
Factors Impacting Refining US & Global Contexts

USAEE
Washington Energy Conference
April 26th 2005

Martin R. Tallett
EnSys Energy
www.ensysenergy.com



EnSys: Petroleum Economics Technology Modeling

Drivers – US & global

- Product quality, environmental regulation
- Demand growth & pattern
- Refining capacity & utilization
- Transportation sector
- Price / financial factors



Product quality - US

- Trends to ultra-low sulfur/reformulated products impact refinery operations and investment
 - Compliance costs “siphon off” capital
 - Effective capacity can be reduced:
 - Longer turnarounds “deep maintenance”
 - Increased dependence on DHT units
 - new process technologies, catalysts
 - problems can bring down whole refinery
 - Increased potential for off-grade material
 - Reduces effective supply



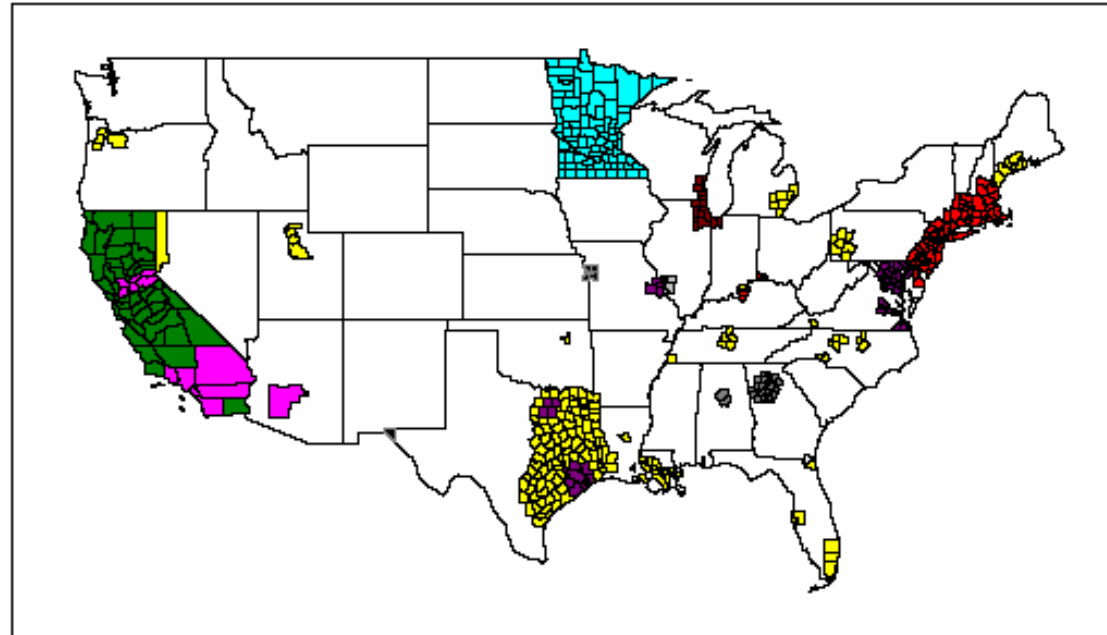
Product quality - US

- Multiple product grades “boutique fuels”
- Gasolines
 - CG (conventional)
 - Federal RFG
 - CARB
 - RVP variants, MTBE/ethanol variants
 - Transition to 30 ppm ULS all grades
- Distillates
 - HS, LS, ULS diesels – transition to 100% ULS
 - Heating oil, jet fuel



Product quality - US

- Gasolines
11 main types, plus
 - 2-3 octane grades per type
 - Marked Summer/Winter differences



Legend:

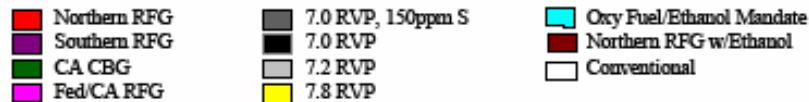


FIGURE II-1: Current Summer U.S. Gasoline Requirements



California – a special case

- Severe CARB product quality specs
- Legal disputes further reduce refiners' blending options
- Severe constraints on expansion
- Limited logistics for product imports
- Remote / long supply lines &
- No forward market to reduce risk



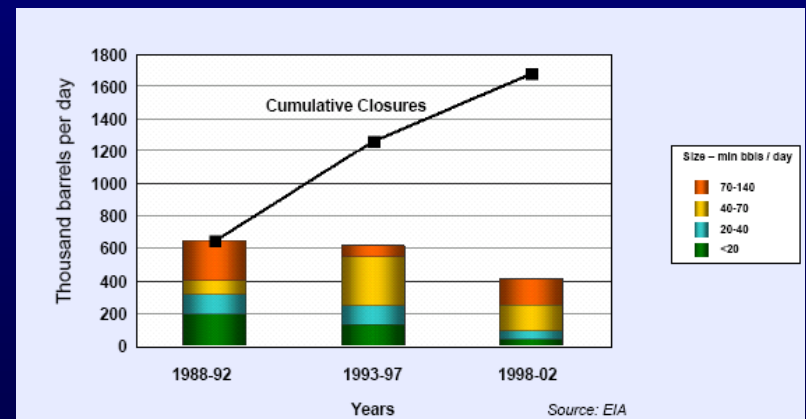
Product quality - Global

- Other OECD:
 - gasoline / diesel totally ULS by 2010/2011
 - Residual fuels:
 - EU industrial directive 1% sulfur max
 - EU marine fuels directives 1.5%
 - Potential for US/elsewhere to follow suite
- Non OECD:
 - Progressively introducing LS/ULS fuels generally per EU II/III/IV standards



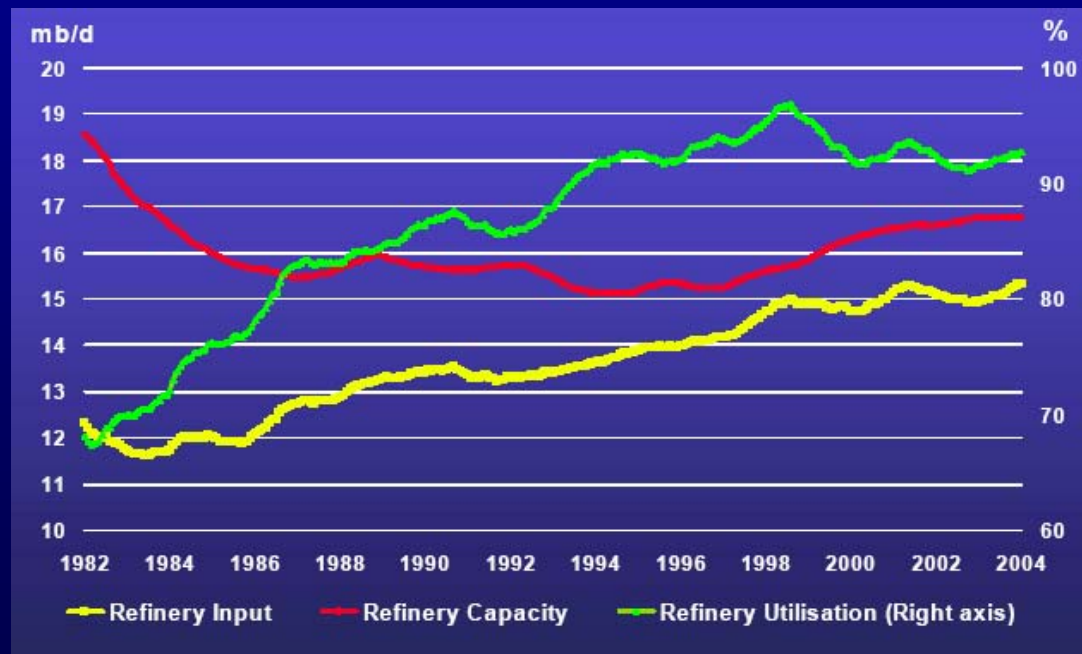
Capacity/demand/utilization - US

- Several factors have combined to constrain net US refinery growth:
 - Complex environmental / permitting regs
 - High compliance costs fuels / emissions
 - Refinery closures
 - Values at low % of replacement cost (27%)
- Poor historical ROI (5.5%) / refining margins
- Management ROI goals
- Competition from product imports



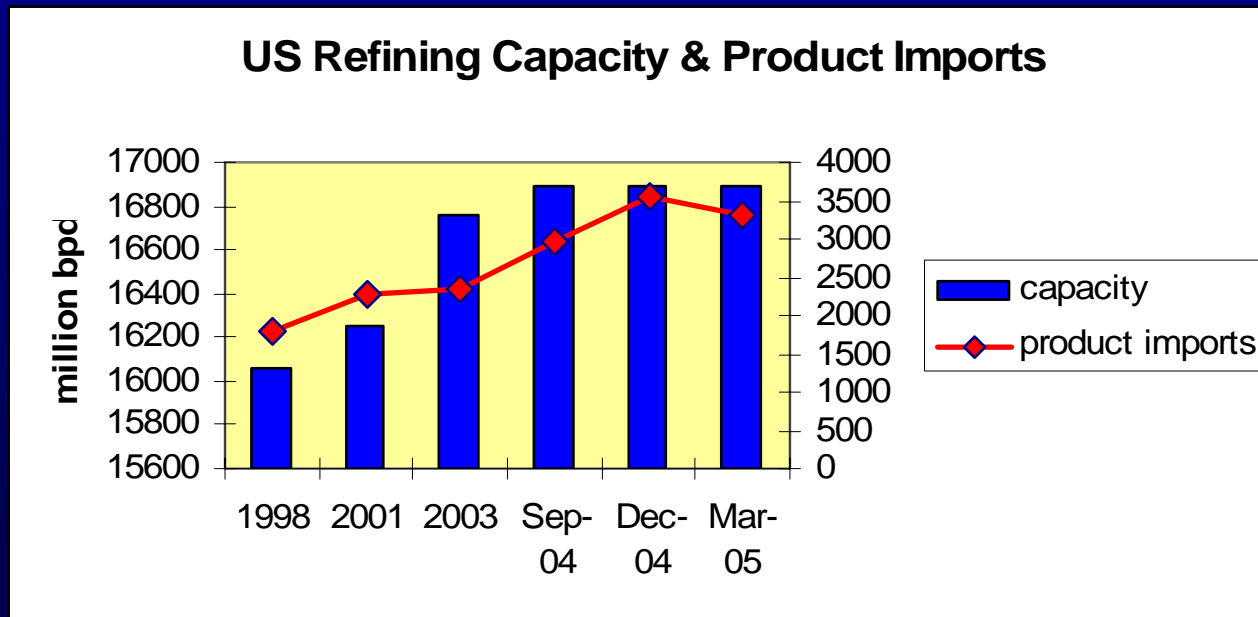
Capacity/demand/utilization - US

- Result – US refinery utilizations have risen



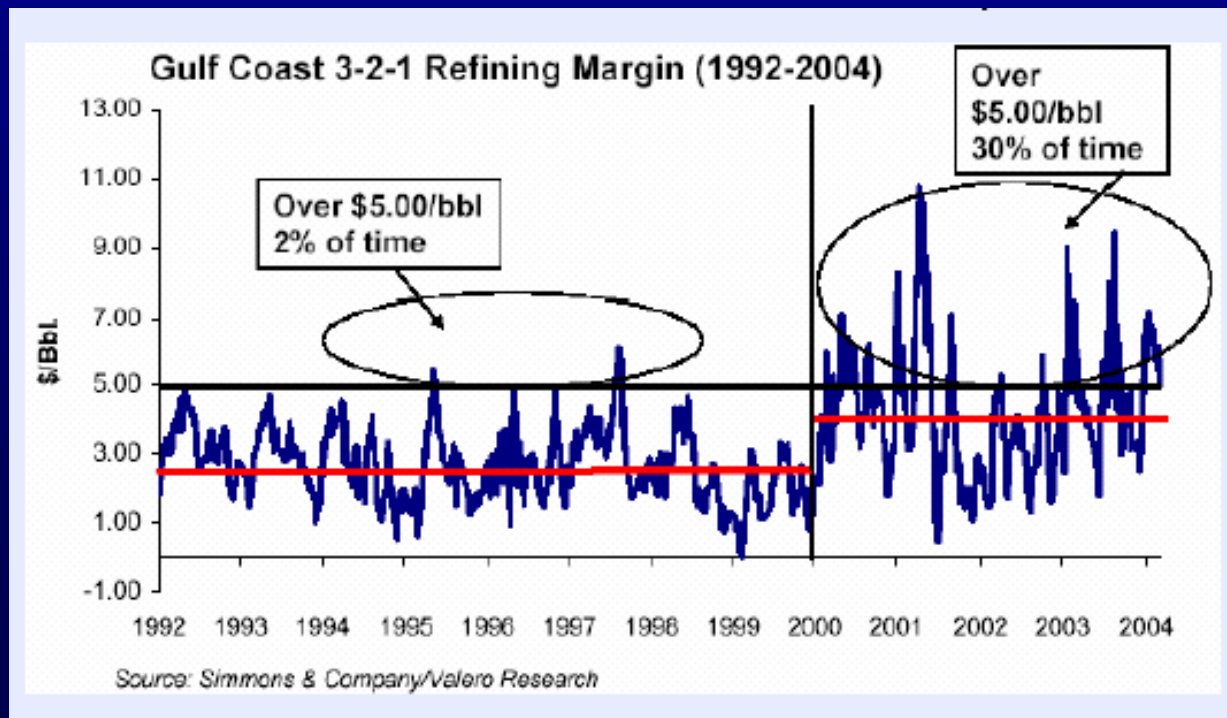
Capacity/demand/utilization - US

- But capacity has not kept pace with demand – big increase in product imports



Capacity/demand/utilization - US

- Refining margins have risen – but not enough to justify grass roots refineries



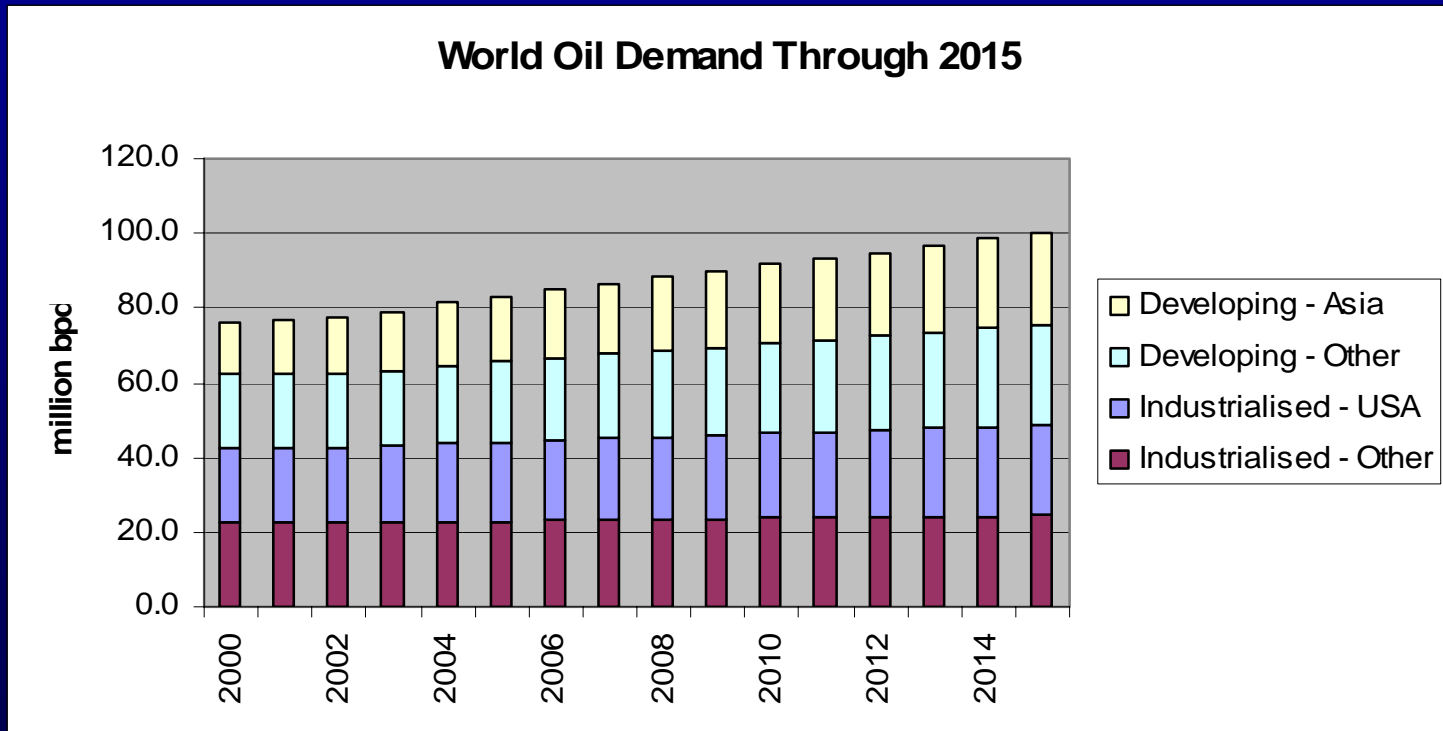
Capacity/demand/utilization - US

- The future?
 - Many of the constraints will stay in place
 - Product quality costs will continue several years
 - Energy Bill could:
 - Provide incentives for refinery expansion
 - Compensate refiners for switching away from MTBE (\$1.8 bn)
 - Leave refiners liable for MTBE clean-up?
 - At up to \$29 bn clean up cost, that equates to up to 10 refineries / 2 million bpd of new refining capacity
 - c.f. WORLD estimate of \$20 bn required for total US+Canada refining investment through 2015 (addns over known projects)



Capacity/demand/utilization - global

non OECD main demand growth engine



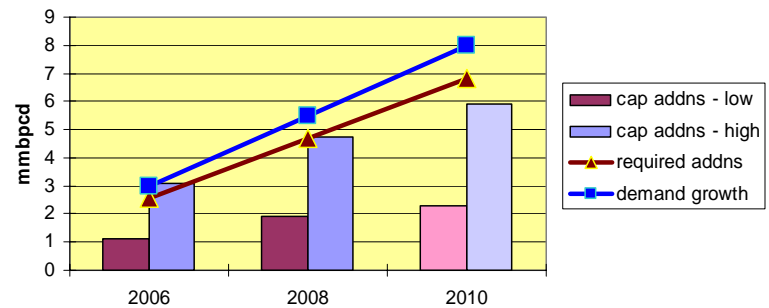
Source: Global Insight



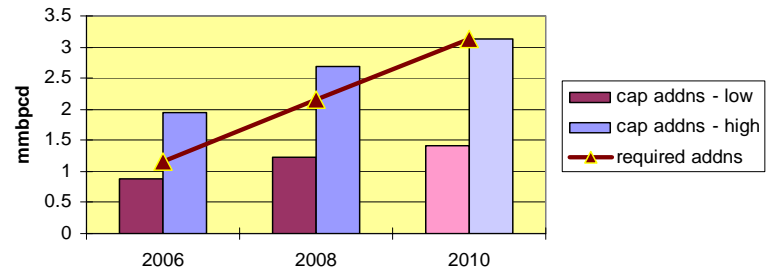
Capacity/demand/utilization - global

- Through 2008, refinery capacity additions look unlikely to keep up with demand growth
- Nearly all demand is for light/clean products

Required Distillation Capacity Additions vs
Announced Projects & Creep
(relative to 2004)

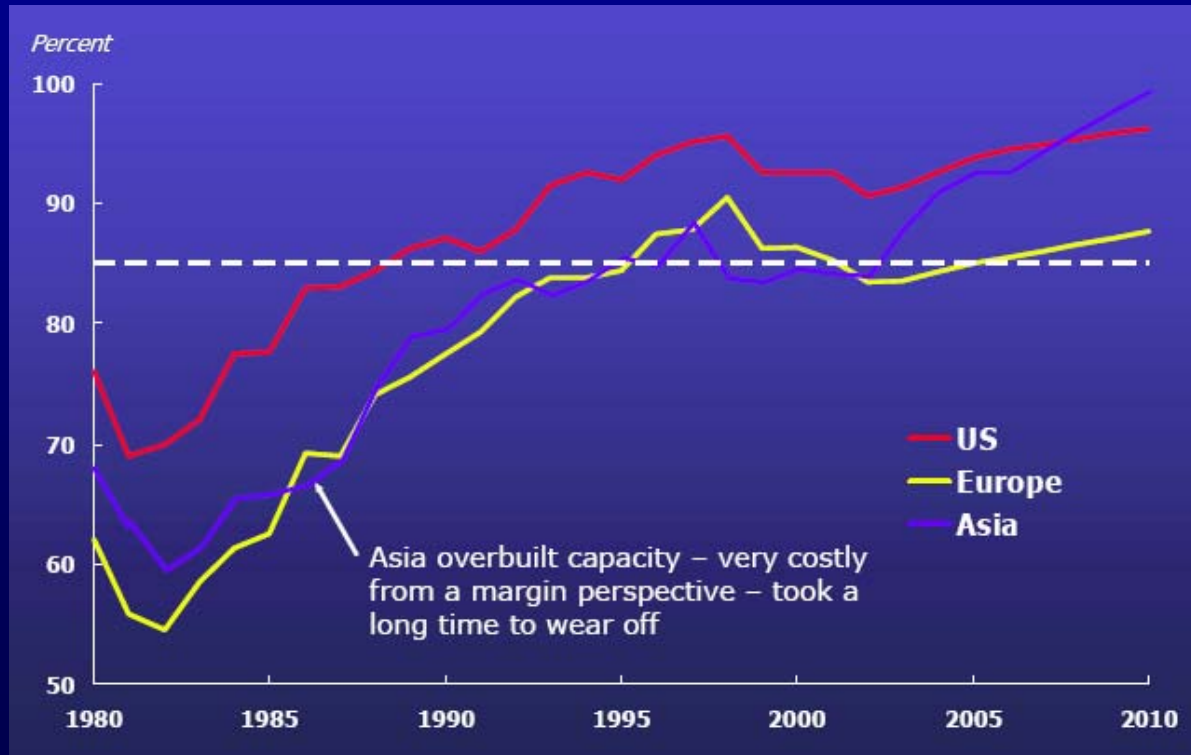


Required Upgrading Capacity Additions vs
Announced Projects & Creep
(relative to 2004)



Capacity/demand/utilization - global

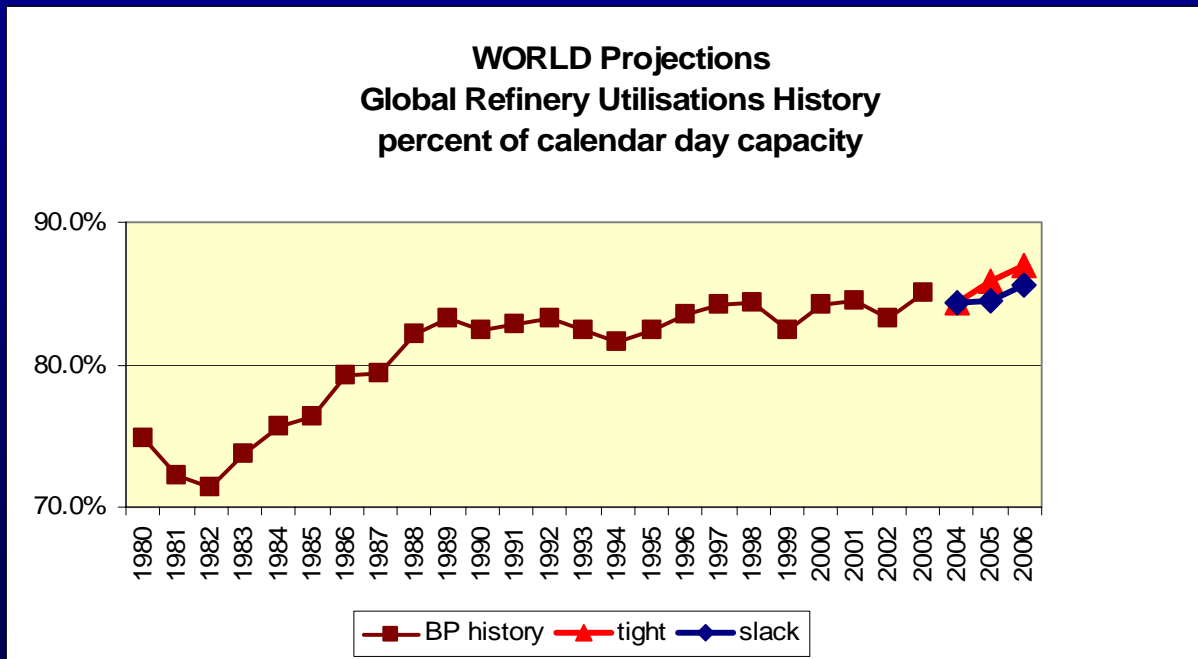
- Global utilizations continue to rise



Source: Purvin & Gertz / IEA
EnSys: Petroleum Economics Technology Modeling

Capacity/demand/utilization - global

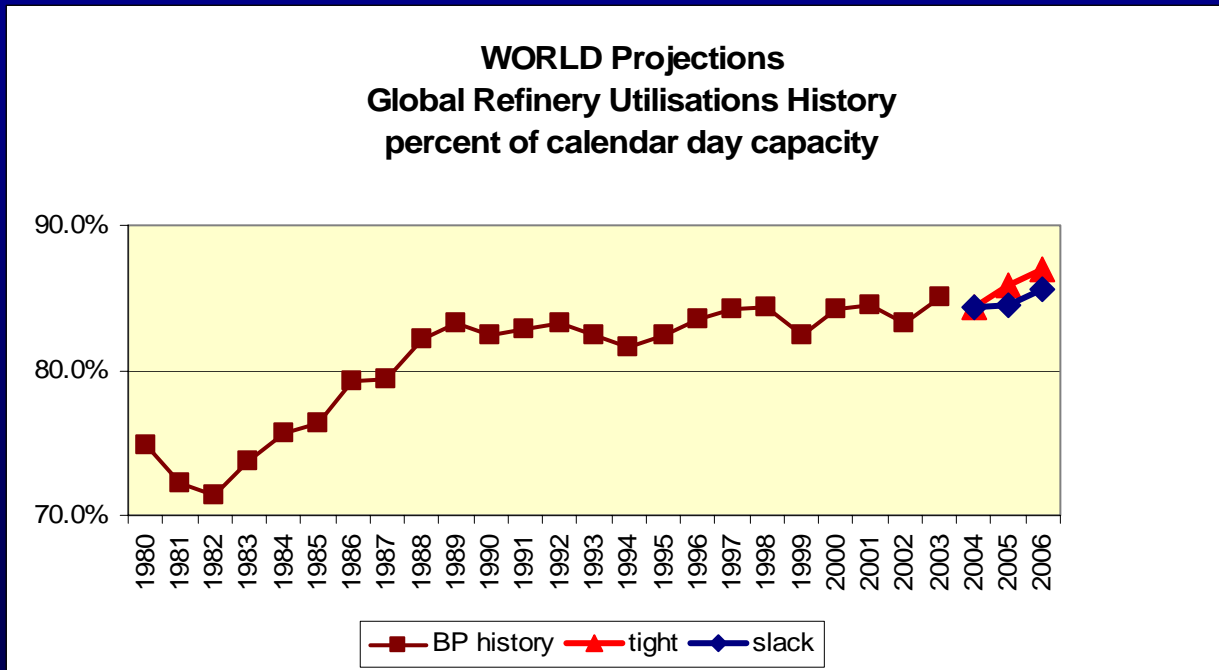
- Global utilizations continue to rise



Source: EnSys WORLD



Capacity/demand/utilization - global



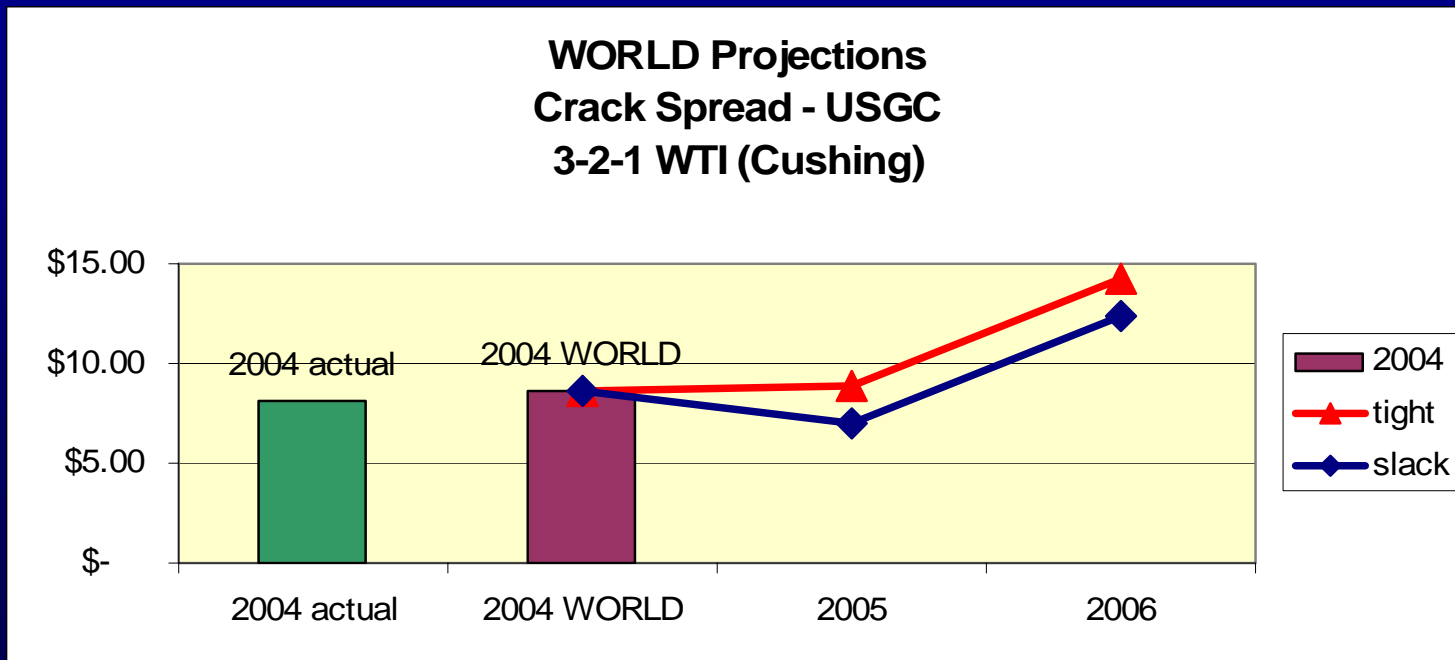
Capacity/demand/utilization - global

- Product demand growth
 - Overwhelmingly for light clean products
 - Growing non-crude supplies help (light, clean) but most crude 650+ must be upgraded
 - Sustains light / heavy differentials
- High absolute prices
 - Raise operating cost
 - Increase upgrading incentives (volume gain)
 - widen light-heavy, sweet-sour differentials



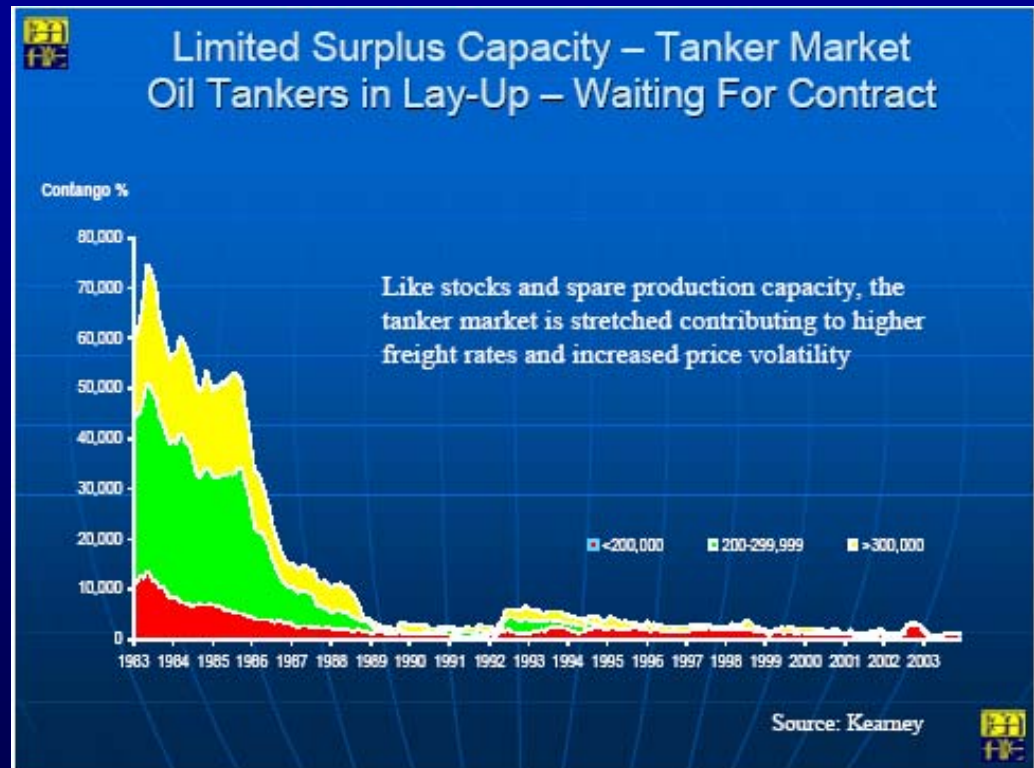
Capacity/demand/utilization - global

WORLD analyses support the outlook



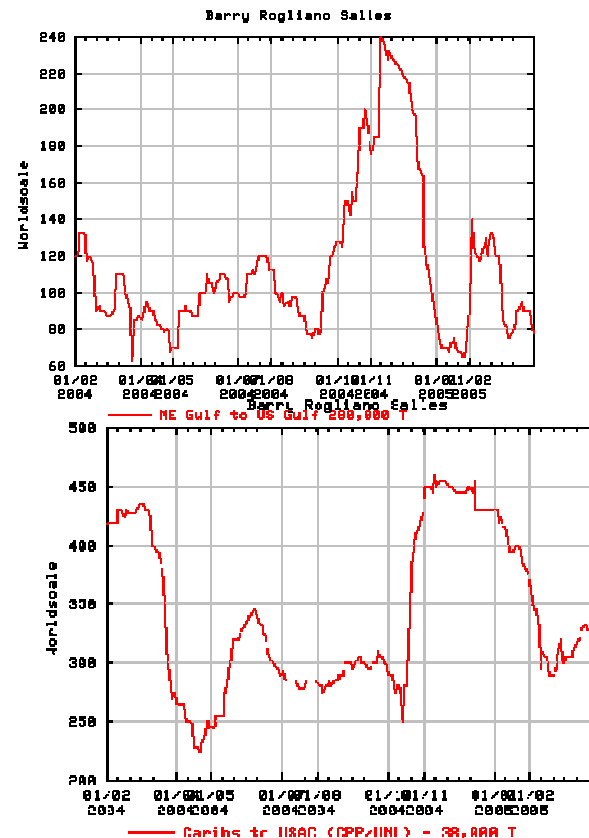
The tanker market

- Spare tanker capacity is low
 - i.e. utilizations high – as refining



The tanker market

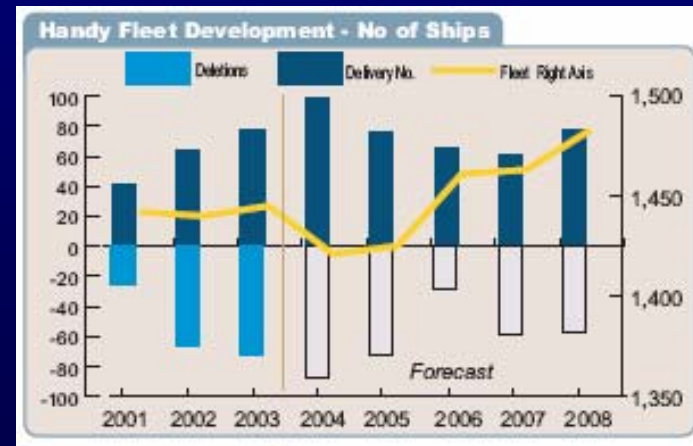
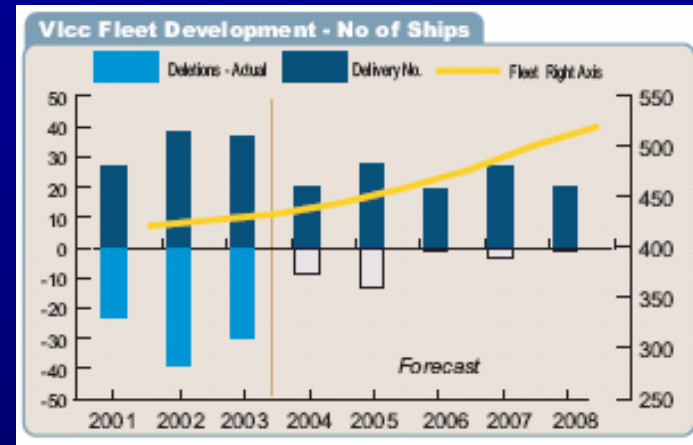
- Spare tanker capacity is low
- Freight rates volatile & historically high



The tanker market

- Fleet capacities are growing
 - But enough to keep up with demand?
 - Shipyard capacity could be a limit
 - competition with LNG, petchem
 - Source: David St. Amand, Navigistics

Source Drewry



The steel factor

- Steel prices are double 2002 levels:
 - Impacts costs of production, processing, tankers, pipelines, storage



Most factors point to continued downstream tightness

- Product quality investments must continue
- More vulnerable refinery operations
- Insufficient refinery projects
 - Fear of over-investing?
 - China
- Competition for capital?
 - E&P, gas/LNG/GTL, petrochemicals
- Tight tanker market
- No technology revolution



downstream tightness the next 2-3 years hinges on

- Demand growth
 - How much will high oil prices ease growth?
 - China / Asia, USA
- Refinery projects that come on stream
 - Still can be refinery closures
- How much revamp / creep achieved
 - USA and other OECD
 - Non-OECD regions raising effective utilisations
- Close race – calls for careful monitoring!

