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3D TRASAR Technology for Crude Distillation Overhead Chemicals

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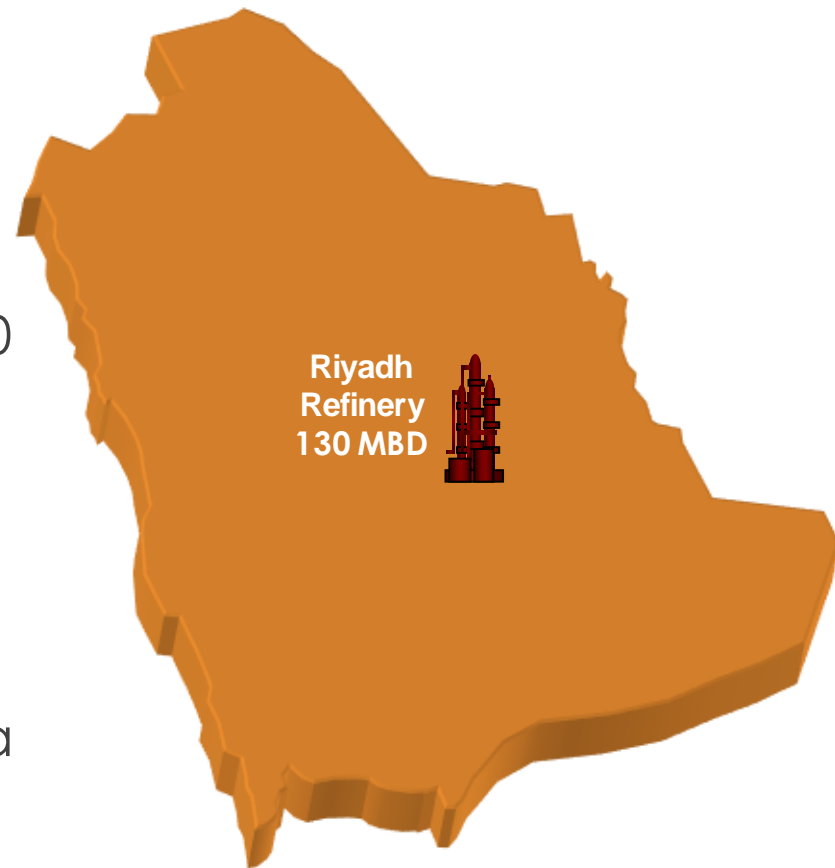


Outline

- ▶ Introduction
- ▶ Objective
- ▶ Results
 - ▶ Compliance
 - ▶ Smart Features of 3D TRASAR
 - ▶ 3D TRASAR Saving Estimate
- ▶ Summary

Introduction

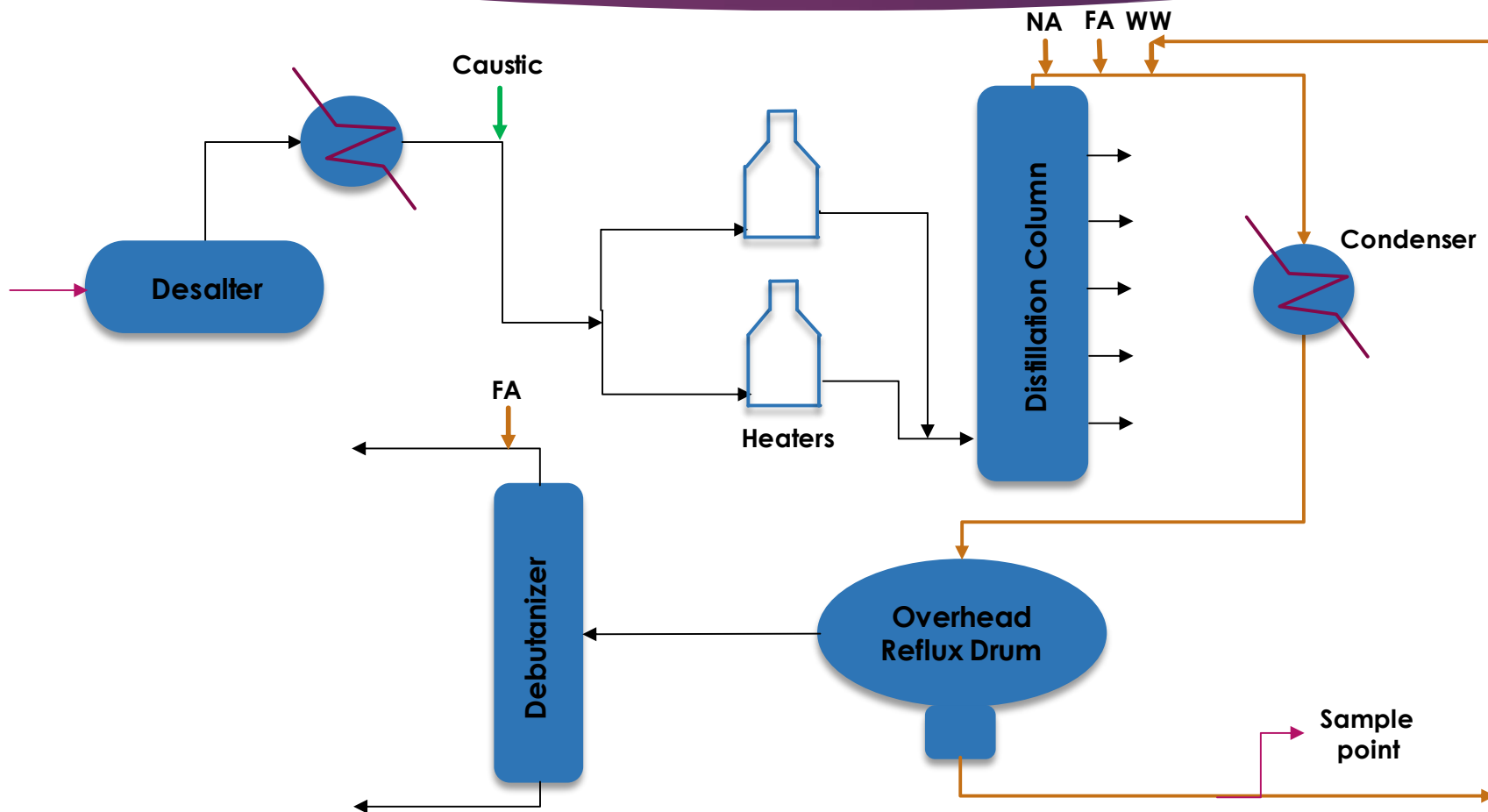
- ▶ Introduction of Riyadh Refinery
 - ▶ RR is an inland refinery established in 1972, with 130 MBD current capacity.
 - ▶ Arab Light & Khurais Crude is RR feedstock,
 - ▶ A 95% conversion factor.
 - ▶ Provide 30% of Saudi Arabia Central Region demand.



Introduction

- ▶ Introduction of the CDU OVHD System
 - ▶ Uncondensed vapor is fed to CDU OVHD at 90-130 °C.
 - ▶ Vapor is condensed via passing through a series of condensers.
 - ▶ Caustic, Filming Amine, and Neutralizing Amine are injected in CDU to remove the remaining Chloride salts, protect CDU equipments integrity, and increase Sour Water pH.

Introduction



The Old CDU OVHD at RR

▶ **General Features of Old CDU OVHD System**

- ▶ 3 samples per day for pH, Chloride, and Fe.
- ▶ 3 Sample per week for H₂S and NH₃.
- ▶ Manual adjustment
- ▶ No online readings.

▶ **Issues**

- ▶ Slow reaction to a rapid change in the crude salt content
- ▶ Chemicals over dosage
- ▶ Low KPI compliance
- ▶ High maintenance cost – short equipments lifetime
- ▶ At a risk of fouling, corrosion, embrittlement

Self Assessment of the Old CDU OVHD

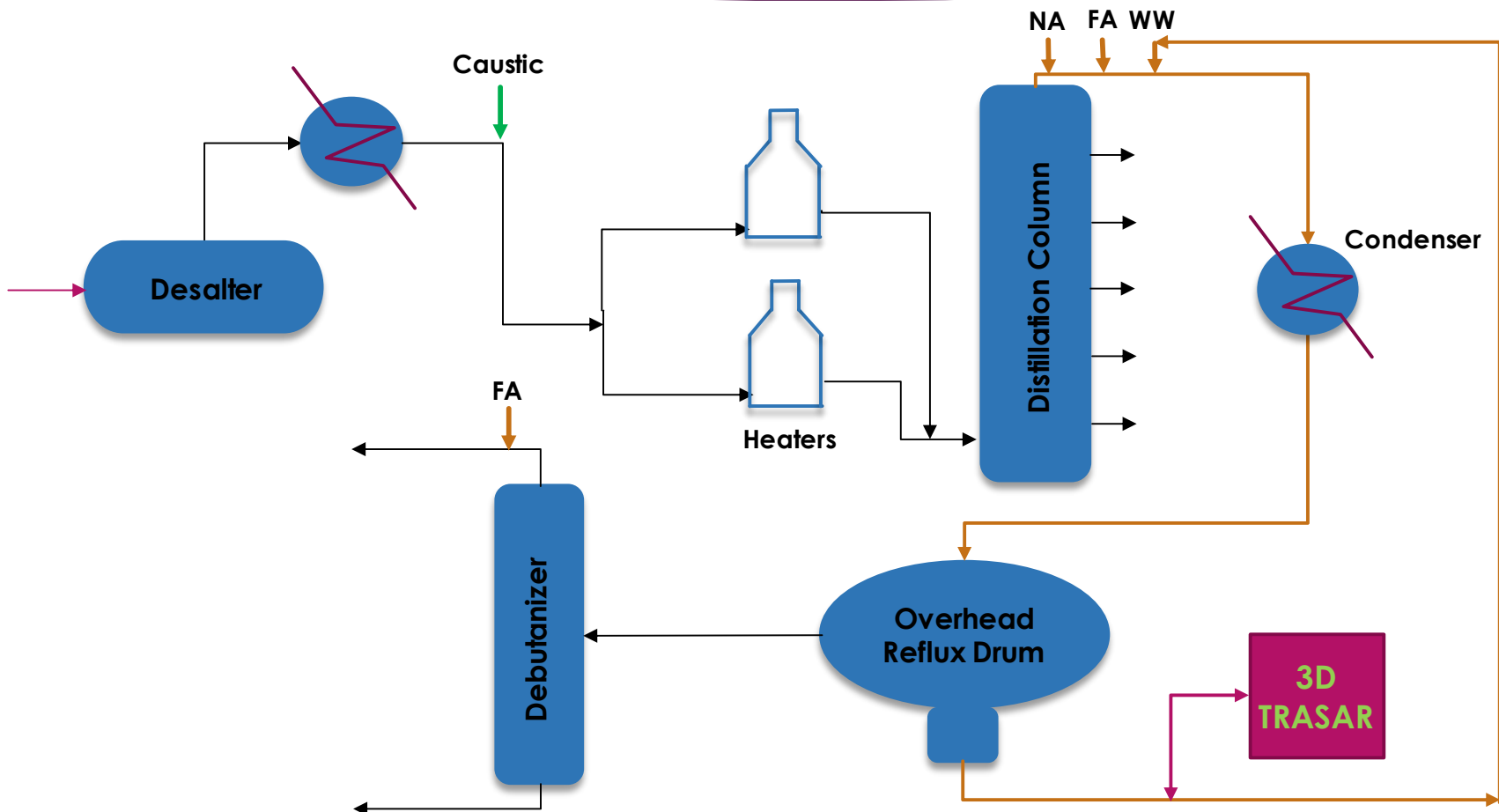
- ▶ Replacement of 8 condenser bundles in 5 years
- ▶ Vacuum Heater Decoking required every 2.5 years
- ▶ Total of 10 days of lost production every 5 years

~\$6 loss per barrel to corrosion issues

Objective

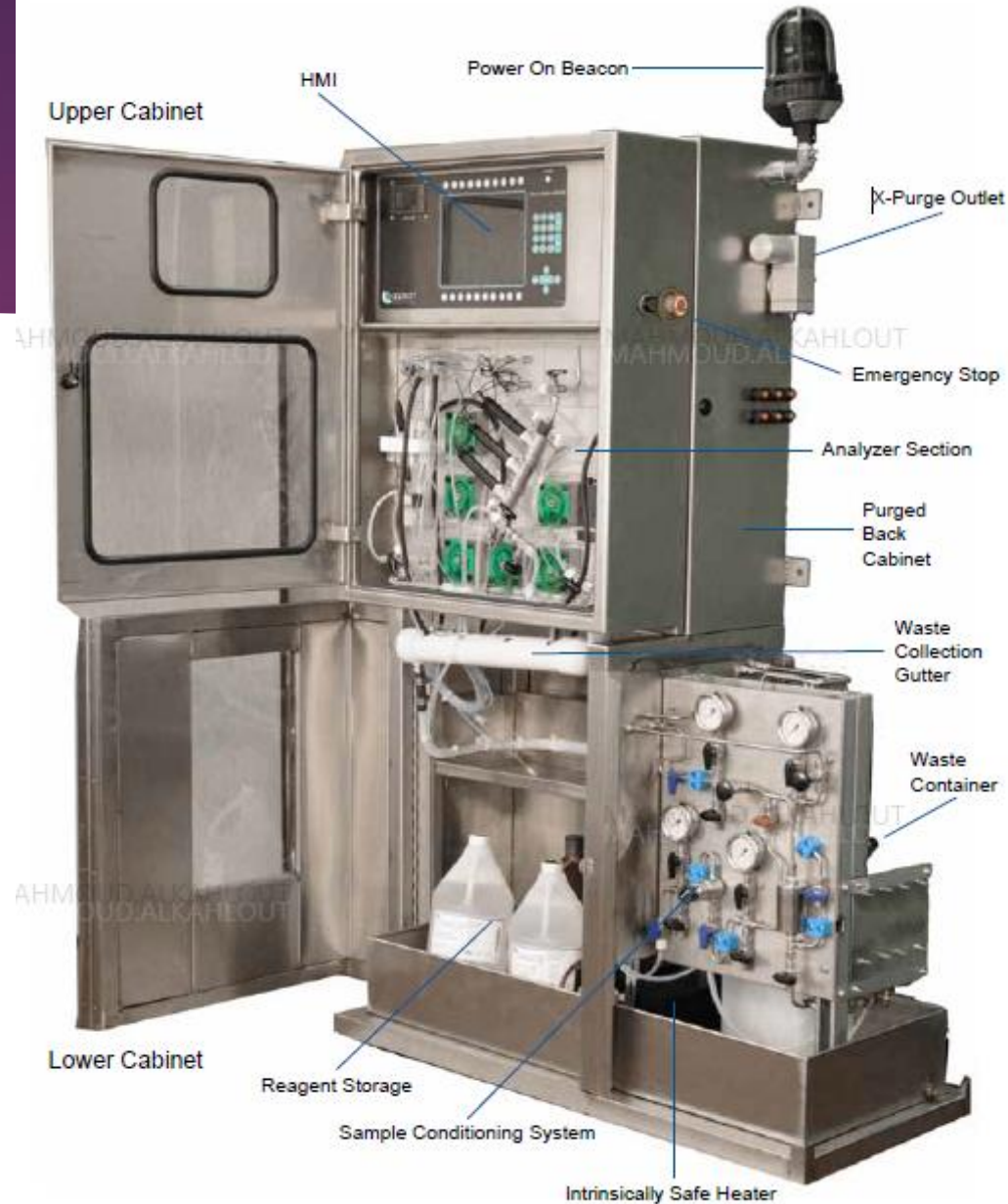
- ▶ Riyadh Refinery made a decision to replace the old CDU OVHD system with the 3D TRASAR, the main driving forces are:
 - ▶ Increase CDU equipment lifetime,
 - ▶ Reduce operational & maintenance cost,
 - ▶ Reduce CDU chemicals consumption.

Solution – 3D TRASAR System



3D TRASAR – Key Features

- ▶ Online reading, every 10 minutes
- ▶ Auto adjustment – limit human interference
- ▶ Right on the spot reaction
- ▶ Injection of the exact amount of chemicals at the exact moment of demand



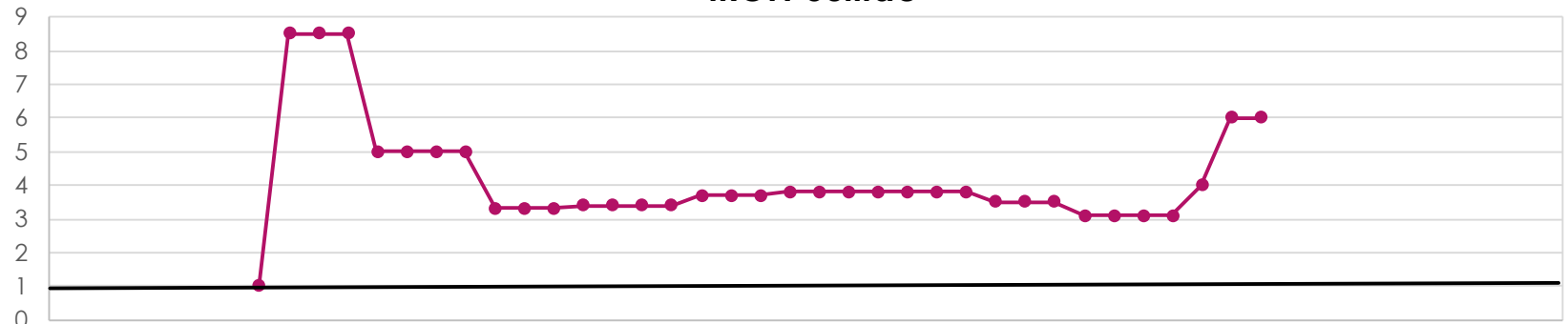
3D TRASAR Impact

- ▶ Improved KPI
- ▶ Low maintenance cost – extended equipment lifetime
- ▶ Direct and indirect savings
- ▶ Improved safety by limiting human interference in chemicals handling
- ▶ Low chemical consumption
- ▶ Online monitoring:

	pH	Cl-	Fe	NH3	H2S
N° by 3DTCOS	84,240	14,040	14,040	14,040	NA
N° by RR Lab	1,095	1,095	1,095	365	365

Iron Sulfide Compliance: From 3% to 95%

IRON Sulfide



13-Sep

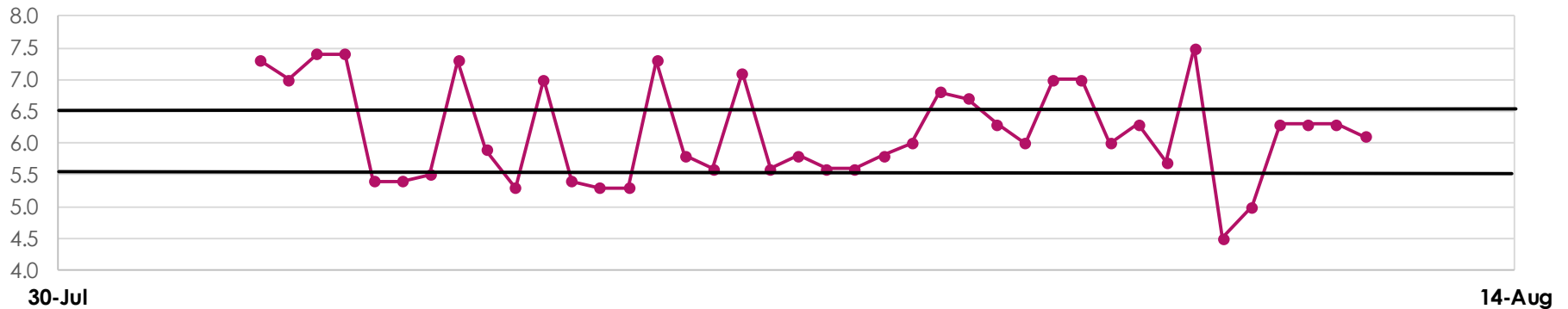
28-Sep

Crude (SN 20005)



pH Compliance: From 65% to above 90%

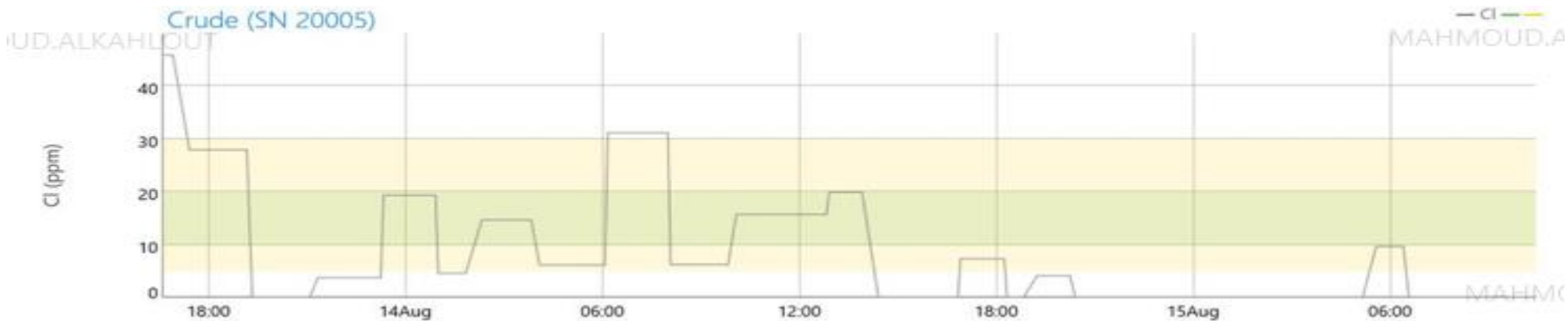
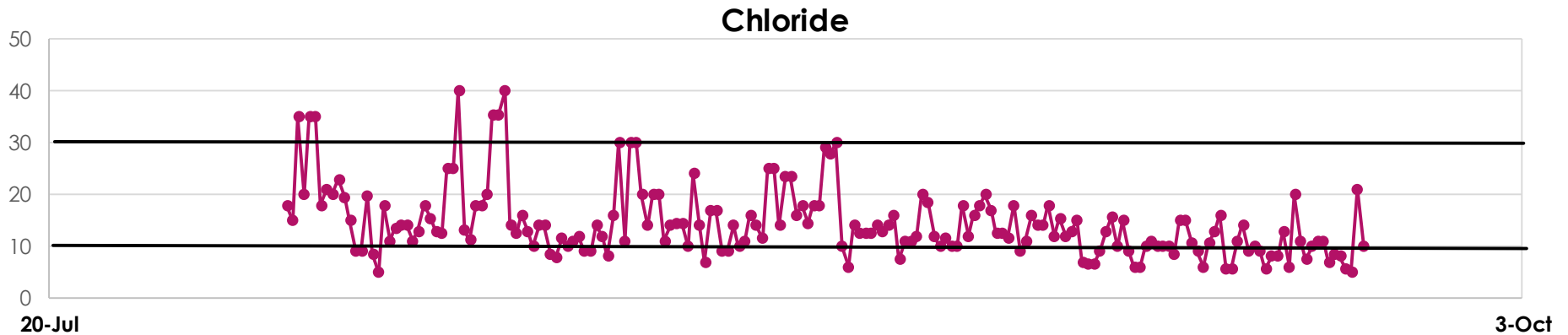
pH



Crude (SN 20005)



Chloride Compliance: From 75% to 85%



Smart Features of 3D TRASAR

- ▶ Trends of pumps dosing rate to help in troubleshooting.
- ▶ Online access via PC or cellphones to your trends and real-time reading.
- ▶ Notification alerts to your email.
- ▶ Recording history of all actions taken, in terms of dosing rate, calibration...etc

Saving Estimate over a 5 Year-Period

5 Years History

Number of bundles replace	8
Number of Hydrotest Pressure	8
Number of headings/de-headings	8

Cost of Corrosion/Fouling for CDU OVHD Condensers

Cost of Bundles Replacement	\$5,808,000
Cost of bundles Hydrotest Pressure	\$40,000
Total Cost	\$5,848,000

Saving Estimate over a 5 Year-Period (Cont'd)

Cost of Lab Tests

Per year	\$39,347
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5 Years Cost

Cost of Production Loss	\$80,640
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5 Years Cost

Total Cost of N-5151	\$203,760
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Total cost of Caustic	\$60,000
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Saving Estimate over a 5 Year-Period (Cont'd)

ROI	
5 Years Total Riyadh Refinery Maintenance & downtime cost (Old system - base)	\$6,231,747
5 Years 3D TRASAR Cost (3D TRASAR)	\$900,000
% Return of Investment	592%

>\$ 1MM per year saving on operation, maintenance, and downtime!

Summary

- ▶ Replaced 3 samples per day by online reading, every 10 minutes.
- ▶ Auto adjustment – limit human interference
- ▶ Reduce risk of fouling and corrosion.
- ▶ Reduce chemical consumption.
- ▶ Increased compliance to over 90%.
- ▶ Saving of around \$1 MM per year.



Thank you