fig. 3 Ammonium Sulfate Block Process Flow Sheet



Phosphogypsum Utilization In China and Economic Analysis

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

4. Operation Cost Estimated



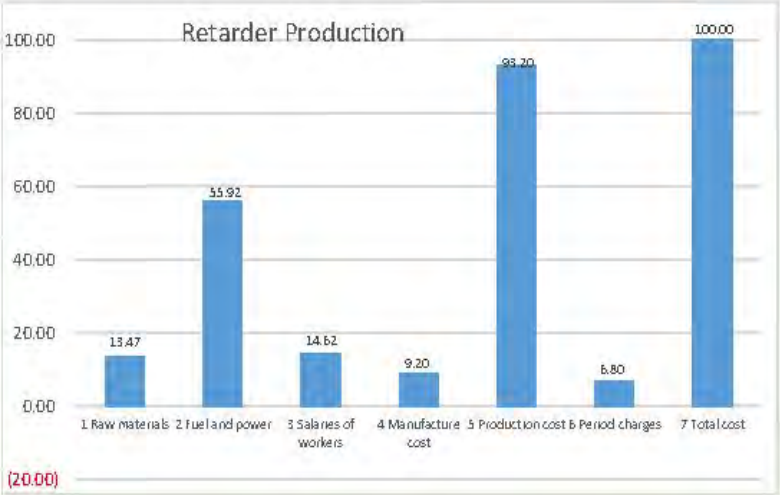
Sulfuric Acid Cost

Phosphogypsum Utilization In China and Economic Analysis

Page 8

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

4. Operation Cost Estimated

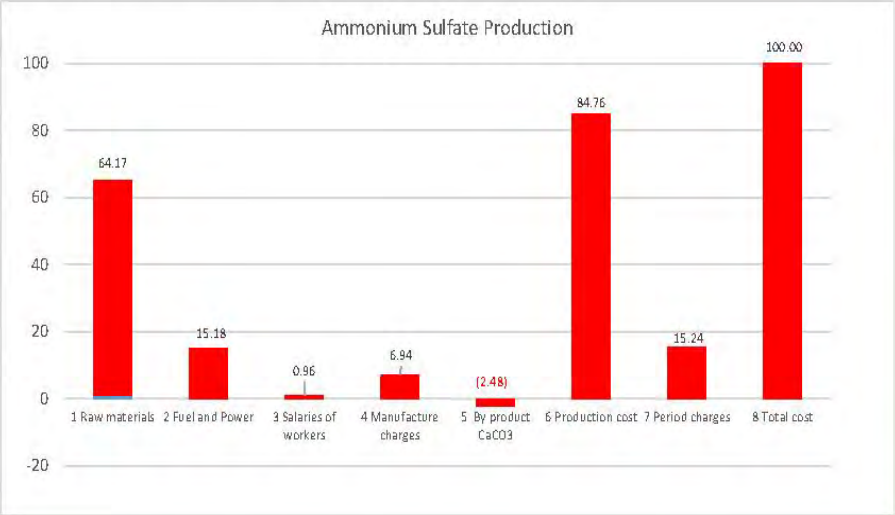


Cement Retarder Cost

Phosphogypsum Utilization In China and Economic Analysis

Page 9

4. Operation Cost Estimated



Ammonium sulfate Cost

5. Reference Plants

SA and Cement Plant
Lubei Group

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

5. Reference Plants

SA and Cement Plant
Calcination
Lubei Group

Phosphogypsum Utilization In China and Economic Analysis

Page 12

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

5. Reference Plants

SA and Cement Plant
Drying & Absorption
Lubei Group

Phosphogypsum Utilization In China and Economic Analysis

Page 13

5. Reference Plants

SA and Cement Plant
Silos in Prehomogenization
Lubei Group

5. Reference Plants

Cement Retarder Plant
Guixi, 200 kt/a

60

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

5. Reference Plants

Cement Retarder Plant
Jiangyou, 200 kt/a

Phosphogypsum Utilization In China and Economic Analysis

Page 16

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

5. Reference Plants

Cement Retarder Plant
Drying Unit

Phosphogypsum Utilization In China and Economic Analysis

Page 17

5. Reference Plants

Cement Retarder Plant
Granulation Unit
600 kt/a

5. Reference Plants

Ammonium Sulfate Plant
PG Purification & AS Filtration
Wenfu Group

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

5. Reference Plants

Ammonium Sulfate Plant
Evaporation & Crystallization
Wenfu Group

Phosphogypsum Utilization In China and Economic Analysis

Page 20

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

5. Reference Plants

Ammonium Sulfate Plant
Carbonization
Wenfu Group

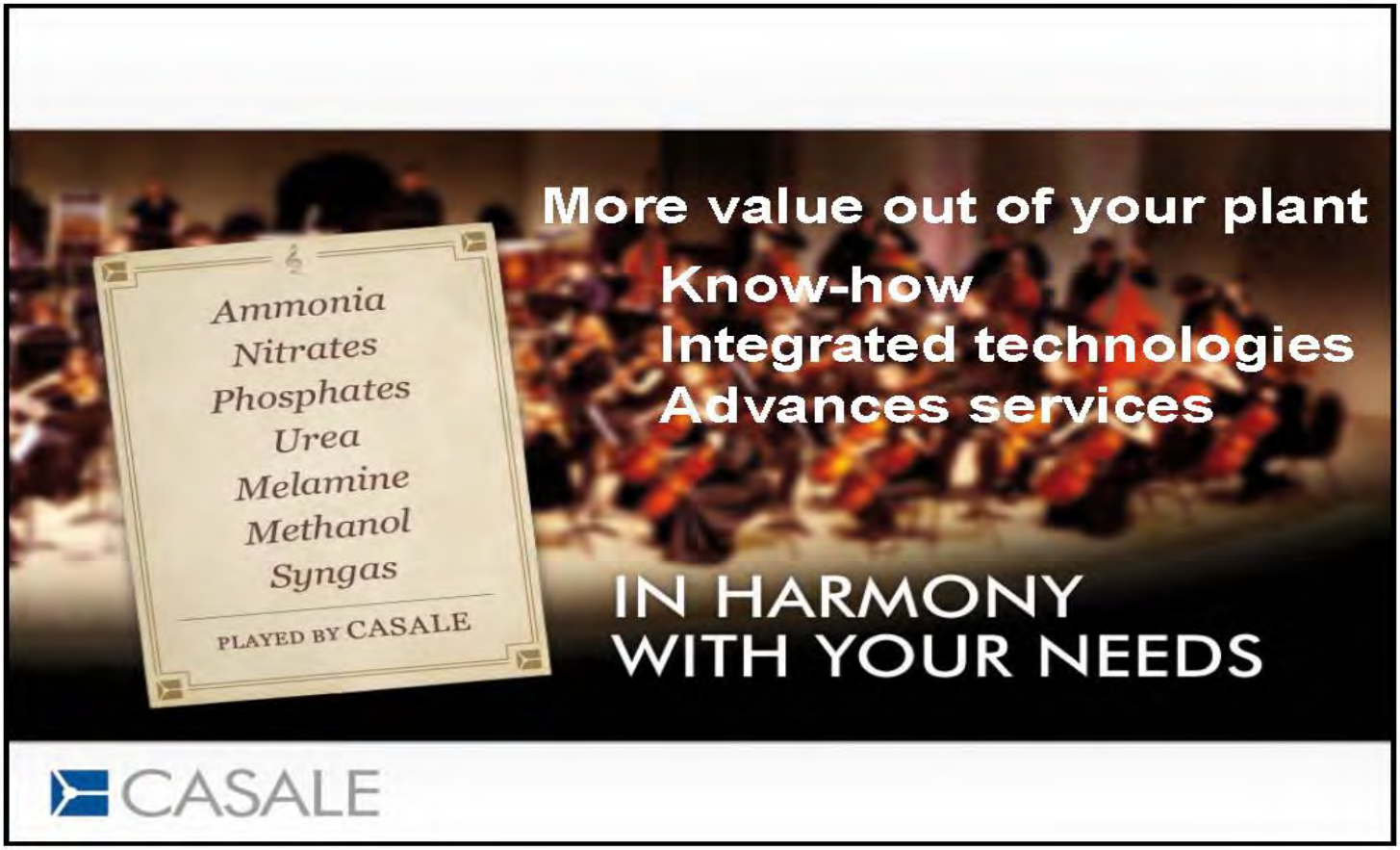
Phosphogypsum Utilization In China and Economic Analysis

Page 21 [21]

THANKS

More value out of your plant
Know-how
Integrated technologies
Advances services

Jean François Granger
CASALE SA
Switzerland



CORE COMPETENCIES

Casale is a global supplier of
technologies & engineering solutions

CASALE

CASALE ENHANCES ITS TECHNOLOGICAL PORTFOLIO

2013: Casale acquires Borealis' HP Melamine technology

2014: Casale acquires Borealis' (GPN) Nitrate, Phosphates and Complex fertilizer technologies

CASALE

NITRATES , PHOSPHATES AND COMPLEX FERTILIZERS

Nitric acid

Ammonium nitrate:
Solution, UAN, solid, CAN

Phosphate: SSP, TSP

Complex fertilizers: DAP, NP/NPK

CASALE

CASALE ENHANCES ITS TECHNOLOGICAL PORTFOLIO

Acquisition includes:

- Collaboration with Borealis for further technology development
- Full support, incl. personnel, during technology transfer

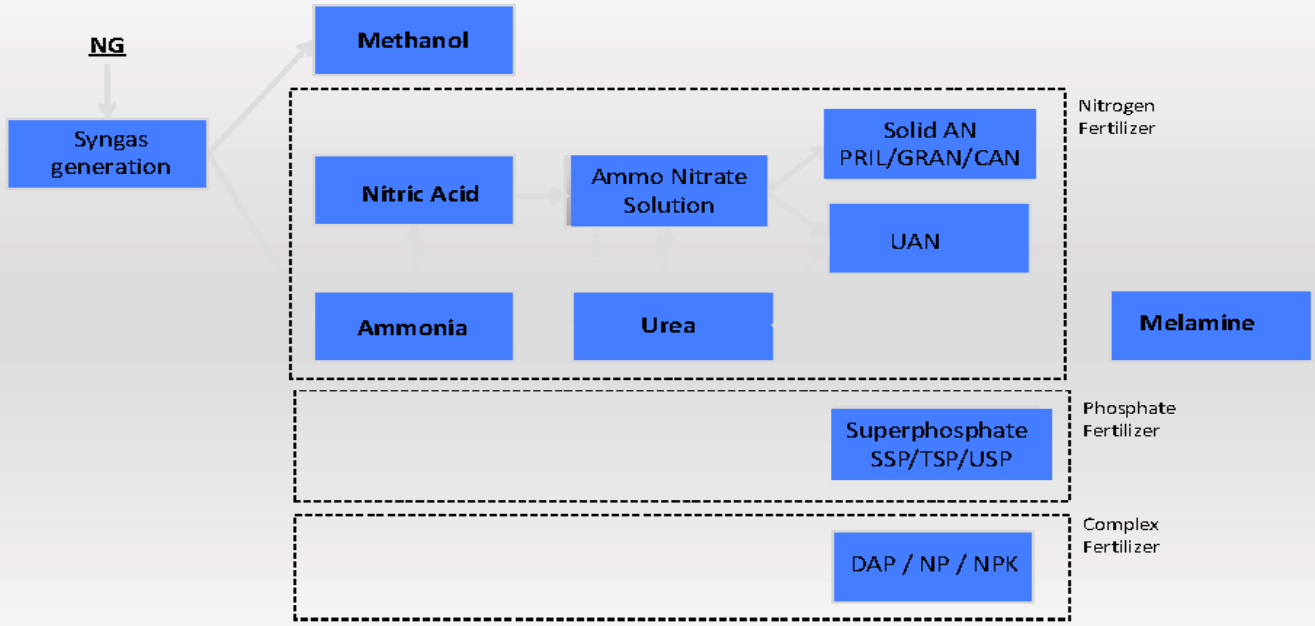
CASALE

TECHNOLOGICAL PORTFOLIO

AMMONIA NITRATES & PHOSPHATES UREA
MELAMINE METHANOL SYNGAS

CASALE

TECHNOLOGICAL PORTFOLIO



CASALE

CASALE NITRIC ACID PROCESS

In 2014 Casale acquired the technology of Nitric Acid production by mono & dual pressure process developed in the 1950's by Grande Paroisse

Continuous improvements have concerned

- ✓ efficiency (both Ammonia consumption and energy)
- ✓ environment,
- ✓ safety.

CASALE

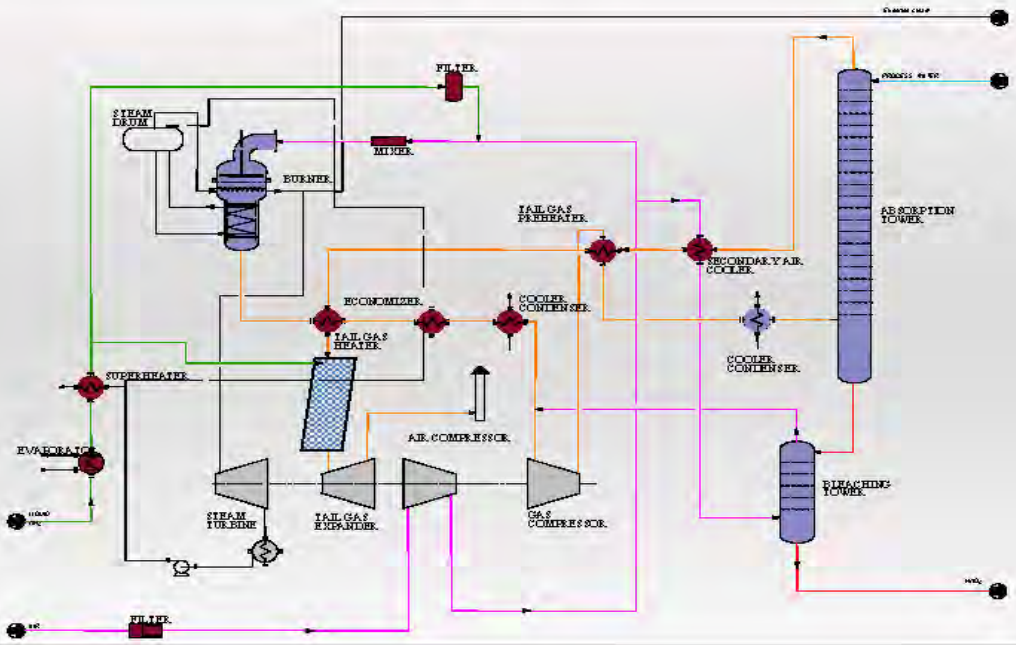
CASALE NITRIC ACID PROCESS

Capacity range

- ✓ First Nitric Acid plant — Frais Marais (France) designed by Grande Paroisse (1958). Capacity 160 MTPD.
- ✓ Largest one (1986) — Yara Sluiskil site (The Netherlands) capacity over 2000 MTPD.
- ✓ Largest single burner (2007) — NZRt Varpalotta site (Hungary) name plate capacity over 1500 MTPD, debottlenecked to 1800 MTPD
- ✓ Borealis Operation — 6 plants 3 dual pressure 3 mono pressure including duplication of NZRt plant
- ✓ Design — 78 plants
  25% mono pressure from 35 to 900 MTPD in 8 countries
  75% dual pressure from 80 to 2000 MTPD in 30 countries

CASALE

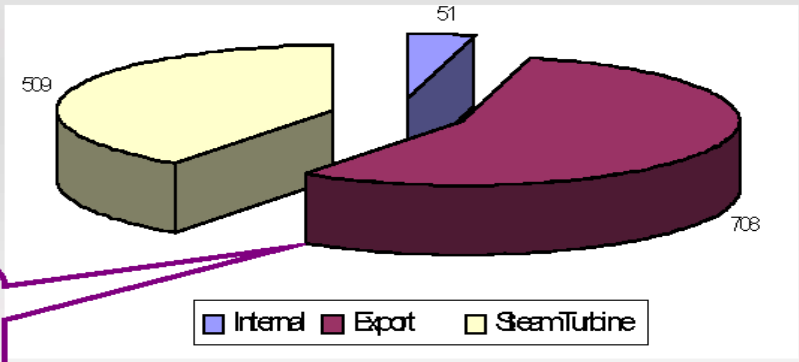
CASALE NITRIC ACID PROCESS



CASALE

CASALE NITRIC ACID PROCESS ENERGY EFFICIENCY

- Improvements = loss reductions
  = pressure drop reductions
- Achieved through collaboration
  - Licensor
  - Engineering
  - Clients



Export > 700 kg/MT HNO3

CASALE

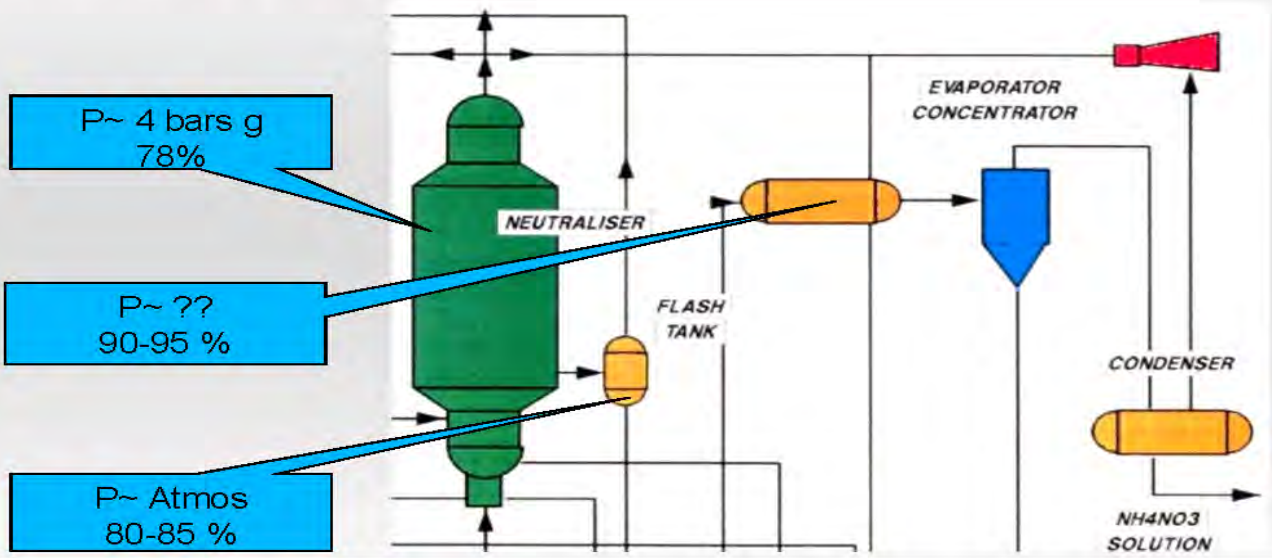
CASALE NITRIC ACID PROCESS

- Successfully commissioned in May-June 2007
- Performances exceeded
- Plant operates smoothly
- Duplicated in France with commissioning in 2010
- Debottlenecked

CASALE

CASALE Ammonium Nitrate Solution Processes

Conventionnal Process

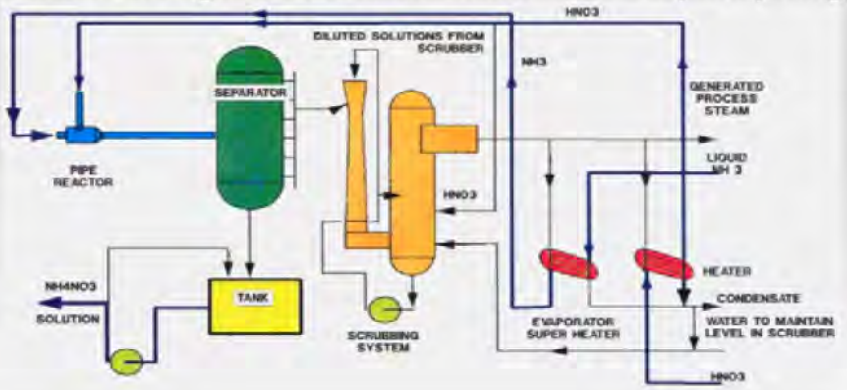


CASALE

CASALE PIPE REACTOR PROCESS

Main features

- ➔Atmospheric
- ➔Proper mixing is ensured through the Pipe Reactor itself
- ➔Nitric acid is added along with the ammonia without any recycling



CASALE

CASALE PIPE REACTOR PROCESS ADVANTAGES

Raw materials	
Downstream uses	Pipe Reactor
Safety	Pipe Reactor
Environmental issues	Pipe Reactor
Flexibility	Pipe Reactor
Ease to operate	Pipe Reactor
Investment cost	Pipe Reactor
Energy consumption	Pipe Reactor

Except in case of re-use of off-gases, Casale considers the Pipe Reactor Process as the best according to all criteria

CASALE

CASALE UAN PROCESS

NITRIC ACID PLANT

AMMONIUM NITRATE SOLUTION PLANT

UAN PLANT

UREA PLANT

CASALE

CASALE NPK PIPE REACTOR PROCESS

- The first GPR was designed in 1970
- The first DPR was designed in 1974

In 1976 GP AZF

designed two of its own NPK plants

without preneutralizer

for the first time.

CASALE

CASALE NPK PIPE REACTOR PROCESS

RECYCLE RATIOS & FUEL CONSUMPTIONS (kg/MT)

	GPR alone		*GPR & DPR*	
DAP :	5+1	8.8	3+1	4
10-26-26 :	3+1	6.6	2+1	3.9
12-32-16 :	3.5+1	7.1	2+1	4.3

CASALE

CASALE NPK PIPE REACTOR PROCESS

FLEXIBILITY IN PIPE REACTOR TECHNOLOGY

- DUAL PIPE REACTOR SYSTEM (DPR & GPR)
- DRYER PIPE REACTOR SYSTEM (DPR)
- GRANULATOR PIPE REACTOR SYSTEM (GPR)

CASALE

CASALE NPK PIPE REACTOR PROCESS

EXAMPLE OF GRADES PRODUCED IN GRANDE PAROISSE PLANT

1.	04:13:26 MGB	18.	14:08:22	35.	15:09:24
2.	06:15:30	19.	14:10:20	36.	15:10:20
3.	10:15:20	20.	14:10:24	37.	15:10:20 SK
4.	10:17:20	21.	14:10:26	38.	15:10:22
5.	10:20:20	22.	14:11:21 S	39.	15:10:25
6.	11:12:24	23.	14:12:16	40.	15:11:22
7.	11:12:25	24.	14:12:18	41.	15:12:16
8.	11:22:16	25.	14:16:12	42.	15:12:23
9.	12:06:24 S	26.	14:16:20	43.	15:12:24
10.	12:08:24	27.	14:20:12 S	44.	15:12:24 B
11.	13:07:21	28.	14:20:12 SMG	45.	15:13:17
12.	13:07:24	29.	14:20:20	46.	15:15:15 SK
13.	13:08:22	30.	15:08:18	47.	15:15:19 SK
14.	13:10:24	31.	15:08:20	48.	15:18:14
15.	13:13:21	32.	15:08:22	49.	15:19:14
16.	14:07:24	33.	15:08:24	50.	15:20:10
17.	14:08:20	34.	15:09:22	51	15:20:20

CASALE

CASALE NPK PIPE REACTOR PROCESS

EXAMPLE OF GRADES PRODUCED IN GRANDE PAROISSE PLANT

52.	16:08:24	69.	19:11:19	86.	20:18:00 S
53.	16:08:24 MG	70.	19:19:00	87.	20:20:00
54.	16:10:22	71.	19:19:00 S	88.	20:222:00 S
55.	16:10:25	72.	20:05:10	89.	20:34:00 S
56.	16:10:18	73.	20:05:10 SMG	90.	22:08:00 S
57.	16:13:10 S	74.	20:06:09	91.	22:12:00 S
58.	16:14:10 S	75.	20:07:12	92.	22:12:08
59.	16:14:18	76.	20:08:12 SMG	93.	23:23:00
60.	16:15:18	77.	20:10:00 S	94.	25:10:00
61.	16:16:10 S	78.	20:10:05 SKMG	95.	25:10:10
62.	18:12:16	79.	20:10:10	96.	26:00:00
63.	18:12:20	80.	20:10:14	97.	27:00:00
64.	18:13:13	81.	20:10:15	98.	27:06:06
65.	18:13:13 S	82.	20:11:18	99.	28:05:00
66.	18:20:00 SMG	83.	20:12:00 S	100.	30:06:00
67.	18:22:12	84.	20:14:16	101.	30:10:00
68.	18:46:00	85.	20:15:12		

S: WITH AMMONIUM SULPHATE MG: WITH MAGNESIUM SK: WITH POTASSIUM SULPHATE B: BORON

CASALE

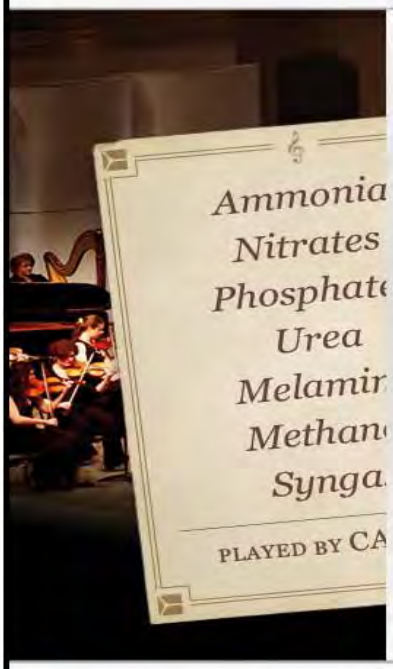
COMPLETE RANGE OF SERVICES

Casale
Service Process

CASALE

AMMONIA NITRATES AND PHOSPHATES UREA
MELAMINE METHANOL SYNGAS

DELIVERING RESULTS



MAKING A DIFFERENCE IS WHAT MAKES US **DIFFERENT**

CASALE

THANK YOU

IN HARMONY WITH YOUR NEEDS

CASALE

Safety Task Force as tool to improve adhesion and positive behavior in the Gantour Mining Site.

Salaheddine KNOUZI
OCP SA
Morocco

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

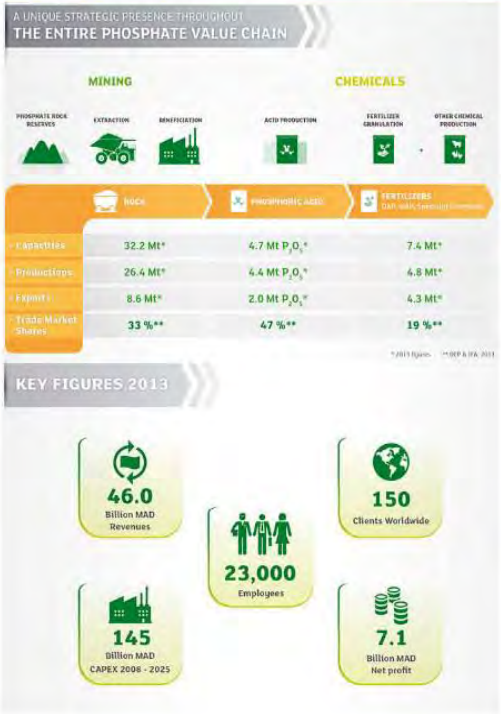
OUTLINE

1. OCP OVERVIEW / GANTOUR SITE
2. OCP INDUSTRIAL STRATEGY/ OCP PRODUCTION SYSTEM
3. SAFETY TASKFORCE PROJECT
4. ILLUSTRATIONS/ACHIEVEMENTS

Page 2

1-1 OCP OVERVIEW:

1-1 OCP OVERVIEW:



1-1 OCP OVERVIEW:

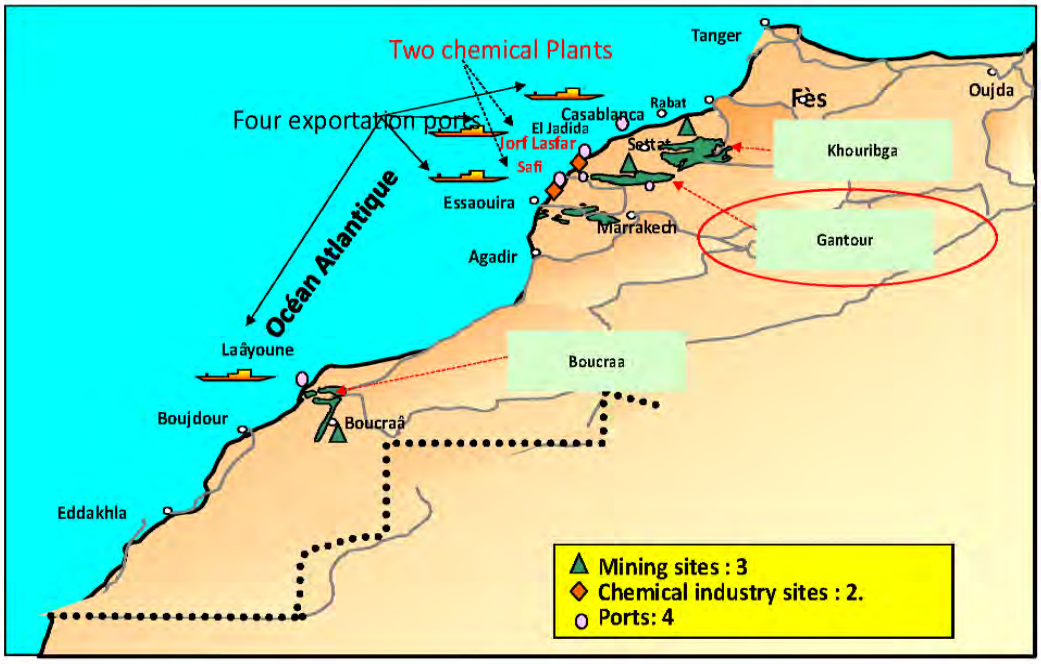
Mining & Processing
- Phosboucraâ
- Pragon
- Euro Maroc Phosphore *(EMAPHOS)*
- Jorf Fertilizer Company V *(JFC V)*
- Indo Maroc Phosphore *(IMACID)*
- Pakistan Maroc Phosphore *(PAKMAROC)*
- Zuari Maroc Phosphates Limited *(ZMPL)*
- Paradeep Phosphates Limited *(PPL)*

International & Trading
- OCP International
- OCP Fertilizantes
- OCP de Argentina
- OCP do Brazil
- Black Sea Fertilizer Trading Company *(BSFT)*

Engineering & Consulting
- Jacobs Engineering *(JESA)*
- Transportation Engineering and Management Consultants *(Team Maroc)*
- DuPont OCP Operations Consulting

Ecosystem Development
- Société d'Aménagement et de Développement Vert *(SADV)*
- Société d'Aménagement et de Développement de Mazagan *(SAEDM)*
- OCP Innovation Fund For Agriculture *(OIFFA)*
- Fondation OCP

1-2 GANTOUR SITE :



1-2 GANTOUR SITE :

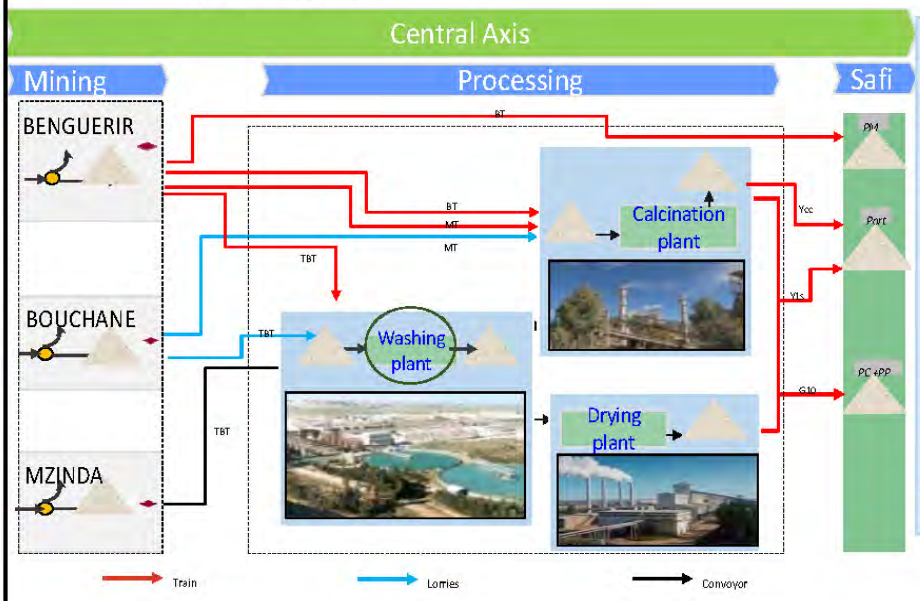
❖ HISTORICAL VIEW

- 1931 : Starting up the underground extraction of white phosphates at Youssoufia with Solar drying;
- 1935 : Drying in 4 rotary ovens dryers (Drying phosphates by using 4 rotary ovens that working with coal thermal power)
- 1965 : Introduction of the mechanization in the underground mining and starting up drying by FUEL (8 ovens);
- 1968 : Use of natural gas in stead of fuel to the drying plant.
- 1974 : Starting up underground mining of black phosphates;
- 1978 : 1st calcination unit (UC1) for black phosphates treatment;
- 1980 : Starting up open pit mining at Benguerir;
- 1986 : Three additional calcination (UC2, UC3 and UC4);
- 1998 : Starting up open pit mining at Bouchane;

- 1999 : Realization of unloading trains station at calcination units
- 2000 : ISO 9001 for processing plant in Youssoufia
- 2002 : Benguerir mine was TPM awarded by JIPM
- 2004 : Starting up open pit mining at Youssoufia
- 2004 : Bouchane mine TPM awarded by JIPM
- 2005 : Stopping the underground mining of black phosphates at Youssoufia;
- 2005 : Starting up of two washing units
- 2007 : Bengurir and Bouchane mines awarded by JIPM
- 2008 : Starting up of the 3rd washing unit
- 2010 : Starting up mining in MZINDA

1-2 GANTOUR SITE :

❖ FLOW PROCESS



❖ *Historical view:*

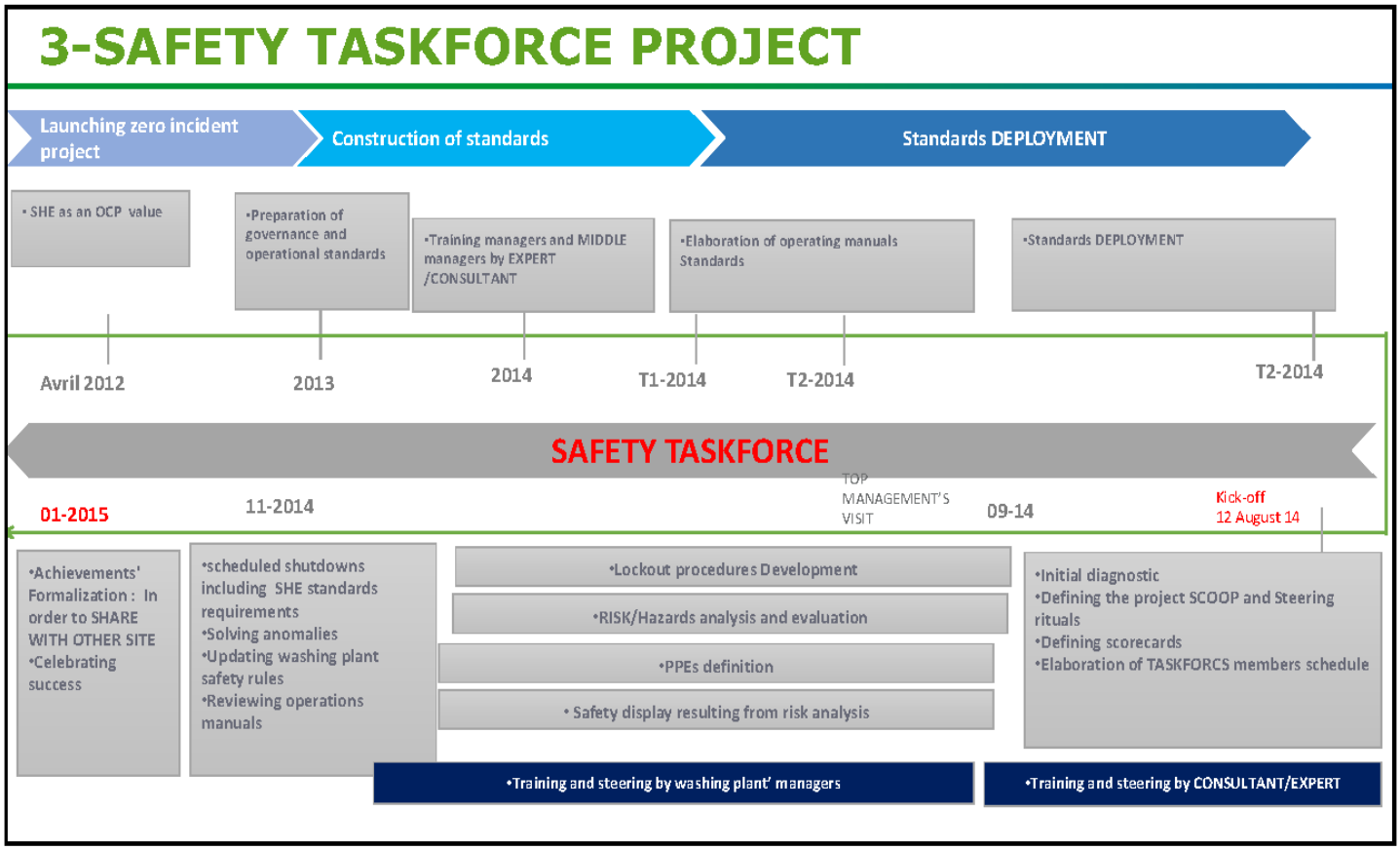
- 2005 : Starting up of two washing units
- 2008 : Starting up of the 3rd washing unit.

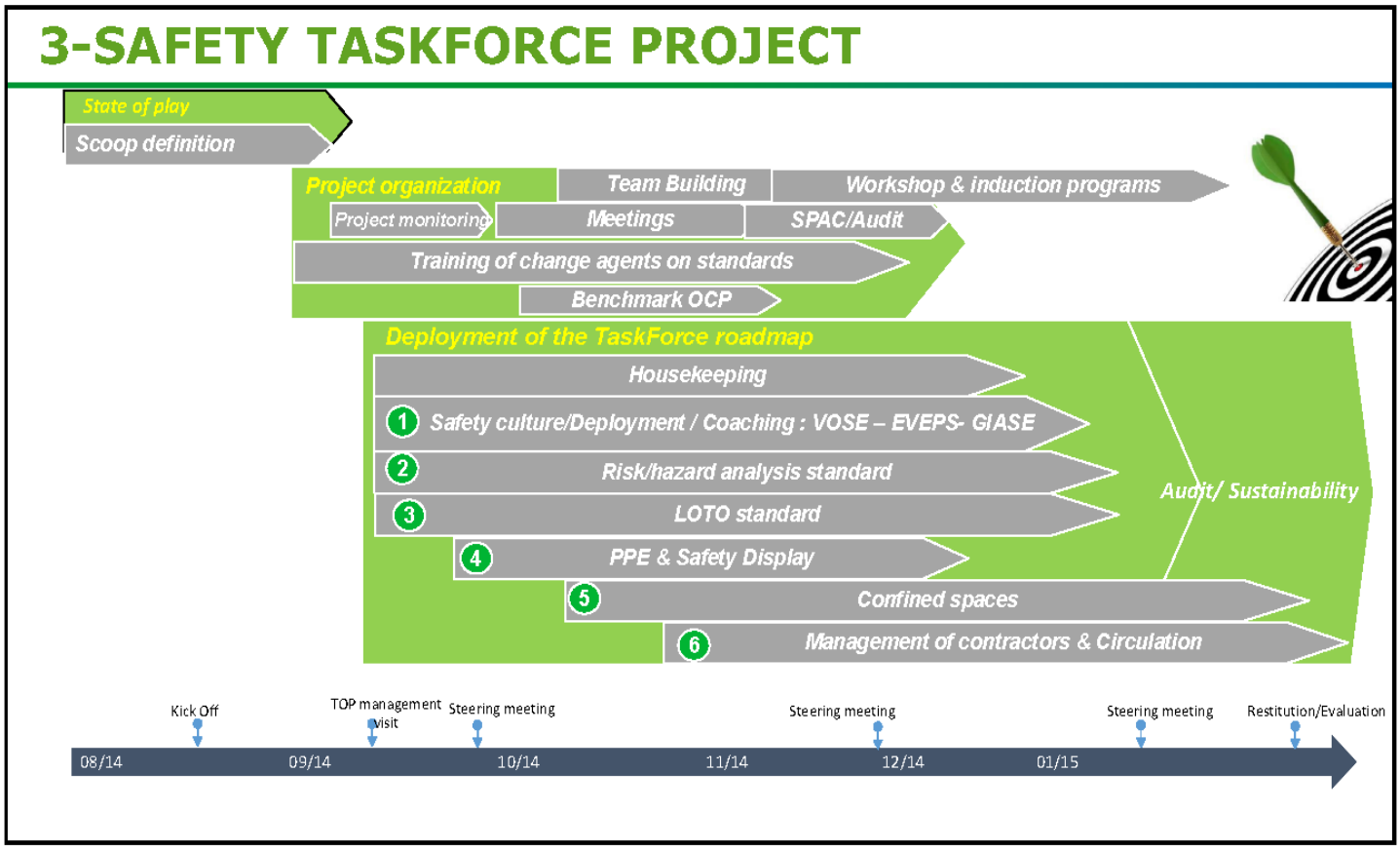
❖ *Objective:* beneficiating Gantour mining phosphate : Mzinda, Bouchane and Benguerir. It is comprised of three processing units, each one involves many separate steps including washing, desliming, and sizing, followed by flotation.

❖ *Capacity :* Each of the processing units can bear as much as 1.4 Mt per year, which gives us an overall production capacity of 4.2 Mt per year.

❖ *total staff:* 245 collaborators including five engineers

2-1 OCP INDUSTRIAL STRATEGY


3-SAFETY TASKFORCE PROJECT
Launching zero incident project
Construction of standards
Standards DEPLOYMENT
• SHE as an OCP value
•Preparation of governance and operational standards
•Training managers and MIDDLE managers by EXPERT /CONSULTANT
•Elaboration of operating manuals Standards
•Standards DEPLOYMENT
Avril 2012
2013
2014
T1-2014
T2-2014
T2-2014
SAFETY TASKFORCE
01-2015
11-2014
TOP MANAGEMENT'S VISIT
09-14
Kick-off 12 August 14
•Achievements' Formalization : In order to SHARE WITH OTHER SITE
•Celebrating success
•scheduled shutdowns including SHE standards requirements
•Solving anomalies
•Updating washing plant safety rules
•Reviewing operations manuals
•Lockout procedures Development
•RISK/Hazards analysis and evaluation
•PPEs definition
• Safety display resulting from risk analysis
•Initial diagnostic
•Defining the project SCOOP and Steering rituals
•Defining scorecards
•Elaboration of TASKFORCS members schedule
•Training and steering by washing plant' managers
•Training and steering by CONSULTANT/EXPERT


3-SAFETY TASKFORCE PROJECT
State of play
Scoop definition
Project organization
Team Building
Workshop & induction programs
Project monitoring
Meetings
SPAC/Audit
Training of change agents on standards
Benchmark OCP
Deployment of the TaskForce roadmap
Housekeeping
1 Safety culture/Deployment / Coaching : VOSE – EVEPS- GIASE
2 Risk/hazard analysis standard
3 LOTO standard
4 PPE & Safety Display
5 Confined spaces
6 Management of contractors & Circulation
Audit/ Sustainability
Kick Off
TOP management visit
Steering meeting
Steering meeting
Steering meeting
Restitution/Evaluation
08/14
09/14
10/14
11/14
12/14
01/15

3-SAFETY TASKFORCE PROJECT

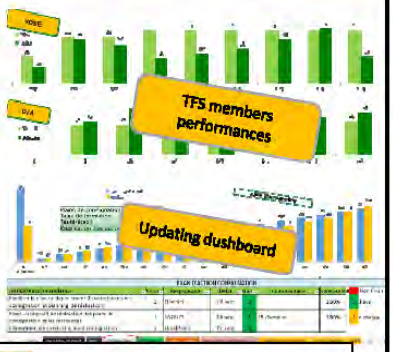
Laverie

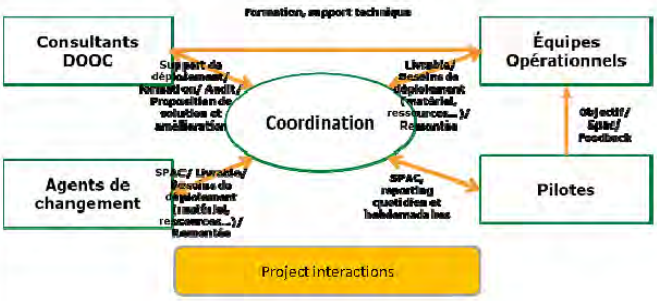
Objective		Main actions
washing plant: an exemplary unit with SHE excellence	visible/visual Change on field	**Opérationnel /governance standards** • Accelerating Deployment of Operational & governance standards **Structure** • Coaching sur VOSE et EVEPS • Review of managers SPAC (schedule) • Solving irritating problems (technical and organizational) that allow the deployment of SHE standards • Establishing taskforce team schedules
Skills Developement Taskforce team	taskforce team to be SHE experts	**Behavior and Competencies/skills** • Training (standards opérationnels, taskforce team to be SHE experts ...) • Safety rules establishement • Culture change workshop • communication • Field Coaching and communication by managers

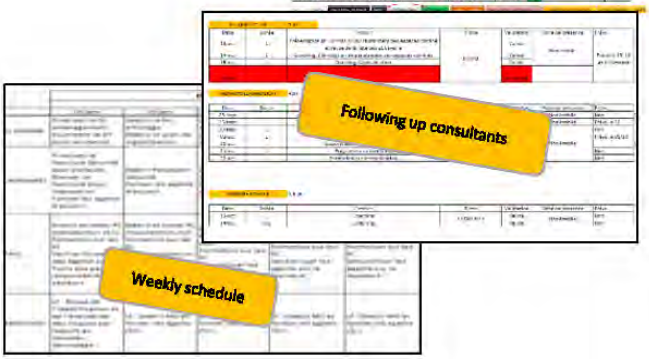
3-SAFETY TASKFORCE PROJECT

Project coordination

- Steering meetings: Daily Check-in/ out, weekly review, steering committee;
- Construction of weekly schedule of TFS members and washing plant managers;
- Following up and reporting daily and weekly schedules progress
- Saving up project data: updating dashboards, verification of standards output, reporting deployment' problems and difficulties
- Following up and sharing TFS members performances
- Coordination and consultants' evaluation







3-SAFETY TASKFORCE PROJECT

1 CULTURE CHANGE: EXEMPLARITY, COMMITMENT AND WORKERS IMPLICATION

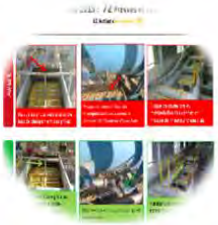
Workshops about Safety culture
- Communication sessions
- Definition of Washing plant Safety rules
- Deployment steering

- Coaching and training on field by managers and consultants

Reinforcing safety dialogue on site : VOSES, steering committee…

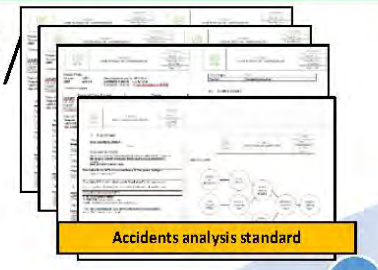
- Training on safety and operational standards

Commitment and implication of managers:
- Prioritization HSE back log execution
- Solving irritating problems
- Actions plans execution : ADRPT, PPE, Confined spaces…
- Reviewing scheduled shutdowns preparations procedures
…



3-SAFETY TASKFORCE PROJECT

1 GIASE/ VOSE/

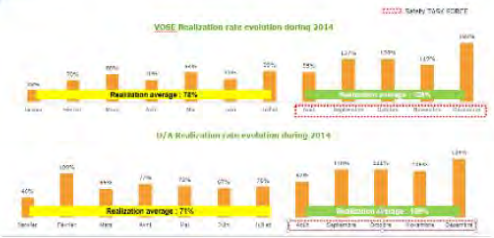


Setting up safety rituals: Safety point, weekly HSE performances meetings, prioritizing HSE back log execution…

- Coaching on safety dialogue rules and SHE leadership
- Training TFS members on VOSE & GIASE
- Workshops on safety culture and behavior change

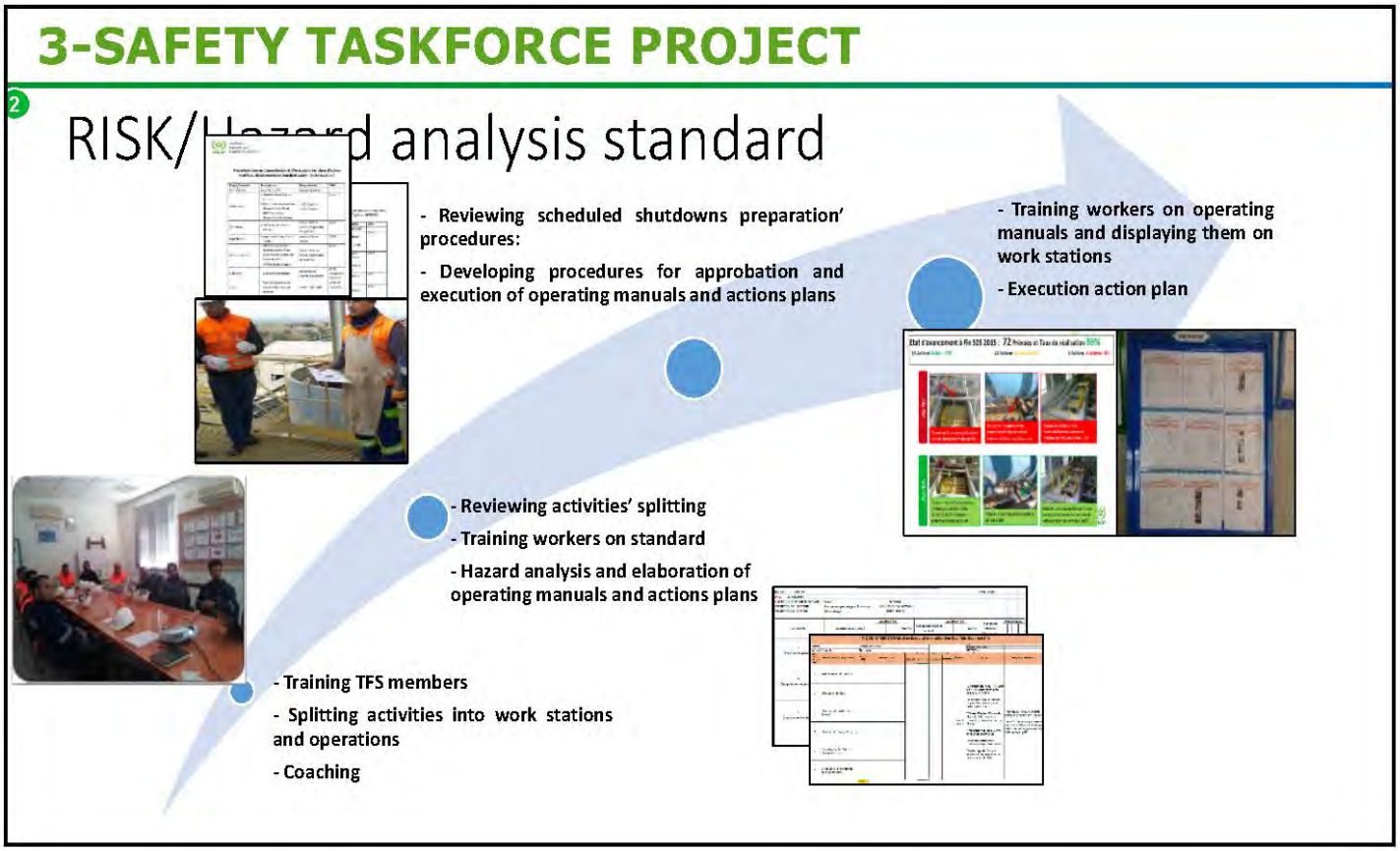
-VOSE: Improvement of realizations rates and dialogue quality

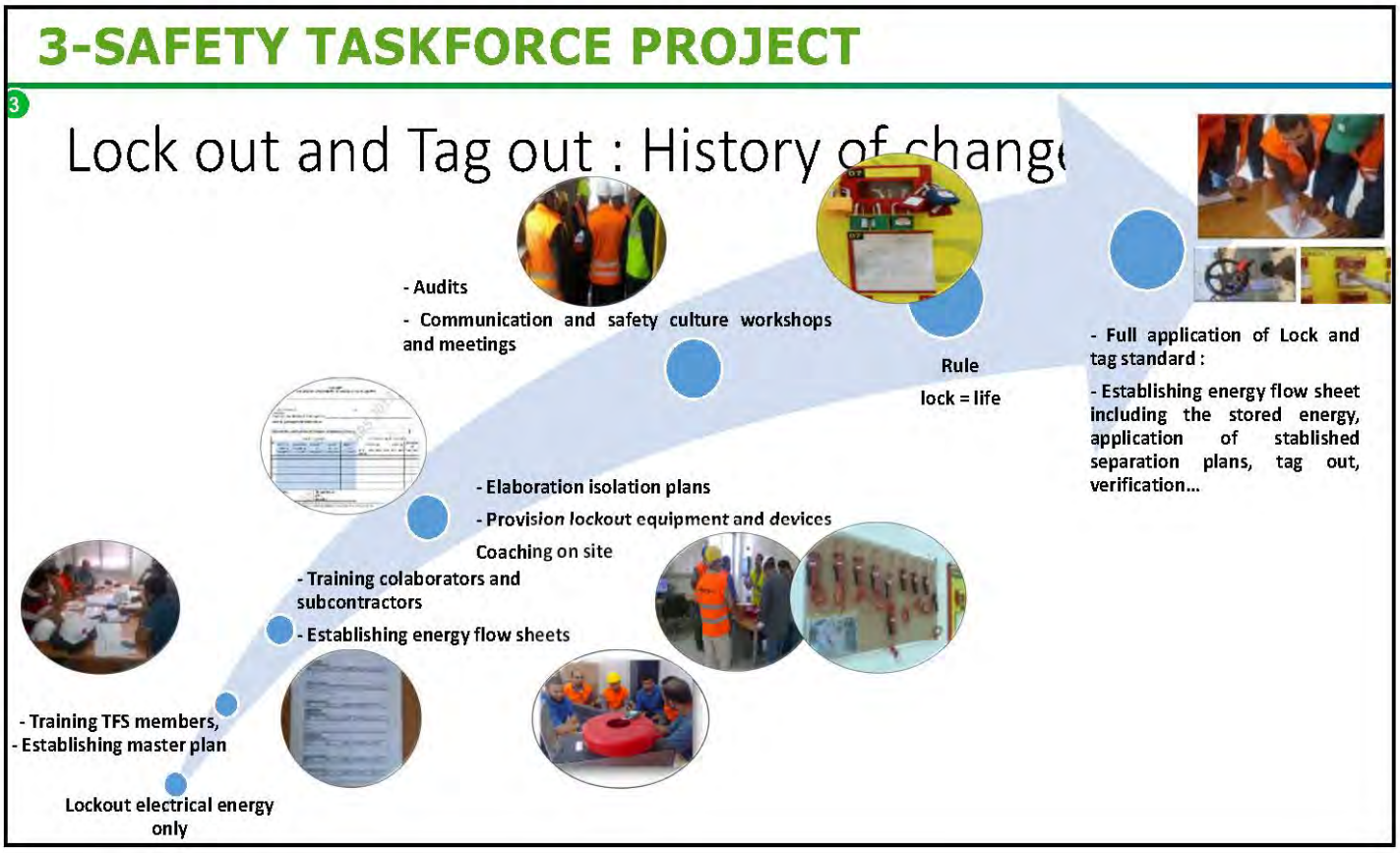
-GIASE: Improvement of Analysis quality



VOSES: Unsatisfactory realization rate

GIASE: Investigation and analysis of incidents and accidents by managers and colaboratorsrs


3-SAFETY TASKFORCE PROJECT
2
RISK/Hazard analysis standard
- Reviewing scheduled shutdowns preparation' procedures:
- Developing procedures for approbation and execution of operating manuals and actions plans
- Training workers on operating manuals and displaying them on work stations
- Execution action plan
- Reviewing activities' splitting
- Training workers on standard
- Hazard analysis and elaboration of operating manuals and actions plans
- Training TFS members
- Splitting activities into work stations and operations
- Coaching


3-SAFETY TASKFORCE PROJECT
3
Lock out and Tag out : History of change
- Audits
- Communication and safety culture workshops and meetings
Rule
lock = life
- Full application of Lock and tag standard :
- Establishing energy flow sheet including the stored energy, application of stablished separation plans, tag out, verification...
- Elaboration isolation plans
- Provision lockout equipment and devices
Coaching on site
- Training colaborators and subcontractors
- Establishing energy flow sheets
- Training TFS members,
- Establishing master plan
Lockout electrical energy only

3-SAFETY TASKFORCE PROJECT

4

PPE & SAFETY Display

Inadequate safety messages on the panel with their position

Display chart

- Training TaskForce team on display standards
- Display chart development

- Initial Diagnostic of safety display on washing plant
- Definition of display content: circulation plan, separation panel…

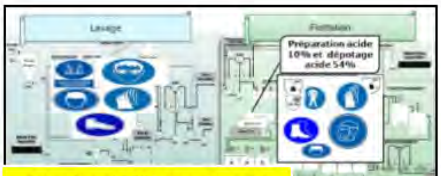
- Starting display project
- Setting a temporary SHE display according to hazards analysis

Setting a standardized HSE display: according to the chart and Risk/hazard analysis

3-SAFETY TASKFORCE PROJECT

4

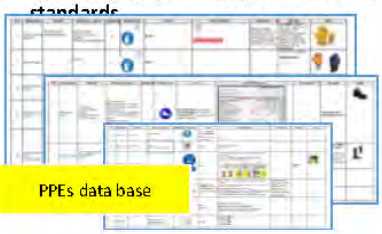
Personal protective equipement



Selection of PPEs for each task/ work stations

- Selection, for each operation, the appropriate PPEs according to the hazard analysis: Construction of PPEs matrix
- Provision of identified PPEs

- Training workers on PPE
- Establishing PPE data base: For every PPE, its contained types, specification, standards



PPEs data base

- Training TFS members

- Displaying and communication of PPEs matrix
- Training the stuff on how to use specific and category III PPEs

Awareness on basic and specific PPEs

3-SAFETY TASKFORCE PROJECT

5

Confined spaces standard

- Holding Preparation meeting a day before between process engineer, operations responsible and SHE animator to set penetration permit's requirements: Rescue procedures, lock out plan, operating manuals…
- Coordination with occupational rescue team

- Planning the interventions on confined spaces 2 days earlier;
- Debriefing meeting for capitalization

- Sharing the penetration permit with all operators
- Verification and validation of confined spaces penetration permit before the beginning of operations

- Establishing confined space penetration's permit slightly before the maintenance task

3-SAFETY TASKFORCE PROJECT

6

Subcontractors management and traffic

- Establishing access's permit for subcontractors
- Training subcontractors on OCP HSE' standards and procedures
- Regular audit and on site safety' awareness

- Realizing a subcontractors audit
- Implementation of Subcontractors management standard

- Updating visitors and subcontractors safety debriefing/awareness

- Elaboration of traffic plans
- Building parking
- Updating traffic signs

4- ILLUSTRATIONS/ACHIEVEMENTS

CULTURE CHANGE: EXEMPLARITY, COMMITMENT AND COLLABORATORS IMPLICATION

Team building/workshop
Learning by doing

Training on safety and operational standards

Visible Commitment of management:
- Prioritization the treatment of Safety anomalies
- Solving irritating problems
- Action plan execution : ADRPT, PPE, Confined spaces...
- Reviewing scheduled shutdowns procedures

Coaching and training on field by managers and consultants

- Workshops about Safety culture change
- Communication sessions
- Definition of Washing plant Safety rules
- steering

Strengthening safety dialogue on field
: VOSES, EVEPS...

4- ILLUSTRATIONS/ACHIEVEMENTS

SECURITY RULES IN THE BENEFICIATION PLANT

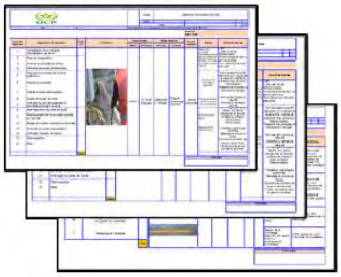
- Reverse parking is mandatory
- Use zebra crossing while crossing roads
- Seat belts must be buckled up at all times
- Hold on to the handrail
- No hand held cell phone use while driving
- No personal vehicle use on site
- Basic Personal protection equipment must be worn at all times
- Specific personal protective equipment related to a specific task or zone are required
- No maintenance or repair on a machine without lockout of all energies
- Every worker must put his personal lock
- Every intervention (maintenance/repair) = operating manual + work permit
- NO intervention inside any confined space without a penetration permit

4- ILLUSTRATIONS/ACHIEVEMENTS

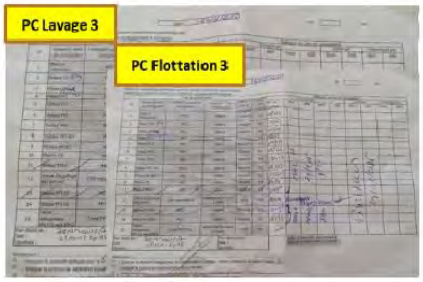
REVIEWING SCHEDULED SHUTDOWN PREPARATIONS PROCEDURES

Shutdown Master plan :

Updating & Communication of operating manuals



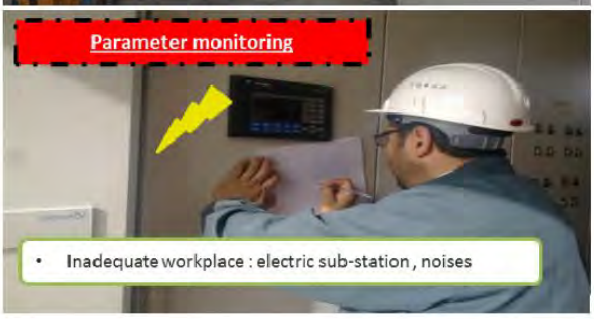
confined spaces : permit to work



Auditing :
100% of scheduled tasks are executed according to operating manuals

4- ILLUSTRATIONS/ACHIEVEMENTS

RISK ANALYSIS STANDARD : WORKPLACE TRANSFORMED IN ORDER TO MASTER THE RISK



4- ILLUSTRATIONS/ACHIEVEMENTS

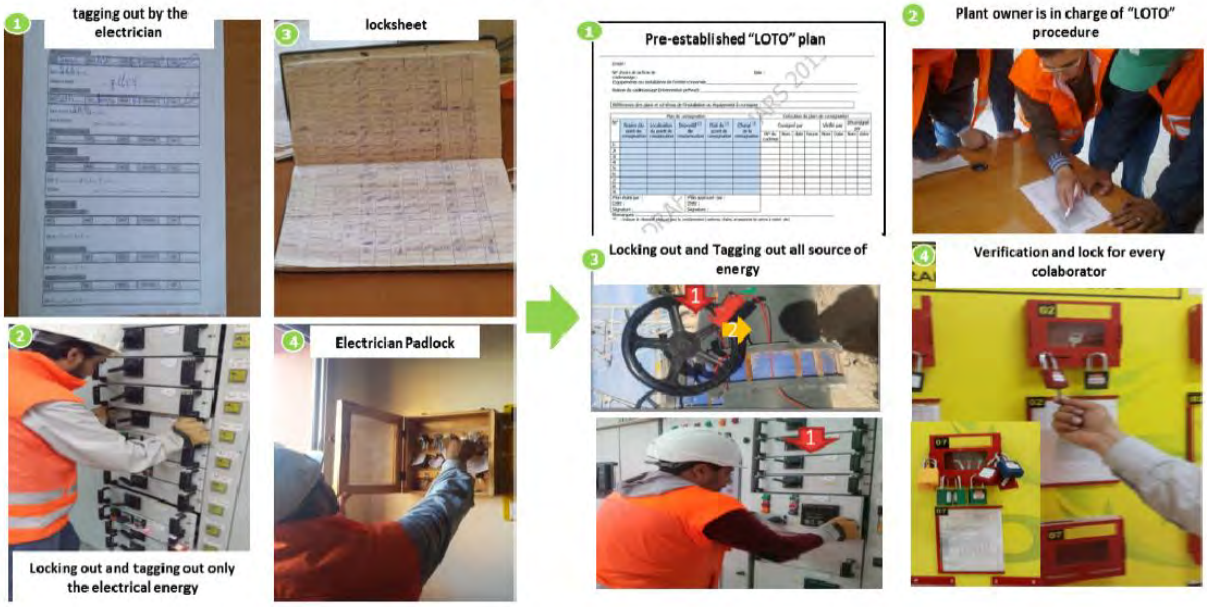
PERSONAL PROTECTIVE EQUIPEMENT : REDEFINED ACCORDING TO RISK ANALYSIS

4- ILLUSTRATIONS/ACHIEVEMENTS

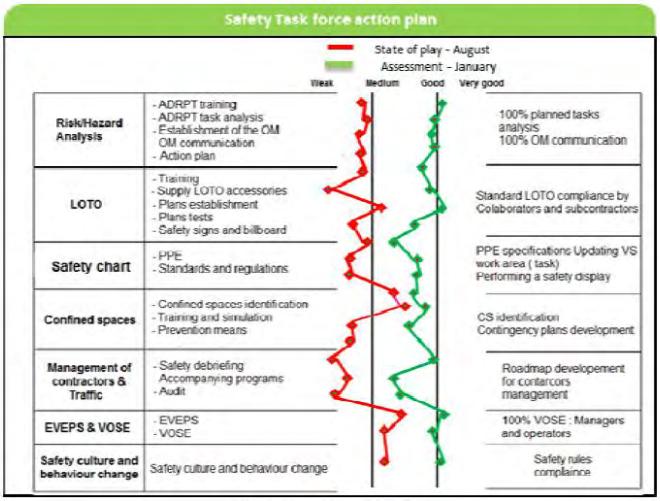
LOCK OUT TAG OUT STANDARD

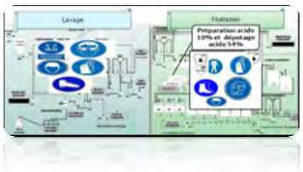
Lock = Life

Dispositif de séparation
Dispositif de condamnation



4- ILLUSTRATIONS/ACHIEVEMENTS





Ammonia Release to atmosphere due to Ammonia pre-heater tube rupture IN UREA -5 PLANT

YACOUB AL-RAYYIS
QATAR FERTILISER COMPANY
QATAR

INTRODUCTION

- At QAFCO Urea-5 plant, Ammonia Pre-heater (152.E2307) tube failed causing a sudden LP section loop pressure increase.
- As an immediate consequence the LP Decomposer Relief valve lifted, resulting in an ammonia release to atmosphere through the blow down separator stack and consequently the Urea-5 plant was stopped.
- Ammonia smell was reported from neighboring plants, while there was no smell observed inside Q5 plant area as the release occurred at a higher elevation (61 m) and having a repellent wind direction.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

SEQUENCE OF EVENTS

During E2307 Tube Failure

In April 20th, 2014 U-5 plant was running at 110% load.

At 18:15hrs plant upset observed as follows:

- Carbamate separator, U2201 level increased.
- Ejector pressure, PIC22021 pressure decreased from 23 Mpa to 19 Mpa
- Ammonia flow to Synthesis suddenly increased.
- Suspected ammonia Pump discharge RV23061A, passing. The RV isolated, & the stand-by RV put on line. Even though no improvement was noticed.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

SEQUENCE OF EVENTS

During E2307 Tube Failure

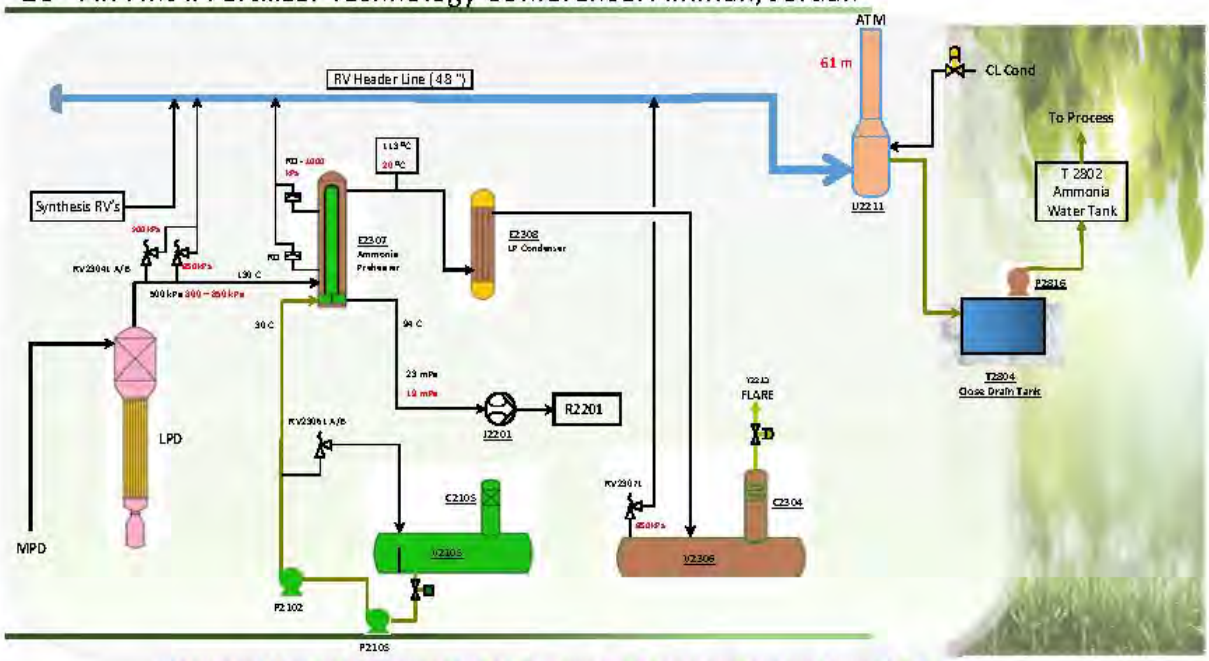
- Ammonia Receiver, V2105 level observed coming down.
- V2105 RV checked, no passing observed.
- All parameters in MP loop found normal.
- LP Loop pressure increased & Ammonia Pre-heater,(E2307) outlet temperature decreased. Which indicates E 2307 tube leak, so immediately decided and stopped the Plant at 18:44hrs.
- There was no Ammonia smell around Urea-5 plant as the emission taken place at higher elevation (61M) through Blow down Separator, U2211.

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT

Page 2

E2307 Tube Failure

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan



AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT

Page 2

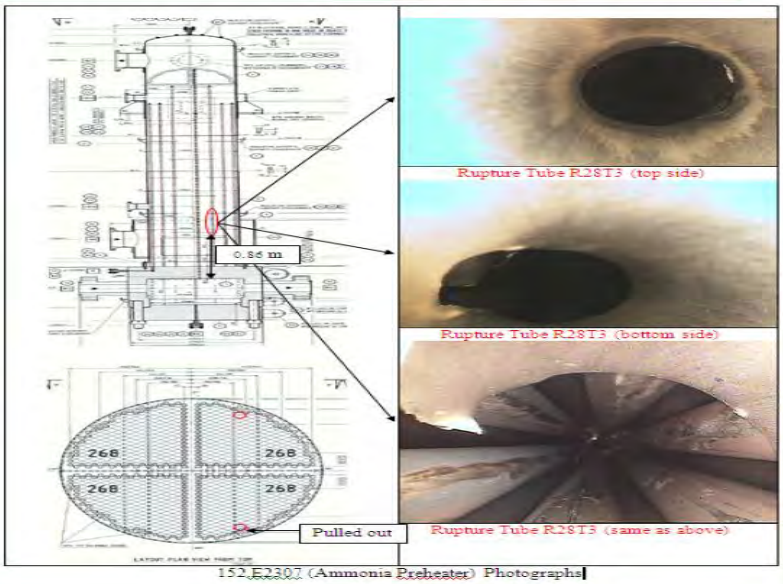
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Q5/6 SITE OVERVIEW

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan



152-E2307 (Ammonia Preheater) Photographs

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT

Page 2

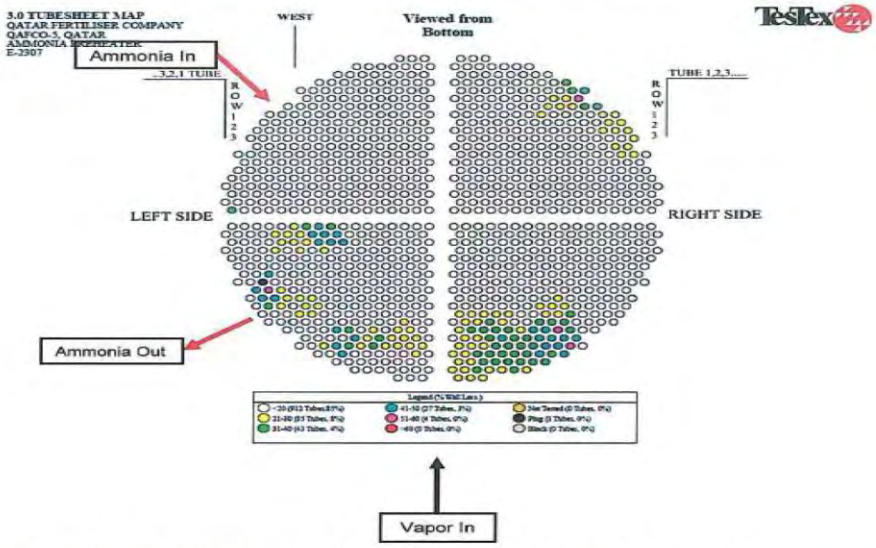
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Ruptured Tube

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan



Total of 67 tubes were plugged (tubes with wall loss >30%).

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT

Page 2

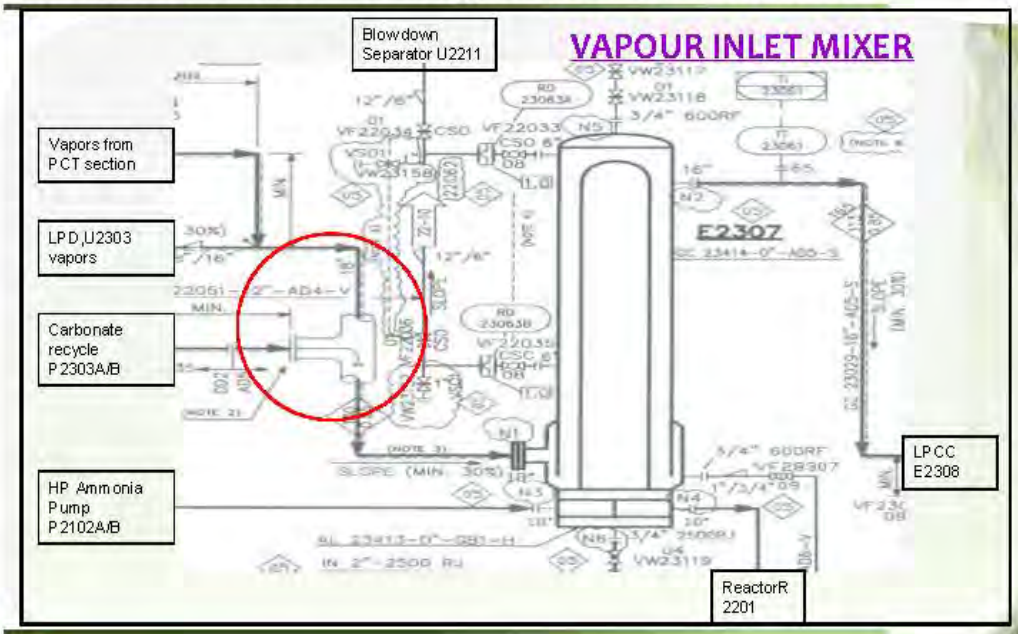
ROOT CAUSE ANALYSIS

A root cause analysis was carried out and the following causes were identified:

1. Initial condensation of inlet vapors to highly corrosive ammonium carbamate solution at the vapor inlet area between baffle no #1 & #2.
2. Accelerated corrosion of tubes having high skin temperatures depending on tube pass. This pattern is evident from the ECT report where in most tubes have thickness loss on tube pass #3 and #4.
3. No Supply of Carbonate Solution from P2303A/B to the vapor inlet mixer. The passivation, which is normally believed to take place via metal ion, is missing in this freshly condensed carbamate solution. Hence presence of oxygen does not completely assure passivation of stainless steel. Therefore to avoid severe corrosion of steel in such areas, liquid phase is added at the inlet via liquid-gas mixing devices to prevent dry spots on surfaces where condensation takes place.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

VAPOUR INLET MIXER



AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT

Page 2

RCA Recommendations

1. Line up the carbonate solution from P2303 A/B to the mixer at the inlet of Ammonia Pre-heater.
2. Replace the existing exchanger/tube bundle with new one.
3. Up-gradation of tube material of construction to Duplex SS or 25/22/2 could be considered for more corrosion resistance to condensation corrosion.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

IMPROVEMENT STUDY

This matter was taken seriously by QAFCO management considering the surrounding area & to avoid such incidents in future, an improvement project team was established to study in detail & recommend possible solutions.

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT
Page 2

UREA-5 BASIC DESIGN

Every effort has been made in the design of Urea 5 plant to avoid any Emission release.

To minimize environmental effect during plant operation, startup & shutdowns, two types of flare and blow down separator system are provided in Urea 5plant.

- **Continuous gaseous effluents:**

Inert effluents are continuously discharged from MP Inert washing drum (C2103) and Vacuum vent scrubber(C2435).

These vents are collected and flared via Continuous flare system (Y2112).

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

UREA 5 BASIC DESIGN

- **Discontinuous gaseous effluents:**

During Plant startup /shutdown or during any upset, the gasses released from HP section, LP section & WWT section vents are flared via Discontinuous flare system (Y2213).

- **Blow down Separator/Stack:**

When the system pressure goes out of control, to protect the equipment & Human, Relief Valves & Rupture discs are provided to release pressure in the system.

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT Page 2

UREA-5 BASIC DESIGN

Every effort has been made in the design of Urea 5 plant to avoid any Emission release.

To minimize environmental effect during plant operation, startup & shutdowns, two types of flare and blow down separator system are provided in Urea 5plant.

- **Continuous gaseous effluents:**

Inert effluents are continuously discharged from MP Inert washing drum (C2103) and Vacuum vent scrubber(C2435).

These vents are collected and flared via Continuous flare system (Y2112).

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

UREA 5 BASIC DESIGN

- **Discontinuous gaseous effluents:**

During Plant startup /shutdown or during any upset, the gasses released from HP section, LP section & WWT section vents are flared via Discontinuous flare system (Y2213).

- **Blow down Separator/Stack:**

When the system pressure goes out of control, to protect the equipment & Human, Relief Valves & Rupture discs are provided to release pressure in the system.

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT Page 2

UREA 5 BASIC DESIGN

- All RVs & RDs are connected to the Blow Down separator (U2212), to recover maximum discharges to the process & the remaining will be released at safe location to atmosphere through blow down separator stack at 61Meters height.
- A number of the instruments in the plant are equipped with passive alarms to warn the operators in the control room against deviating operating conditions which may lead to dangerous situations or which may cause damage to the equipment.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Improvement Study Details

The team studied the system in detail for further improvements:

- All RVs /RDs & equipment details checked. Extra controls are discussed and evaluated to mitigate any ammonia release to the atmosphere.
- Based on equipment criticality & condition, RVs lifting chance & its control evaluated.

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT
Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Improvement study
Conclusions/Recommendations

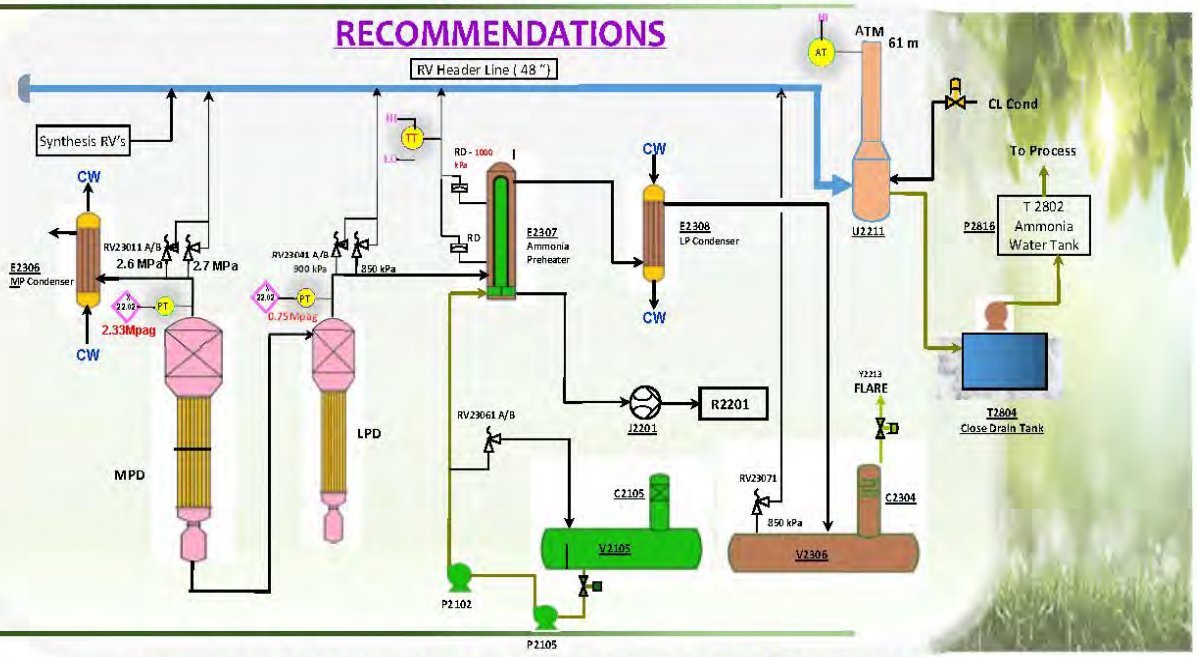
- ✓ Provide high pressure trip for MP/LP loops before RV setting.
- ✓ Provide temperature indication /Limit switch with alarm at the outlet of RD to get RD failure indication immediately.
- ✓ Provide on line NH3 Analyzer at U2212 stack top with alarm to alert DCS operator in case of any Ammonia release.

AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT

Page 2

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

RECOMMENDATIONS



AMMONIA RELEASE TO ATMOSPHERE DUE TO AMMONIA PRE-HEATER TUBE RUPTURE IN UREA -5 PLANT

Page 2

THANK YOU

ARAB FERTILIZER IMPRESSING FUTURE SUSTAINABILITY

شركة مناجم الفوسفات الأردنية المساهمة العامة
JPMC

شركة البوتاس العربية المساهمة العامة
Arab Potash Company PLC

JIC

NJFC

KEMAPCO
Arab Fertilizers and Chemicals Industries Ltd.

Premium catalyst and technology solutions

Kristina Svennerberg,
Haldor Topsoe A/S
Denmark

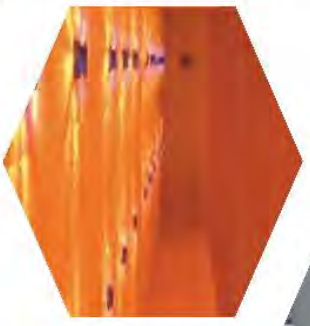

Premium catalyst and technology solutions
Leading the way forward for the fertilizer industry
28th AFA Int'l. Fertilizer Technology 7-9 June 2015
1
HALDOR TOPSOE


"Support of food security and the fight against hunger. **Best utilization of available natural resources, utmost achievement of added value**, effective contribution in economic, social and agriculture development and efficiently promote safe and secure production, storage and transportation of agricultural nutrients."
Mission statement for Arab Fertilizer Association

Premium catalyst and technology solutions

Best utilization of available natural resources, utmost achievement of added value

Optimizing steam reformer operation

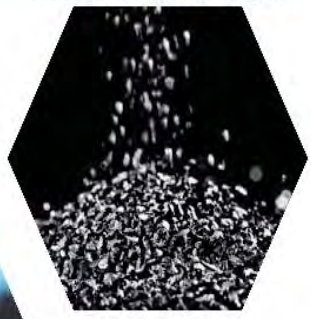


Debottlenecking reduces energy consumption

Innovative loading method saves 4 days during turn-around

Premium LTS catalysts reduces CO leakage

Premium ammonia synthesis catalysts reduces energy consumption

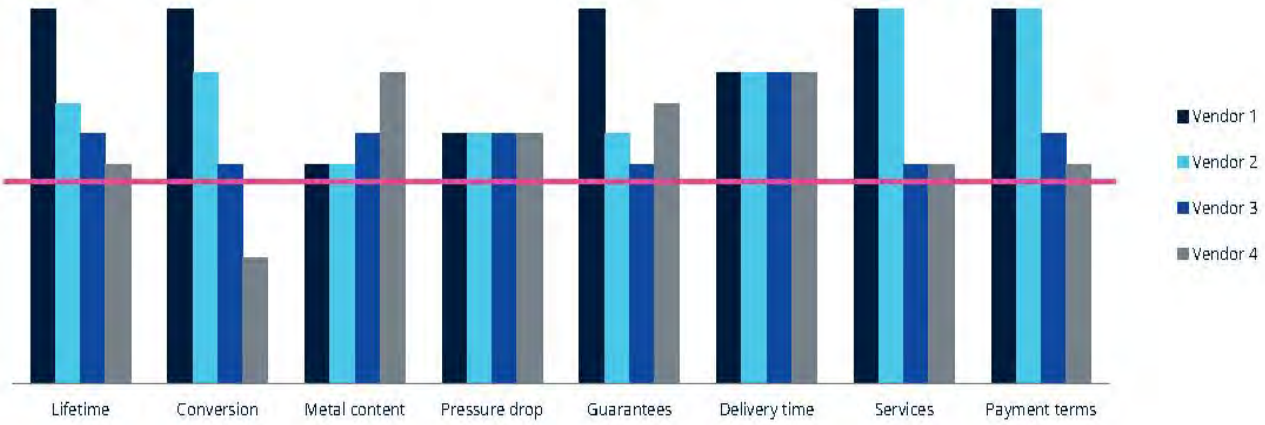


3

HALDOR TOPSOE

Purchasing strategy

Are you saying yes to added value?



4

HALDOR TOPSOE

Reformer optimization boosts production

"Successful plants can't afford to underperform"

- Challenge
  - Verify actual conditions
  - Compare to design limits
  - Optimize performance
- Solution
  - Combustion air adjustment
  - Reinstallation of burners
  - Increase furnace draught
  - Insufficient sealing
- Outcome
  - Increase production by 2.6%
  - Saving on natural gas consumption

5

HALDOR TOPSOE

Topsoe helps realize full potential

"Topsoe's plant optimization expertise enabled us to boost production by 3%"

- Challenge
  - Bottlenecks in reforming
  - Poor heat transfer from waste heat section
  - Too hot tubes
- Solution
  - Tuning of burner air intake
  - Higher flue gas flow
- Outcome
  - 3% higher production
  - 0.74 GJ energy saving per metric ton

6

HALDOR TOPSOE

Load twice as fast with SpiraLoad™

"SpiraLoad™ enabled catalyst loading twice as fast with better results"

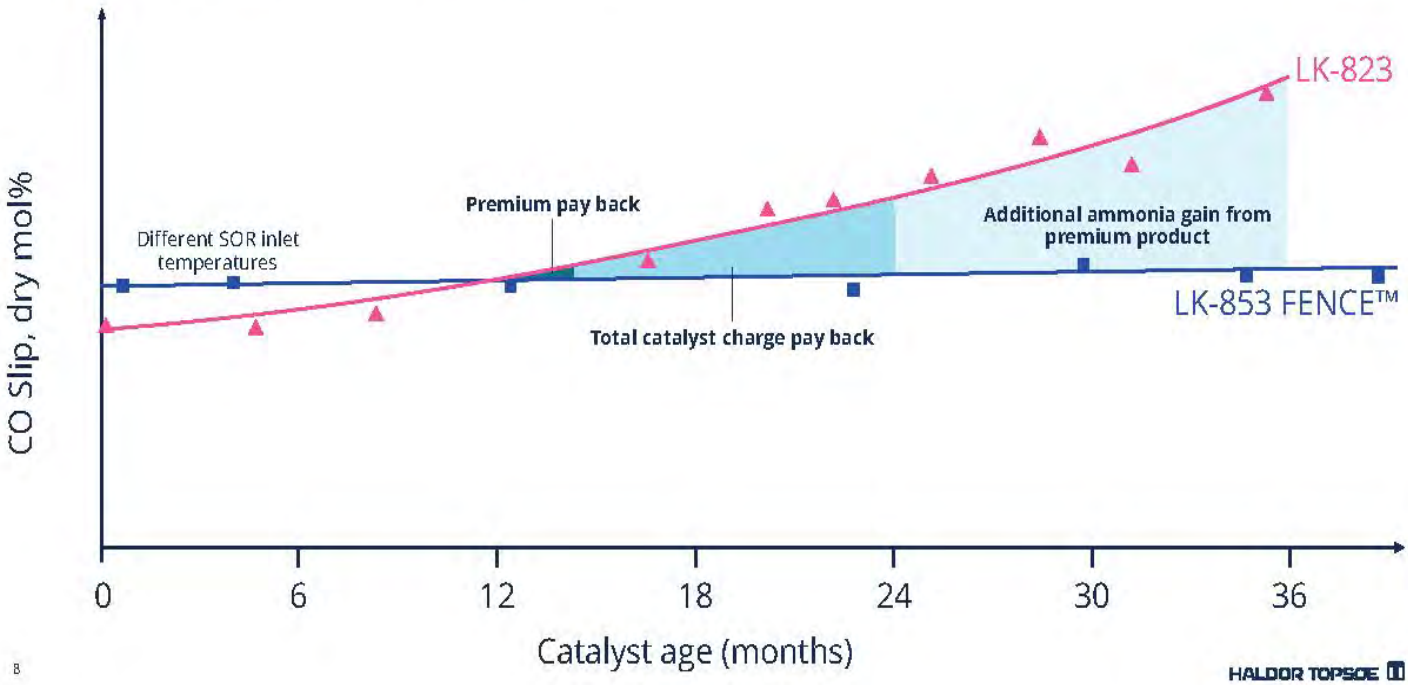
- Challenge
  - Traditional sock-loading has been used before
  - Find significantly faster loading method
- Solution
  - SpiraLoad™ technology
  - Less labor intensive method
  - Fast and uniform loading
- Outcome
  - SpiraLoad™ is twice as fast
  - More uniform pressure drop distribution
  - Reformer performance enhanced

7

HALDOR TOPSOE

LK-853 FENCE™

Optimized use of natural resources



8

HALDOR TOPSOE

KM111
Leading the way forward

Minimized energy consumption

- 3.5 Bar reduced operating pressure
- 1% lower energy consumption
- Premium payback 100 days

- Up to 1.9% increased production
- Premium payback 10 days

Maximized feed stock utilization

9

HALDOR TOPSOE

Are you saying yes to added value?
Premium products and services from Topsoe

10

HALDOR TOPSOE


To find out more
or get in contact
www.topsoe.com
To stay up to date regarding upcoming events, product launches, cases and other developments get connected and follow us:
HALDOR TOPSOE


Thank You
HALDOR TOPSOE

Carbon formation in steam reforming and effect of K-promotion

Mohammed Bendjana & Malika Oukhedou
Johnson Matthey
Bahrain

Carbon formation in steam reforming and effect of K-promotion

Mikael Carlsson

1. Introduction

When choosing a reformer catalyst, there are a number of important things to consider. Steam reforming of methane is an endothermic reversible reaction, whilst steam reforming of higher hydrocarbons is not reversible. The activity of the catalyst installed is critical in determining the reaction rate within the reformer. However, the steam reforming reaction is diffusion limited, so the geometric surface area of the installed catalyst is directly related to the catalyst activity. This article will show the mechanisms by which carbon can form on a catalyst and how a potassium dopant can prevent carbon formation and aid catalyst recovery following a carbon formation event.[1]

Because the reaction is endothermic, the transfer of heat from the burners to the catalyst is just as important as the activity. Whilst within the reformer itself the primary heat transfer mechanism is radiation, within the tube it is convection and conduction. Within the tube the hottest point is the internal tube wall. The size and shape of the catalyst will impact on the tube-side laminar film layer, and therefore on the overall heat transfer coefficient as represented in Figure 1.

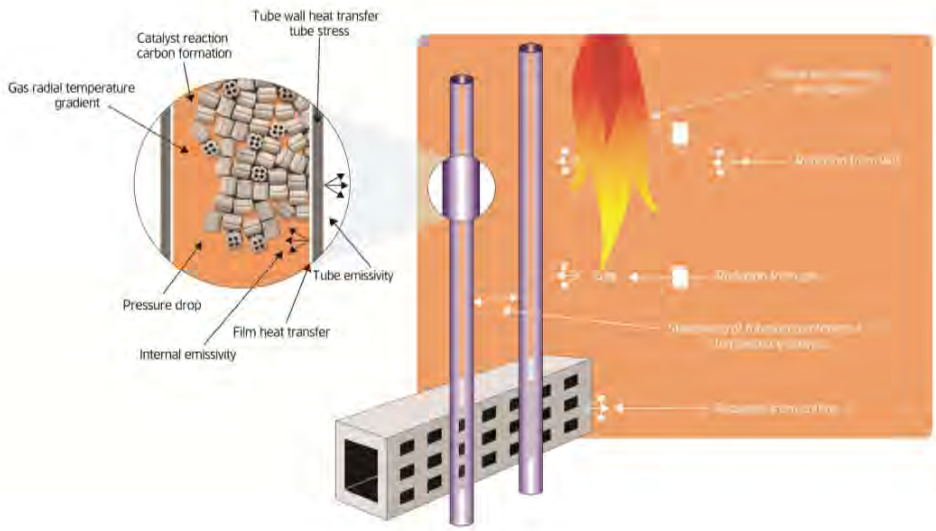


Figure 1: Heat transfer / balance inside a steam reformer box from flames to reactant stream

[1] M.V. Twigg, *Catalyst Handbook Second Edition*, Manson Publishing Ltd, **1996**

Due to the temperatures at which steam reformers operate, carbon is constantly being formed from the hydrocarbon feedstock, with the primary route being through cracking reactions. However, there are also carbon removal (or gasification) reactions that occur at the same time which remove the carbon laid down, meaning there is no net accumulation of carbon in a well-run plant. With a given catalyst loading in the reformer, the rate of gasification is fixed by the catalyst type and the process conditions. However, the rate of carbon laydown is a function of a number of conditions such as the catalyst activity, degree of sulphur poisoning and heat input to the tubes. The rate of laydown is therefore more likely to vary than the rate of gasification. The selected catalyst should have appropriate activity or alkali promoters to ensure that the carbon removal rate is faster than the carbon formation rate, which would result in no net carbon laydown.

Finally, the catalyst should allow for the lowest possible pressure drop, as this will enable the highest possible plant throughput before compressor limits are reached. However the catalyst breakage characteristics are also important as all pelleted steam reforming catalysts will break due to the forces exerted on them when reformer tubes expand in operation and then contract during plant shutdowns, which will lead to an increase in pressure drop.

2. Carbon-formation

The three main reactions for carbon formation are hydrocarbon cracking (Equation 1 and 2), carbon monoxide disproportionation (the Boudouard reaction) (Equation 3) and carbon monoxide reduction (Equation 4).

$CH_4 \rightleftharpoons C + 2H_2$	$\Delta H_{298} = +75$ kJ mol^{-1}	Equation 1
$C_nH_m \rightarrow nC + (m/2)H_2$		Equation 2
$2CO \rightleftharpoons C + CO_2$	$\Delta H_{298} = -172$ kJ mol^{-1}	Equation 3
$CO + H_2 \rightleftharpoons C + H_2O$	$\Delta H_{298} = -131$ kJ mol^{-1}	Equation 4

Cracking or decomposition of hydrocarbons is favoured at temperatures above approximately 620°C (1148°F) depending on the hydrocarbon species. As can be seen in the equations the reaction with methane is reversible but with the heavier hydrocarbons they are not.

Both the carbon monoxide reduction and disproportionation reactions are more prevalent at lower temperatures but at those temperatures the concentrations of carbon monoxide would normally be low, depending on recycle rates, so the cracking reactions are normally the most important to consider. However, any combination of these reactions can lead to detrimental effects on catalyst activity and, if left untreated, eventually lead to permanent damage and carbon build-up.

There are three catalyst parameters that can be altered to prevent carbon formation. These are the activity, the inherent heat transfer coefficient, and the catalyst alkali promoter content.

Increasing the catalytic activity can be achieved by the use of a higher surface area catalyst due to the diffusion limited nature of the reaction mentioned previously. This has a threefold effect; firstly, as there is more reforming reaction near the inlet of the tube, there is a lower process gas temperature due to the increased heat of reaction required. Secondly, the hydrocarbon content of the process gas is reduced. And finally as more hydrogen is produced the carbon formation reaction is suppressed.

By improving the heat transfer characteristics of the reforming catalyst, the rate of heat transfer within the tube can be increased. Intuitively this would appear to increase the process gas temperature thereby making the carbon forming potential worse. However since carbon is most likely formed on the inside tube wall which is the hottest part of the process where carbon can form, increasing the heat transfer characteristics of the catalyst reduces this temperature by transferring heat to the bulk of the catalyst. The additional heat transferred will in turn increase the reaction rate, which will also reduce the hydrocarbon content of the process gas making carbon formation less likely. It also reduces the process gas temperature as there is more reaction. Overall, this has a similar effect as that seen by installing a highly active catalyst. Another way of preventing the formation of carbon is to include a promoter in the catalyst to help increase the rate of carbon gasification; one such promoter is potassium.

3. Potassium promotion

It is well known that the carbon formation on a surface, either the support or catalyst, is affected by the acidity of that surface. Positively charged acidic sites on a surface will increase the rate of carbon formation, which is partly due to acidic sites catalysing the cracking reaction which enables carbon formation. Alpha alumina which is a common catalytic support contains acidic sites and adding group 2 metals such as magnesium or calcium neutralises these making the surface less acidic.

For a supported nickel catalyst the steam ratio at which a catalyst would run without forming carbon can be decreased by approximately 16% compared to an un-doped alumina through the addition of dopants such as calcium or magnesium. A way to further increase the surface basicity is to add a potassium-containing compound such as potash as a dopant, which will lead to an increased prevention of carbon formation. For alkalized calcium aluminate catalyst the steam ratio can be decreased by approximately 65% without forming carbon compared to an un-doped alumina. The reason for this is due to both the acceleration of carbon gasification reaction and the suppression of carbon formation reactions.

In addition to increasing the surface basicity, the potassium will form hydroxide species in the presence of steam and these will aid in any removal of carbon that is formed on the surface. As highlighted earlier, depending on the conditions, there are locations within the reformer where carbon will form on hot surfaces e.g. the inner tube wall. This is especially likely if heavier species slip further down the tube where the wall is hotter. That carbon will have to be removed at a faster rate that it is formed in order to prevent any build-up.

The history of potassium promoted catalysts goes back to 1975 where a trial was carried out on the No 1 Low Pressure Ammonia Plant in Billingham. During the trial it was shown that the promoted catalyst, where the potassium was incorporated in the support, was successful

in the suppression of hot bands that had been seen for the previous charge of un-promoted catalyst. These hot bands associated with carbon formation appeared after only a few months of operation, and it was thought at the time that they were due to a plant uprate. Alkali metals are known to inhibit the steam reforming reaction, but the findings of the plant trial were that the way the potassium was incorporated into the support did not inhibit activity and this was confirmed by laboratory experimental testing. After nine months of operation the reformer was inspected and the tubes containing the potassium promoted catalyst were running cooler with a more uniform temperature than adjacent tubes. The material was discharged and when examined only a very limited potassium loss of was detected.

The Johnson Matthey **KATALCO$_{JM}$** catalyst range available today has been designed with different amounts of promoter for different operations. As can be seen in Table 1 the range spans from un-promoted **KATALCO$_{JM}$** 23 and 57 series which are used for light feedstock's such as methane in combination with a low heat flux, up to **KATALCO$_{JM}$** 46-3 which contains much higher levels of potassium for operations with heavy naphtha. The two catalysts series with intermediate levels of potassium promotion are for operations where the feed composition is heavier than methane but lighter than heavy naphtha e.g. LPG. In reality this summary is slightly over-simplified as both the steam to carbon ratio and the overall heat flux also affects the amount of carbon protection required.

K_2O wt%	Series	Feedstock / carbon protection requirement
0	**KATALCO$_{JM}$** 23-4 or 57 series	Light feed/low C protection
1.5 – 2.5	**KATALCO$_{JM}$** 25-4 series	↓
4 – 5	**KATALCO$_{JM}$** 47 series	Heavy feed/high C protection
6 – 7	**KATALCO$_{JM}$** 46-3	

Table 1: Range of Johnson Matthey KATALCOJM with different potassium promotion

The potassium is incorporated into the catalyst in ceramic phase reservoirs with a precise stability to regulate the rate of release onto the surface. This leads to the right level of potassium and hydroxide species on the surface to ensure gasification of carbon from all nickel sites throughout the catalyst's lifetime.

The potassium-containing phases present in Johnson Matthey catalysts depends on the catalyst series but typically they are either a potassium-aluminosilicate or potassium-aluminate which is incorporated in the support. The use of a range of phases allows for the release of potassium at an appropriate rate under a range of process conditions and maintains high activity in terms of carbon removal. This also ensures that any adverse effect on the steam reforming activity is minimized.

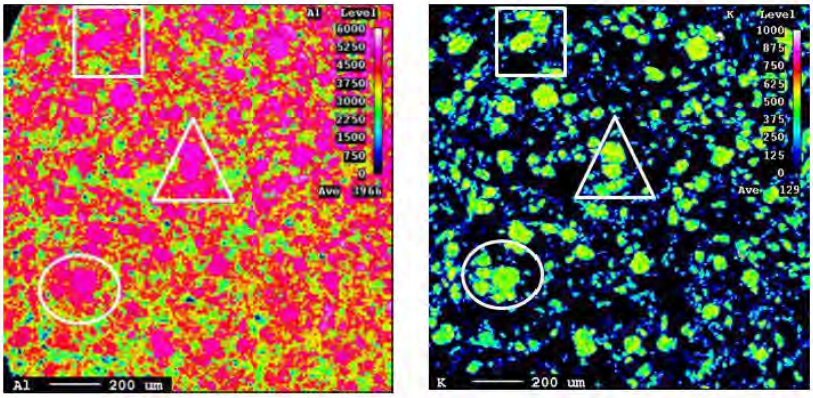


Figure 2: EMPA images showing aluminium and potassium distribution in a catalyst support highlighting areas of K-Al reservoirs

Figure 2 shows an Electron Probe Micro Analysis (EPMA) of a potassium-promoted catalyst which clearly shows areas which are rich in Al (left image) and K (right image). What can be seen is that where there is a high abundance of potassium there is also high aluminium content. This clearly indicates that there are areas of potassium-aluminates which are there as potassium reservoirs for the catalyst.

Froment *et al.* examined different potassium loadings on a nickel catalyst and found that in conditions where methane cracking was taking place the presence of potassium seemed to have three effects on the carbon formation.[2] Firstly it reduced the final level of carbon formed, secondly it reduced the rate of carbon formation and finally it apparently delayed the onset of carbon formation, which is speculated to be as a result of decreasing the nucleation rate on the catalyst surface. Furthermore, the gasification rate of filamentous carbon that had been deposited is also affected by the presence of potassium as shown in Figure 3. The rate of gasification by steam as a function of the potassium content exhibits a maximum of around 1.6 - 2.0 wt% K_2O for this catalyst system.

[2] Snoeck, J. W.; Fowles M.; Froment, G. F., *Ind. Eng. Chem. Res.* **2002,** *41,* 3548-3556

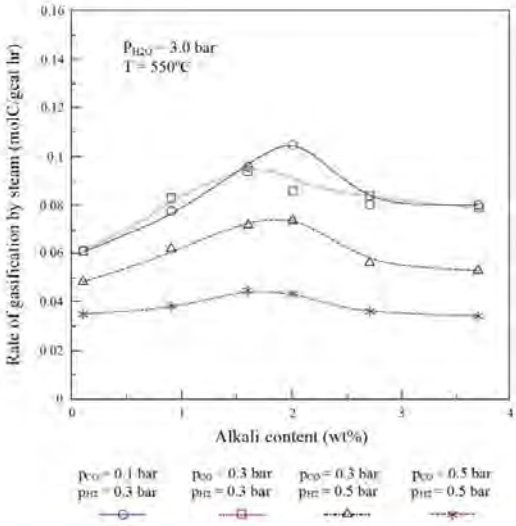


Figure 3: Carbon gasification rate as a function of potassium loading. (Recreated from Ind. Eng. Chem. Res. 2002, 41, 3548-3556)

The presence of a potassium dopant will promote the adsorption of water which will in turn increase the carbon gasification.[3] The potassium will also affect the gasification kinetics and increase the carbon monoxide production rate and, as steam adsorbs dissociatively, there could be an increase in oxygen on the surface as a result of the increase number of sites for water adsorption on an alkalized catalyst, which leads to an increase of the rate of gasification.

4. Carbon formation case study

An example of the where the use of a potassium promoted catalyst was crucial in the recovery after a carbon incident in a reformer on an European ammonia plant is shown in Figure 4 to Figure 6 and discussed below.

Figure 4 shows hot bands on the reformer tubes that appeared following a carbon incident due to LPG condensate trapped in a line being inadvertently fed into the reformer. This carbon led to an increase in pressure drop from 3.6 to 5.0bar (52.2 to 72.5psi) across the reformer.

[3] Hadden, R. A.; Howe, J. C.; Waugh, K. C., *Catal. Deact.* **1991**, 177-184

Figure 4: Hot bands shown on tubes after a carbon forming incident

Although carbon had been formed, the presence of the potassium promoted catalyst will have limited the severity of this incident and a full shutdown was averted. As the plant needed to keep running the operators decided that it would be run at a higher steam to carbon ratio in an attempt to promote the carbon gasification reactions. Over the following months the pressure drop decreased to 4.7bar (68.1psi) and the extent of hot bands on the tubes decreased, which can be seen in Figure 5. The measurement of the tube wall temperature revealed a decrease of up to 30°C (54°F). This highlights the effect of carbon removal that is promoted by the potassium containing catalyst.

Figure 5: Tube appearance two months after the carbon incident, illustrating with some improvement

After two months of running at an increased steam to carbon ratio the plant tripped, providing an opportunity to steam the catalyst prior to restart. When the plant was restarted no hot bands were observed (as can be seen in Figure 6) and operation was back to normal with pressure drop at 3.8bar (52.2psi). This case study illustrates both how the **KATALCO$_{JM}$** catalyst can slowly recover during normal operation and also the dramatic return to normal operating conditions after steaming.

Figure 6: Tube appearance after plant shutdown and steaming showing conditions returning to normal

5. Conclusion

There are a number mechanisms by which carbon formation can occur on a nickel based steam reforming catalyst, with the cracking of hydrocarbons most prevalent. Carbon deposition happens when the formation rate is greater than the removal rate which is a function of surface chemistry and the addition of promoters to reduce the carbon formation rates. It is important that the potassium dopant is added to the catalyst in optimized phases with appropriate hydrothermal stability to give a controlled release rate. The release and mobility of the potassium is required to keep tube walls free from carbon and also assist in recovery from plant upset conditions resulting in carbon formation.

HSE Best Practices in APC

Yousef Al Ma'aytah,
APC
Jordan

Best Practices in Arab Fertilizers' Association For Health, Safety and Environment

Arab Potash Company (APC) as a Case Study

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Fields of Best Practices

1. Corporate Social responsibility
2. Safety
3. Environment

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

1. Corporate social responsibility:

1.1. Water
1.2. Solar energy
1.3. Education
1.4. HEALTH

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

- APC's CSR work is inspired by the vision of His Majesty King Abdullah II's vision that that the first priority is to secure a better life for all Jordanians. Accordingly, APC actively cooperates with government organizations, local community leaders, charities and NGOs to drive social development across Jordan, particularly in the governorates of Karak, Tafileh and Ma'an where we operate.
- Our annual CSR contributions support and sustain initiatives focus primarily on the vital sectors of education, health, water, and the environment, with the overall aim of alleviating poverty, raising living standards, upgrading infrastructure and public services, and addressing community needs. In 2012 and 2013, APC's CSR programs amounted to JD 10 million each year and directly benefited more than 2,000 organizations and 100,000 citizens.

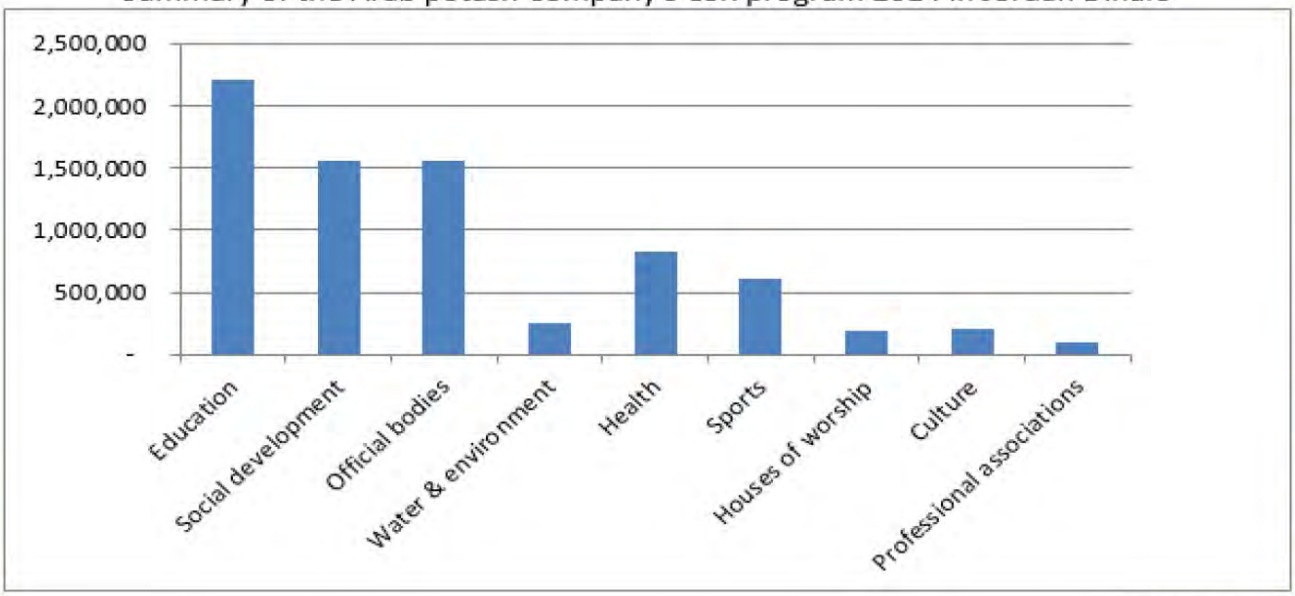
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Arab potash Company's CSR program 2014 in Jordan Dinars

Sector	Sub-Sector	Subsector total	Sector total
	Universities	949,117	
	Schools	1,254,140	
Education			2,203,257
	Welfare associations	918,249	
	Welfare packages	513,670	
	Orphans' care	122,500	
Social development			1,554,419
	Municipalities	567,329	
	Official organization	288,619	
	Community halls	530,000	
	Development associations	165,000	
Official bodies			1,550,948
Water & environment			256,147
	Health organization	586,500	
	Health associations	174,800	
	Special needs care	70,440	
Health			831,740
Sports			604,550
	Churches	18,000	
	Mosques	168,899	
Houses of worship			186,899
Culture			209,340
Professional associations			102,700
Total			**7,500,000**

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Summary of the Arab potash Company's CSR program 2014 in Jordan Dinars



28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

His Excellency Jamal Al Sarayrah, APC Chairman of the Board opens two wells in Southern Ghors in September 2014

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

His Excellency Jamal Al Sarayrah, APC Chairman of the Board inspects Phase-01 of the "Environmental Villages" Project

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Patients at Salt Hospital receive treatment using dialysis machines provided by APC

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Her Princess Dina Mira'ed of King Hussein Cancer Foundation receives a grant from Chairman of the Board His excellency/ Jamal Al Sarayrah for the expansion of King Hussein Cancer Center Project

2. safety

- 2.1. Safety Forums
- 2.2. Effective Safety Control on APC Service Providers
- 2.3. Effective Key Safety Procedures Audits
- 2.4. Effective Multi-Disciplinary and Specialized Safety Committees
- 2.5. Effective Emergency Response Planning and Application
- 2.6. Effective Incidents' Investigation Methodology

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

2.1. safety forums

- A Total of 8 Safety forums are conducted every year
- The targeted attendees are : Superintendents, Supervisors and Trucking Drivers
- GM, DGMT, Directors and Managers attend these forums and they are profoundly engaged at these forums.

2.1. safety forums...(Cont.)

- At Trucking Drivers' Forums; "Incident Recall Technique" is applied, where those drivers who encountered dangerous driving situations and DID prevented an accident from happening, explain WHAT happened and WHAT was that element they did which prevented the accident from happening
- Effective Direction, Coaching , Awareness and Recognition Platform
- Drivers' Proposals for improving Trucking Safety are taken during the forum, timely acted upon and the corrective actions taken are announced at the next forum

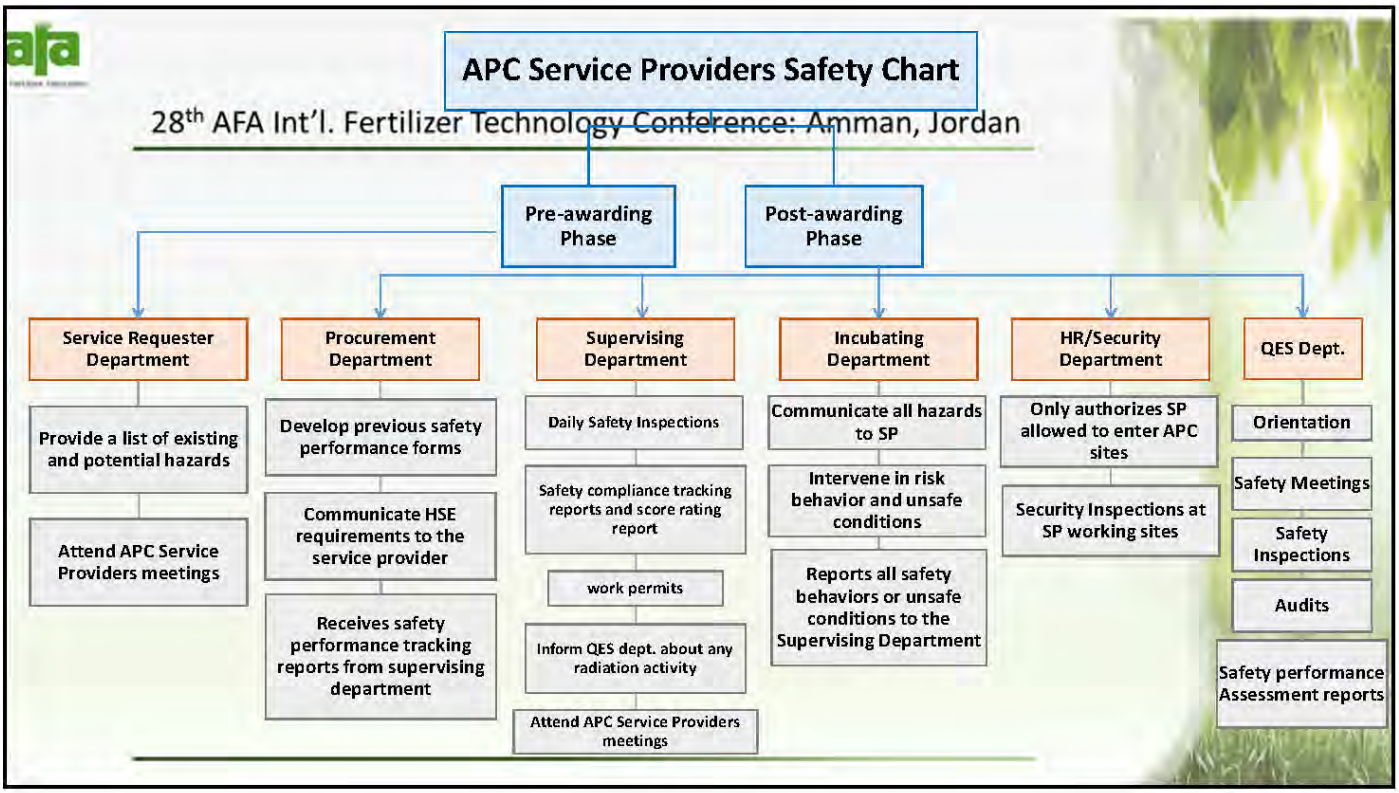
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

2.1. safety forums...(Cont.)

- Superintendents and Supervisors' forums:
- As Superintendents and Supervisors are the most important link in the supervisory chain:
- Effective Communication, Direction, Coaching, Awareness and Recognition platform.
- Critical Near Misses are discussed at these forums and corrective actions are developed at these forums.
- Actual performance on the set Sectional Safety Objectives is addressed
- The APC Service Providers attend these forums and asked to present their safety performance


16


28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan
2.2. Effective safety control on contractors
• 2.2.1. Effective Safety Procedure was developed for APC Service Providers-(Bi-lingual), of pocket size and a copy is timely distributed for every contractor worker.
ARAB POTASH COMPANY
APC Service Providers' Safety Procedure
HSP # 4-4-6-10
Issued By QES Department
شركة البوتاس العربية
إجراء السلامة لمزودي الخدمة لدى شركة البوتاس العربية
HSP # 4-4-6-10
اصدر من قبل دائرة الجودة والبيئة والسلامة


APC Service Providers Safety Chart
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan
Pre-awarding Phase
Post-awarding Phase
Service Requester Department
Provide a list of existing and potential hazards
Attend APC Service Providers meetings
Procurement Department
Develop previous safety performance forms
Communicate HSE requirements to the service provider
Receives safety performance tracking reports from supervising department
Supervising Department
Daily Safety Inspections
Safety compliance tracking reports and score rating report
work permits
Inform QES dept. about any radiation activity
Attend APC Service Providers meetings
Incubating Department
Communicate all hazards to SP
Intervene in risk behavior and unsafe conditions
Reports all safety behaviors or unsafe conditions to the Supervising Department
HR/Security Department
Only authorizes SP allowed to enter APC sites
Security Inspections at SP working sites
QES Dept.
Orientation
Safety Meetings
Safety Inspections
Audits
Safety performance Assessment reports


28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan
Contractors' Safety Performance Assessment Criteria for Full Compliance:
Mandatory PPE "Full Compliance" = 15 scores
As Applicable PPE "Full Compliance" = 3 Scores for each equipment/individual
APC Procedures = 20 Scores
Legal Requirements = 5 Scores
Electrical Safety Requirements = 10 Scores

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

- Protective guards = 05 Scores
- Warning Signs = 05
- Effective Fire Protection Availability = 05
- Housekeeping = 10
- Others safety requirements as applicable = 10
- Demerits = Minus Scores
- For each "Serious at Risk Behavior" observed, 10 points from the total score will be deducted.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

2.3. effective key safety procedures audits

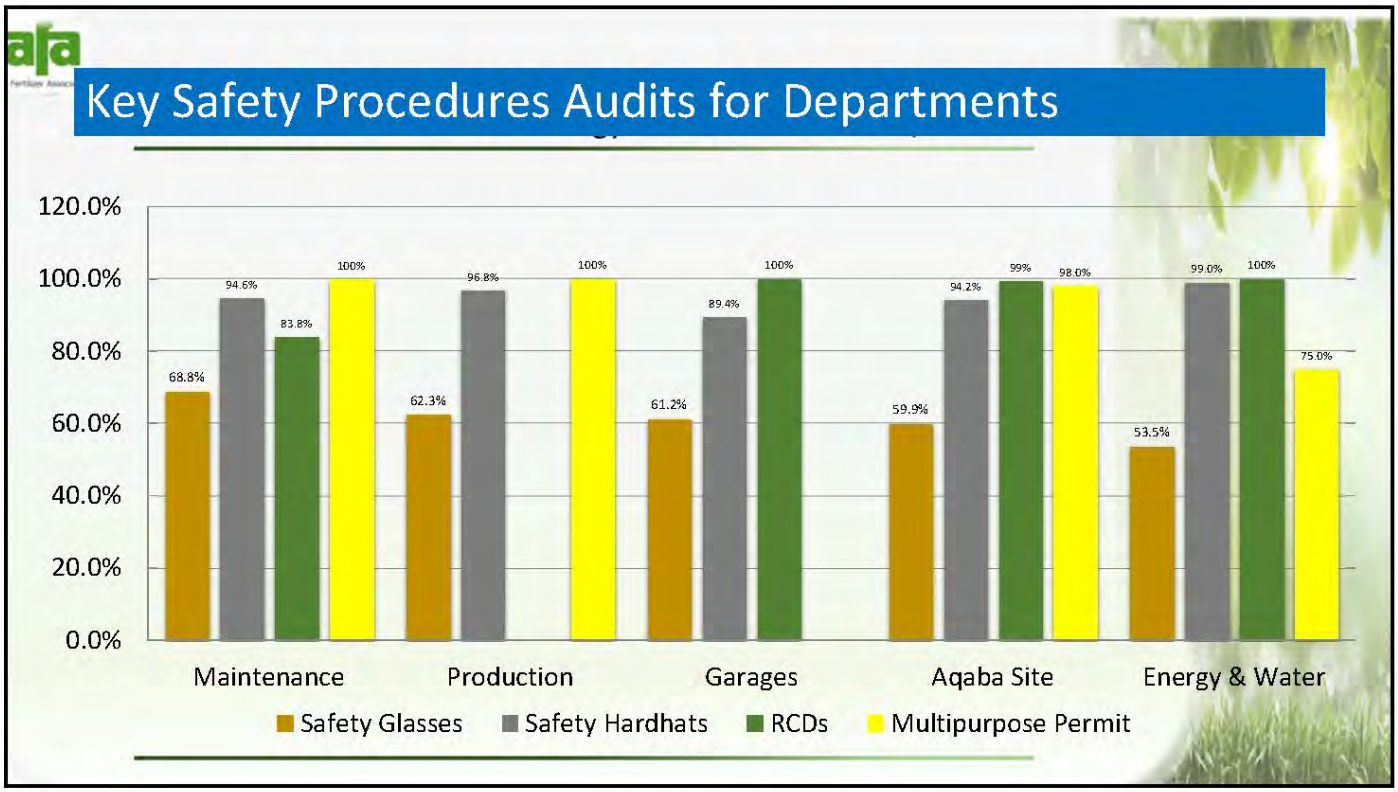
- A special audit procedure has been developed and applied at APC for our Key Safety Procedures. Examples of these Key Safety Procedures are:

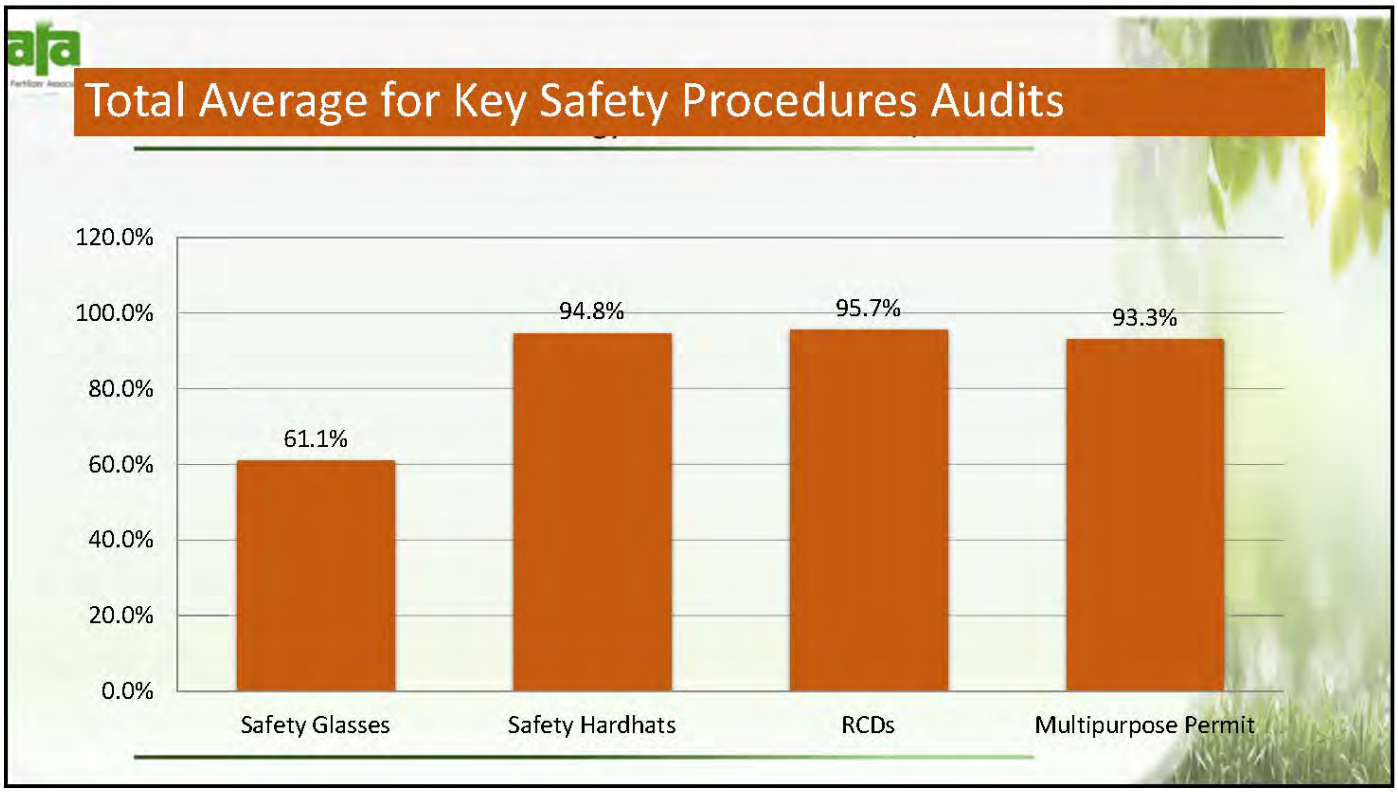
1. Energy Isolation (LOTO)
2. Confined Space Entry
3. Fall Protection

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

2.3. effective key safety procedures audits…(Cont.)

- 4. Crane Use
- 5. Work Permit Procedure (HSP 4.4.6.4)
- 6. Hot Work Permit (HSF 4.6.6.4.1)
- 7- Safety Instructions for Operators and Maintenance technicians for Avoiding injuries caused by Rubber Joints of Hot Lines (HSWI 4.4.6.1.22)


Key Safety Procedures Audits for Departments
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
68.8%
94.6%
83.8%
100%
62.3%
96.8%
100%
61.2%
89.4%
100%
59.9%
94.2%
99%
98.0%
53.5%
99.0%
100%
75.0%
Maintenance
Production
Garages
Aqaba Site
Energy & Water
Safety Glasses
Safety Hardhats
RCDs
Multipurpose Permit


Total Average for Key Safety Procedures Audits
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
61.1%
94.8%
95.7%
93.3%
Safety Glasses
Safety Hardhats
RCDs
Multipurpose Permit

2.4. Effective Multi-Disciplinary and Specialized Safety Committees

- The following are the functional safety and environmental committees:

1. Labors' Safety Committee- Mandatory by Jordan Labor Law
2. Electrical Safety Committees-(2)
3. Slings and Lifting Ropes Committees-(2)

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

2.4. Effective Multi-Disciplinary and Specialized Safety Committees…(Cont.)

1. Labors' Safety Committee:

- This committee is composed of 16 members representing management and non-management workers and meets on monthly basis
- The head of this committee is the DGM/Technical
- It is very effective platform to gather observations and proposals for improving safety performance and at the same time engages the members in needed safety tasks pertaining their departments' works

2.4. Effective Multi-Disciplinary and Specialized Safety Committees…(Cont.)

- 1. Labors' Safety Committee…(Cont.):
  - ➢ Members and guests are encouraged to freely talk and address safety issues across all organization and APC worksite
  - ➢ Actions on the addressed issues and concerns are reported at the following meeting

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

2.4. Effective Multi-Disciplinary and Specialized Safety Committees…(Cont.)

- 2. Electrical Safety Committees-(2)
- 2.1. Steering Electrical Safety Committee – Meets Monthly
- 2.2. Executive Electrical Safety Committee – Meets Weekly
- > The DGM/Technical is the head of the steering while the Electricity and Instrumentation Manager is the head of the executive one

Executive Electrical Safety Committee:

Electrical Maintenance Hand Tools, extension cords & RCDs for APC & Contractors. Check lists were prepared and audits are being done.

Arab Potash Company — شركة البوتاس العربية

النموذج (ب): قائمة تدقيق الصيانة الكهربائية للمعدات اليدوية وكوابل الإطالة وأجهزة الحماية من تيار التسرب مع الأرض

Form (B): Electrical Maintenance Hand Tools, Extension Cords & RCDs Check List

بيانات تحديد المعدات
Equipment Identification Data

Data / البيانات	المعدة اليدوية / Hand Tool	كابل الإطالة/ Extension Cord	RCD Adapter	RCD Plug
TAG # / الرقم				
Type / النوع				
رقم التسلسل/الموديل Serial/model # /				
Manufacturer/ الشركة المصنعة				

User Identification Data/ بيانات تحديد المستخدم

(يترجب على قسم الصيانة الكهربائية فحص المعدات فصلياً وعند وجود اي عطل)
Checks to be performed by the Related Electrical Maintenance Section Quarterly and upon failures

Technician Name / اسم المستخدم			
Employee Number/رقم الموظف			
Section /القسم			
Department / الدائرة			
الوقت/اليوم/التاريخ Time/Day/Date	Time / الوقت:	Day / اليوم:	Date /التاريخ:

Checked Data / بيانات التدقيق

Check / التدقيق	Hand Tool / المعدة اليدوية			Extension Cord / كابل الإطالة			RCD	
	المعدة / Tool	الكيبل / Cable	القابس / Plug	المقبس / Sockets	الكيبل / Cable	القابس / Plug	RCD Adapter	RCD Plug
المعاينة البصرية / Visual Inspection								
فحص التسرب / Leakage Test							NA	NA
فحص العزل (ميجر)/ Insulation (MEGGER test)								
فحص فعالية RCD/ RCD Functional Test	NA	NA	NA	NA	NA	NA		
النتيجة النهائية (نجاح/اخفاق)/ Final Result (Pass/Fail)								

التواقيع/ Signatures:	الفني الكهربائي/ Electrical Technician:	المشرف/ Supervisor:

1- Electrical Technician copy 2- Log Book Copy SHF # 4.4.6.11-2rev.a
Prepared By: Electrical Safety Working Committee

Arab Potash Company — شركة البوتاس العربية

النموذج (أ): قائمة تدقيق المستخدم للمعدات اليدوية وكوابل الإطالة وأجهزة الحماية من تيار التسرب مع الأرض

Form (A) : User of Hand Tools, Extension Cords & RCDs Check List

بيانات تحديد المعدات
Equipment Identification Data

Data / البيانات	المعدة اليدوية / Hand Tool	كابل الإطالة / Extension Cord	RCD Adapter	RCD Plug
TAG # / الرقم				
Type / النوع				
رقم التسلسل/الموديل / Serial/model #				
الشركة المصنعة / Manufacture				

بيانات تحديد المستخدم : (يترجب على المستخدم فحص المعدات قبل اي استخدام)
User Identification Data: (Checks to be performed by the User before each use)

اسم المستخدم/ User Name			
رقم الموظف/ Employee Number			
Section /القسم			
Department / الدائرة			
الوقت/اليوم/التاريخ Time/Day/Date	Time/ الوقت:	Day / اليوم:	Date / التاريخ :

Checked Data/ بيانات التدقيق

Check / التدقيق	Hand Tool / المعدة اليدوية			Extension Cord / كابل الإطالة			RCD	
	المعدة/ Tool	الكيبل / Cable	القابس/ Plug	المقبس / Sockets	الكيبل / Cable	القابس / Plug	RCD Adapter	RCD Plug
المعاينة البصرية / Visual Inspection								
فحص التسرب / Leakage Test							NA	NA
فحص فعالية RCD/ RCD Functional Test	NA	NA	NA	NA	NA	NA		
النتيجة النهائية (نجاح/اخفاق)/ Final Result (Pass/Fail)								

التوقيع/ Signatures	المستخدم/ User :	المشرف/ Supervisor:

1- User copy 2- Log Book Copy SHF # 4.4.6.11-1 rev.a
Prepared By: Electrical Safety Working Committee

Arab Potash Company شركة البوتاس العربية

النموذج (ج) قائمة تدقيق لجنة العمل للسلامة الكهربائية
للمعدات اليدوية وكابلات الاطالة وأجهزة الحماية من تيار التسرب مع الأرضي

Form (C): Electrical Safety Working Committee Hand Tools, Extension Cords & RCDs Check List

الوقت/اليوم/التاريخ Time/Day/Date	Time/ الوقت:	Day / اليوم :	Date / التاريخ :

التسلسل Ser. #	رقم المعدة Equipment Tag #	نوع المعدة Equipment Type	الملاحظات /المدققات Findings / Remarks	النتائج النهائية نجاح / فشل Final Results (Pass/Fail)	الإجراءات المتبعة Corrective Actions
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Name /الاسم	Signature /التوقيع

Note 1: Equipment Are: Hand Tools (Comprise: the tool, the cable and the plug). Extension Cords (Comprise: the sockets, the cable and the plug) and RCDs (RCD Plug or RCD Adapter).	**ملاحظة ١ : المعدات هي :** المعدات اليدوية (وتشمل المعدة والكابل والقابس) وكابلات الإطالة(وتشمل المقبس والكيبل والقابس) وأجهزة الحماية من تيار التسرب مع الارضي (وتشمل RCD Plug or RCD Adapter)
Note 2: Checks Are: Visual Inspection, Leakage Test, Insulation / MEGGER Test and RCD Functional Test.	**ملاحظة ٢ : الفحوصات هي :** المعاينة البصرية وفحص التسرب وفحص العزل/ ميجر وفحص فعالية RCD

1- DGMT Copy 2- Log Book Copy
Safety Working Committee

SHF # 4.4.6 11-3rev. dPrepared By: Electrical

النموذج (أ) : قائمة تدقيق المستخدم للمعدات اليدوية وكوابل الاطالة وأجهزة الحماية من تيار التسرب مع الارضي

Form (A) : User of Hand Tools, Extension Cords & RCDs Check List

بيانات تحديد المعدات
Equipment Identification Data

Data / البيانات	المعدة اليدوية / Hand Tool	كابل الاطالة / Extension Cord	RCD Adapter	RCD Plug
TAG # / الرقم	[illegible]			
Type / النوع	[illegible]			
رقم التسلسل الموديل / Serial/model #	[illegible]			
الشركة الصانعة / Manufacture	[illegible]			

بيانات تحديد المستخدم : (يتوجب على المستخدم فحص المعدات قبل اي استخدام)
User Identification Data: (Checks to be performed by the User before each use)

اسم المستخدم / User Name	[illegible]		
رقم الموظف / Employee Number	[illegible]		
القسم / Section	[illegible]		
الدائرة / Department	[illegible]		
الوقت/اليوم/التاريخ Time/Day/Date	Time / الوقت: [illegible]	Day / اليوم: [illegible]	Date / التاريخ: [illegible]

بيانات التدقيق / Checked Data

Check / التدقيق	Hand Tool / المعدة اليدوية			Extension Cord / كابل الاطالة			RCD	
	المعدة / Tool	الكيبل / Cable	القابس / Plug	المقبس / Sockets	الكيبل / Cable	القابس / Plug	RCD Adapter	RCD Plug
المعاينة البصرية / Visual Inspection				Good	Good	Good		
فحص التسرب / Leakage Test							NA	NA
فحص فعالية RCD / RCD Functional Test	NA	NA	NA	NA	NA	NA	Good	Good
النتيجة النهائية (نجاح/فشل) / Final Result (Pass/Fail)					Good	Good	Good	
التوقيع / Signatures	المستخدم / User: [illegible]				المشرف / Supervisor: [illegible]			

1- Gate copy 2- Log Book Copy

SHF # 4.4.6

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

2.4. Effective Multi-Disciplinary and Specialized Safety Committees…(Cont.)

- 3. Slings and Lifting Ropes Committees-(2)
- 3.1. Steering Committee
- 3.2. Executive committee

Sling & Lifting Ropes Committee:
Sorting, Tagging and periodical inspection internally & externally.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

- **Perform internal quarterly inspection for all lifting hand tools stored at all sections & submit findings to VP / Operations.**
- **Check the section slings & lifting hand tools checklists are filled in a proper way.**
- **Ensures all lifting hand tools have their tags, clear and observable.**

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

- Ensures that all lifting hand tools arranged in a proper way and clean.
- Ensures that all lifting hand tools are in good working condition.
- Ensure supervisors to focus on selecting the right tool depending on the nature of the work (actual load to match with selected capacity of lever hoist)

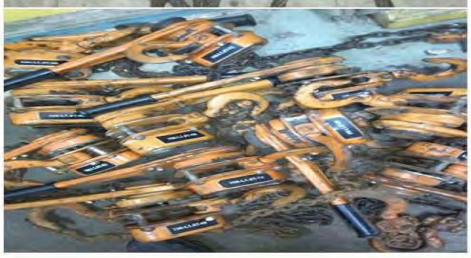
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

- Adopt new inventory stock items for all rigging materials and equipment to ensure purchasing upon standard specification for these equipment,
- New purchased and received lifting tools are inspected by committee members, before handing over to the requester.
- Execute annual external inspection for slings; lifting tools by third party certified inspector and document inspections.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

FIXING TAG NUMBERS

Tag numbers have been prepared & fixed on all lifting hand tools.



28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

LIFTING HAND TOOLS SURVEY

All lifting hand tools in all concerned sections / departments have been defined, Total lifting hand tools is 983, distributed on all concerned sections / departments as below:-

No	Section	Available Quantity					
		Tool Name					
		Wire sling	Nylon Belt	D-shackle	Lever Hoist	Chain Block	Elect. Chain Block
1	Hot Leach Plant Mech	66	39	43	24	15	0
2	Cold Cryst. Plant 1 Mech.	47	26	16	13	14	0
3	Cold Cryst. Plant 2 Mech.	58	30	34	7	10	0
4	Mech. Workshop	156	12	16	20	12	0
5	Garages-TRK (Trucks)	1	8	1	1	7	4
6	Garages- GRG (General)	3	4	0	2	2	0
7	Garages- HVG (Heavy Vehicles)	4	11	12	0	1	1
8	Construction W/S	8	7	8	9	6	0
9	Aqaba Site Mech.	13	17	32	7	13	0
10	Off Site Mech.	13	38	6	10	4	0
11	Utilities Mech.	15	13	12	7	2	0
12	Spare Parts Manuf. W/S	1	6	11	3	2	0
	Total	385	211	191	103	88	5
	Total						983

THIRD QUARTER INSPECTION HAS BEEN DONE

Inspection for all slings & lifting hand tools have been done by committee members

CHAIN BLOCK					CHECKBOX - SATISFACTORY (✓) , UNSATISFACTORY (X)			
					QUARTERLY INSPECTION DATE			
	Tool Description / size	OLD TAG No (if exist)	NEW TAG No	LOAD / TON	First quarter Date :	Second quarter Date :	Third quarter Date : 28/08/2014	Fourth quarter Date :
1	chain block 1 ton		HM-C1T-24	1			✓	
2	chain block 1 ton		HM-C1T-28	1			✓	
3	chain block 1 ton		HM-C1T-30	1			✓	
4	chain block 1 ton		HM-C1T-33	1			✓	
5	chain block 1 ton		HM-C1T-34	1			✓	
6	chain block 1 ton		HM-C1T-53	1			✓	
7	chain block 1 ton		HM-C1T-84	1			✓	
8	chain block 1 ton		HM-C1T-93	1			☒	
9	chain block 1 ton		HM-C1T-96	1			✓	
10	chain block 1 ton		HM-C1T-01	1			✓	
11	chain block 3 ton		HM-C3T-03	3			☒	
12	chain block 3 ton		HM-C3T-05	3			✓	
13	chain block 3 ton		HM-C3T-06	3			✓	
14	chain block 3 ton		HM-C3T-66	3			✓	
15	chain block 3 ton		HM-C3T-84	3			✓	

Inspector Name:-		Signature:-	28-8-2014
Inspector Name:-		Signature:-	28-8-2014

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

2.5. effective emergency response planning and application

- As a part of APC Management commitment to protect APC individuals and assets, APC established an Emergency Response Center operated by Civil Defense crew in 2009 through an agreement with Civil Defense to ensure high level performance in rescue, Paramedic and Fire Fighting operations.
- The location of the center was carefully selected vis-à-vis APC plants which enables very short response time to all APC work units.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Follow-up of Some Refreshing Training Exercises

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

- APC supports & shares effectively to open the closed roads by snow accumulation & landslides also in rescue operations & emergency cases such as floods, as support to local community.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

- **Updating the Emergency Safety Plan for all APC sites and implementing scheduled emergency drills in conjunction with Civil Defense.**

Rescue Operations: Logistic support to Potash Civil Defense for rescue operations from heights, sinking accidents and the related paramedic. Training Drills were implemented.

Arab Potash Company / QES Department

2014 Emergency Drills Plan

Place	Name Of Exercise	Suggested Date For Execution												Responsibility
		1	2	3	4	5	6	7	8	9	10	11	12	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
APC Salt Plant	Radiation Accident													QES Manager
	Rescue & Evacuation	X												
APC Aqaba Site	Rescue & Evacuation													QES & Aqaba Site Managers
APC Amman Adm. Building	Rescue & Evacuation													QES & HR Managers
APC Hospital	Rescue & Evacuation													QES & Medical Services Managers

Suggested — Executed — Not Executed

Approved by QES Manager — Safety Superintendent — Fire Fighting Supervisor

2.6. effective incidents' investigation methodology

- Effective 2007 APC has applied TapRoot Incidents' Investigation Methodology
- TapRoot methodology is applied through a software developed by Systems' Improvements' Company in Tennessee/U.S.A and proved to be the most effective incidents' investigation methodology and it is widely applied in US.

2.6. effective incidents' investigation methodology…(Cont.)

- TapRoot is a Non-Blame oriented investigation process that addresses the sequence of events that led to the incident in chronological order, defining the causal factor, then root cause/s and then the development of SMARTER corrective actions.
- A group of highly skilled TapRoot investigators from APC engineers were trained and they effectively perform the investigations to APC incidents.

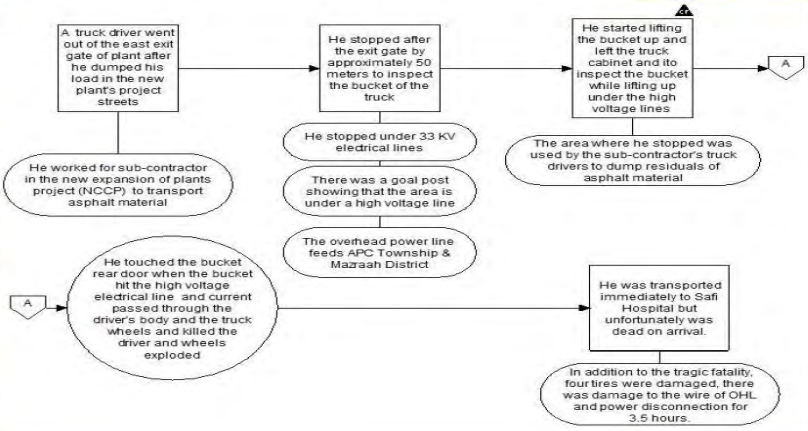
Taproot investigations

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

ARAB POTASH COMPANY

Flash Report # 61 — **Fatal Injury for a Sub-contractor**

Report Date:	June -30- 2010
Classification of Incident:	Fatal Injury for a Sub-contractor
Plant/Facility:	APC Safi Site- The area between Petrojet Gate & the Highway to Aqaba
Department/Affected Area:	Expansions - DAR- Petrojet- APC/110/R/2006- Sub-contractor Issa Jarad Tarawneh
Date of Incident:	June -29- 2010
Time of Incident:	10:25 AM
Account of Incident:	The operator of a tandem dumper employed by a subcontractor had been hauling hot asphalt. The operator left the site via the Petrojet gate, which is used by contractors and is several hundred meters north of the APC employee entrance. He ignored the " Goal Post" outside the gate which clearly indicates the clearance under the existing power line, and proceeded to empty residual asphalt from the rear box. He parked the dumper under the power line and switched on the lifting jack using controls near his seat, and the box started to rise. He left the cab, walked to the back of the truck and touched the door at the back of the truck box. At the same time, the front of steel truck box contacted the overhead power line that feeds APC Township & Mazraah District and caused a short- circuit. The driver was subjected to an electrical shock and four tires exploded. He was transported immediately to Safi Hospital but unfortunately was dead on arrival. In addition to the tragic fatality, four tires were damaged, there was damage to the wire of OHL and power disconnection for 3.5 hours. Attached are illustrative pictures.
Nature of Incident:	Fatal Injury.
External Agencies:	Safi Hospital & Local Police
Immediate Actions Taken to Prevent Recurrence:	1. DAR/ The consultant sent a letter to Petrojet to request the sub-contractor to prohibit dumpers' parking outside their gate under OHL and to assure that all safety instructions are followed. 2. A detailed investigation report is awaited from the contractor ; this report will be reviewed by the Tap Root investigation team. 3. Taproot investigation has been assigned.
General Manager:	Keith Thornton



28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Corrective Action: 01

To raise up the 33kV overhead lines at locations where trucks and heavy equipments are expected to cross under energized lines; this will give more clearance and more safety distance since wooden poles at both sides of the crossed road could be elevated by two meters utilizing a concrete foundation built above ground level. 2. Execution by Civil and Maintenance Departments.

. **Responsible Person/Department:** / Civil Works

Implementation Due Date:October-03-2010 **Verification Due Date: March-03-2011**

Associated Causal Factor(s)	Associated Root Cause(s)
He started lifting the bucket up and left the truck cabinet and into inspect the bucket while lifting up under the high voltage lines	Human Performance Difficulty Management System Corrective Action Corrective action NI

Corrective Action: 02

To installation of Overhead line Insulating Sleeve on 33kV conductors passing across roads and main entrances.

. **Responsible Person/Department:** Maintenance

Implementation Due Date: December -12-2010 **Verification Due Date: June -12-2011**

Associated Causal Factor(s)	Associated Root Cause(s)
He started lifting the bucket up and left the truck cabinet and into inspect the bucket while lifting up under the high voltage lines	Human Performance Difficulty Management System Corrective Action Corrective action NI

Corrective Action: 03

To install and maintain of Goal Posts at all locations where 33kV overhead lines cross roads and main entrances

. **Responsible Person/Department:** Maintenance

Implementation Due Date: Oct-25-2010 **Verification Due Date: Dec-30-2010**

Associated Causal Factor(s)	Associated Root Cause(s)
He started lifting the bucket up and left the truck cabinet and into inspect the bucket while lifting up under the high voltage lines	Human Performance Difficulty Management System Corrective Action Corrective action NI

Corrective Action: 04

To assure that high level of Safety awareness among all contractors who is/will working in APC projects is implemented , this could be achieved by conducting individual safety lectures and by introducing individual bulletins informing them of the electrical hazardous associated with APC high voltage networks

. **Responsible Person/Department:** Safety

Implementation Due Date: September -26-2010 **Verification Due Date: Feb-23-2011**

Associated Causal Factor(s)	Associated Root Cause(s)
He started lifting the bucket up and left the truck cabinet and into inspect the bucket while lifting up under the high voltage lines	Human Performance Difficulty Management System Standards, Policies, or Admin. Controls NI Not strict enough

Corrective Action: 05

Warning signs shall be fixed at all locations where there is a road crossing with high voltage lines and main entrances

. **Responsible Person/Department:** Safety

Implementation Due Date: Aug. -01-2010 **Verification Due Date: Jan. -02-2011**

Associated Causal Factor(s)	Associated Root Cause(s)
He started lifting the bucket up and left the truck cabinet and into inspect the bucket while lifting up under the high voltage lines	Human Performance Difficulty Management System Corrective Action Corrective action NI

Corrective Action: 06

The contractors and sub-contractors to have close supervision regarding their safety activities and their adherence to APC safety instructions

. **Responsible Person/Department:** Safety

Implementation Due Date: Oct-20-2010 **Verification Due Date: Dec-20-2010**

Associated Causal Factor(s)	Associated Root Cause(s)
He started lifting the bucket up and left the truck cabinet and into inspect the bucket while lifting up under the high voltage lines	Human Performance Difficulty Management System Standards, Policies, or Admin. Controls NI Not strict enough

Best Regards

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

3. Environment

- APC had been granted the certification of compliance for ISO-14001:2004 effective 2001 and had been continuously certified since then.
- Effective and periodic measurements and monitoring for APC Plants effluents and emissions
- Effective Waste management Projects had been implemented

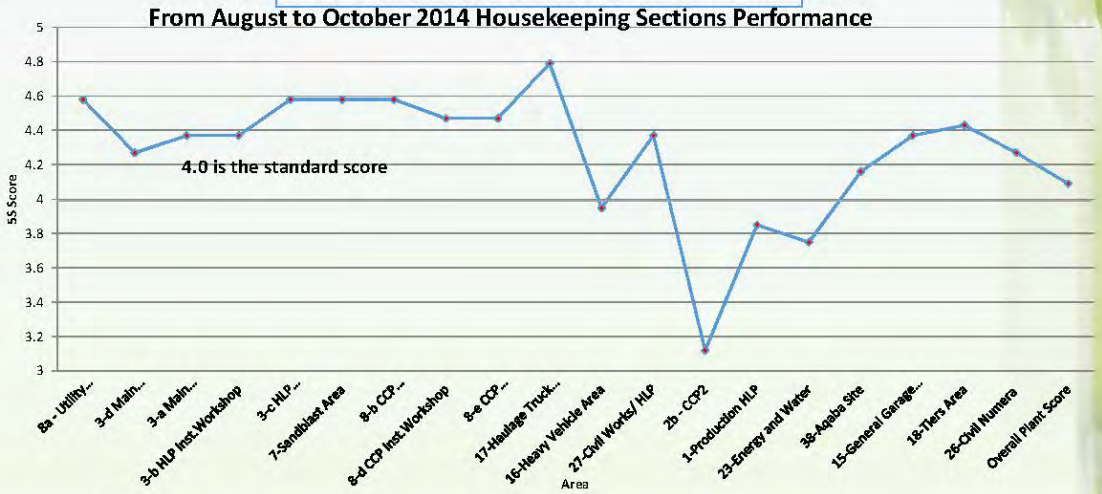
28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Used Oil Separation and Collection Station at APC Solid and Liquid Waste Yard => 100000 JD Saving Annually

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Environment Best Practice

From August to October 2014 Housekeeping Sections Performance



Housekeeping Scoring program is adopted by APC according to 5S Criteria

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Two Ambient Air Quality Stations will be installed by June 2015 to measure Sox, NOx and PM10 at Two Locations :

1- At APC Township

2- Southern the Plants.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

Water effluent from Softener is used to irrigate 50,000 m^2 of plants, these mainly are date palms and olive trees.

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

المؤسسة العامة للضمان الاجتماعي
Social Security Corporation

جائزة التميز في السلامة والصحة المهنية

Award of Excellence

The Board of Directors of the Social Security Corporation has the pleasure to award

Arab Potash Company

this certificate of excellence in recognition of the outstanding efforts in promoting and implementing occupational safety and health standards and practices in the workplace in 2012.

Nadia AL-Rawabdeh
Director-General

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

28th AFA Int'l. Fertilizer Technology Conference: Amman, Jordan

CERTIFICATE

TÜV AUSTRIA

Management System as per
OHSAS 18001 : 2007 / ELOT 1801 : 2008

Arab Potash Company (APC)
111 18 AMMAN, JORDAN.

PRODUCTION, LAND TRANSPORTATION, SHIP LOADING AND MARKETING OF MURIATE OF POTASH (STANDARD, FINE, GRANULAR AND INDUSTRIAL) COVERING THE FOLLOWING SITES AND PLANTS (SOLAR PANS, HOT LEACH & COLD CRYSTALLIZATION REFINERIES, INDUSTRIAL KCL PLANT, STEAM & POWER PLANT, APC TOWNSHIP, AMMAN OFFICES AND AQABA SITE).

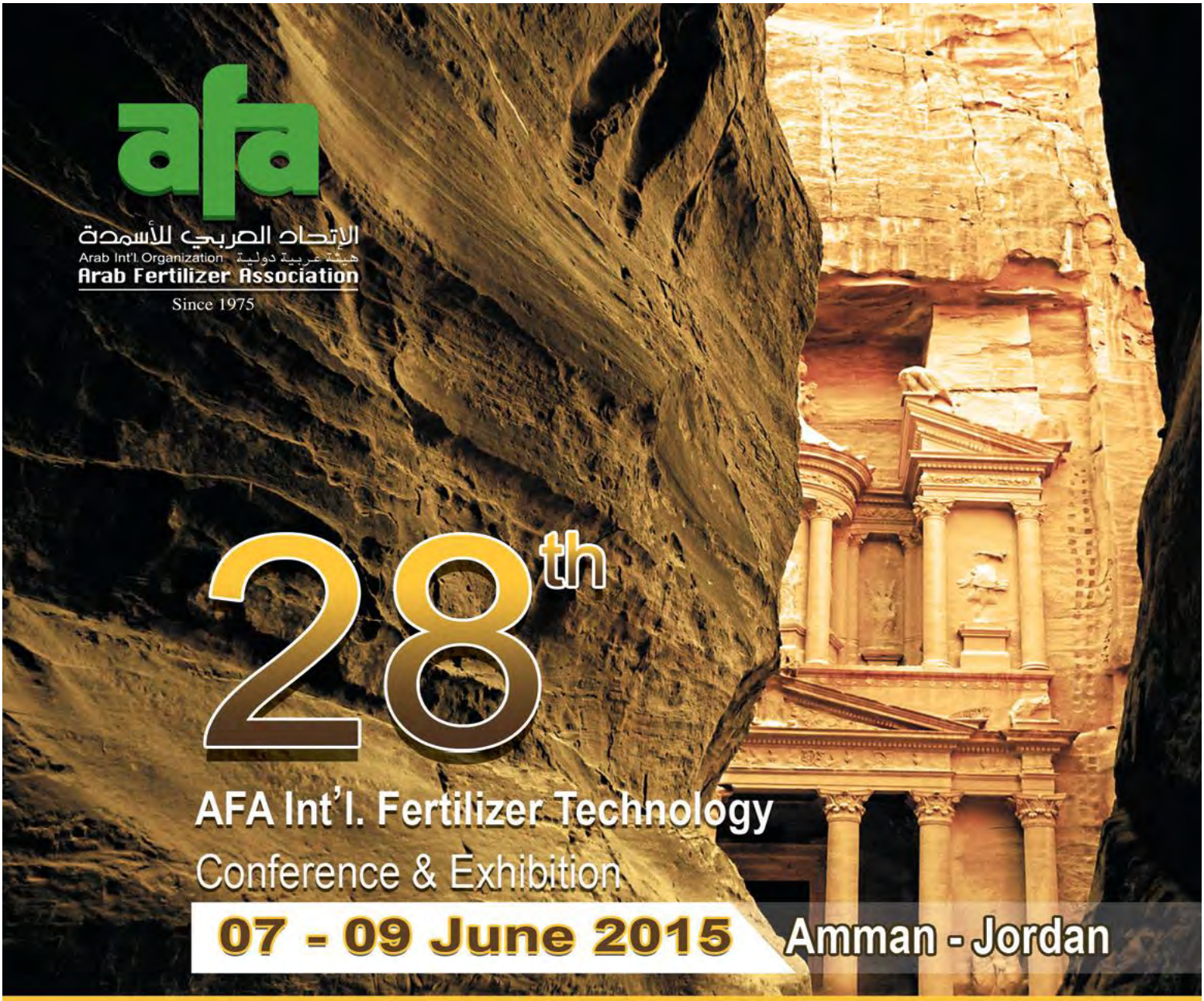
CERTIFICATE

TÜV AUSTRIA

Management System as per
EN ISO 14001 : 2004

ARAB POTASH COMPANY (APC)
111 18, AMMAN JORDAN

MANUFACTURING OF VARIOUS TYPES OF POTASH (KCL) IN HOT LEACH AND COLD CRYSTALLIZATION REFINERIES, ASSOCIATED WITH FINAL PRODUCT WAREHOUSES IN BOTH GHOR SAFI AND AQABA SITES.



Delegates List

ARAB FERTILIZER IMPRESSING FUTURE SUSTAINABILITY

شركة البوتاس العربية المساهمة العامة
Arab Potash Company PLC

NJFC

KEMAPCO
Arab Fertilizers and Chemicals Industries Ltd.

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Algeria	FERTIAL		FERTIAL			
Algeria	kada larbaoui	process engineer	sorfert algeria	00213661857493		aminou126@yahoo.com
Bahrain	Omar Al-Mansoori	Syngas Catalyst Manger - Middle East	CLARIANT	+973 38800362	+973 17556309	omar.almansoori@clariant.com
Bahrain	Prasant Kumar	Technical Director MEA	CLARIANT	+97339401027	+97317556309	prasant.kumar@clariant.com
Bahrain	A. Rahman JAWAHERY	President	GPIC	+973 39684447	+973 17730873	jawahery@gpic.net
Bahrain	Yasser Abdulrahim	Plants Operation Manager	GPIC	+973 177 33355	+973 177 31 047	yarahim@gpic.net
Bahrain	Yusuf Fakhroo	Human Resources Manager	GPIC	+973 177 33321	+973 177 31047	yfakhroo@gpic.net
Bahrain	Zuhair Tawfiqi	Public Relations Manager	GPIC	+973 17733316		ztawfiqi@gpic.net
Bahrain	Bader Al Mansoori	Planning Superintendent	GPIC			
Bahrain	Adel Al Hamad	Senior Shift Supervisor	GPIC	+973 17 33353		a.alhamad@gpic.net
Bahrain	Entesar Falah	Senior Procurement Supervisor	GPIC	+973 177 33357	+973 177 31047	purchasing_entesar@gpic.net
Bahrain	Mohamed Al Isa	Fire & Safety Supervisor	GPIC			
Bahrain	Faisal Ebrahim	Civil Supervisor	GPIC	+973 39883636		

Arab Fertlizer Association
since 1975

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Bahrain	Mohamed Jawad	Urea Shift Supervisor	GPIC			
Bahrain	Mahmood Adel	Planning Engineer (Designate)	GPIC			
Bahrain	Fatima Nedham	Senior Office Administrator	GPIC	+973 39232333	+973 17731047	fatima.khanji@gmail.com
Bahrain	Ebrahim Al Ali	Assistant Officer	GPIC			
Bahrain	Fatima AL- MOSALLY	PR & Event Officer	GPIC	+973 36603630	+973 17731047	falmosally@gmail.com
Bahrain	Elham EBRAHIM	Senior Office Adminstrator	GPIC	+973 177 33359		easad@gpic.com
Bahrain	Raeda AL SHEMERI	Media Analyst Supervisor	GPIC			
Bahrain	Omar AL-BASTEKI	Chief Internal Auditor	GPIC	+973 39935594		oalbastaki@gpic.net
Bahrain	Noor ABDULJALIL	Internal Auditor	GPIC	+973 17 39946364		nohmed@gpic.net
Bahrain	Mazen ABDULQADER	Facilities Maintenance Supervisor	GPIC	+973 368 50002	+973 1731047	mazen@gpic.net
Bahrain	Raed AL-MASKATI		Haldor Topsoe	+973 399 87175		raam@topsoe.dk
Bahrain	Malika OUKHEDOU	Technical Sales	Johnson Matthey	+97339265583	+973 17310081	malika.oukhedou@matthey.com
Bahrain	Mohammed Bendjana	Technical Sales Manager	Johnson Matthey	+973 39957173	+973 17310081	mohammed.bendjana@matthey.com

Arab Fertilizer Association
since 1975

28th AFA Int'l Fertilizer Technology Conference & Exhibition ~ 2015

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Belgium	Alain Henrad	Sales Manager	EFC NV	+32 476220098	+32 13530541	alain.henrad@efc-belgium.be
Belgium	Tom Wisnieuwski		EFC NV			tom.wisniewski@efc-belgium.be
Belgium	Slim Letaief		EFC NV			
China	Xia Lungang	Regional Marketing Manager	ECEC	+86 55163626512		xialungang@chinaecec.com
China	Liu Bo	Senior Project Manager	ECEC	+86 55163626785		liubo@chinaecec.com
Denmark	Kristina SVENNERBERG	Catalyst Marketing Manager	Haldor Topsoe	+45 2265 7591		krsv@topsoe.dk
Denmark	Yawar Abbas NAQVI		Haldor Topsoe	+45 22 754073		yawar7@gmail.com
Denmark	Haldor Topsoe		Haldor Topsoe			
Egypt	Saad ABOU ELMAATY	Chairman & CEO	Abu Qir Fertilizers Company (AFC)	+203 5603030	+203 5603032	Chairman@abuqir.com
Egypt	Hamdy ALAAELDIN	Vice Chairman for Commercial Affairs	Abu Qir Fertilizers Company (AFC)	+203 5603030	+203 5603032	afctrainingcenter@yahoo.com
Egypt	Ibrahim ALY	Production Sector Head (AFC3)	Abu Qir Fertilizers Company (AFC)	+203 5603030	+203 5603032	afctrainingcenter@yahoo.com
Egypt	Samir BARSOUM	Lab Section Head	Abu Qir Fertilizers Company (AFC)	+203 5603030	+203 5603032	afctrainingcenter@yahoo.com
Egypt	Metwally ELBANNA	Urea 1 Sector Head	Abu Qir Fertilizers Company (AFC)	+203 5603030	+203 5603032	afctrainingcenter@yahoo.com

Arab Fertlizer Association
since 1975

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Egypt	Amro ELSOKARY	Urea 1 Sector Head	Abu Qir Fertilizers Company (AFC)	+203 5603030	+203 5603032	afctrainingcenter@yahoo.com
Egypt	Fouad ELHABASHY	Sales Sector Head	Abu Qir Fertilizers Company (AFC)	+203 5603030	+203 5603032	afctrainingcenter@yahoo.com
Egypt	Mahmoud ALI	A.N. Maintenance G.M	Abu Qir Fertilizers Company (AFC)	+203 5603030	+203 5603032	afctrainingcenter@yahoo.com
Egypt	Ahmed ELBASSIONY	A.N Process Engineer	Abu Qir Fertilizers Company (AFC)	+203 5603030	+203 5603032	afctrainingcenter@yahoo.com
Egypt	Mohamed Reda AL-AEDAL	Chairman	CIHC	+202 7954006	+202 7957475	info@cihc-eg.com.eg
Egypt	Alaedin Abbas HASSAN	Managing Director	Consulting office of mechanical engineering (COME)	+203 5710296		alaedin.abbas@comecomsulf.com
Egypt	Sabry EL-SANADEDY	EFC Managing Director	Egyptian Fertilizer Co. (EFC)	+2 01226381115	+2 062 3599312	sabry.elsanadedy@orascomci.com
Egypt	Ehsan Mohamed ABDELLATEF		El Delta Co. for Fertilizers & Chemical Industries			
Egypt	Naser A. IBRAHIM		El Delta Co. for Fertilizers & Chemical Industries			
Egypt	Mohamed Adel EL-DANAF	Cherman & CEO	Helwan Fertilizers Co.	+202 25430370	+202 25430370	hfc01@hfcegypt.com
Egypt	Ahmed EL-SAEED	Production Manager	Helwan Fertilizers Co.	+202 254 30370	+202 254 30370	hfc01@hfcegypt.com
Egypt	Gamel Habyb MEKHAEL	Finance Manager	Helwan Fertilizers Co.	+202 254 30370	+202 254 30370	hfc01@hfcegypt.com
Egypt	Hesham H. EL-NAGAR	Urea Manager	Helwan Fertilizers Co.	+202 25430370	+202 25430370	hfc01@hfcegypt.com

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Egypt	Ahmed Mahmoud ABU ELFADL	Urea Manager	Helwan Fertilizers Co.	+202 25430370	+202 25430370	hfc01@hfcegypt.com
Egypt	Wael Abdo FAHEM	Chemistry	Helwan Fertilizers Co.	+202 254 30370	+202 254 30370	hfc01@hfcegypt.com
Egypt	Mohamed Hasan MOUSTAFA	Electric Engineer	Helwan Fertilizers Co.	+202 25430370	+202 25430370	hfc01@hfcegypt.com
Egypt	Ahmed Mosa HOUSNY	Head shift Industrial Safety	Helwan Fertilizers Co.	+202 254 30370	+202 254 30370	hfc01@hfcegypt.com
Egypt	Eid EL-HOUT	Chairman & Managing Director	KIMA	+2097 2314500	+2097 2314505	info@kimaegypt.com
Egypt	Ahmed Othman EL-GHAREEB		KIMA	+202 25740966	+202 25771239	info@kimaegypt.com
Egypt	Ahmed Mohamed ABDELMOTTALEB		KIMA	+202 25740966	+202 25771239	info@kimaegypt.com
Egypt	Mohamed Ali MORSY		KIMA	+202 25740966	+202 25771239	info@kimaegypy.com
Egypt	Mohamed Abdelmaged KASED		KIMA	+202 25740966	+202 25771239	info@kimaegypt.com
Egypt	SAYED MOHAMED HEMDAN	H.S	KIMA	25743197	25771239	INFO@KIMAEGYPT.COM
Egypt	NEVIN WAFIK ABOUELMATTY	Export Manager	KIMA	25743197	25771239	INFO@KIMAEGYPT.COM
Egypt	Mohamed EL MOETAZ		MAZARS			
Egypt	Hassan Abd El Alim	Chairman & CEO	MOPCO	+202 26714495		ceo@mopco-eg.com

Arab Fertilizer Association
since 1975

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Egypt	Adel EL-MAHDY		MOPCO			
Egypt	Mohamed El-Ghwalby	Chief Maintenance Officer	MOPCO	+2057 2292287		cmo@mopco-eg.com
Egypt	Zakaria Salem	GM Technical Services & Planning	MOPCO	+2057 2292062		pnpgmgr@mopco-eg.com
Egypt	Nawal MEZIATI		OCP			
Egypt	Khaled el ghazaly HARB	Chairman & managing Director	Phosphate Misr Co.	+2 02 25167532		info@phosphatemisr.com
Egypt	phosphate misr 1		Phosphate Misr Co.			
Egypt	phosphate misr 2		Phosphate Misr Co.			
Egypt	Mohamed Kamaleldeen NASER	Chairman	SEMADCO			
Egypt	Mohamed Moustaf AHMED		SEMADCO			
Egypt	Mohamed Hamed EL-DESOKY		SEMADCO			
Egypt	Mohsen Mahmoud ABDELAL		SEMADCO			
Egypt	Nor Ibrahim MOHAMED		SEMADCO			
Egypt	Mohamed Abu Elhasn ABDELHAKEM		SEMADCO			

Arab Fertilizer Association
since 1975

28th AFA Int'l Fertilizer Technology Conference & Exhibition ~ 2015

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Egypt	Abdelnaser Goma BAKHET		SEMADCO			
Egypt	Mohamed Yousef MOHAMED		SEMADCO			
France	Franck Mairet	International sales manager	ArrMaz	+33613794065		fmairet@arrmaz.com
France	CFIH		CFIH			
France	Emmanuelle BIADI	Sales Manager	PALL			
France	Saleh EL-SHAER	Sales Engener	PALL	+966 56 8707777		saleh_elshaer@pall.com
France	Yazan HAROUN	Sales Engineer	PALL	+971 48996301		yazan_haroun@pall.com
India	Avdhesh MATHUR	President & CEO	NAQ	+91 772 8886215	+91 141 2525761	indiaoffice@naqglobal.com
India	Prakash MATHUR	Director	NAQ	+91 141 2525661	+91 141 2525761	
India	Suman BHATTACHARJEE	Manager Technical	NAQ	+91 141 2525661	+91 141 2525661	
India	NAQ		NAQ			
India	Neelan		Neelam Aqua & Speciality Chem. Ltd.			
Iraq	Adil Kareem	Deputy Minister	Ministry of Industry & Minerals			

Arab Fertlizer Association
since 1975

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Italy	Marco BERTORELLE	Sales and Prodects Manager	Bedeschi	+39 0497663100	+39 0498848006	elena.marcato@bedeschi.com
Jordan	Jamal Al SARAYRAH	Chairman	APC	+962 775482282	+962 6 5651248	jamal.sarayrah@Arabpotash.com
Jordan	Osama BAWADI	NCC Shift Supervisor	APC	+962 6 5200501	+962 6 5651248	
Jordan	Naji NAZAL	XCCP Shift Supervisor	APC	+9626 5200501	+9626 5651248	
Jordan	Mohammed Tarawneh	Harvesters Shift Supervisor	APC	+9626 5200501	+9626 5651248	
Jordan	Fuad Maaytah	Dredgers Shift Supervisor	APC	+9626 5200 501	+9626 5651248	
Jordan	Ala,a AL-Omari	Process Specialist	APC	+9626 5200501	+9626 5651248	alaa.o@arabpotash.com
jordan	Eyad KHRAISAT	Solar Pond Engineer	APC	+9626 5200501	+9626 5651248	
Jordan	Hussein SHORMAN	Power Plant Superintendent	APC			
Jordan	Alaa AL-BAWAT	Process Eng.	APC	+9626 5200501	+9626 5651248	
Jordan	Fahed JABER	Workshop Supervisor	APC	+9626 5200501	+9626 5651248	
Jordan	Mohammad SARAYRAH	NCCP mech maint Supervisor	APC	+9626 5200501	+9626 5651248	
Jordan	Mohammad SHAMAILEH	CCPs Electrical Maint Supervisor	APC	+9626 5200501	+9626 5651248	

Arab Fertlizer Association
since 1975

28th AFA Int'l Fertilizer Technology Conference & Exhibition ~ 2015

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Jordan	Odai MADADHA	Civil Manager	APC	+9626 5200501	+9626 5651248	
Jordan	Yousef MAAYTAH	Safety Superintended	APC	+962 775482363	+9626 5651248	yousef.m@arabpotash.com.jo
Jordan	Issam ABU ISSA	Safety Supervisior	APC	+962 775 482363	+9626 5651248	isam.a@arabpotash.com.jo
Jordan	Waleed ADAILEH	Water Superintended	APC	+9626 5200501	+9626 5651248	
Jordan	Fuad OMARI	QES	APC	+9626 5200501	+9626 5651248	
Jordan	Kamal NOAIMAT	Shift Supervisor	APC	+9626 5200501	+9626 5651248	
Jordan	Hamada SHAHEEN		APC	+9626 5200501	+9626 5651248	
Jordan	Amro AL-HROUB	Environment Engineer	APC	+962 77 5482517		amro.h@arabpotash.com
Jordan	Jamal AMIRA	Technical Director	APC	+9626 5200 501	+9626 5651248	jamal.amira@arabpotash.com
Jordan	Hasan Yaseen AL-TAKRORY		ARMICO	+962 6 5663 146	+962 6 5684 114	armico@armico.com
Jordan	Basel MASARWAH		ARMICO	+962 6 5663 146	+962 6 5684 114	armico@armico.com
Jordan	Osama NOFAL		ARMICO	+962 6 5663 146	+962 6 5684 114	armico@armico.com
Jordan	Bassam FAKHOURI	Managing Director	Chemicals & Mining Industries Co .	+962 6 5996111	+962 6 5336111	

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Jordan	Mahmoud AL-GHARAIBEH	Mining Consultant	Chemicals & Mining Industries Co .	+962 6 5996111	+962 6 5336111	gharaybeh@gmail.com
Jordan	Qaise Haddad	Senior Engineer (Mechanical)	Indo-Jordan Chemicals Co.	+962798673590	+96265512871	mdoffice@jcltd.com
Jordan	Osama Nayef	Senior Engineer (Electrical)	Indo-Jordan Chemicals Co.	+962798673506	+96265512871	mdoffice@jcltd.com
Jordan	Shaban Abdul Majeed	Shift Engineer (Operation)	Indo-Jordan Chemicals Co.	+962798673412	+96265512871	mdoffice@jcltd.com
Jordan	Shafik ASHKAR	CEO	JPMC	+962 65697795	+962 65652917	ceo@jpmc.com.jo
Jordan	JPMC 1		JPMC			
Jordan	JPMC 2		JPMC			
Jordan	JPMC 3		JPMC			
Jordan	JPMC 4		JPMC			
Jordan	JPMC 5		JPMC			
Jordan	JPMC 6		JPMC			
Jordan	JPMC 7		JPMC			
Jordan	JPMC 8		JPMC			

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Jordan	Thabit Alsunna	Maintenance Engineer	KEMAPCO	+9627979731349 3	+96264601995	thabit.alsunna@kemapco.com
Jordan	Rakan Malahmeh	Quality Inspector	KEMAPCO	+962799413800	+96264601995	rakan.malahmeh@kemapco.com
Jordan	Fadi Basheer	Electrical and Instrument Engineer	KEMAPCO	+962797313462	+96264601995	fadi.basheer@kemapco.com
Jordan	Amer AL AABED		Modern Company For Fertilizer Production	+962 6 4023691	+962 6 4023607	mcfp@agrimatco-me.com
Kuwait	Abdullah AL-SWAILEM	Deputy Managing Director, Fertilizers	PIC	+965 99071805	+965 23261530	Abdullah_alswailem@pic.com.kw
Kuwait	Ahmad AL MULLA	Technical Services, Manager	PIC	+965 23852161	+965 23261530	ahmad_almulla@pic.com.kw
Kuwait	Suliman AL-SALAM		PIC			
Kuwait	Mohammed SHAIKAN		PIC	+965 99761671	+965 23261530	
Kuwait	Abdulaziz AL FARHOUD	SNR. Sales Admin Support	PIC	+965 99393553	+965 23261530	abdulaziz_alfarhoud@pic.com.kw
Kuwait	Mustafa ABDULLAH	Supervisor	PIC	+965 99808296	+965 23260637	Mustafa_mohamed@pic.com.kw
Kuwait	Ahmed AL ANSARI	Saftey Engineer	PIC	+965 23852161	+965 23261530	Ahmed_alansari@pic.com.kw
Kuwait	Abdullah AL AZMI	Mechanical Engineer	PIC	+965 23852161	+965 23261530	abdullah_alazmi@pic.com.kw
Kuwait	Hamood AL ENZI		PIC	+965 23852161	+965 23261530	Hamood_alenzi@pic.com.kw

Arab Fertlizer Association
since 1975

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Libya	Awad ELSABER	CEO	LIFECO	+218 913820966	+218 61 2226082	awad.elsaber@lifeco.ly
Libya	Abdelkarim ABDRABA	Amm-2 Coord	LIFECO	+218 64 7630283	+218 64 76206077	salah@yahoo.com
LIBYA	Aboubaker BUKHAMADAH	Manager, Urea of shipping	LIFECO	+218 91 3845616	+218 64 7622210/11	abubaker.elmahdi@lifeco.ly
Libya	Ahmed HAROUN	Group Supervisor	LIFECO	+218 92 5965207	+218 64 7622210/11	ahmedharun@yahoo.com
libya	Ashraf EL-WERFALI	Acting Inspection Coordinator	Lifeco	+218 927294373		ashraf.altarshol@lifeco.ly
Libya	Abdalla AL-BARASI	Safety Coordinator	LIFECO	+218 922917483		hasht59@yahoo.com
Libya	Ibrahim MOHAMED	Ammonia Manager	LIFECO	+218 64 7630283	+218 64 7626077	ibrahim.belgasim@lifeco.ly
Morocco	Jamal Eddine BENSARI	Director Raw Material Procurements & Freight	OCP	+212 661 145765	+212 522 998305	je.bensari@ocpgroup.ma
Morocco	Ahmed SADEK	Helth & Environment Manager	OCP	+212 524 465640	+212 661 893511	SADIK Ahmed <A.SADIK@ocpgroup.ma>
Morocco	Mohamed BENZEKRI		OCP			
Morocco	EL Kanit ABDELMONIM		OCP			
Morocco	Salaheddine KNOUZI	Washing Plant Manager	OCP	+212 524 465440	+212 66189 3511	S.KNOUZI@ocpgroup.ma
Morocco	Abdelghani FILALI		OCP			

Arab Fertlizer Association
since 1975

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Morocco	Mohamed CHEHTANE		OCP			
Morocco	Omar AMRAOUZA		OCP			
Morocco	Tarik FKINICH		OCP			
Morocco	Abdelhak KABABI	Environmint Manager	OCP	+212 661 264 694		a.kabbabi@ocpgruop.com
Netherlands	Milo STALMAN	Mechanical & Solutions manager	Stamicarbon bv	+31 46 4237080		milo.stalman@stamicarbon.com
Netherlands	Wilfried DINKX	Licensing manager	Stamicarbon bv	+31 46 4237080		wilfried.dirkx@stamicarbon.com
Netherlands	Luc DIELTJENS	R&D Director	Stamicarbon bv	+31 46 4237080		luc.dieltjens@stamicarbon.com
Oman	Hamed AL-HASHMI	GM CA	OMIFCO	+968 25532222	+968 25532598	h.hashmi@omifco.com
Oman	Mohamed MASRORI	HSE Manager	OMIFCO			masrori@omifco.com
Pakistan	Aman Mir	Head Human Resouce Services Division	Fauji Fertilizer Company Limited	+92 51 8454201	+92 51 8459948	aman_mir@ffc.com.pk
Qatar	Khalifa SOWAIDI	Vice Chairman & CEO	QAFCO	+974 44779779	+974 44772266	ksowaidi@qafco.com.qa
Qatar	Narayansamy Selvaraj	Head of Urea-1 Plant	QAFCO	0974 55833725	0974 44770347	nselvaraj@qafco.com.qa
Qatar	OTHMAN AL-BORSHID	HEAD OF SECTION PH&L	QAFCO	+97455863386	+97444228198	oboursaid@qafco.com.qa

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Qatar	Fahad Al-Shamari	Head of Ammonia 1	QAFCO	00974 55506919	00974 44770347	fshammari@qafco.com.qa
Qatar	Eisa Al-Rayes	Plant Engineer	QAFCO	00974 66975154	00974 44770347	erayes@qafco.com.qa
Qatar	Yacoub Abdulla AL-RAYYIS	Head Of Urea 6	QAFCO	+974 55507854		yrayyis@qafco.com.qa
Qatar	Hazim ALKADI	Director,Project Department	Qatar	+974 55878092	+974 44831609	Dr.hazem@qimc.com.qa
Russia	DMITRII OBEDIN	International Affairs Manager	NIIK (R&D Institute of Urea)	+79103968142		guschina_na@niik.ru
Russia	ANDGEY BARINOV	Ð¡hief engineer	NIIK (R&D Institute of Urea)	+79103969364		guschina_na@niik.ru
Russia	Dmitrii MALYSHEV		NIIK (R&D Institute of Urea)	+79103969364		guschina_na@niik.ru
Saudi Arabia	Muhammad Nasir ABBAS # 28180	Inspection Engineer	AlBayroni/SABIC	+966 3 340 64 75	+966 3 340 60 92	abbasmn@albayroni.sabic.com
Saudi Arabia	Mohammed Al Habib	Account Manager	GE	+966 564239702		mohammed.alhabib@ge.com
Saudi Arabia	Khaled AL-MANA	Executive Vice President, Fertilizer SBU	SABIC	+966 11 2258 555	+966 11 2559080	almana@sabic.com
Saudi Arabia	Khalid AL-MOGBIL # 22399	Market Intelligence Manager	SABIC			khalidmm@sabic.com
Saudi Arabia	Zia VALLUR M. # 43759	Senior TA Planning Engineer , Central Maintenance	SABIC			Zia, VALLUR M. <ziaVM@safco.sabic.com>
Saudi Arabia	Khaled AL-KHURAIMI # 24406	Operation Engineer	Safco/SABIC			khuraimika@safco.sabic.com

Arab Fertlizer Association
since 1975

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Saudi Arabia	Jamal Matalka	Chairman & CEO	Saudi Specialty Chemical Ind.	00966557861884		jmatalka@ssci.com.sa
Singapore	Rached Ratib	Marketing Manager	CFIH	+33 02 99 540773	+33 02 99 541015	rratib@cfiholding.com
Singapore	Mahmoud Aziza	Technical Director	CFIH	+33 02 99540773	+33 02 99541015	maziza@cfiholding.com
Sudan	Mohamed EL Mahdi		Giad Industrial Group	+249912664226		mohdtig@gmail.com
Switzerland	RODERICK CANT	BUSINESS MANAGER	BUSS CHEMTECH	0041795405211	+41618256737	roderick.cant@buss-ct.com
Switzerland	Olivier RUFFINER	Sales Manager Fluorine Technology	BUSS CHEMTECH AG	+41 61 825 62 04	+41618256737	olivier.ruffiner@buss-ct.com
Switzerland	Sergio PANZA		CASALE			
Switzerland	Iacopo CEREA	Syngas Senior Process Engineer	CASALE SA	+41 91 6419314		i.cerea@casale.ch
Switzerland	Jean-Francois Granger	Borealis Licensing Manager	Casale SA	+41 91 6419314	+41919607291	Jean-Francois.Granger@borealisgroup.com
Tunisia	Hedhili KEFI		Board Member	+216 71 797623	+216 71 782988	kefi.h@granuphos.com.tn
Tunisia	AL-Basher BEN SALEM		GCT	+216 71 780038	+216 71 800931	gct@gct.com.tn
Tunisia	Omar LABEDY		GCT	+216 71 780038	+216 71 800931	gct@gct.com.tn
Tunisia	Lassaad EL-MEKEY		GCT	+216 71 780038	+216 71 800931	gst@gst.com.tn

Arab Fertilizer Association
since 1975

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Tunisia	Sohael AL-QANONY		GCT	+216 71 780038	+216 71 800931	GCT@GCT.COM.TN
Tunisia	Khereddine BEN AMMAR	Plant Manager	Groupe ALKIMIA	+216 25 96 2022	+216 75 27 3900	khereddine.benammar@alkimia.com.tn
Tunisia	Khemoussi FERJANI	Purchase Chef Department	Groupe ALKIMIA	+216 25 96 2020		khemoussi.ferjani@alkimia.com.net
Tunisia	Fathi HATTAB	Soft & Computer Chef Department	Groupe ALKIMIA	+216 27 362 007	+216 75 237 900	fathi.elhattab@alkimia.com.tn
UAE	Roland Taff	Technical Sales Manager	Borregaard Middle East	+971048813958		roland.taff@borregaard.com
UK	Bill Jordan	President	RoSPA	+44 1214757319		JORDANW@parliament.uk
United Arab Emirates	Ayoob Mohd Saleh Al Zarooni	Act. CEO	FERTIL	971506110038		s.ayoob@fertil.com
United Arab Emirates	Mohamed Saleh AL-HAMED	Vice Precedent	FERTIL	+971 26016611		m.saleh@fertil.com
United Arab Emirates	Ahmed AL-SHEHHI	Planning Manager	FERTIL	+971 50 2120212		a.ahmed@fertil.com
United Arab Emirates	Walid ALMAS	VP -Plant Availability	FERTIL	+971 506148146		m.walid@fertil.com
United Arab Emirates	Khalid Saleh AL-BRAIK	Day Operations Engineer	FERTIL	+971 260 160 66	+971 260 16102	b.khalid@fertil.com
United Arab Emirates	Rashed AL-HAMMADI	Shift Supervisor	FERTIL	+971 2 60 22586	+971 260 16102	h.rashed@fertil.com
United Arab Emirates	Wadhah Ahmed AL-AMERI	Shift Supervisor	FERTIL	+917 260 16121		a.wadhah@fertil.com

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
United Arab Emirates	Sultan AL-NAMER	Shift Supervisor	FERTIL	+971 260 16122		n.sultan@fertil.com
United Arab Emirates	Fertil		FERTIL			
United Arab Emirates	Rashed Abdullah AL-SHAMSI	Day Operations Eng	FERTIL	+971 050 3333261		a.rashed@fertil.com
United States of America	Donal Tunks	President	Phosphatics LLC	+1-813-843-8354		donal.tunks@phosphatics.com
USA	DNV		DNV			
Egypt	Mohamed Abdallah Zain	Secretray General	AFA	+20 2 23054464	+20 2 23054466	info@afa.com.eg
Egypt	Mohamed SHABOURY	Finance & Adminstration Manager	AFA	+202 23054465	+202 23054466	info@afa.com.eg
Egypt	Mohamed Ali	Studies Manager	AFA	+20 2 23054464	+20 2 23054466	info@afa.com.eg
Egypt	Mushira MOHARAM	Manager, Publishing & Doc. Section	AFA	+20 2 23054464	+20 2 23054466	info@afa.com.eg
Egypt	Wael Mazen	Manager, Admistration Section	AFA	+20 2 23054464	+20 2 23054466	info@afa.com.eg
Egypt	Yasser Khairy	Head, Economic Section	AFA	+20 2 23054464	+20 2 23054466	info@afa.com.eg
Egypt	Mazen GHONIEM	Head Section, IT	AFA	+20 2 23054464	+20 2 23054466	info@afa.com.eg
Egypt	Marwa Mohsen	Head Executive Secretary Section	AFA	+20 2 23054464	+20 2 23054466	info@afa.com.eg

Arab Fertlizer Association
since 1975

28th AFA Int'l Fertilizer Technology Conference & Exhibition ~ 2015

Delegate Report

Country	Name	Position	Company	Telephone	Fax	Email
Egypt	Ghada ABU ZAID	Head Section ,Executive Secretary Section	AFA	+20 2 23054464	+20 2 23054466	info@afa.com.eg
Egypt	Abdallah Taher		AFA	+20 2 23054464	+20 2 23054466	info@afa.com.eg