

Capitalizing on Opportunity Crude Oils

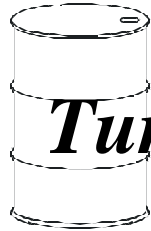
Betz/Dearborn HPG Crude Oil Conference

South Shore Harbor Conference Center

League City, Texas

September 17, 1997

TURNER, MASON & COMPANY
Consulting Engineers



Turner, Mason & Company – Dallas, Texas

- ❖ **Consulting firm focused on petroleum refining**
- ❖ **Established in 1971**
- ❖ **10-15 chemical engineering professionals**
- ❖ **Areas of expertise include:**
 - ◆ **Economic and feasibility studies**
 - ◆ **National policy analysis**
 - ◆ **Acquisitions and ventures**
 - ◆ **Major computer studies and surveys**
 - ◆ **Strategic planning, process engineering and project management**
 - ◆ **Expert witness**



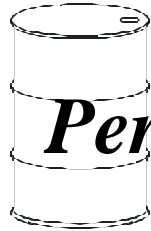
What are opportunity crude oils?

- ❖ **Crude oils the “market” currently undervalues**
- ❖ **Crude oils that provide a higher refining margin in your facility relative to other crudes**



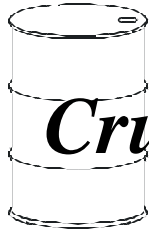
Why are some crude oils undervalued?

- ❖ **Perceived operating risk**
- ❖ **Limited demand**
- ❖ **Difficult to market**
- ❖ **Undesirable characteristics**
- ❖ **Any or all of the above**



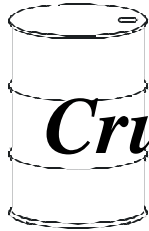
Perceived Operating Risk

- ❖ **New crude with limited processing history**
- ❖ **Potential compatibility problems with existing crude slate**
- ❖ **Characteristics that exceed a refinery's historical limitations**



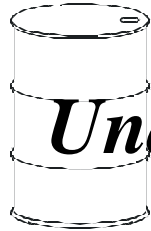
Crude Oils with Limited Demand

- ❖ **Few refineries capable of processing**
- ❖ **Weak demand for primary refined products**
 - ◆ **Fuel grade coke**
 - ◆ **High sulfur fuel oil**
 - ◆ **Asphalt**
- ❖ **Product streams will not meet specifications**



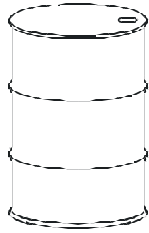
Crude Oils That Are Difficult to Market

- ❖ **Relatively small volume**
- ❖ **Remote location or complex transportation logistics**
- ❖ **Crude oil is not considered “fungible” with common “marker” crudes**
- ❖ **High pour point crudes**

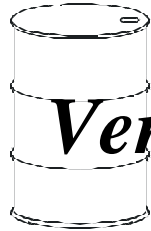


Undesirable Characteristics

- ❖ **Significant volume of 1,000+°F fraction**
- ❖ **High sulfur content**
- ❖ **High nitrogen content**
- ❖ **High naphthenic acid content**
- ❖ **Pour product qualities (freeze, smoke, cetane, pour, K factor, N+A)**
- ❖ **Not compatible with other crude oils**

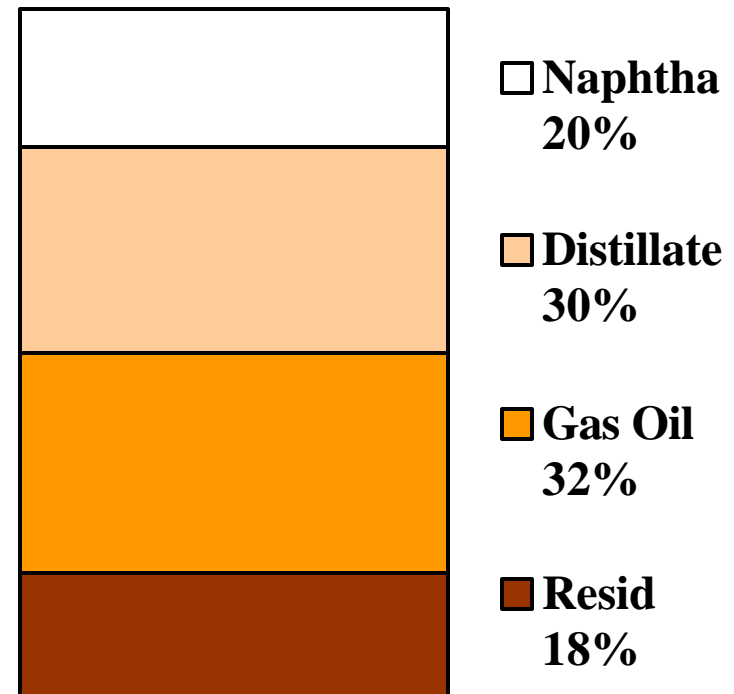


Examples of Opportunity Crude Oils



Venezuela Mesa

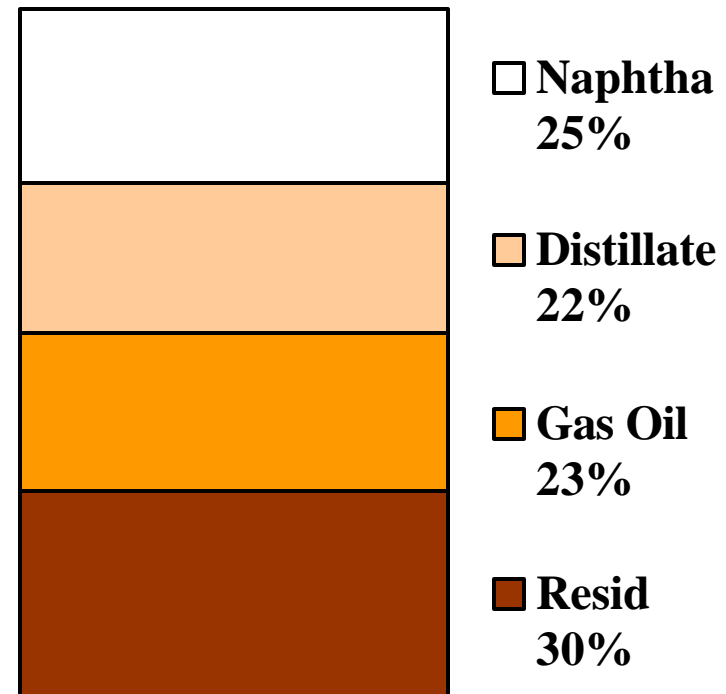
- ❖ **30° API**
- ❖ **11.8 UOP K factor**
- ❖ **1.0% sulfur**
- ❖ **2,300 ppm nitrogen**
- ❖ **0.05 acid number**
- ❖ **68 Ni + V**

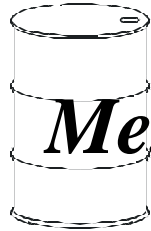




Arab Heavy

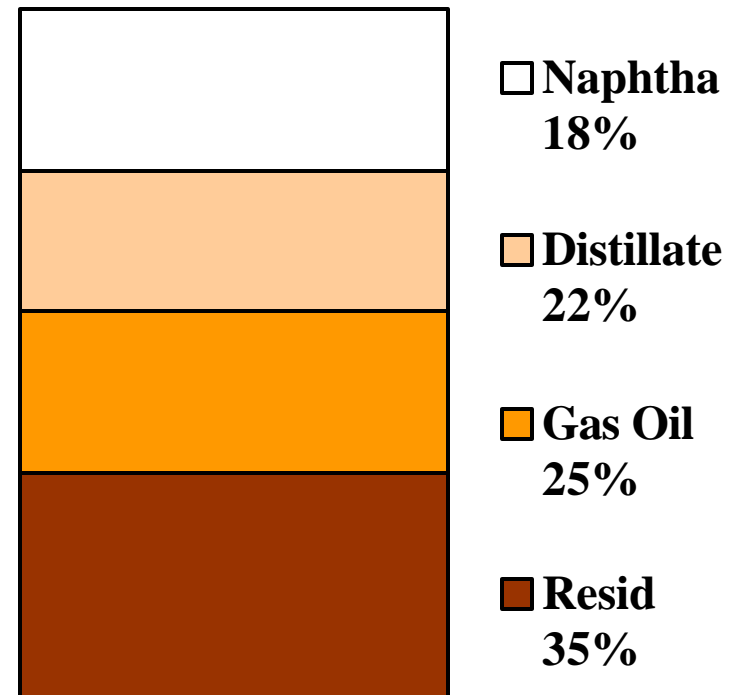
- ❖ **28° API**
- ❖ **12.0 UOP K factor**
- ❖ **2.8% sulfur**
- ❖ **1,600 ppm nitrogen**
- ❖ **0.10 acid number**
- ❖ **65 Ni + V**





Mexico Maya

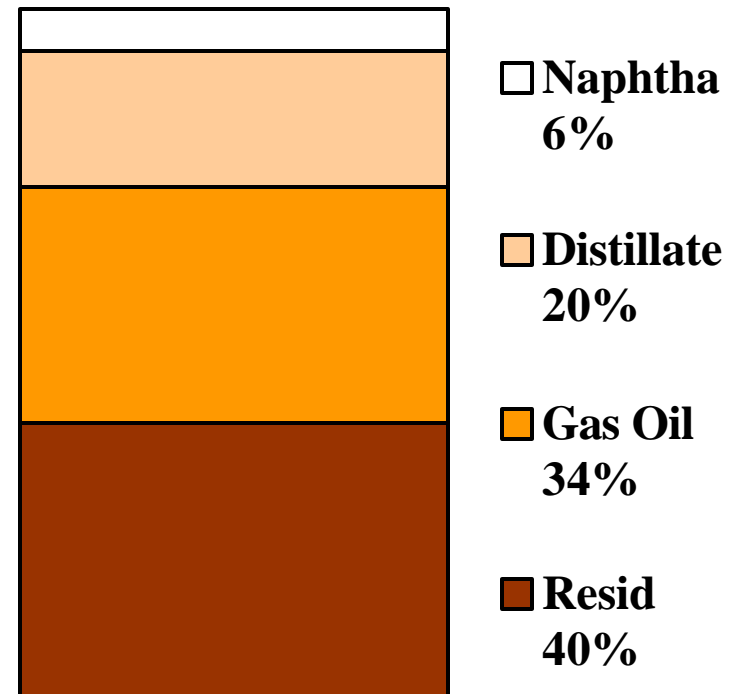
- ❖ **22° API**
- ❖ **11.9 UOP K factor**
- ❖ **3.4% sulfur**
- ❖ **3,400 ppm nitrogen**
- ❖ **0.10 acid number**
- ❖ **280 Ni + V**

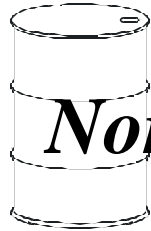




Venezuelan Merey

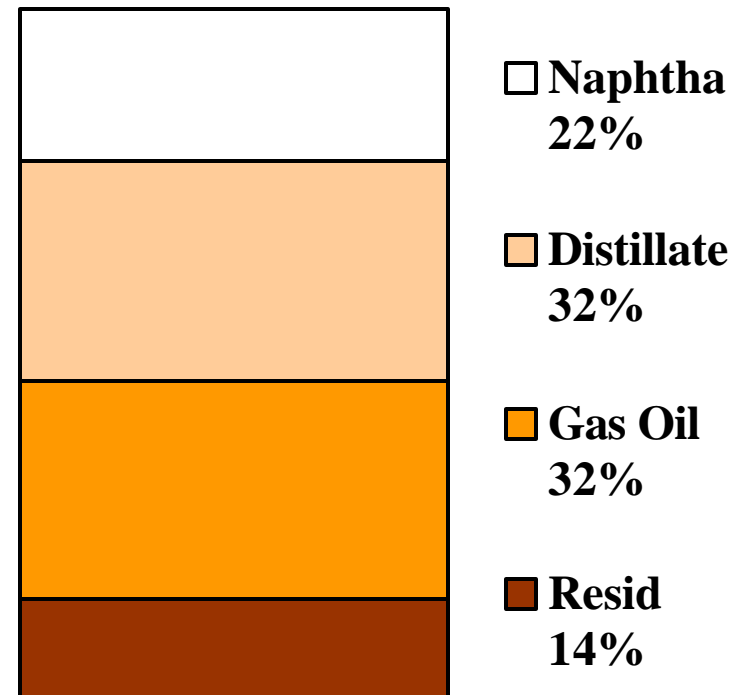
- ❖ **16° API**
- ❖ **11.5 UOP K factor**
- ❖ **2.7% sulfur**
- ❖ **3,600 ppm nitrogen**
- ❖ **1.0 acid number**
- ❖ **300 Ni + V**

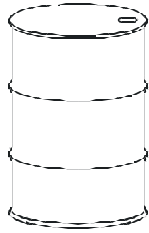




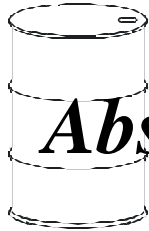
Norway Heidrun

- ❖ **29° API**
- ❖ **11.6 UOP K factor**
- ❖ **0.5% sulfur**
- ❖ **900 ppm nitrogen**
- ❖ **2.5 acid number**
- ❖ **11 Ni + V**





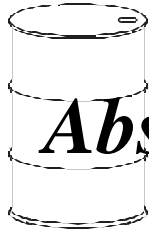
How to Maximize Any Opportunity to You



Absorb Maximum Volume in Existing Refinery

- ❖ **Maximize use of idle capacity and conversion capability**
 - ◆ **Reduce coke drum cycle length**
 - ◆ **Maximize distillate and gas oil hydrotreating**
 - ◆ **Maximize sulfur recovery capacity**

- ❖ **“Blend off” poor product characteristic with current quality “giveaway”**
 - ◆ **Diesel cetane**
 - ◆ **Kerosene freeze or smoke point**
 - ◆ **Gas oil sulfur, nitrogen, acid number or metals**
 - ◆ **Coke metals**



Absorb Maximum Volume in Existing Refinery

- ❖ **Accept and manage risk of running “new” crude oils**
 - ◆ **Improve assay information**
 - ◆ **In-house laboratory crude oil testing**
 - ◆ **Process unit test runs**
 - ◆ **Specialized treatment programs**
 - ◆ **Modify company and/or corporate culture**

- ❖ **Use creativity to avoid capital spending**



Increase Volume with Small, Selective Capital Projects

❖ **Minor metallurgy upgrades to handle naphthenic acid and sulfur**

- ◆ Atmospheric tower lower pumparound
- ◆ Atmospheric tower bottom
- ◆ Vacuum heater transfer line
- ◆ Vacuum tower pumparounds

❖ **Simple, cost-effective debottlenecking of existing units**

- ◆ Vacuum unit bottoms section
- ◆ Cokers
- ◆ Distillate hydrotreaters
- ◆ Gas oil hydrotreaters
- ◆ Sulfur recovery units



Increase Volume with Small, Selective Capital Projects

- ❖ **Installation of new conversion units that will not require additional ancillary facilities such as:**
 - ◆ **Hydrogen plants**
 - ◆ **Hydrotreating**
 - ◆ **Sulfur recovery units**
 - ◆ **Steam, air and utilities**
 - ◆ **Waste water treating, tankage, flares, etc.**



Manage Price Risk Associated with Major Investments

- ❖ **Partnership with crude oil producer**
 - ◆ **Lyondell/Citgo/PDVSA**
 - ◆ **Shell Deer Park/PEMEX**
 - ◆ **Mobil Chalmette/Lagoven**
 - ◆ **Phillips Sweeny/Corpoven**
 - ◆ **Coking joint ventures between several U.S. majors and PDVSA**

- ❖ **Lock in desirable WTI-opportunity crude margin for part or all of project life**

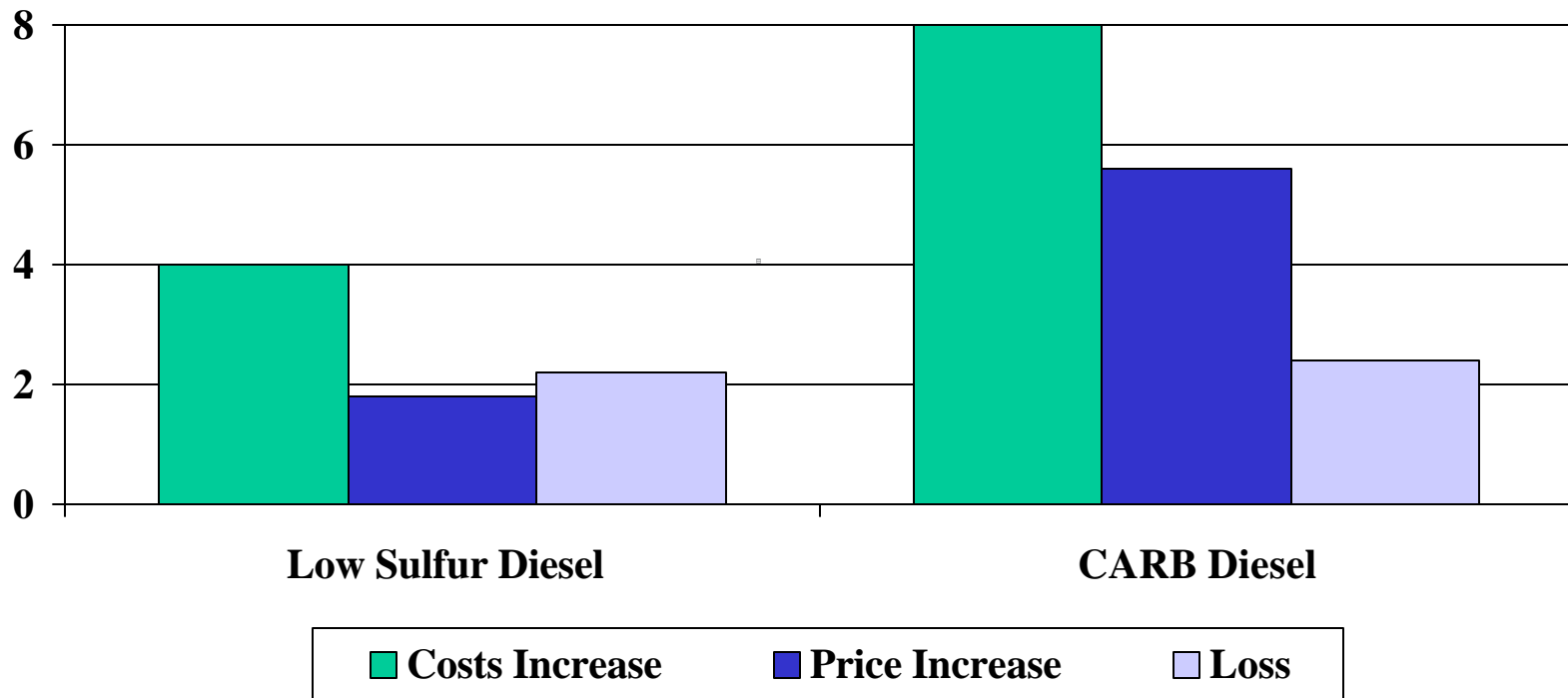


Assure You Have an Advantage Relative to Your Competitors

- ❖ **Common access to feedstocks, technologies and product markets**
- ❖ **Refining industry history of over-building and poor ROI from refining assets**
 - ◆ **Capacity addition economy of scale encourages excess capacity**
 - ◆ **Base fuels refinery ROI approximately 6%**
 - ◆ **Recent clean fuels have poor ROI**



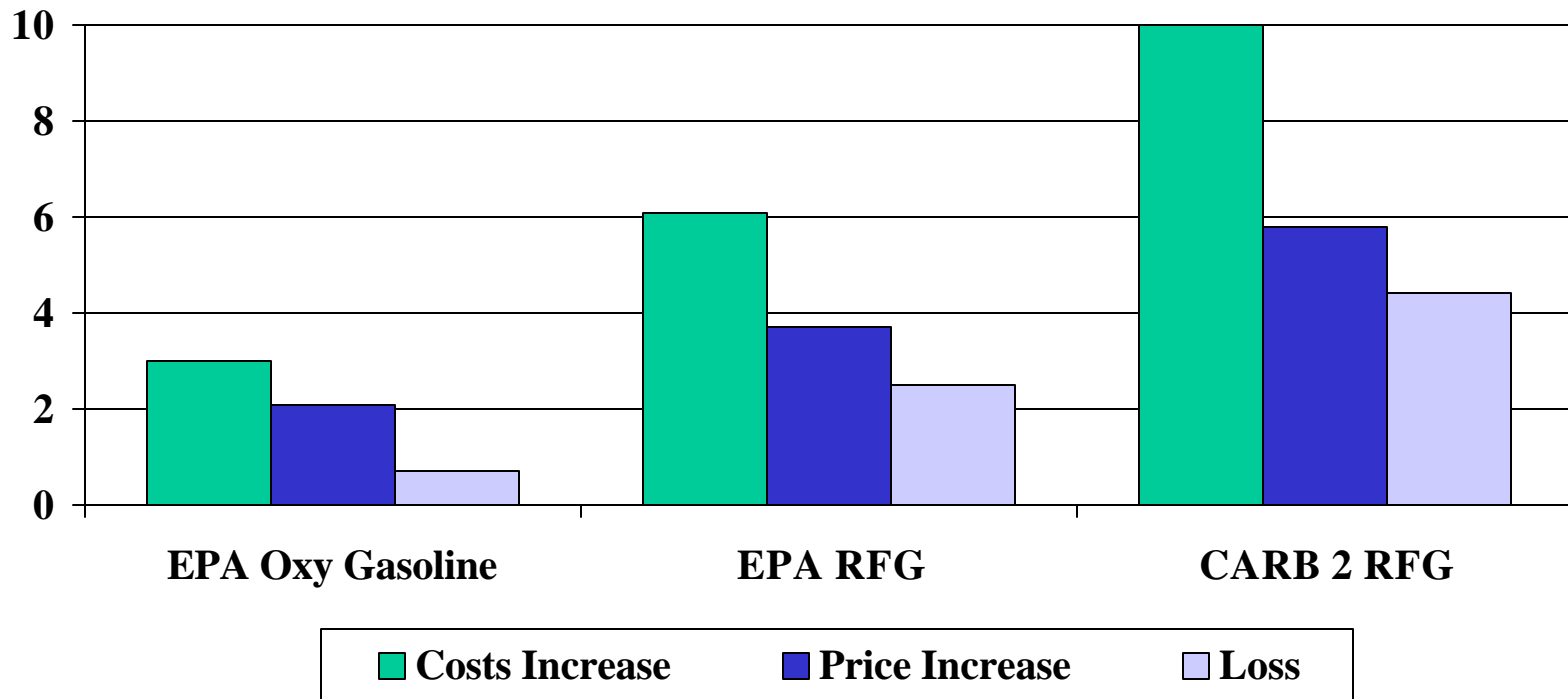
Clean Fuels Cost Increases vs. Price Increases Over Base Fuels – ¢/gallon of diesel



Source: Delta costs – TM&C studies for API, NPC and PDVSA. Delta prices – *Platt's* pipeline lows. Delta loss – by difference.



Clean Fuels Cost Increases vs. Price Increases Over Base Fuels – ¢/gallon of diesel



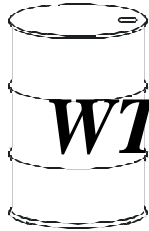
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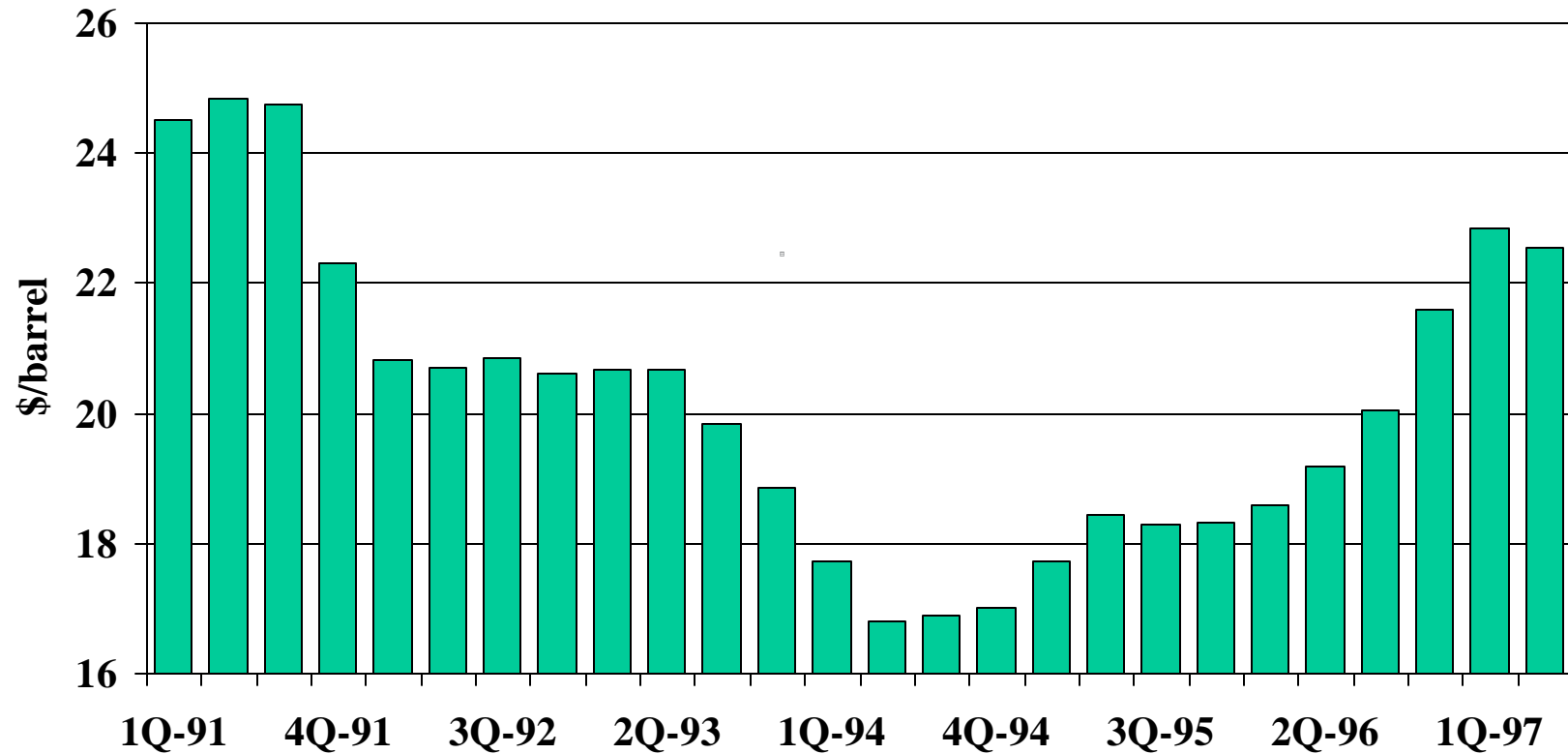


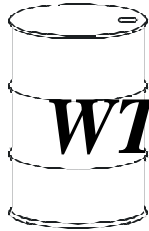
Over Time, Opportunity Crude Oil “Discounts” Tend to Diminish

- ❖ **Refiners gain experience and “sharpen pencil”**
- ❖ **Ways to minimize risk are developed**
- ❖ **Capital investments viewed as sunk cost**
 - ◆ **Drive to maximize refining net margin**
 - ◆ **Crude selection methods ignore past investment**

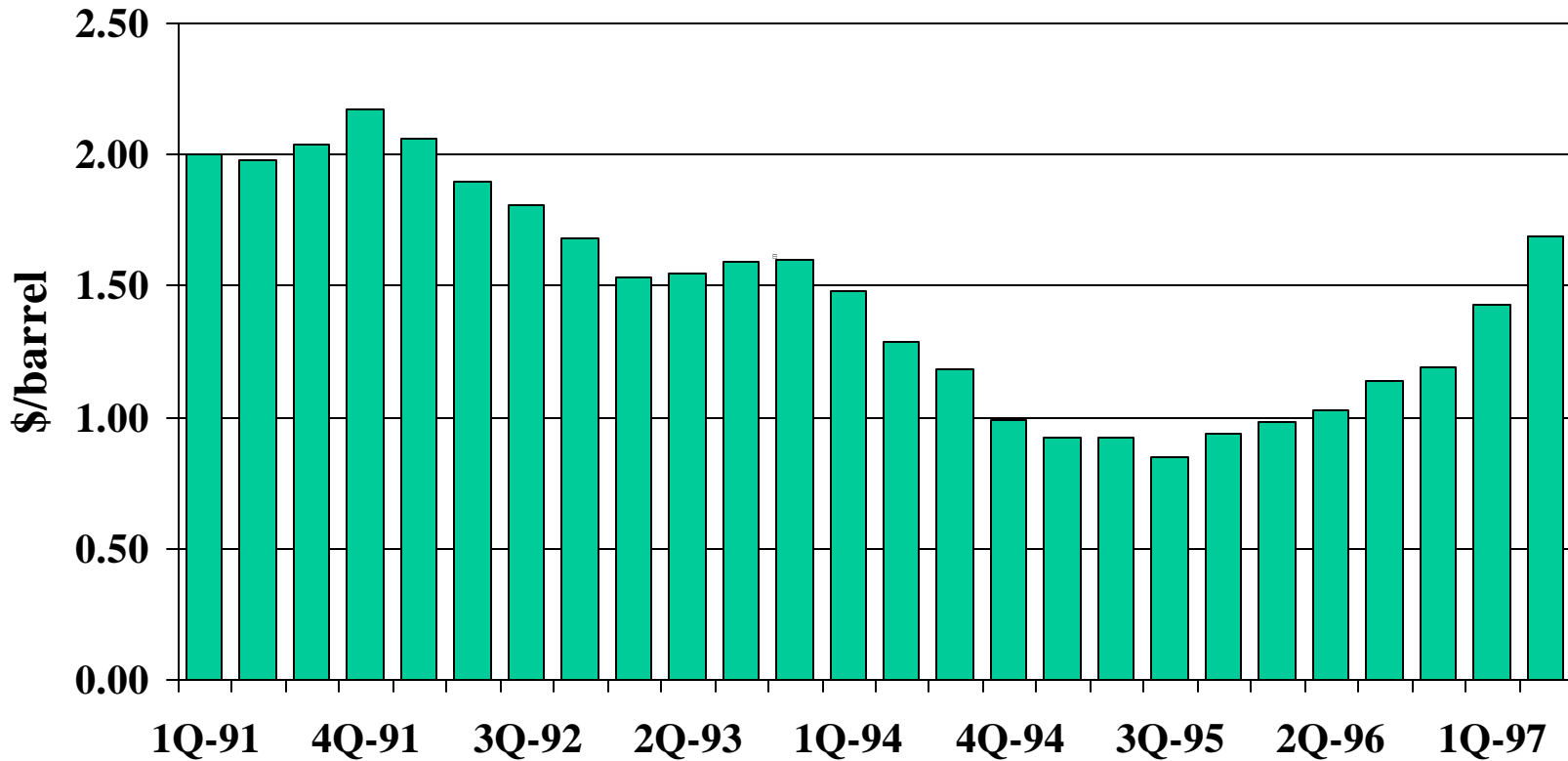


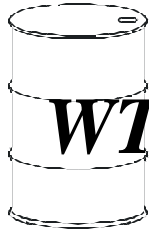
WTI Cushing – 12-Month Rolling Average



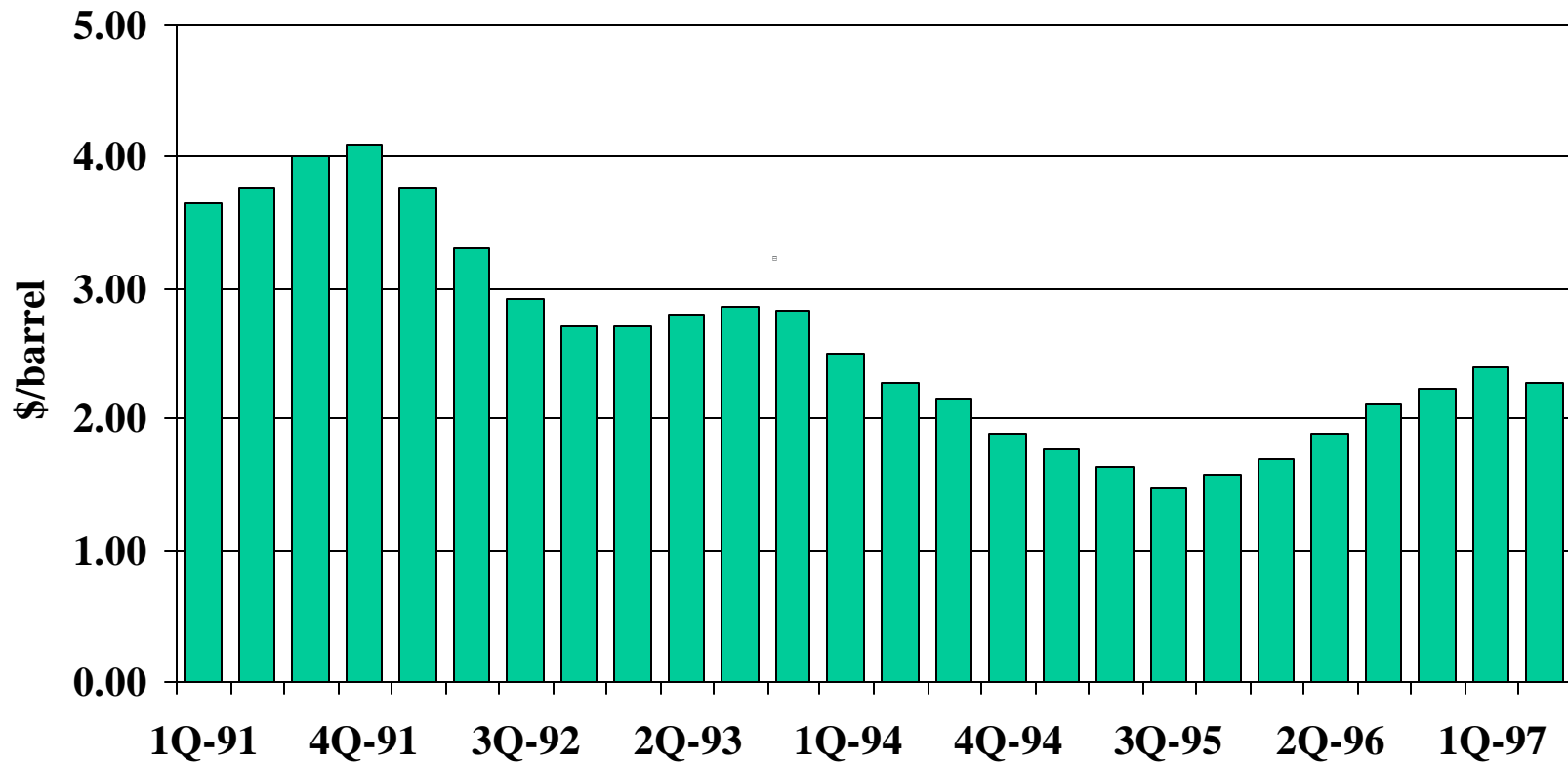


WTI-WTS – 12-Month Rolling Average



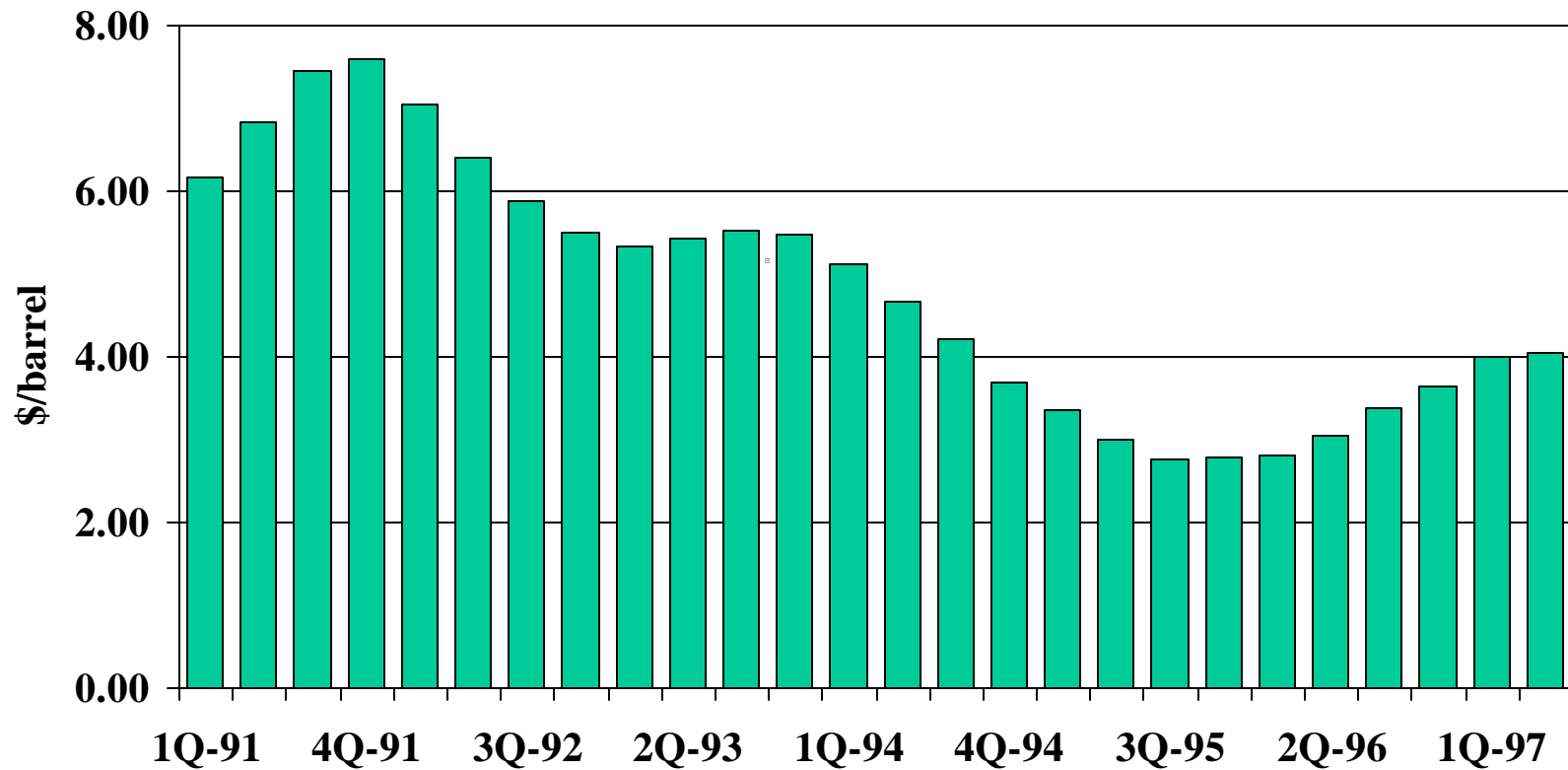


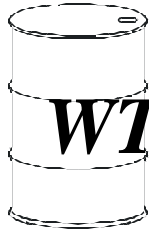
WTI-Arab Light (USGC) – 12-Month Rolling Average



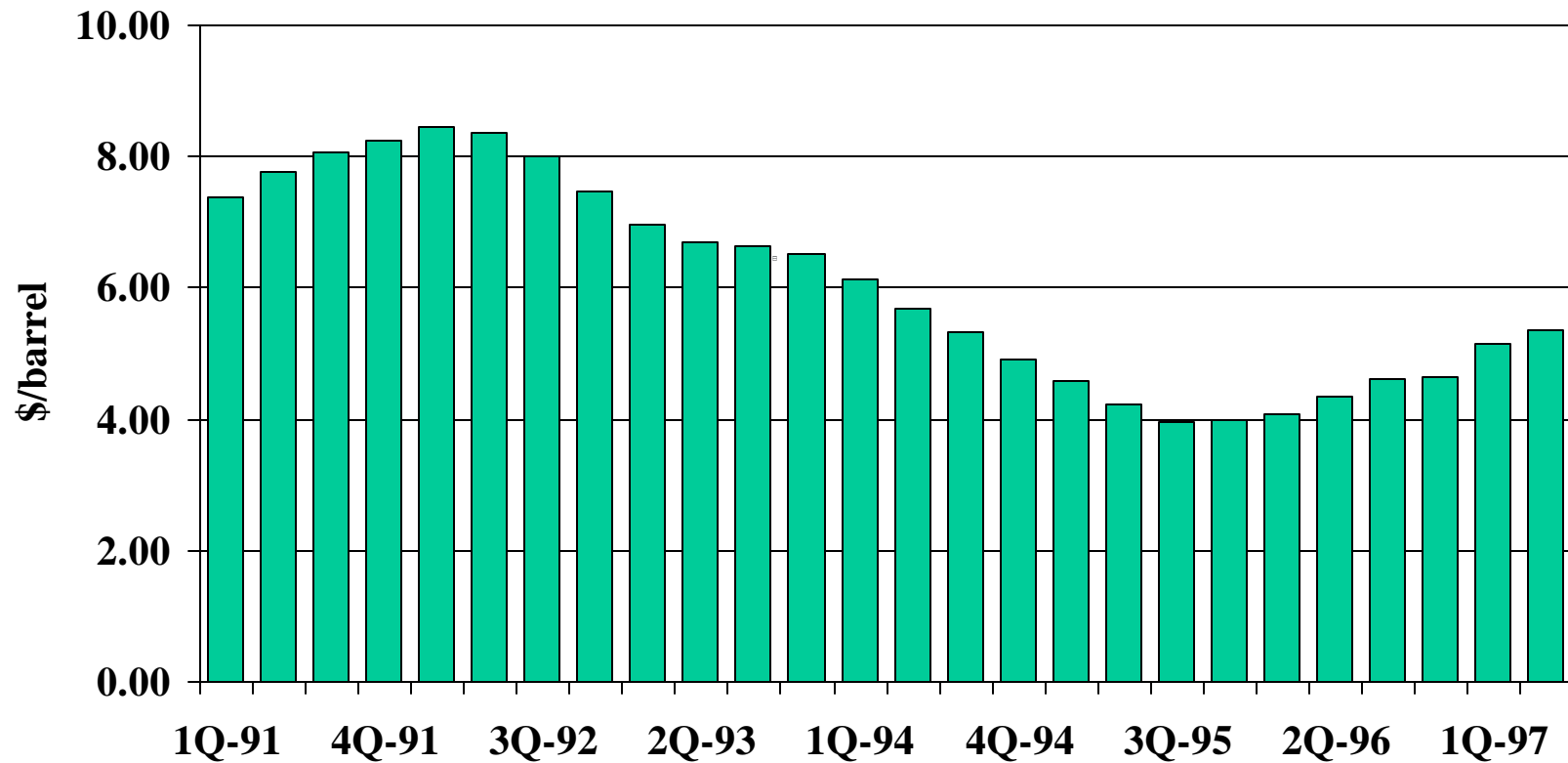


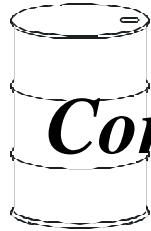
WTI-Arab Heavy (USGC) – 12-Month Rolling Average





WTI-Maya (FOB) – 12-Month Rolling Average





Conclusions

- ❖ **Creatively identify ways to fit opportunity crude oils into existing feedstock slates without capital investment**
- ❖ **Identify “niche” capital projects requiring less investment relative to competitors to increase volumes of opportunity crude oils**
- ❖ **Avoid “non-niche” capital projects sensitive to crude price “discounts” unless price risk can be managed**