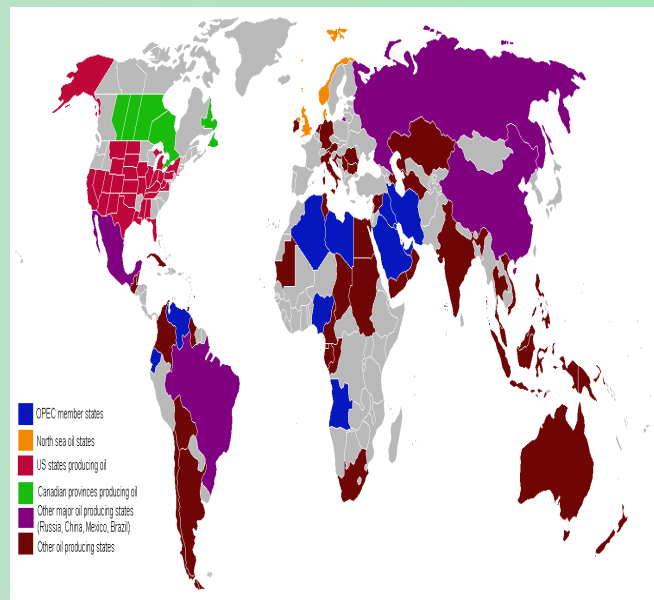


# Key changes in feedstock and how additives can help in making the most of the price differentials



ERTC  
19-21 November 2013  
Budapest

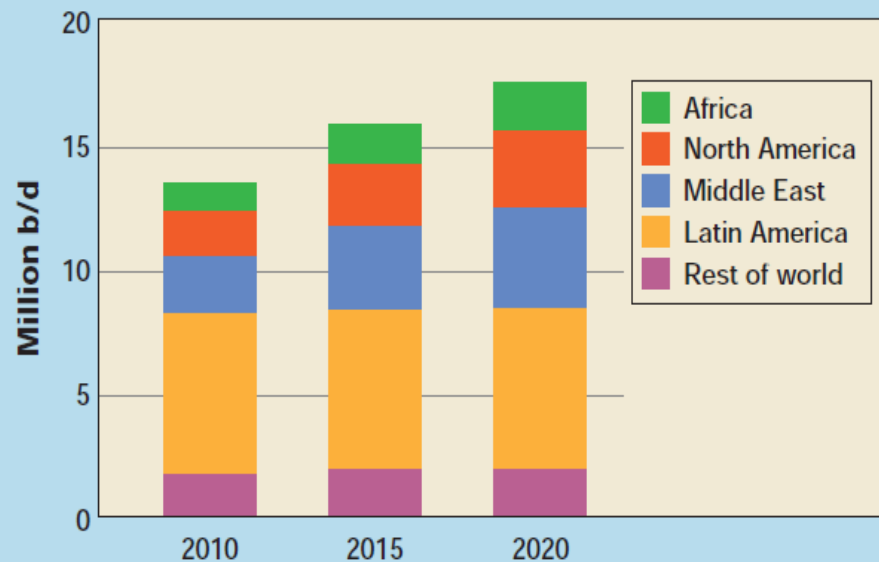


# Contents

- **Changes in Feedstock- Heavy crudes**
- **Challenges of Heavy and Opportunity crudes**
- **Common processing problem of Opportunity crudes**
- **Emulsion problem**
- **Impact of Metals in heavy crude**
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# Changes in Feedstock- Heavy crudes

- Declining supplies of light sweet crudes and high price.
- Ever growing demand for petroleum products.
- Increase in Heavy oil production and easy availability.
- Need for enhancing Profit Margin.



## Key changes in feedstock

- High organic metals
- High TAN
- High solid content
- Unconventional oil like shale oil
- Higher amines and drilling chemicals
- Ammonia and amines in process water




# Challenges of Heavy and Opportunity crudes

Crude	Origin	API <sup>o</sup>	TAN Mg KOH/gm	other unfavorable properties
Eocene	Kuwait	18.7	0.20	High viscosity
Doba	Chad	21.1	5.18	High calcium naphthenate
Merey 16	Venezuela	16.0	0.96	High conductivity
Kuito	Angola	19.7	2.41	High metal content
Maya	Mexico	20.2	0.06	High metal content

- Emulsion problem
- High metal content
- High wash water pH (presence of ammonia and tramp amine).
- Fouling problem
- High TAN

# Emulsion problem in Desalter

- High viscous crudes: poor desalting
- Solids migrate to Interface : Stable emulsion : Brine system fouling

- Metal content  : Conductivity  : Voltage   
: of neat crude or crude blend : across grid

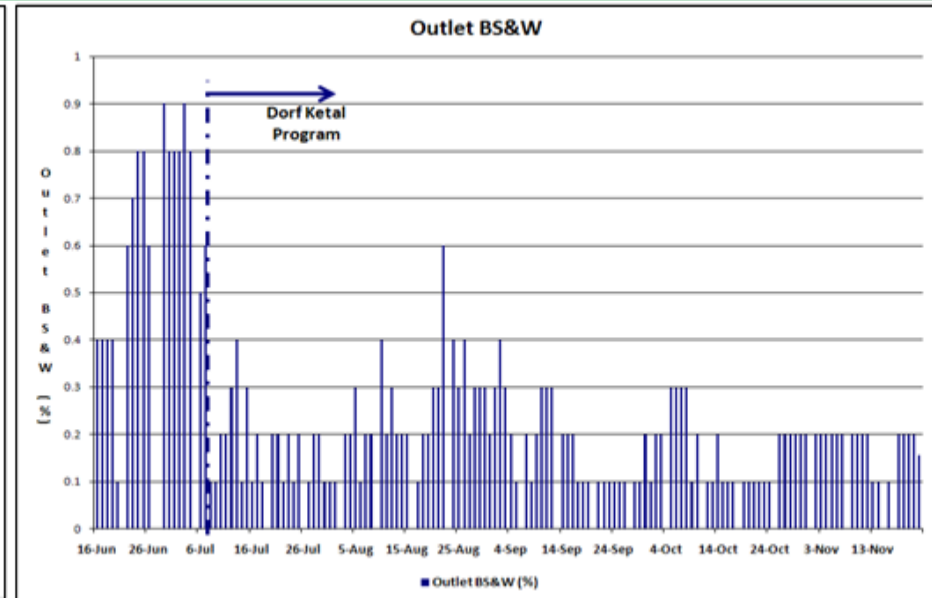
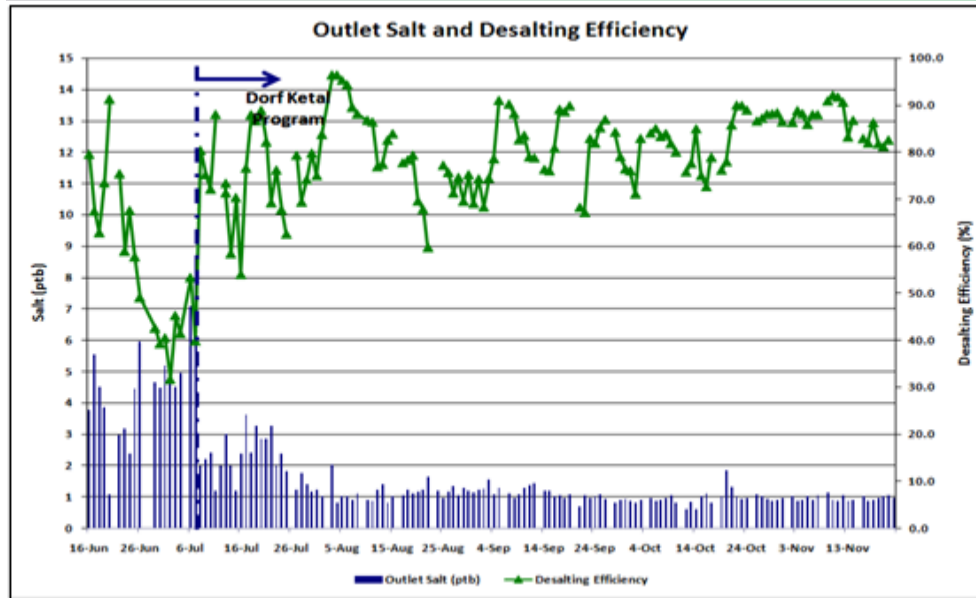
- Poor-oil water separation leads to water carry over, oil under carry, salt slippage and effluent treatment loading

# Innovative Demulsifier Chemistry

- **Range of Demulsifiers for Heavy crudes(< 25 API)**
- **Combination of dehydrating compounds, solid wetting agent and reverse emulsion breakers.**
- **Effective emulsion resolution.**



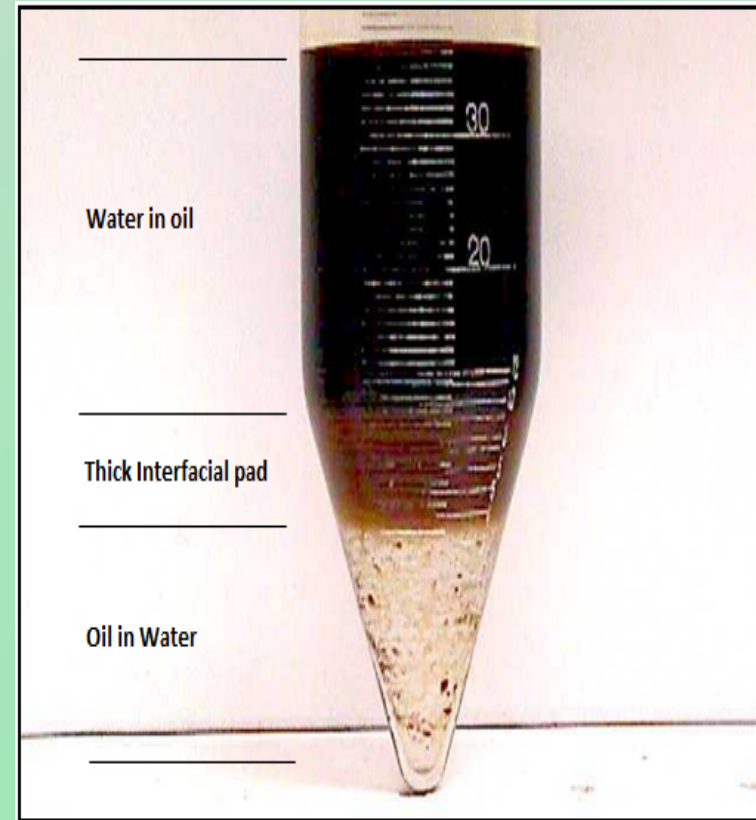
# Demulsifier Case Study-South East Asian Refinery



- Emulsion problem during heavy crude processing
- Dorf Ketal program: Improved desalting and dehydration
- Energy cost Savings: USD 120 K
- Reduced environmental impact with less oil in brine.

# Impact of Metals in heavy crude

- Calcium and Iron in the form of Naphthenate.
- At high pH: migration to the rag layer: emulsion stabilization.
- High Emulsion: Oil under carry, Water carry over, salt slippage.
- Calcium in desalted crude => Resid upgrader catalyst de-activation => Increase in operating cost.



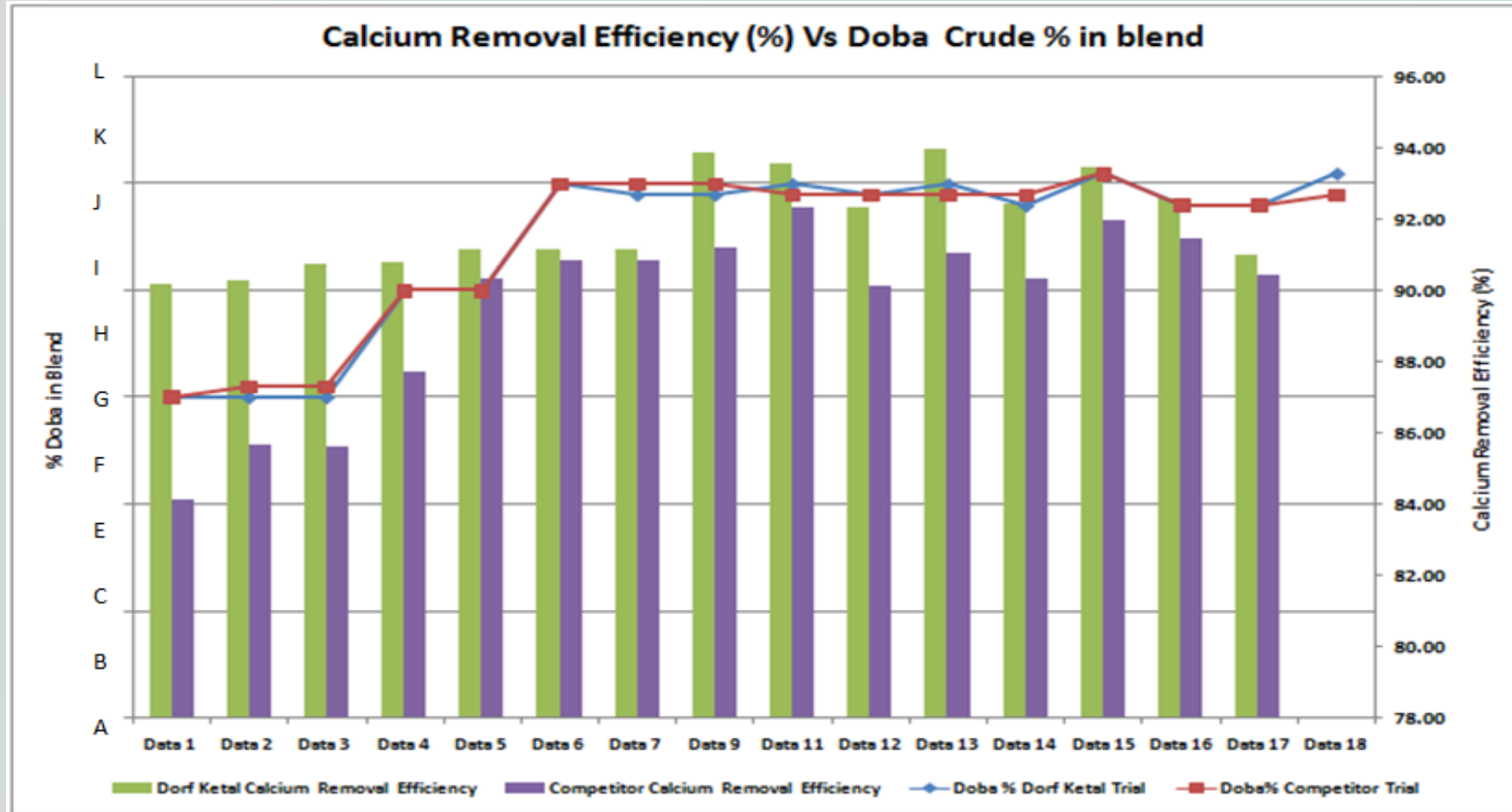


# Calcium Removal aid(CRA)

- **Conventional CRA like sulphuric or acetic acid has drawbacks.**
- **Dorf Ketal Novel CRA:**

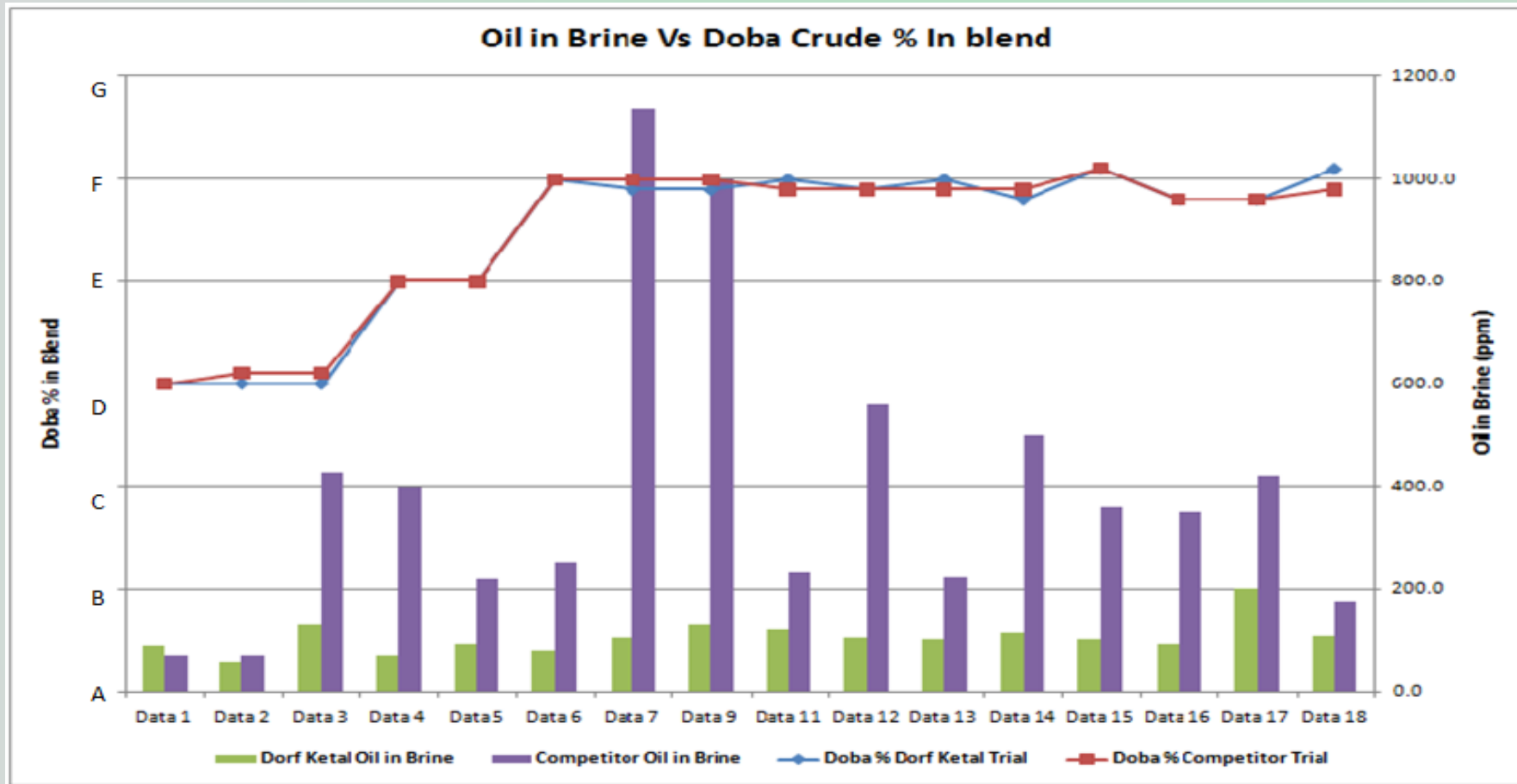
Acid Based CRA	Acid free CRA
<ul style="list-style-type: none"><li>• <b>Organic acid based product</b></li><li>• <b>For heavy and sour crude with high H<sub>2</sub>S</b></li><li>• <b>Hydrolyze Calcium Naphthenate to Calcium salt(water soluble)</b></li><li>• <b>Less calcium in desalted crude</b></li><li>• <b>No downstream problems</b></li></ul>	<ul style="list-style-type: none"><li>• <b>Forms water soluble calcium adduct</b></li><li>• <b>Acid free product</b></li><li>• <b>Doesn't cause corrosion</b></li><li>• <b>No separate scale and corrosion inhibitor</b></li><li>• <b>Bio-degrades easily</b></li></ul>

# CRA Case Study- Doba Crude



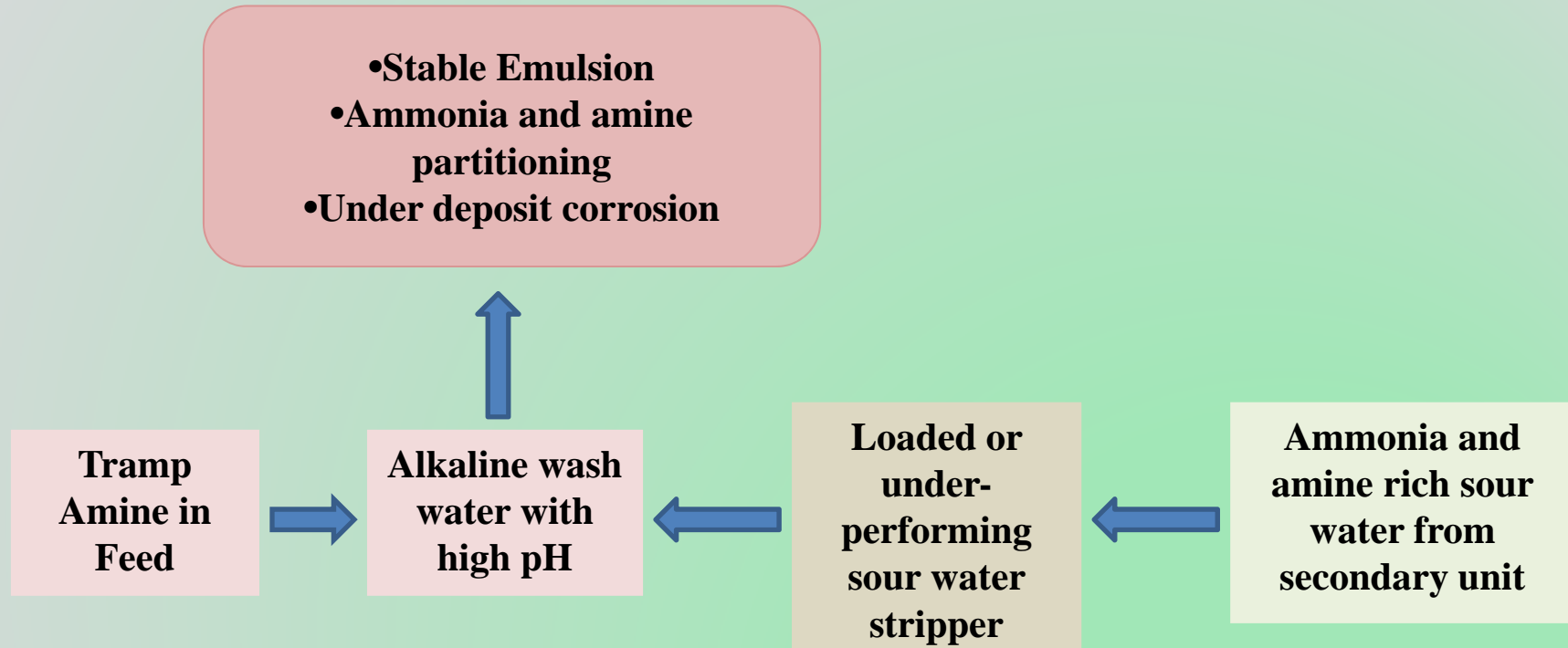
- Dorf Ketal CRA showed greater calcium removal performance

# CRA Case Study- Doba Crude



- Dorf Ketal CRA outperformed alternate chemistry in terms of Oil in Brine.

# Effects of Ammonia and tramp Amine

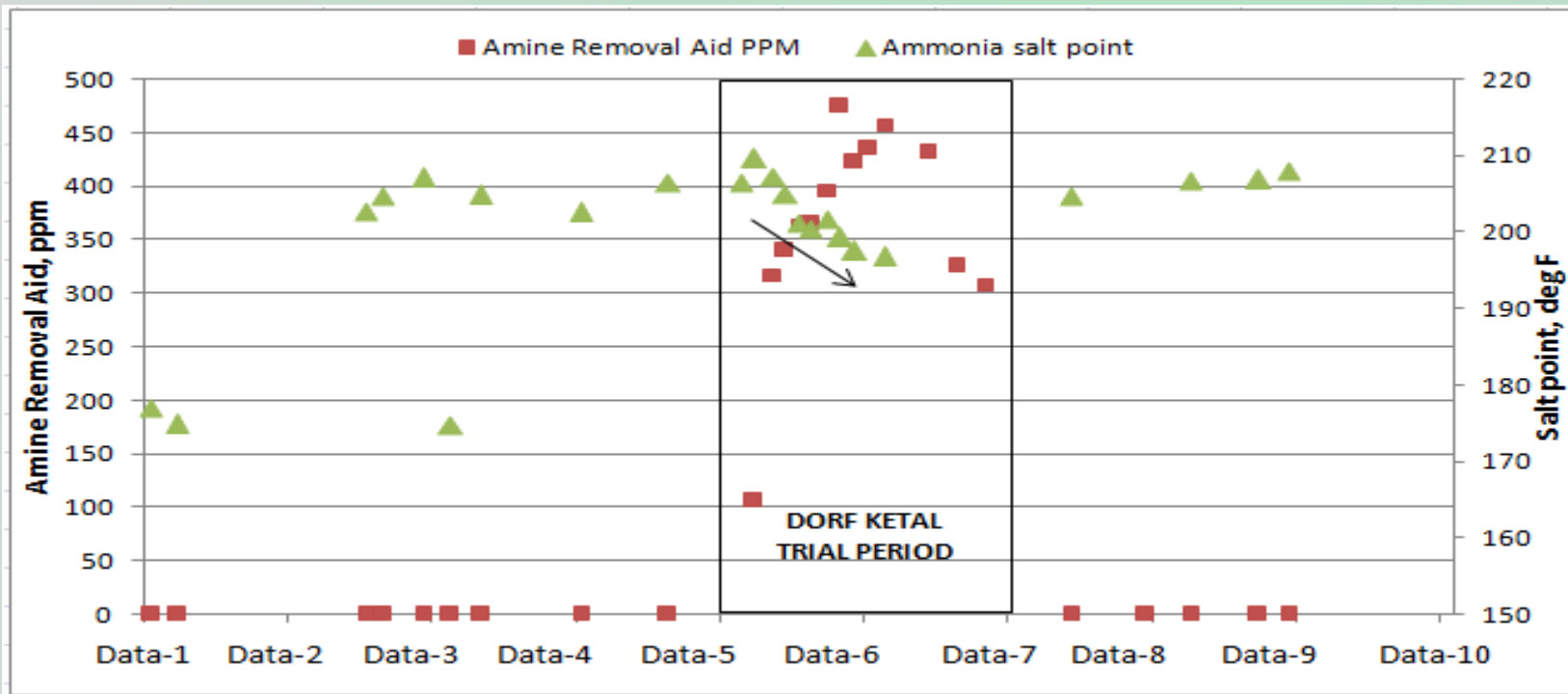


- At high pH desalting efficiency is degraded
- At high pH : Ammonia and amine partitions to the crude.

# Dorf Ketal wash water pH management

- **pH management aid:**
  - ✓ Reduces alkalinity to pH 6-7
  - ✓ Better emulsion resolution
- **Amine Removal Aid:**
  - ✓ Acid free approach to reduce ammonia and amine
  - ✓ Forms water soluble imines.
  - ✓ Decreased overhead salting point
  - ✓ Decreased under deposit corrosion

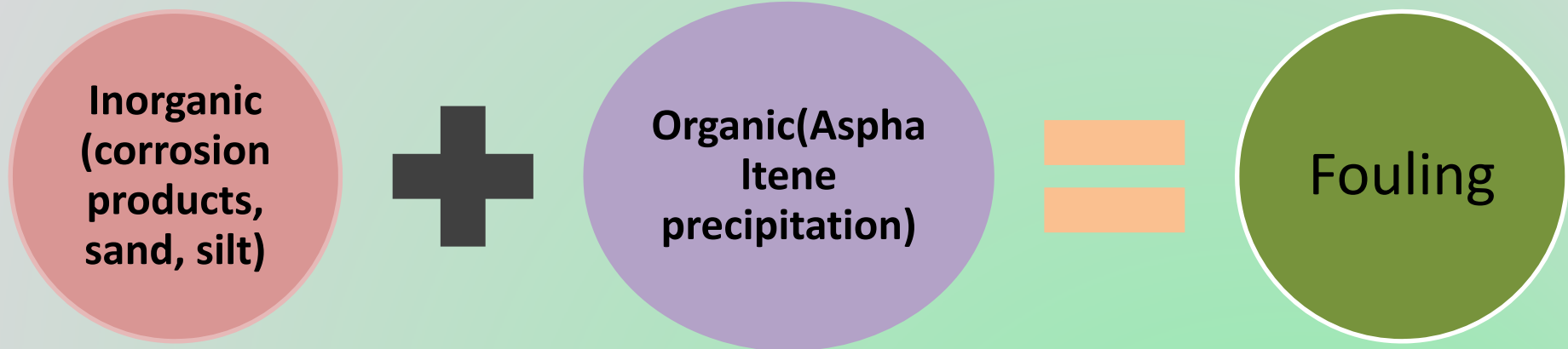
# Amine Removal Case study: Gulf coast Refiner



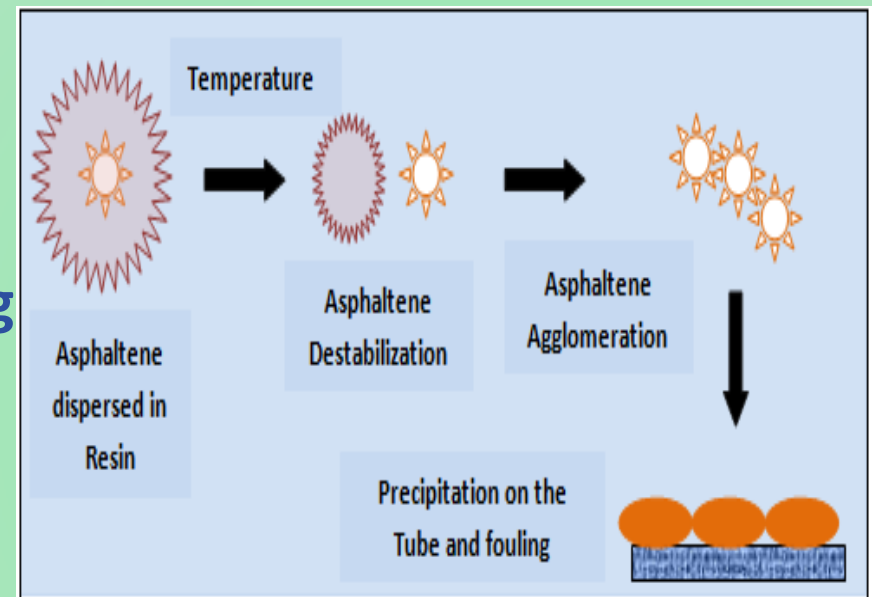
- Reduced Ammonia slippage: Reduced salting point
- Increased operational flexibility
- Increased Jet fuel Make



# Preheat Train fouling



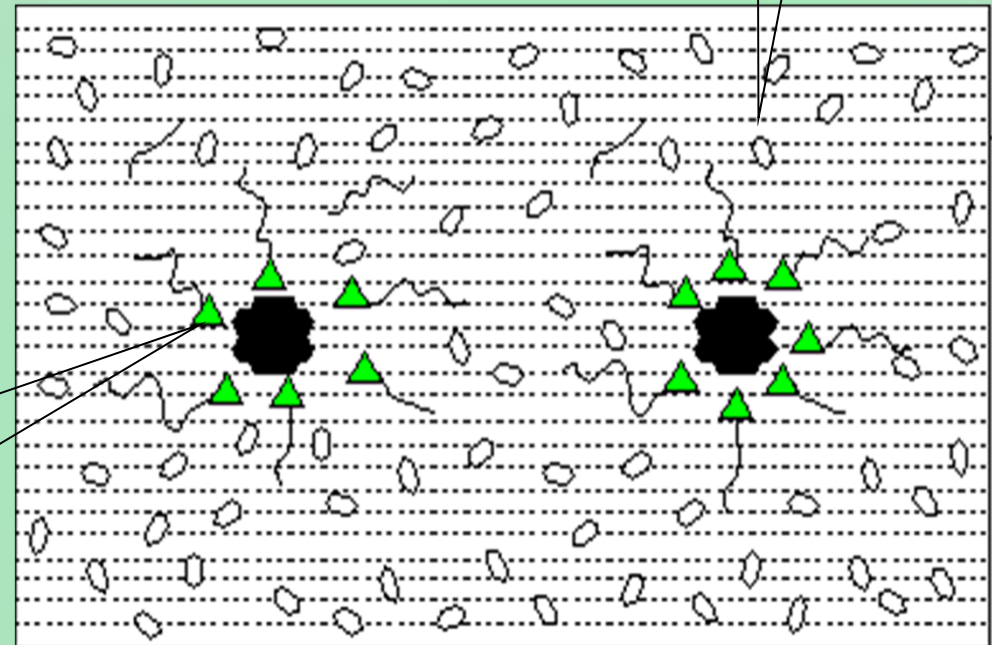
- Impacts: Energy loss, Pressure drop loss, maintenance cost, throughput loss.
- Cold preheat Train: Inorganic Fouling
- Hot Preheat train: Organic Fouling



# Mitigation of Fouling

- **Inorganic Fouling : Good tankage and Desalter operation, Effective wash water upstream of Cold train.**
- **Organic fouling: Dorf Ketal high thermal stability antifoulant. Asphaltene dispersant with Metal deactivator.**
- **Monitoring Tools: Engineering tools based on Various technologies for NFIT**

*Asphaltene surrounded by Antifoulant to solubilize in Oil*





# Antifoulant Case study: Crude Preheat train

Exchanger Series		Date	Run Length	Plant Throughput	Delta T	Temp Loss	FIT	Monthly Temperature Loss
			Days	m <sup>3</sup> /hr	°C	°C	°C	°C
HX A	SOR	12-May	29.0	1994.8	24.5	3.08	266.0	3.19
	EOR	10-Jun	29.0	1994.7	21.4	3.08	275.7	
HX B	SOR	12 May	29.0	1994.8	21.1	1.77	266.0	1.84
	EOR	10-Jun	29.0	1994.7	19.3	1.77	275.7	

- Severe fouling during opportunity crude processing
- Frequent exchanger cleaning and environmental impact.

# Antifoulant Case study: Crude Preheat train

Exchanger Series		Date	Run Length	Plant Throughput	Delta T	Temp Loss	FIT	Monthly Temperature Loss
			Days	m <sup>3</sup> /hr	°C	°C	°C	°C
HXA	SOR	30-Jun	41.0	2023.3	22.5	-1.83	271.5	-1.34
	EOR	10-Aug	41.0	2010.8	24.3	-1.83	275.7	
HXB	SOR	30-Jun	41.0	2023.3	26.0	-0.20	271.5	-0.15
	EOR	10-Aug	41.0	2010.8	26.2	-0.20	275.7	

- Dorf Ketal Antifoulant performed well with stable FIT
- Increased run length and Saving in Energy cost

# Conclusion

- Taking advantage of discounted heavy crudes
- Analyzing the risks involved
- Adopting better planning and strategy

**Opportunity crudes**  
**With undesirable**  
**Properties**      +      **Benefits of**  
**Innovative**      =      **Enhanced**  
**Additives**           **Profit**  
                **Margins**

THANK YOU