



Economic Treatment of “Whole Crude Oil” for Odor/Corrosion Control & Value-Added Marketing

**COQA
March 1, 2012**

Outline

- Customer Value Proposition
- Process Highlights
- Commercial Highlights
- Summary



Mercaptan Treatment → Numerous Benefits!

TREATING BENEFITS/ "CUSTOMER" VALUE	Odor Control (to be widely monetized?)	Corrosion Control (to be widely monetized?)	Toxicity Minimization (to be widely monetized?)
Increase "Customer" Sales Volume	Yes	Yes	Current: Unaware Future: ???
Increase "Customer" Sales Margin	Current: Limited Info Future: ???	Current: Limited Info Future: ???	Current: Unaware Future: ???

Current Value Proposition:

- Transportation costs reduced
- Odor complaints minimized



Feed/Product Properties (typical)

Description	Feed	Product
Design Capacity	65,000-190,000 BPSD	Same as feed
API Gravity	≥ 35	Same as feed
Carbon Dioxide	≤ 40 wppm	Nil
Hydrogen Sulfide	≤ 60 wppm	1 wppm (max)
Mercaptans as S	150-650 wppm (caustic-treatable)	30 wppm as S (max) (volatile)
Total Acid Number (TAN)	≤ 0.05 mg KOH/g	0.01 mg KOH/g (max)

Total S reduction is possible but is not typically requested for crude oil treating



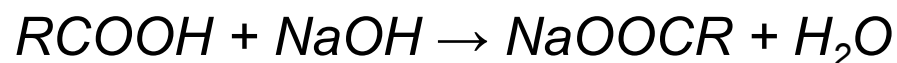
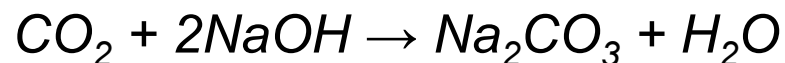
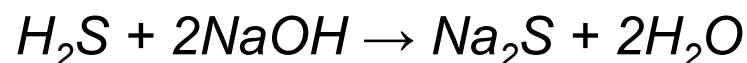
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Treating Chemistry

NAPFINING™ technology extracts hydrogen sulfide, carbon dioxide, & naphthenic acids “directly” from the whole crude oil using caustic:



MERICAT™C technology extracts/oxidizes mercaptans by contacting the whole crude & caustic “directly” in the presence of air in a single stage (sweetening):



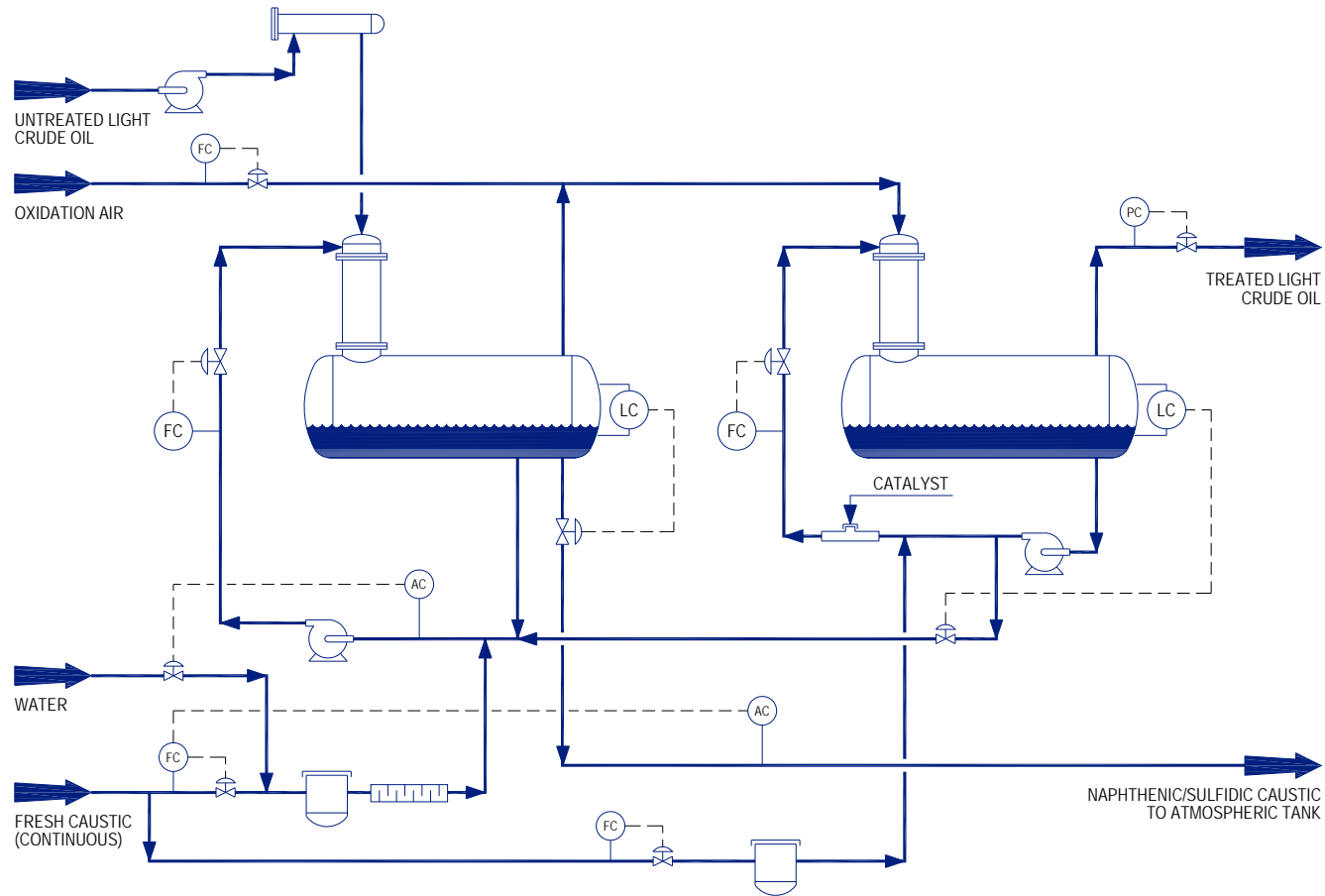
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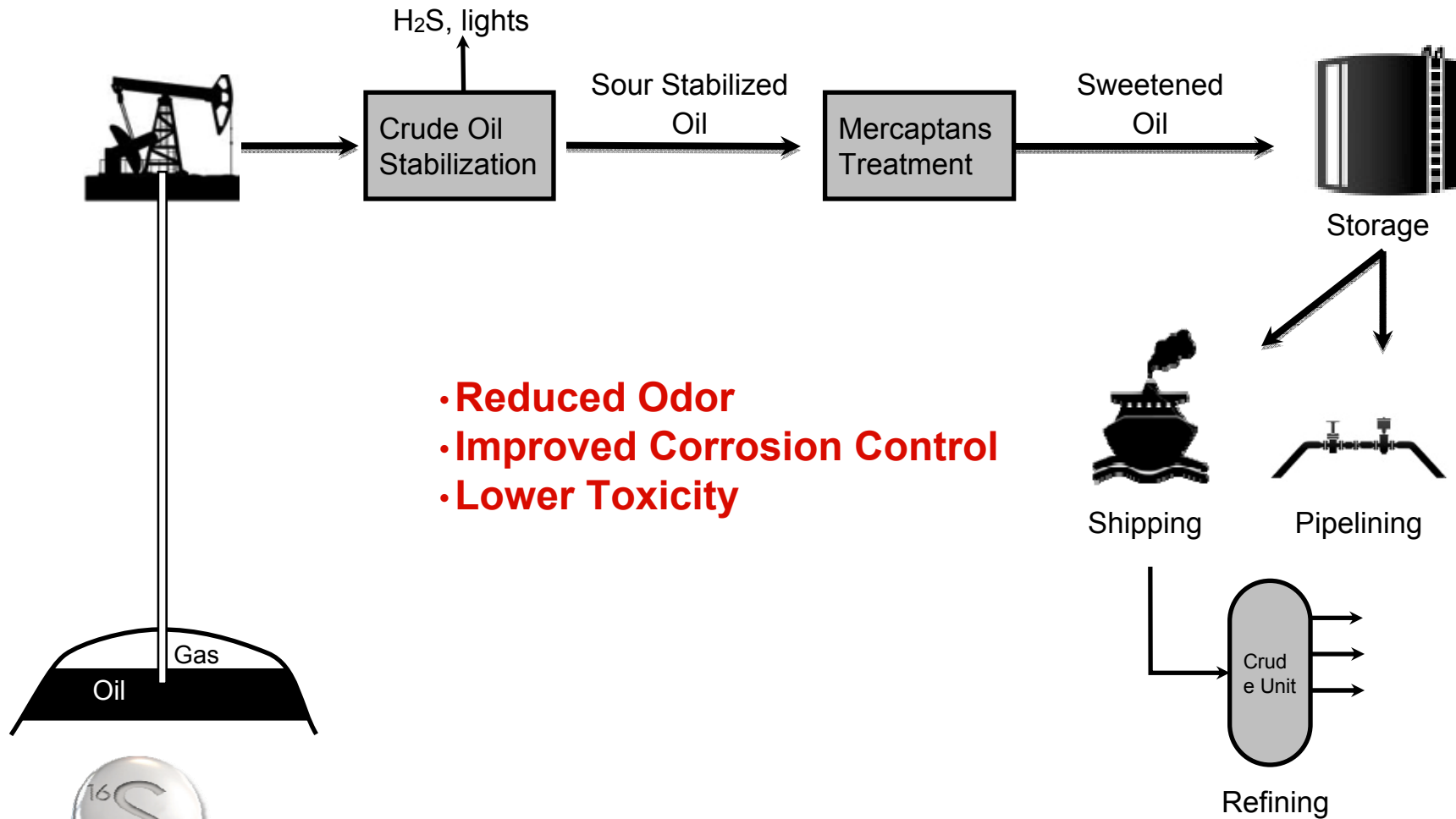
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NAPFINING / MERICAT C

Flow Diagram



Where Does Sweetening Fit?



Operational Summary

- Temperature
- Pressure (**min ΔP**)
- Chemicals/utilities
- Effluent handling
- Plot space requirements
- Maintenance requirements



Total Cost of Ownership

Initial Investment:

- Under normal operation, no major equipment replacement costs expected in less than 10-15 years

Operating Costs:

- Fresh Caustic
- Spent Caustic
- Oxidation Air
- Oxidation Catalyst
- Electricity
- Labor (operating/maintenance)



Note: BPSD assumes 350 stream days per year.



Tailored to Customer Requirements

- Minimum Offering
- Modular Offering
- Technical Services
- Legal Agreements
 - Confidentiality Agreement
 - Process License Agreement
 - Process & Equipment Guaranty Agreement
 - Engineering & Equipment Supply Agreement



Technology Comparison

- “Direct” treating of whole crude oil **gives superior performance at a lower cost** vs. “indirect” treating
- Only one “direct” method capable of treating whole crude oil – patented **FIBER FILM® contactor technology**
- “Indirect” methods involve fractionation or stripping of the crude oil and is very costly
- Scavenger additives are cost-prohibitive at increased rates



Summary/Conclusions

- **Merichem “direct” treating is superior to conventional “indirect” methods**
- Deodorizing and reducing the corrosivity of crude oils via mercaptan sweetening “adds value” through higher sales margins and a broader potential customer-base
- Merichem’s crude oil treating technologies are well-suited for remote locations
- Treating solutions are effective at the wellhead, midstream, and end-user locations
- Merichem’s **NAPFINING/MERICAT C** technology combination achieves near complete removal of acidic impurities
- **FIBER FILM®** designs provide better overall value/effectiveness compared to other capital-based projects and scavenger technologies

