Challenges of Processing Canadian Crudes

Low Cost Reliable Operation in a Competitive Business Environment

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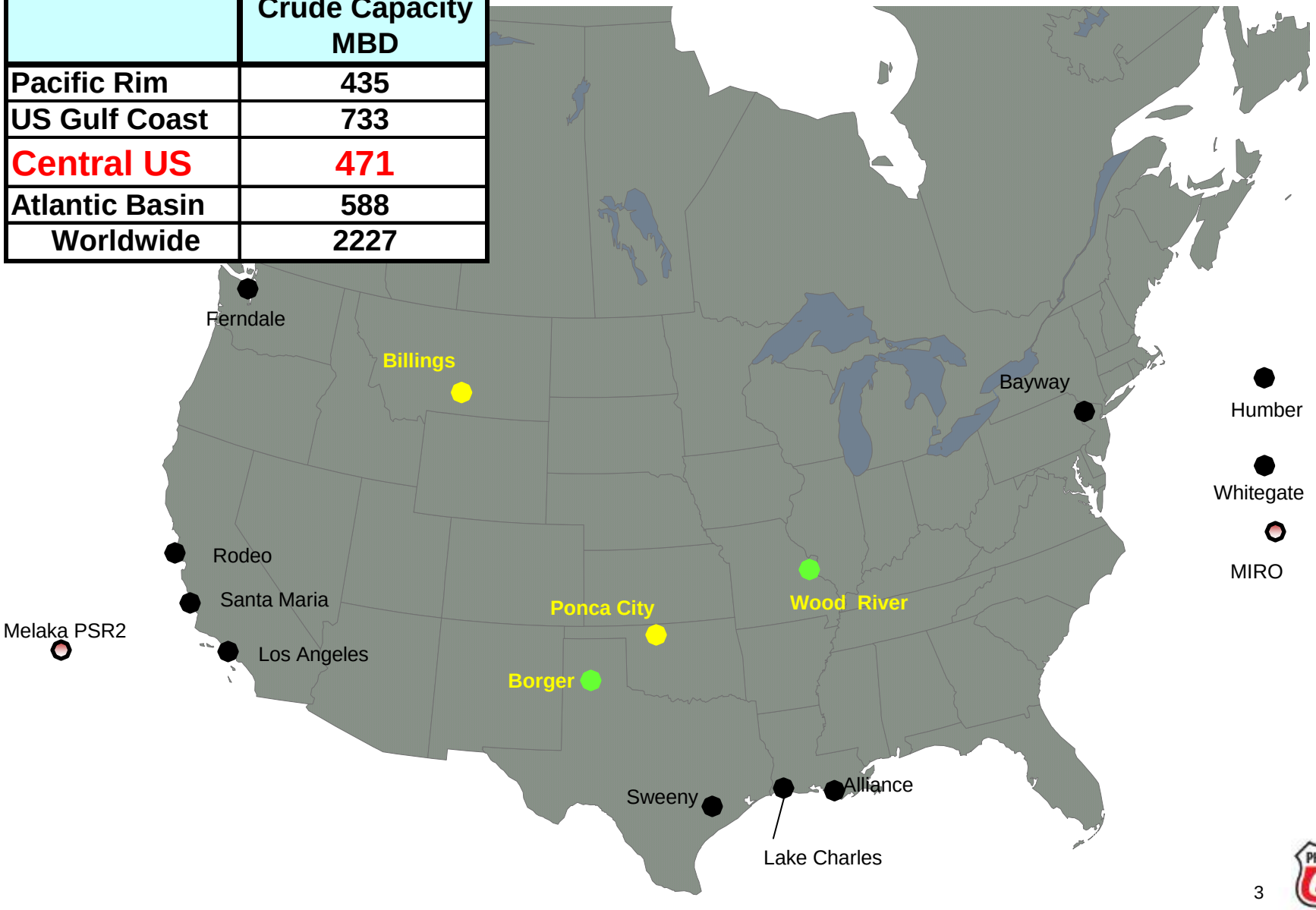
Joint CCQTA/COQA Meeting

Agenda

- **Phillips 66 Refining**
  - Background
  - Challenges
- **Canadian Crude Challenges**
  - Variability
  - Corrosion
  - Desalting
  - Fouling
- **Phillips 66 approach to Canadian crude processing**

Phillips 66 Refining Network

	Crude Capacity MBD
Pacific Rim	435
US Gulf Coast	733
Central US	471
Atlantic Basin	588
Worldwide	2227



Phillips 66 Refining

- **2.2 MMBD processed in 2011**
- **Full range of world crudes processed**
- **Well situated to process Canadian Crude**
  - Pipeline Access
  - Existing cokers at Billings, Ponca City, & Wood River
  - New Cokers with Cenovus JV at Wood River and Borger

Characteristics of a "Terrible Industry"

- ✓ **Undifferentiated commodity products**
- ✓ **Everyone has same costs**
- ✓ **No technology differentiation**
- ✓ **Knowledgeable, price sensitive buyers**
- ✓ **Buyers willing to switch suppliers**

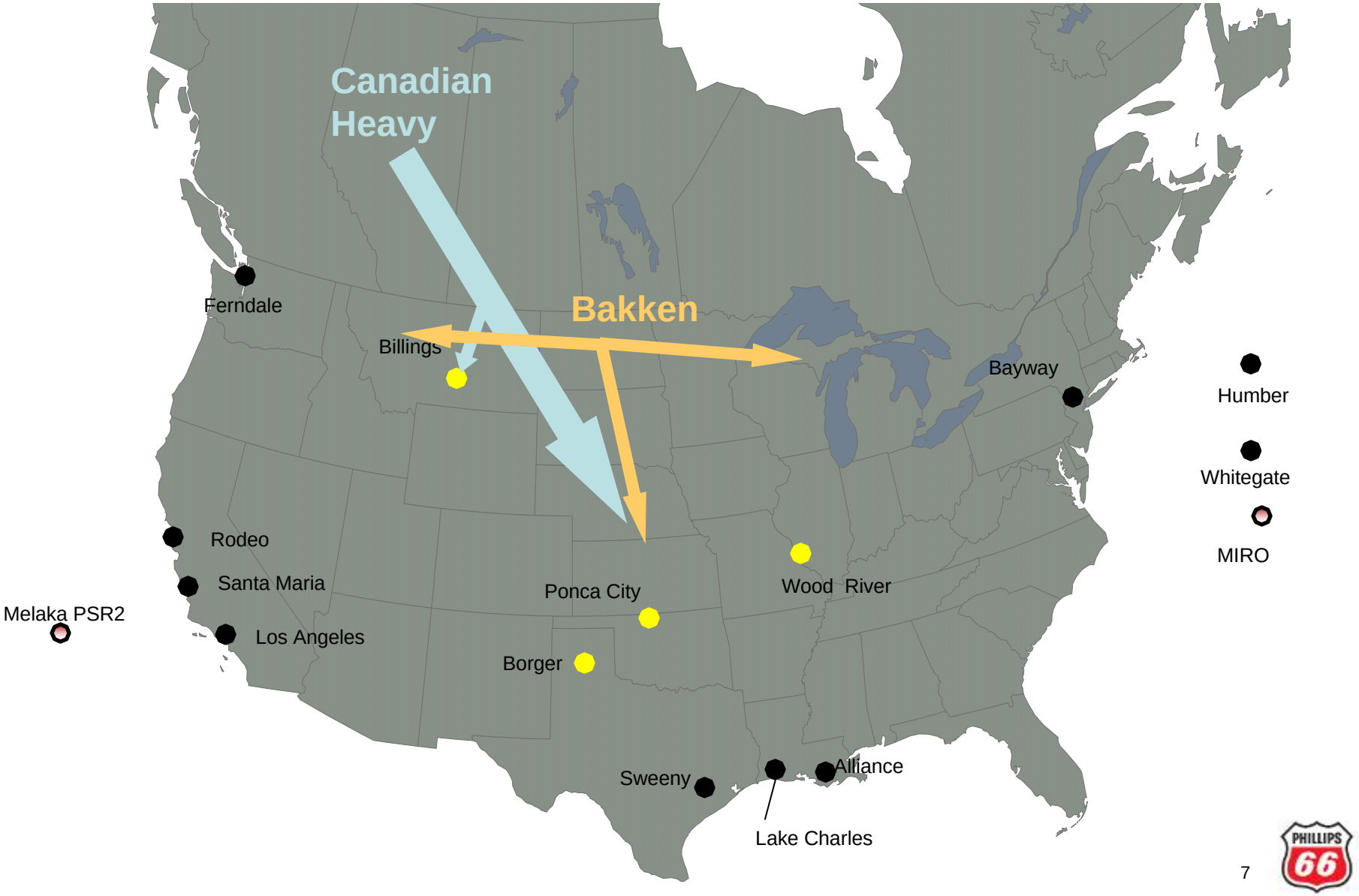
This describes Refining industry

Source: Good Strategy Bad Strategy© by Richard Rumelt

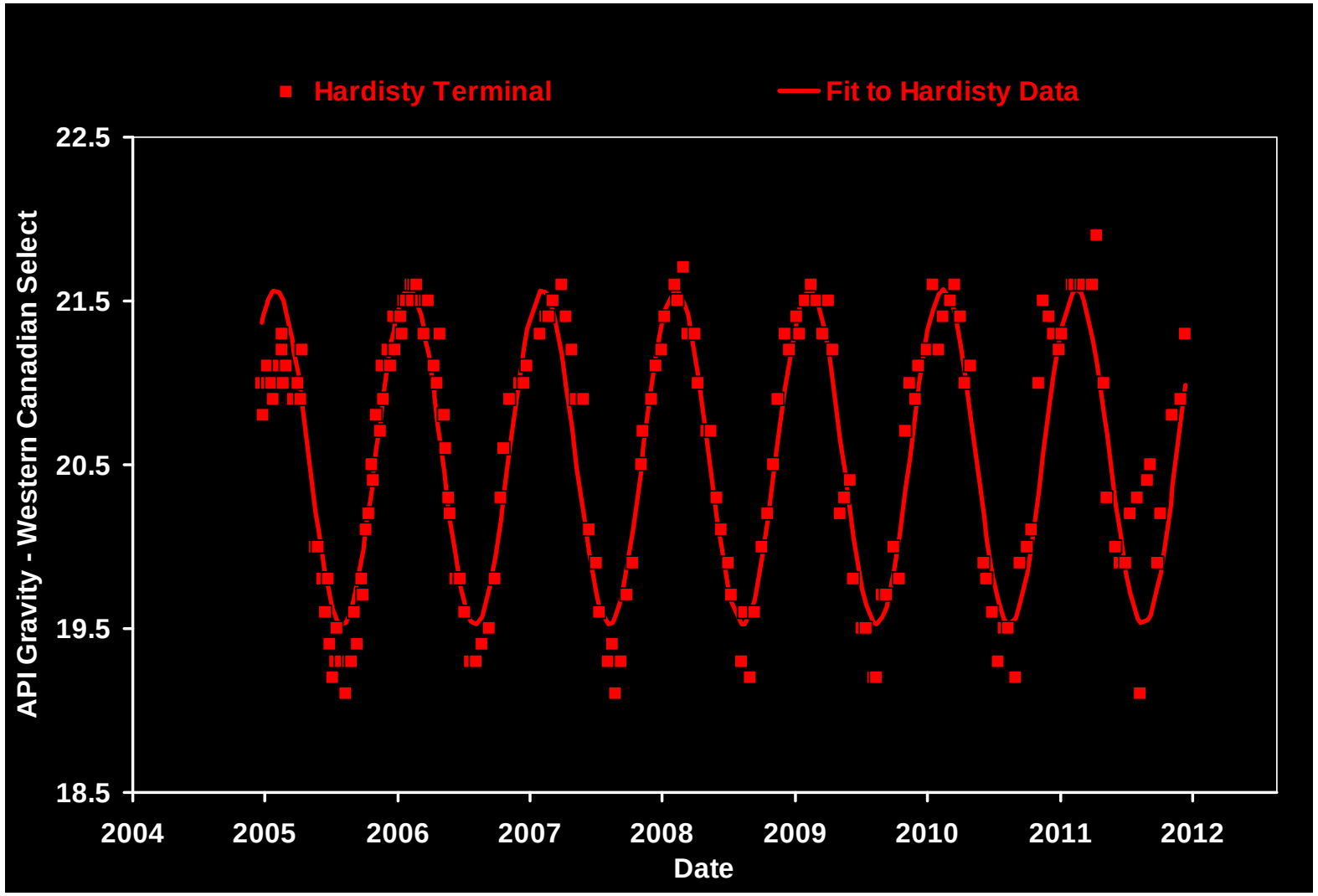
Refinery Challenges

- **Business environment**
  - Low margins
  - Tightening regulatory environment
  - Uncertain, rapidly changing crude supply
- **Opportunities**
  - Low cost feedstocks
  - Low maintenance and turnaround costs
  - High reliability

Evolving Mid Continent Crude Supply

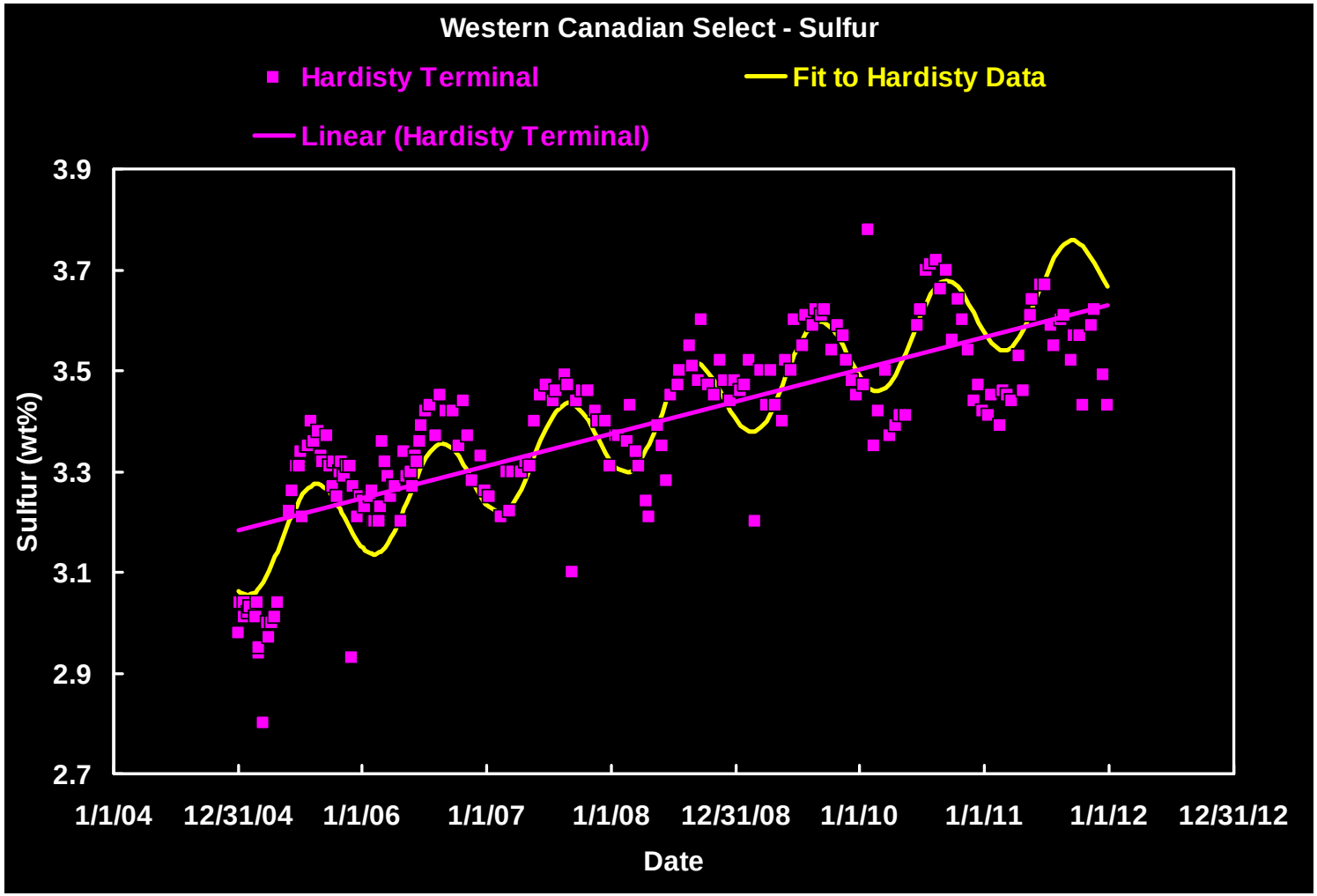


Challenge #1 – Crude Variability - Seasonal



Data with permission from crudemonitor.ca

Challenge #1 - Crude Variability – Change over time



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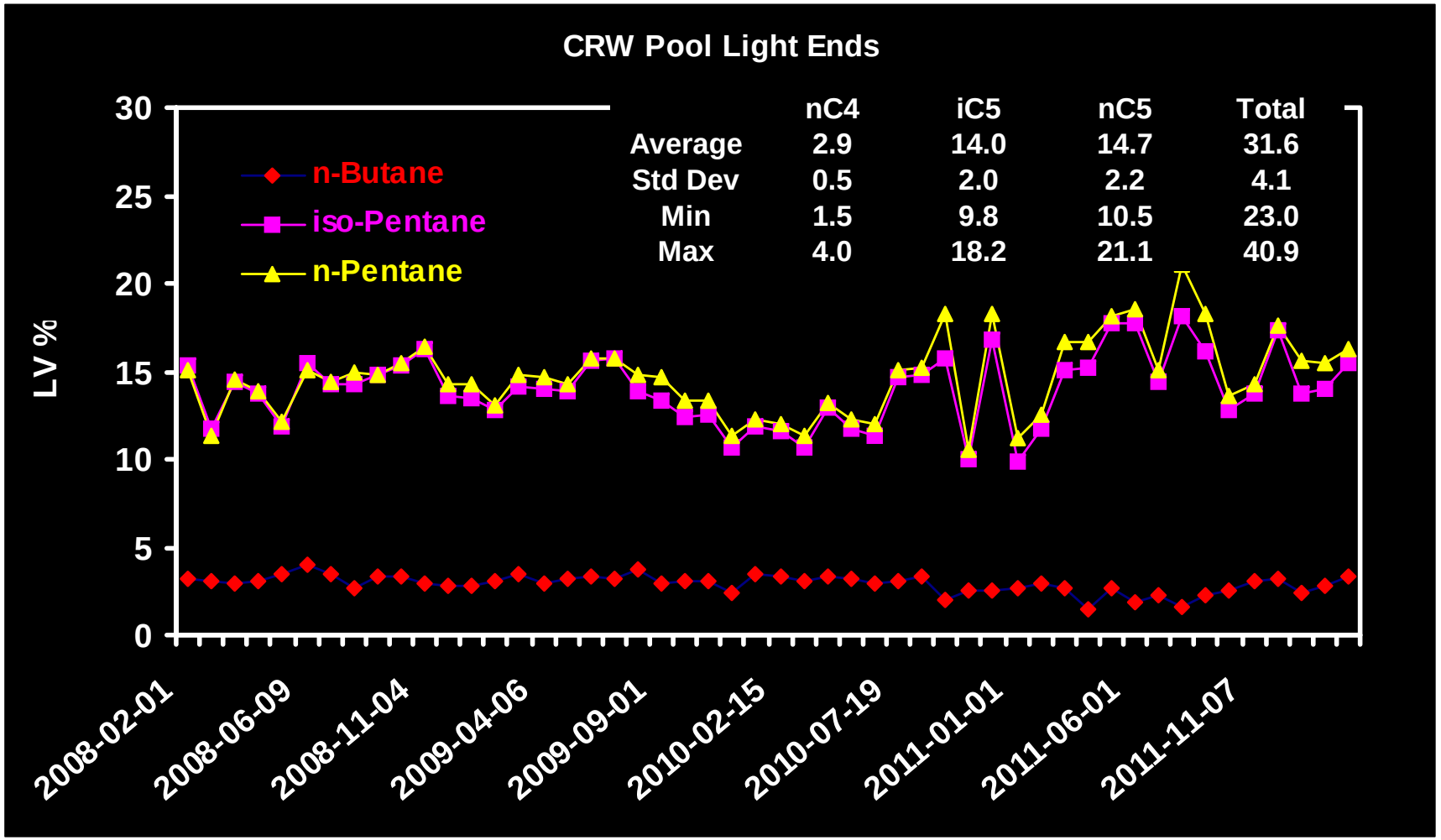
Challenge #1 – Crude Variability – Batch to Batch



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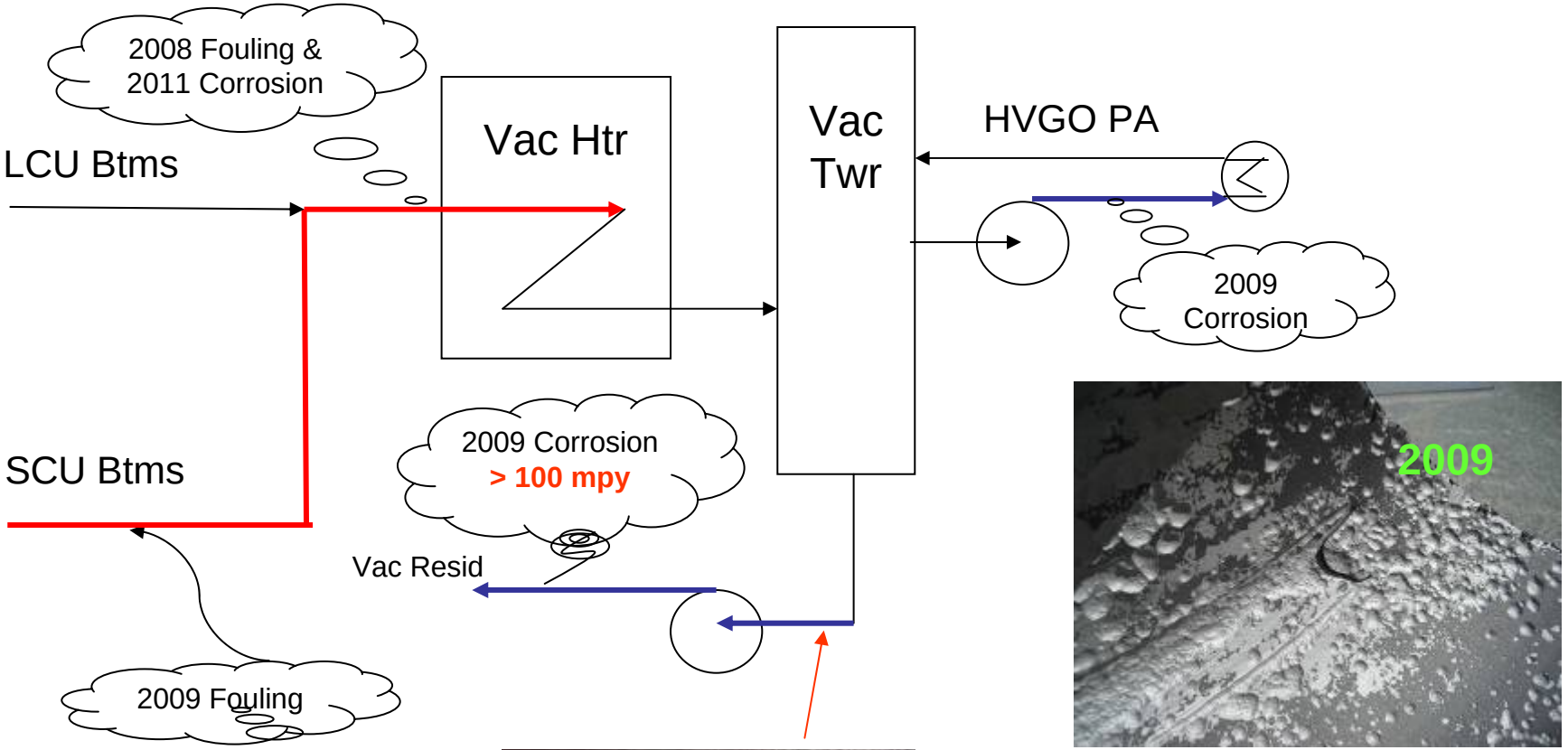
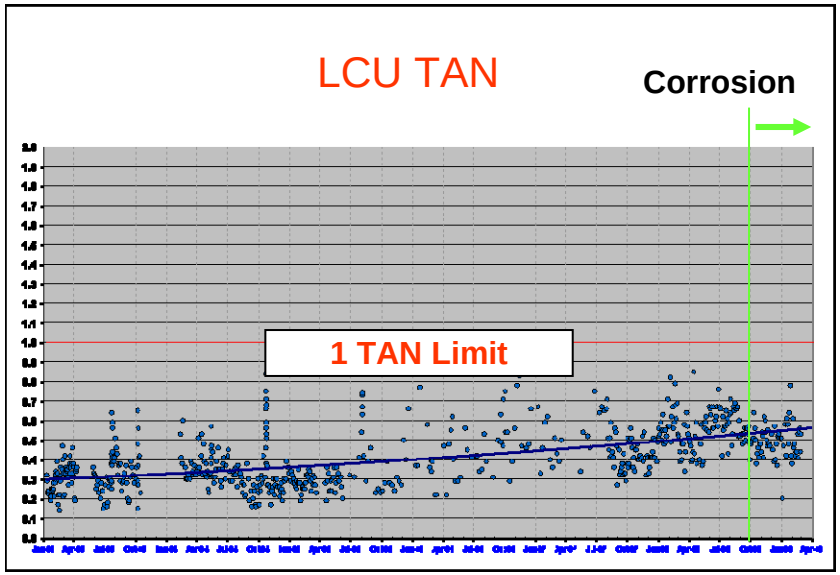
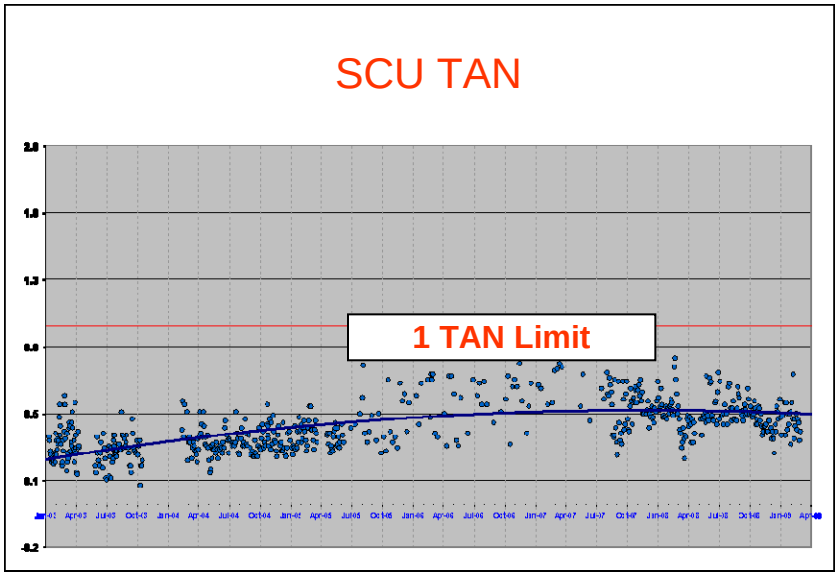
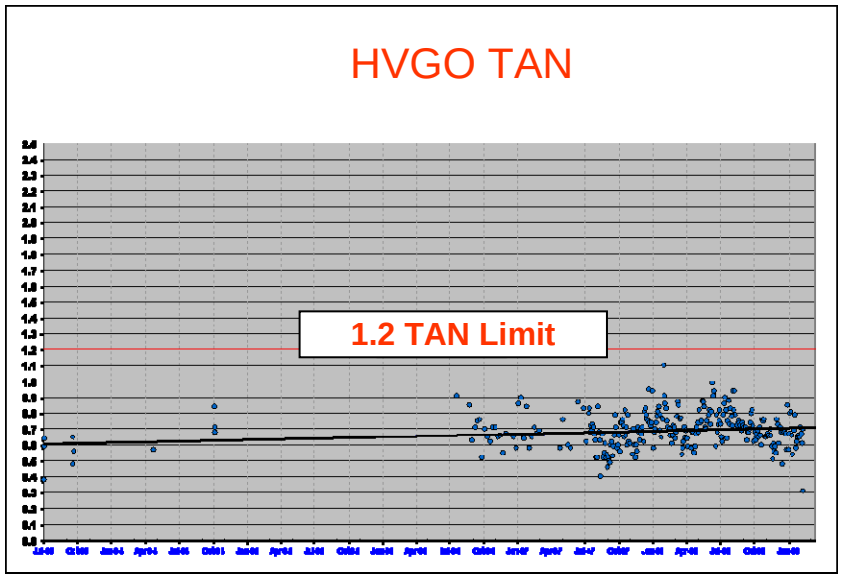
Challenge #2 – Naphthenic Acid Corrosion



Subtle TAN Changes

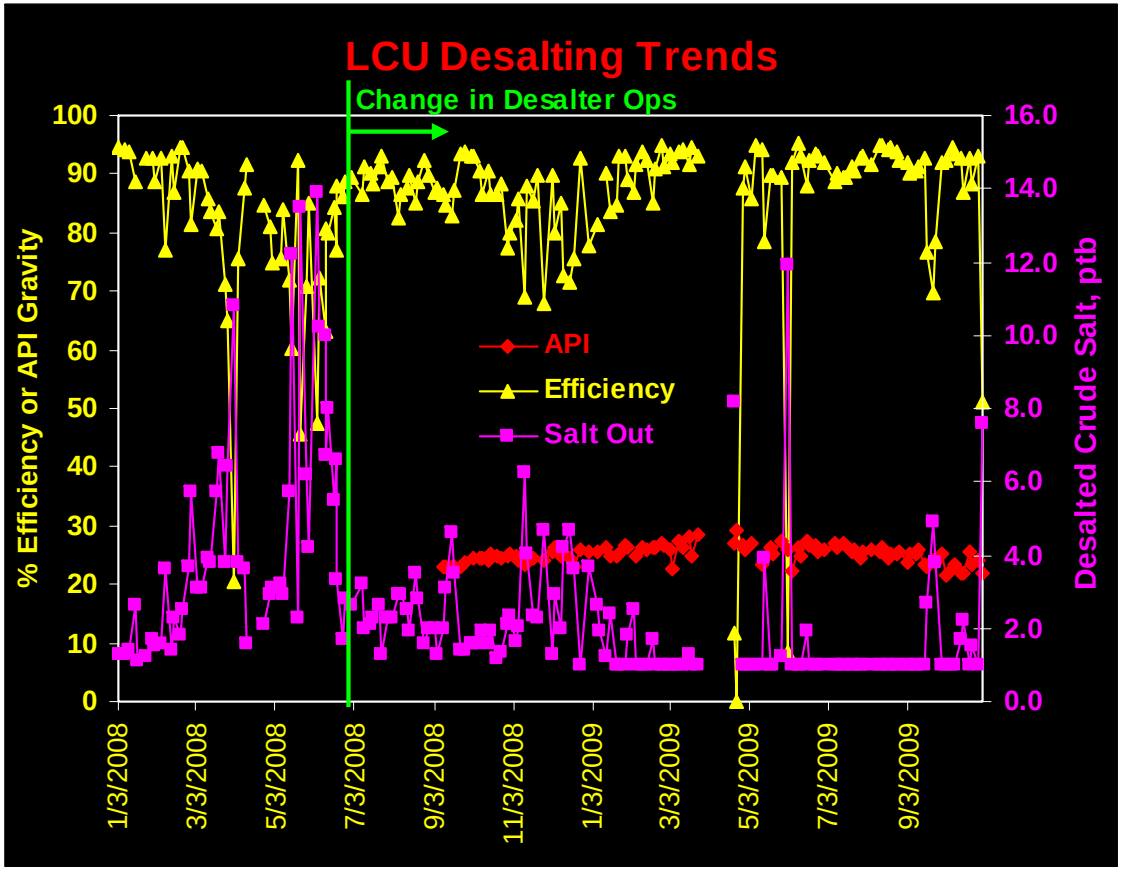






Data did not point to accelerated corrosion

Challenge #3 - Desalting



- Tank switches to new heavy crude caused upsets
- Proactive increase in demulsifier alleviated problem

Challenge #3 – Desalting Part 2

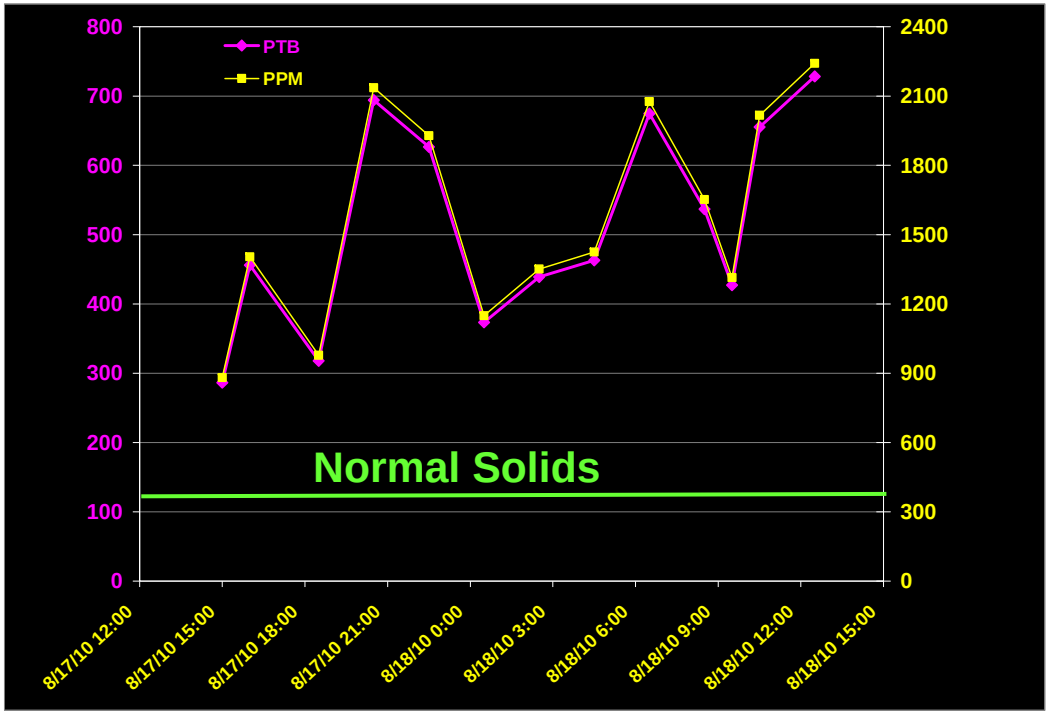
Try-line	8/16/10 10:00 AM	8/17/10 8:00 AM	8/17/10 2:00 PM	8/23/10 7:00 AM
69”	O	O	O	O
66”	O	O	O	O
60”	O	O	O	O
51”	DW	E	E	DW
42”	DW	DW	E	E
36”	DW	DW	E	E
30”	DW	DW	DW	E

Timeline

10:00 AM 8/17 EB dose increased & mix valve decreased

11:00 AM 8/17 Problem crude starts

2:00 PM 8/17 Desalter severely upset



Challenge #4 - Fouling

- **Asphaltene stability related problems**
  - Been linked to:
    - Desalter upsets
    - Preheat train fouling
  - Some feedstocks may contain precipitated asphaltenes

- **High solids**
  - Linked to desalting problems
  - Furnace fouling – vacuum and coker

Phillips 66 Approach to Canadian Crudes

- **Practical understanding through internal applied research**
  - Corrosion
  - Desalting
  - Fouling
- **Participation in industry projects**
  - CCQTA
  - Ohio U naphthenic acid corrosion JIP
- **Understand refinery experience**
- **Set reasonable limits to minimize problems**
- **Capital upgrades where economically justified to run higher %'s of more challenging crudes**

Conclusions

- **The boom in Canadian Heavy and Shale Liquids production creates both opportunities and challenges for US Refiners**
- **Issues not just with individual crudes but also with how they interact with other crudes in the slate**
- **Reliably processing these challenging feedstocks requires:**
  - Understanding of refinery impacts
  - Developing strategies to manage issues

Questions??