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Trends in Butadiene & SBS

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January Edition

General Industry

Momentive Specialty Chemical to sell ink and adhesive resins business to Harima.

Dynasol forms synthetic rubber JV in China boosting their capacity by 50%.

Reichhold announces hydrogenated resin entry.

Foreign Exchange – Most exchange rates finish the year as they started, except for the Japanese Yen.

Energy/Ethylene Production

Crude Oil – Crude continues to march higher with Alaskan pipeline outage.

Gasoline – Prices rise in sync with crude oil.

Natural Gas – Projected lower winter-time demand expected to moderate prices.

Ethylene – Higher propylene values may drive cracking slate heavier.

Monomers

Resin Formers – Some supply improvement, but overall supply remains tight.

Piperylenes – Supplies improve, but market is still net short.

DCPD – DCPD can be the next resin former to be short as demand returns.

Aromatic Resin Oils – Supplies improve over 4Q, but rosin supply and price issues soak up any surplus.

Isoprene – US imports slow by 12kt during second half of 2010.

Butadiene – Fairly static year-end period ahead of what is expected to be a fairly dynamic year.

Tackifier Resins

C5 Aliphatic Tackifiers – Short term supply improvement overshadowed by long term concerns.

Waterwhite Tackifiers – Market goes short due to operating issues.

C9 Resins – Supply returns to normal tight condition after fourth quarter feed supply issues.

Rosin – Chinese gum rosin prices remain in record territory as the new year starts..

Polyterpenes – Terpene prices are stable, but at a high level.

Polymers

Natural Rubber – Record prices close out 2010.

e-SBR – Demand remains strong and prices are rising.

Polyisoprene – Prices continue to increase, but still below NR prices.

SBS – Costs on the rise during the slow season.

SIS – Raw material costs creep up with crude oil.

UPR – Weaker year-end demand and higher costs put pressure on producers.

LDPE – Over supply remains tight with some small regional differences.

EVA – Supply remains tight.

Polypropylene – Western world monomer operational problems drive prices up.

Acrylates – Monomer prices drive up prices in a tight supply environment.

Oils/Waxes – Shell to double GTL wax capacity.

Other Key HCR Country Exports – Exports average 20 kt/month in 2010.

US HCR Imports/Exports

2010 US Exports – Europe is the largest importer of US hydrocarbon resins

2010 US Imports – Asia is the largest importer of hydrocarbon resins to the US.

General

Introductory Comments

- Several Tsunami's of change coming to the chemical industry
- Biggest dynamic in the history of the chemical industry
- Much of the change has been masked by the global recession
- Economic recovery will reveals the hidden "icebergs"
- Overlay a natural rubber shortage just to make things worse

2009 Perspective

Positives

- Tire demand for butadiene likely to fall with less domestic ethylene production
- NR prices could be lowe
  low growth market backing o
  butadiene containing syntheti
  rubber
- New offshore SBS and butadiene capacity - Asia

Negatives

- Less ethylene production
- Lighter cracking slate

New US tariffs bolster domestic tire production

New car production rebounds

2009 Perspective

Positives

- Tire demand for butadiene likely to fall with less domestic ethylene production
- NR prices could be lower against a low growth market backing out butadiene containing synthetic rubber
- New offshore SBS and butadiene capacity - Asia

Negatives

- Less ethylene production
- Lighter cracking slate
- US short Crude C4's against

Natural rubber prices go through the roof

Setting a new record every month

2009 Perspective

Positives

- **Tire demand for butadiene likely to fall with less domestic ethylene production**
- **NR prices could be lower against a low growth market backing out butadiene containing synthetic rubber**

- **New offshore SBS and butadiene capacity - Asia**

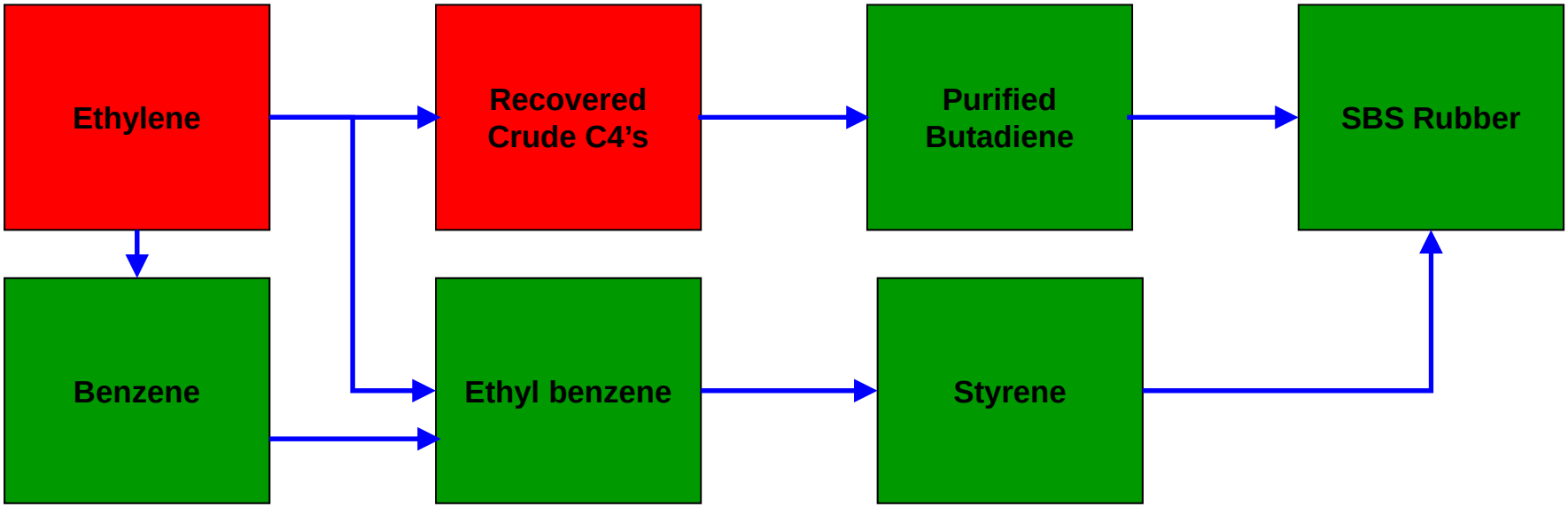
Negatives

- **Less ethylene production**
- **Lighter cracking slate**
- **US short Crude C4's against butadiene purification capa**city

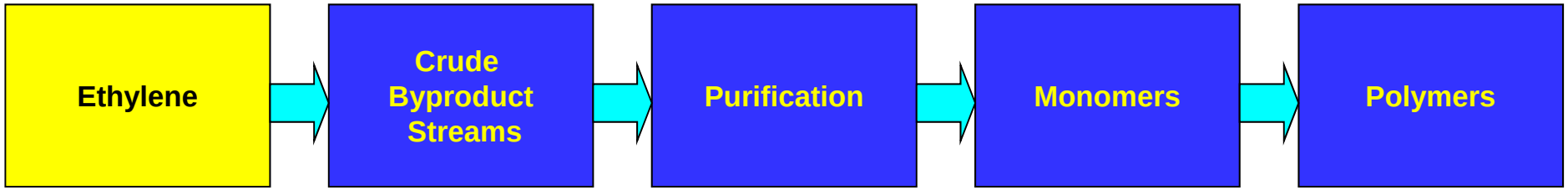
Presentation Covers 5 Steps in the Supply Chain

- Today we will be covering five steps in the supply chain
- Most of what you want to know is in the beginning, not in the end
- The end is a consequence of upstream factors that will continue for the foreseeable future

US SBS Supply Chain



- Supply chain shows problem areas
- Upstream supply is the issue for Butadiene
- Shortage of crude C4's from ethylene production

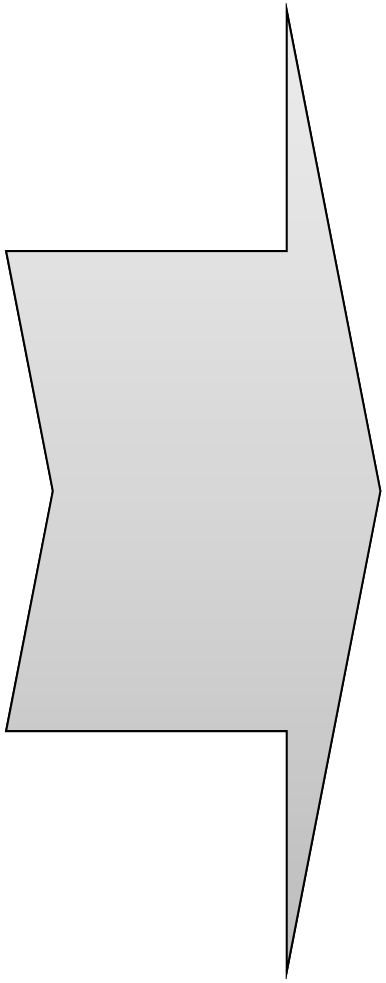


Global Ethylene Supply

Where Do Raw Materials Come From ?

Polymers

- **SBS/SBR/SIS**
- Polyethylene
- Polypropylene
- Tackifiers Resins
- EVA
- Acrylics
- Ink Resins
- EPDM Rubber
- Butyl Rubber
- EP Metallocene Rubber
- Metallocene Polyolefins
- Polyethylene waxes



Basic Chemical Raw Materials

- Styrene
- Ethylene
- Propylene
- **Butadiene**
- Isoprene
- Pentadiene
- Cyclopentadienes
- Aromatic Resin Formers
- Isobutylene
- Amylenes
- Hydrogen
- Benzene

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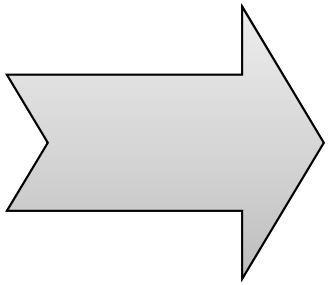
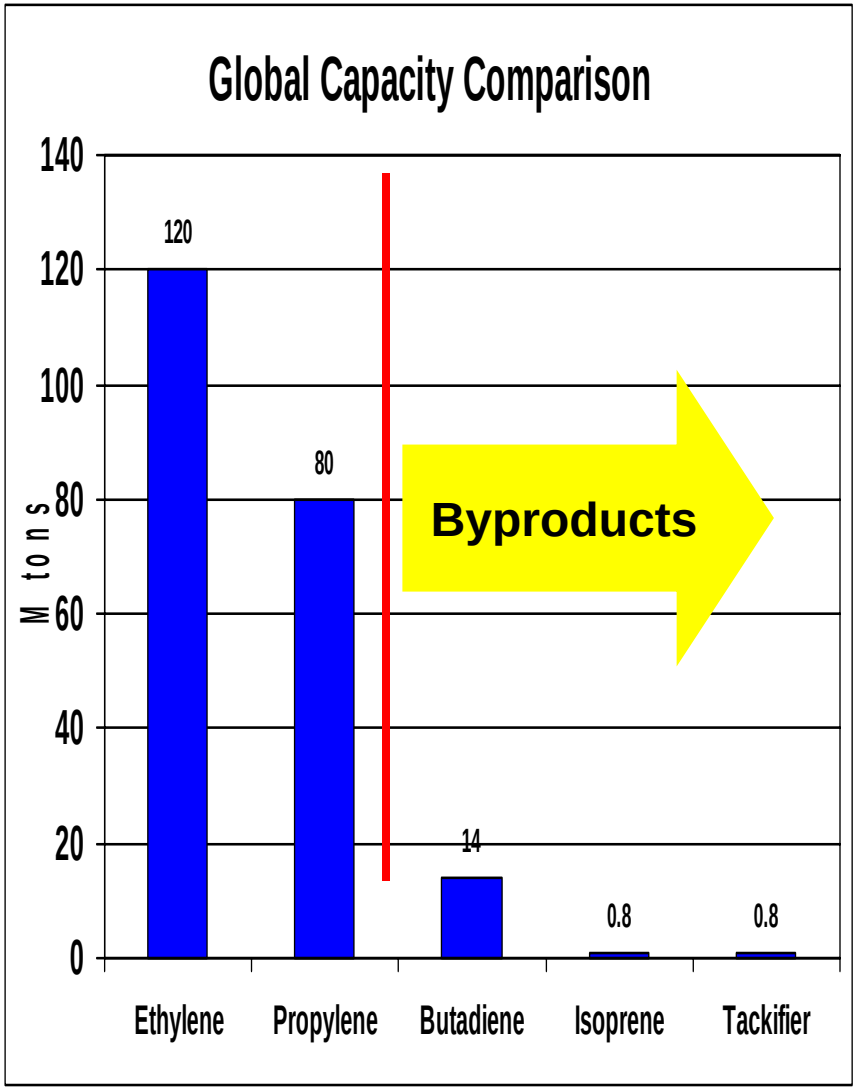


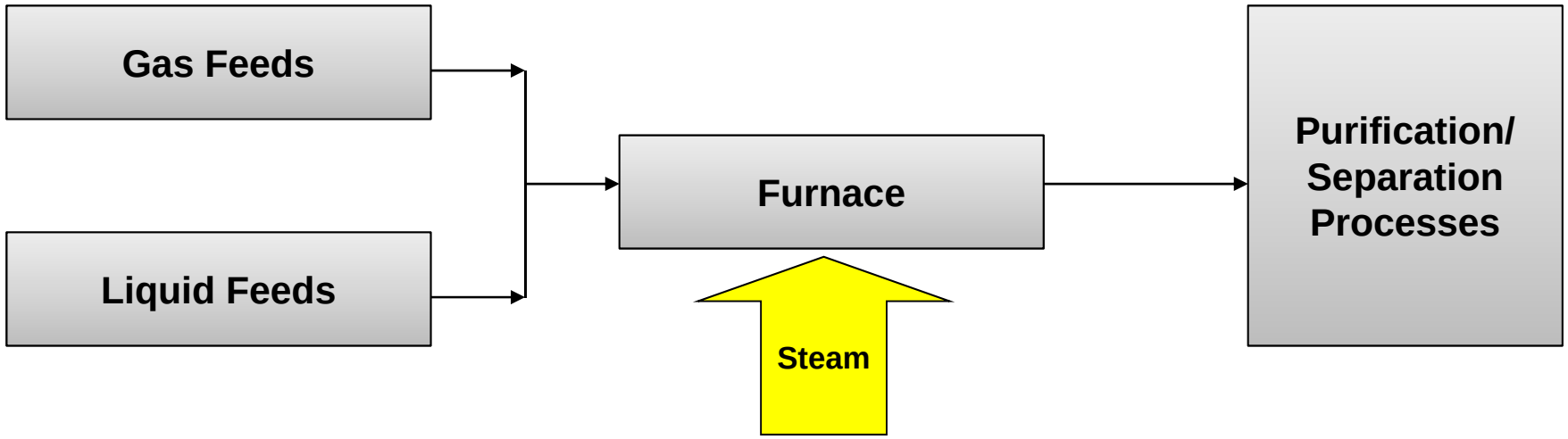
Ethylene

Scale Of The Chemical Industry



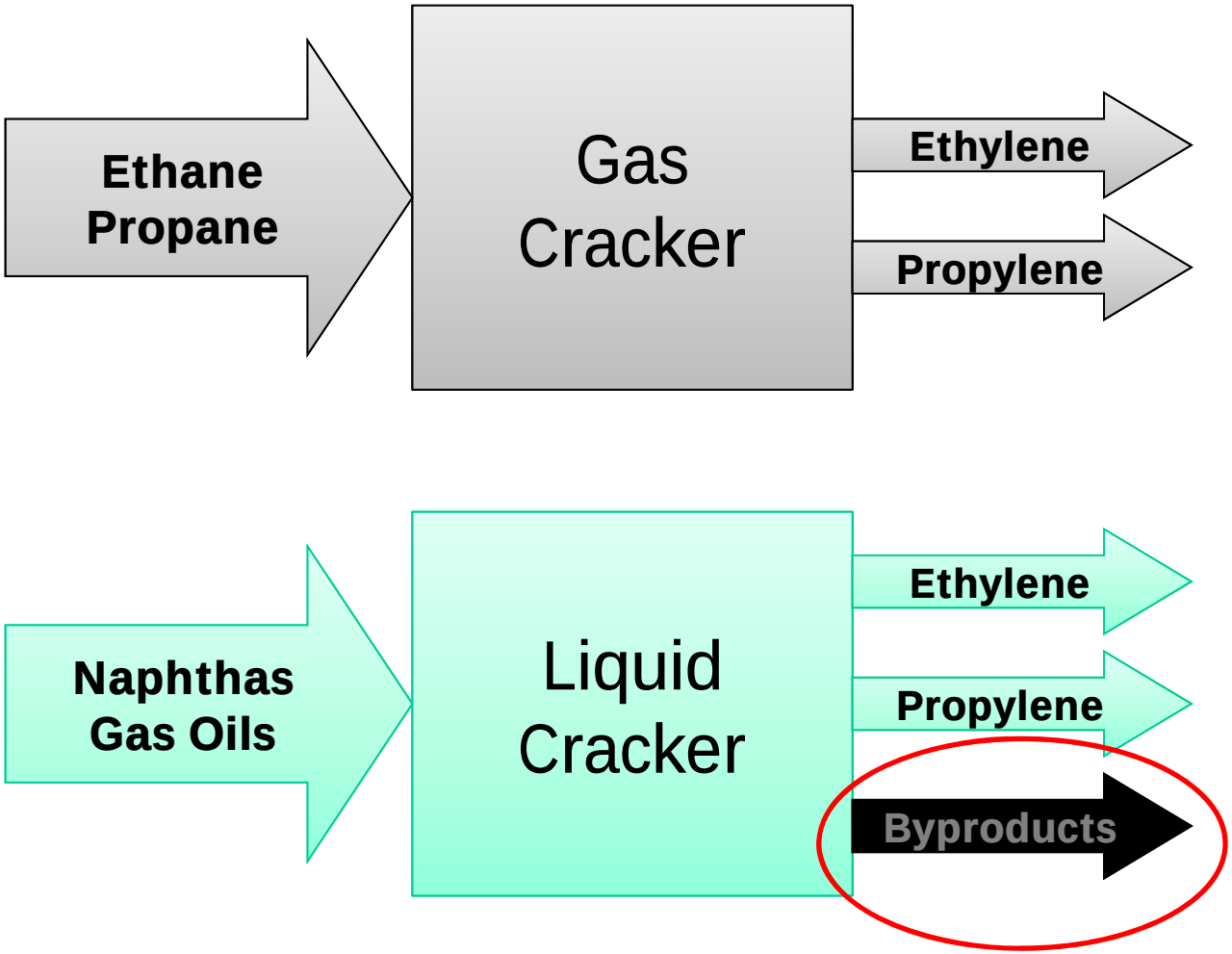
- Prime drivers for chemical production are ethylene and propylene
- Many monomers of interest are very small
- Strategic interest by most chemical producers are ethylene and propylene
- Historically, many products used were disposal issues – gum formers in gasoline
- Businesses were built around these low valued byproducts of ethylene production
- Byproduct streams are capturing more value now, but strategic interest remains low

Making Ethylene



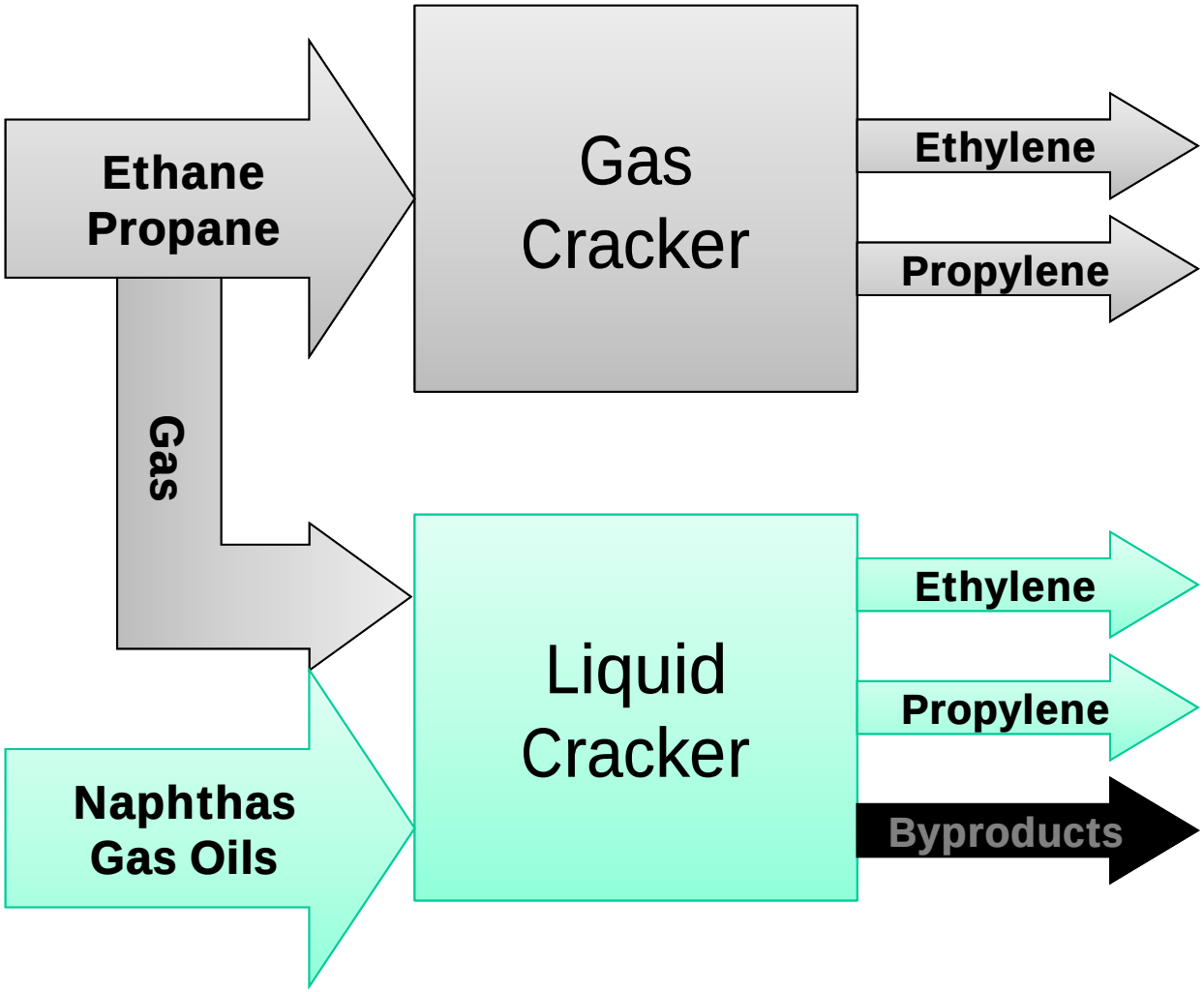
- Called a steam cracking process - Often referred to as **"Cracker"**
- Gas feeds makes mostly ethylene
- U.S. is the most flexible region on feeds
- Output is a mixture of ethylene to heavy products like tar
- Need downstream purification processes to separate products

Historic US Ethylene Production



- Fixed facilities – hard wired
- Little flexibility
- Majority liquid crackers +90%
- Liquid economics favored
- Excess byproduct streams

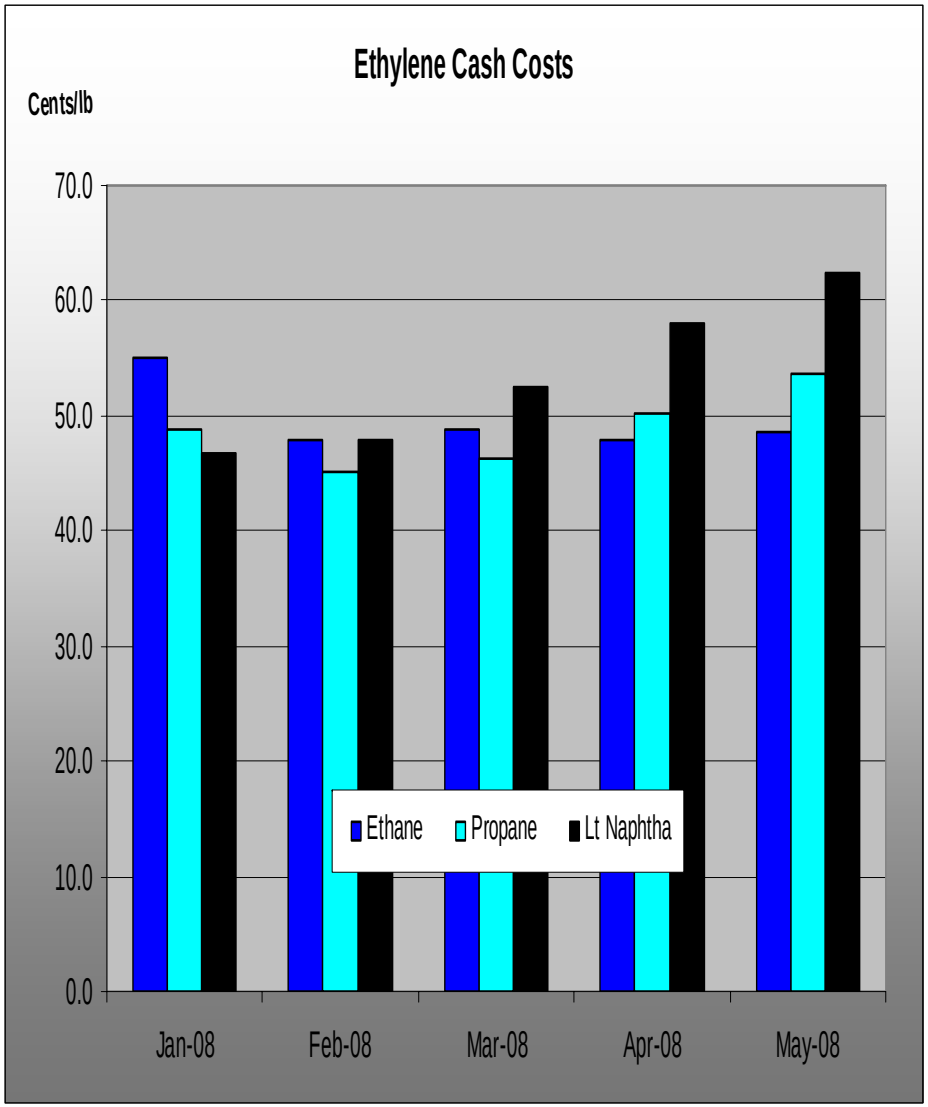
Historic US Ethylene Production



- Fixed facilities – now flexible
- **20-30% Flexibility**
- Capitalizes on cheap gas feeds
- Feed slate now moves with weekly economics
- Byproduct streams vary with cracking slate
- **N. American flexible approach moving into other regions**

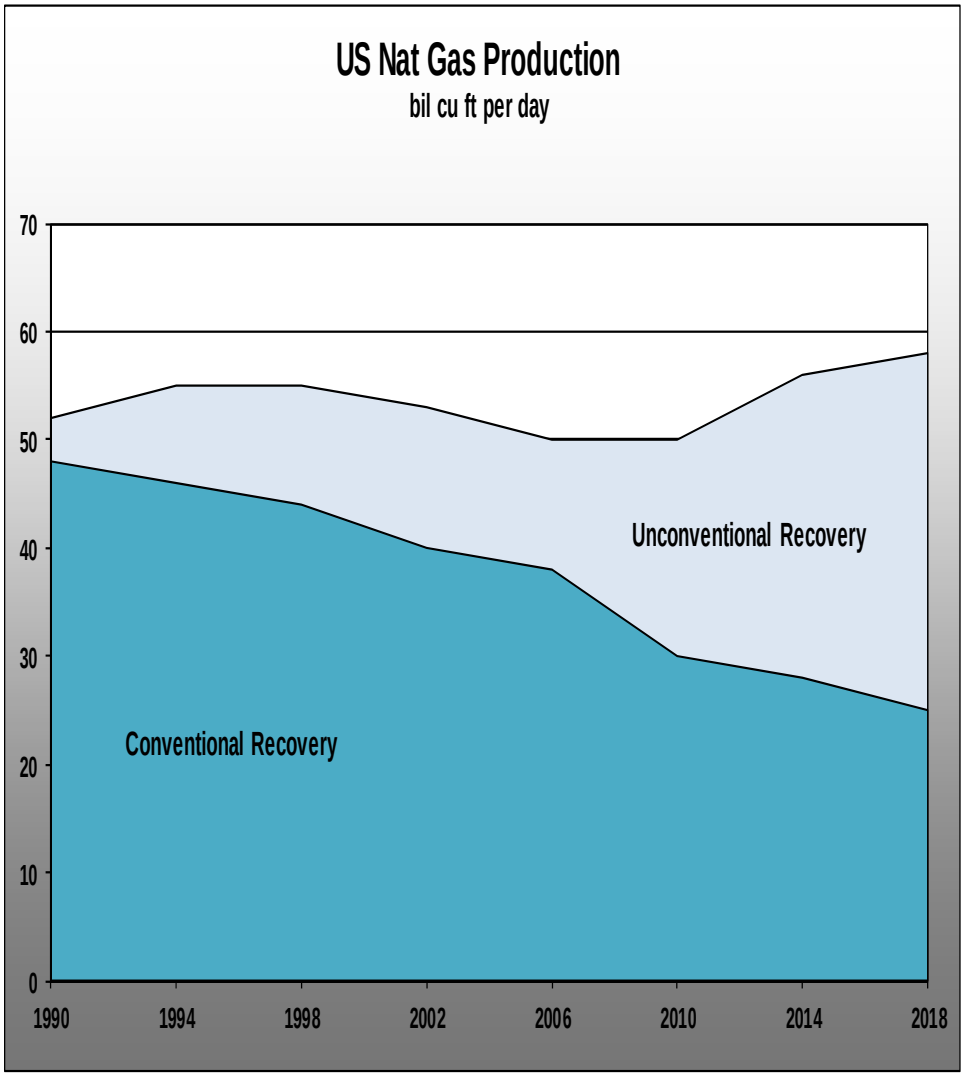
The First Tsunami

When Did the Tsunami Hit?



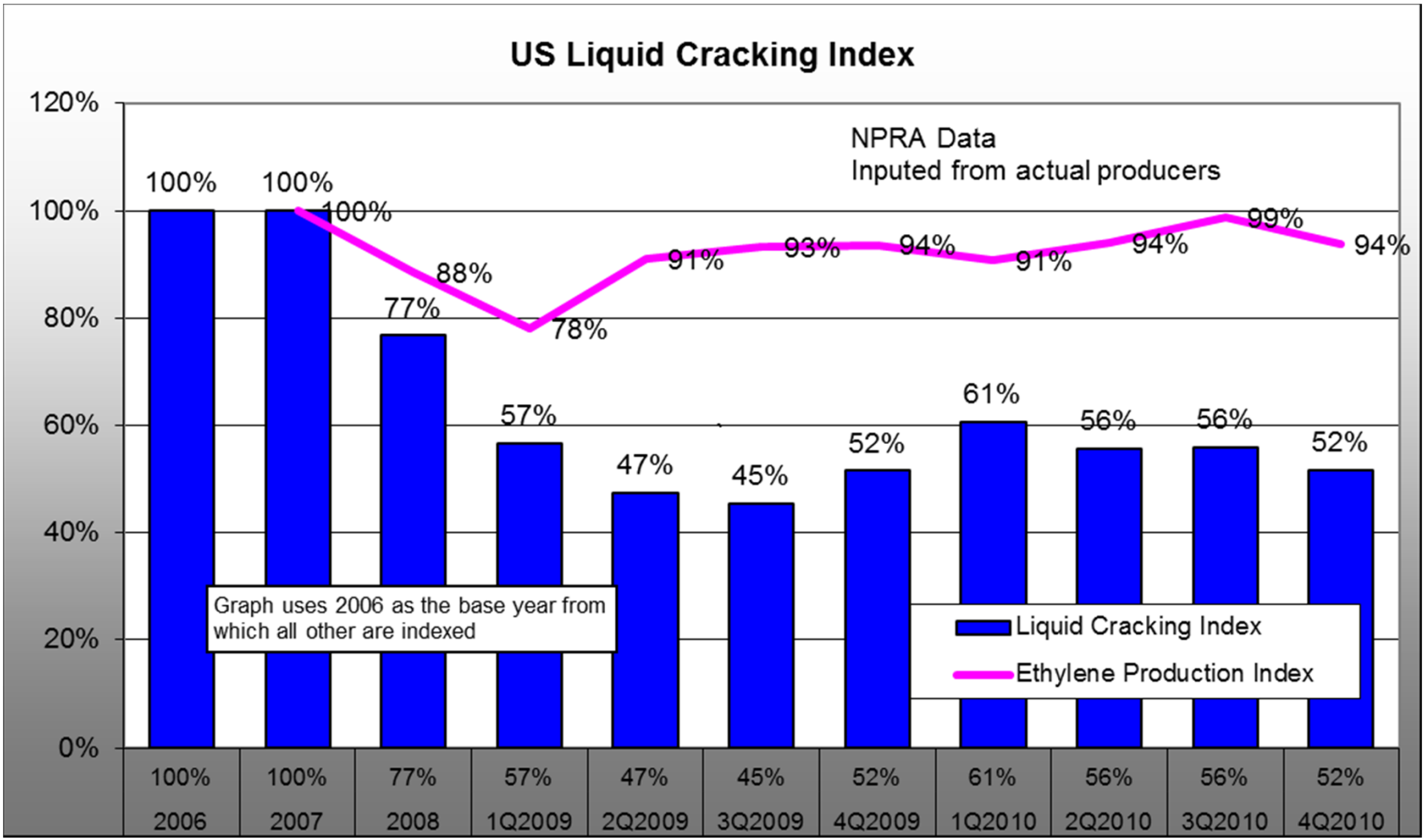
- Decisions on ethylene feed slate are based on cost of ethylene economics
- Cost of ethylene economics net backs all the credits for the byproduct streams
- The graph shows January to May 2008 cost of ethylene for N. America

US Natural Gas Trends



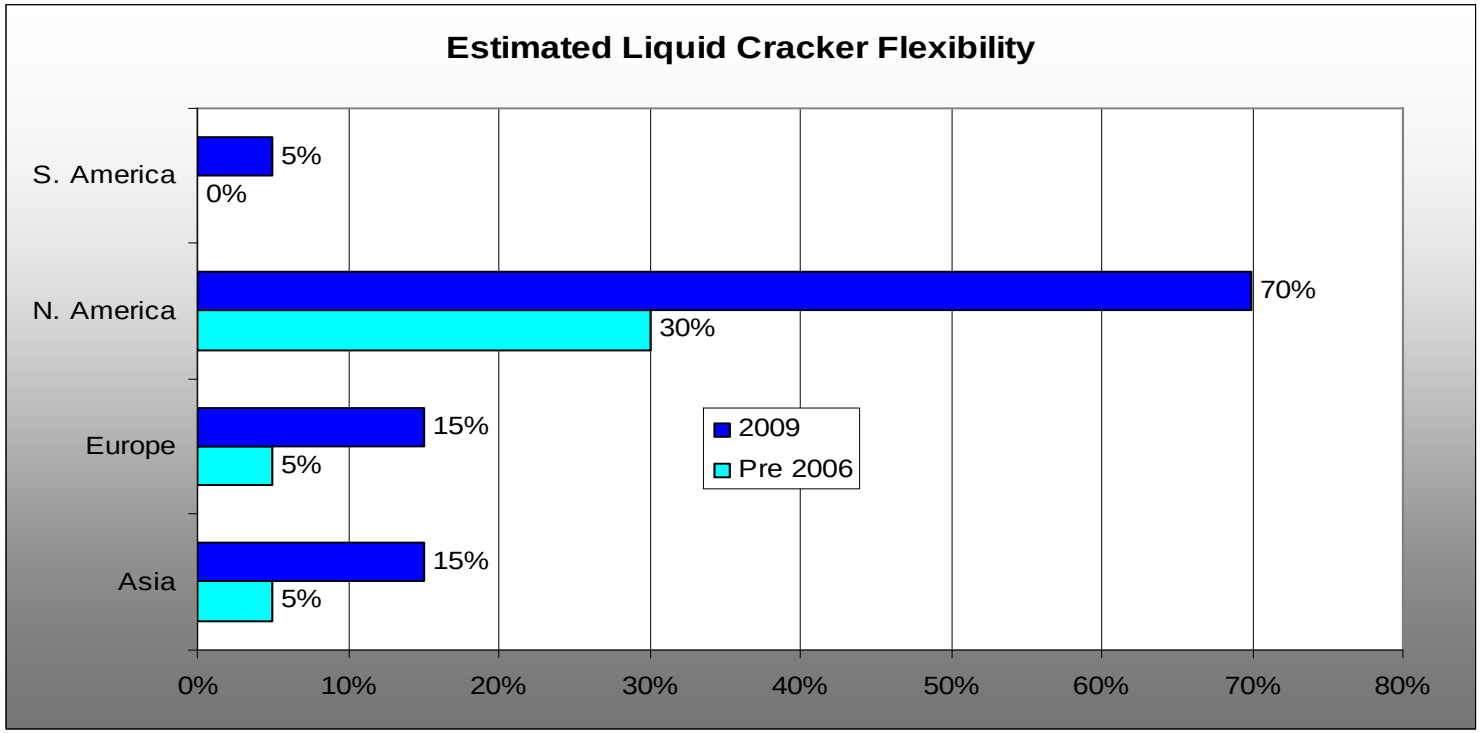
- Expected decline averted
- Unconventional recovery adds to supply
- NG pricing expected to remain advantaged versus crude oil
- NG producers separate ethane as an upgrade
- Ethane is a preferred ethylene cracking feed.

US Liquid Cracking Trends – NPRA Data



Byproduct Production is Down 40-50%

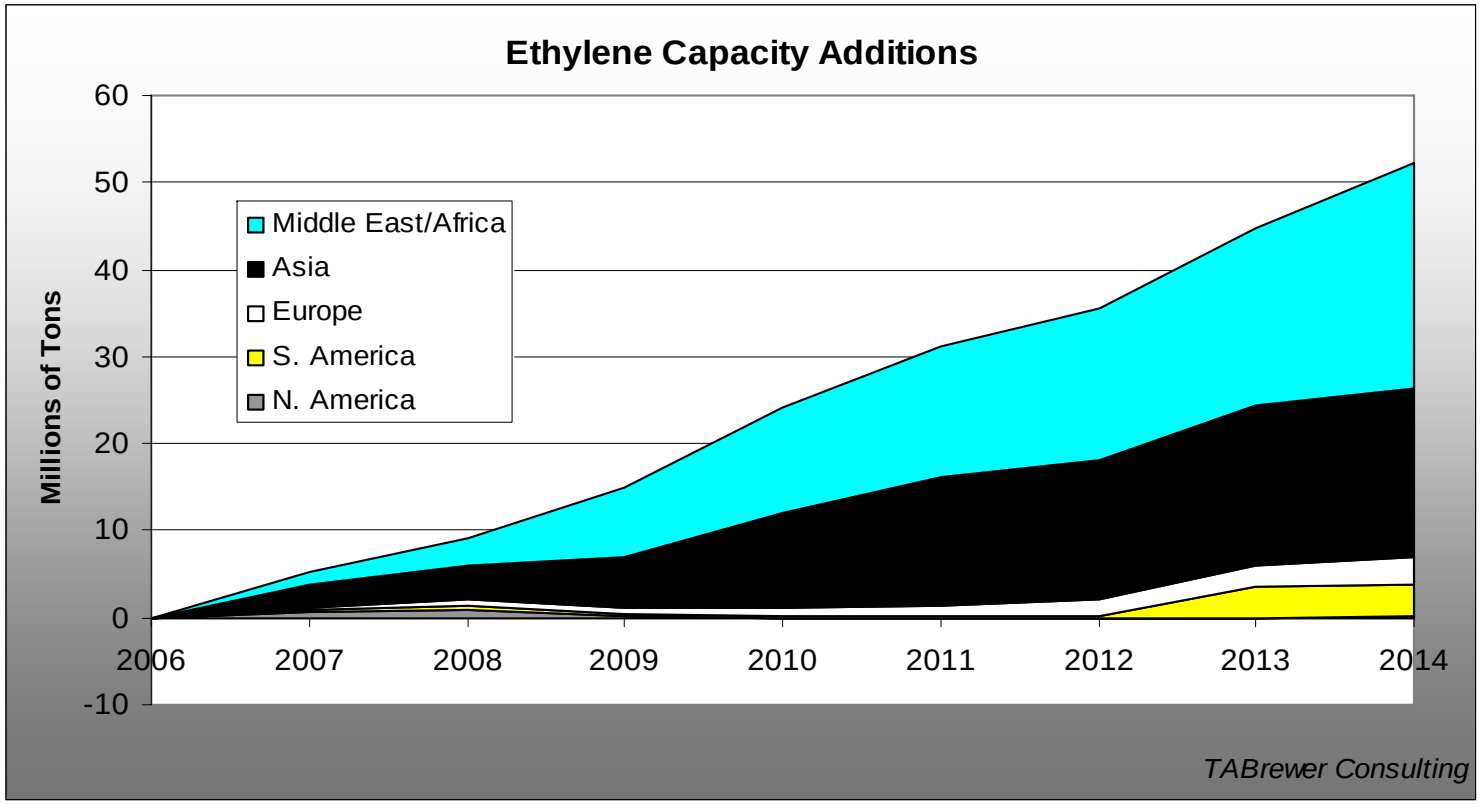
Liquid Crackers Flexing to Use More Gas



- Historically, N. America flexed 10-30% depending on feed costs - Now able to flex up to 70%
- Flexibility in Asia/Europe depends on access to refinery waste gas and a port to import LPG
  - Large liquid crackers can flex up to 30%, but dependent on availability of cheap gas

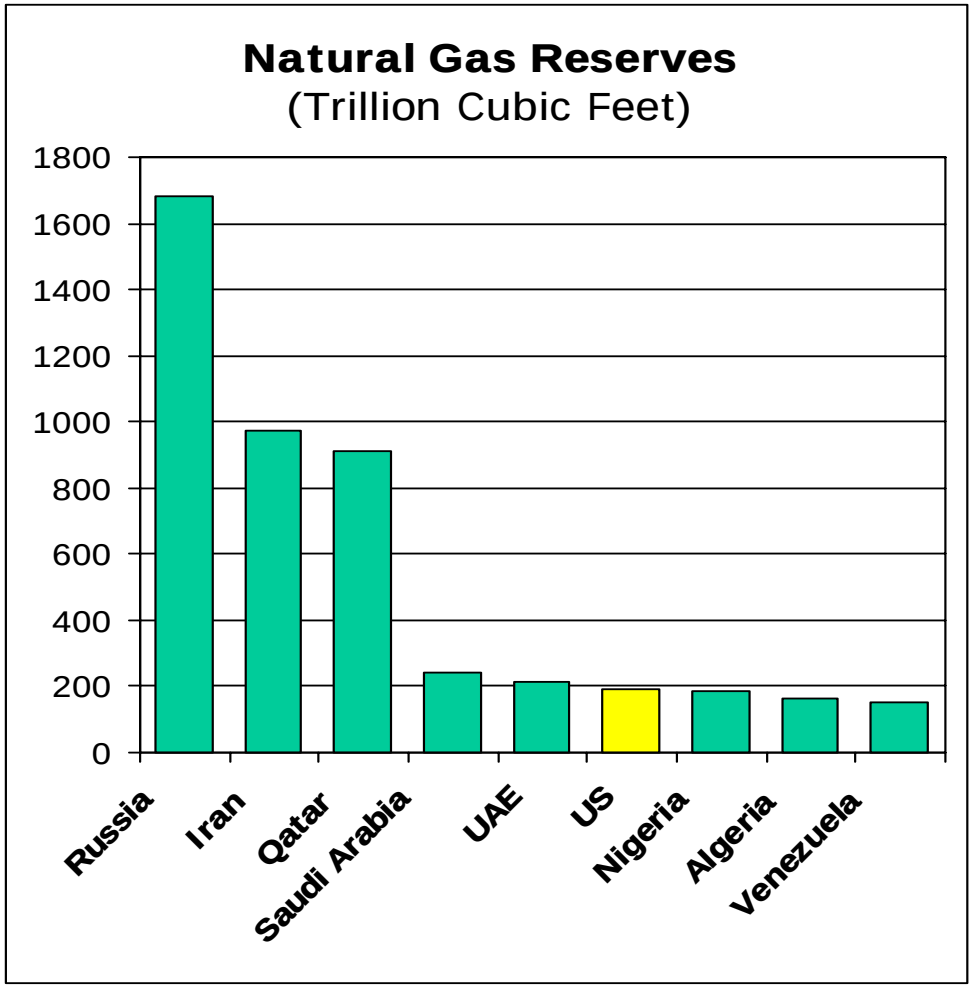
The Second Tsunami

Ethylene Capacity Additions



- Most all new capacity is in Asia and Middle East
- N. America, W. Europe, and Japan expect no growth in ethylene capacity
- Capacity growth is 3-7% per year

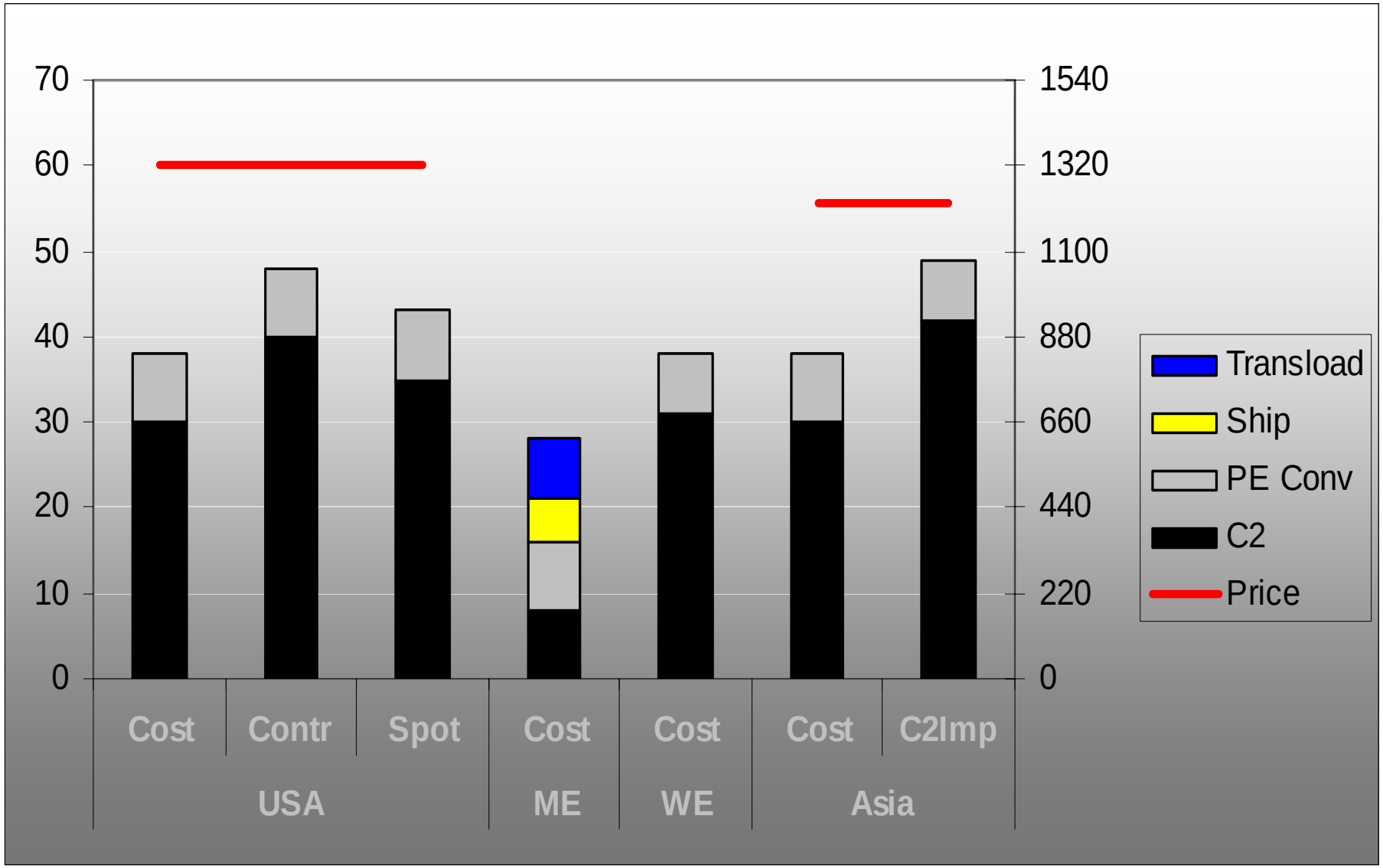
Global Natural Gas



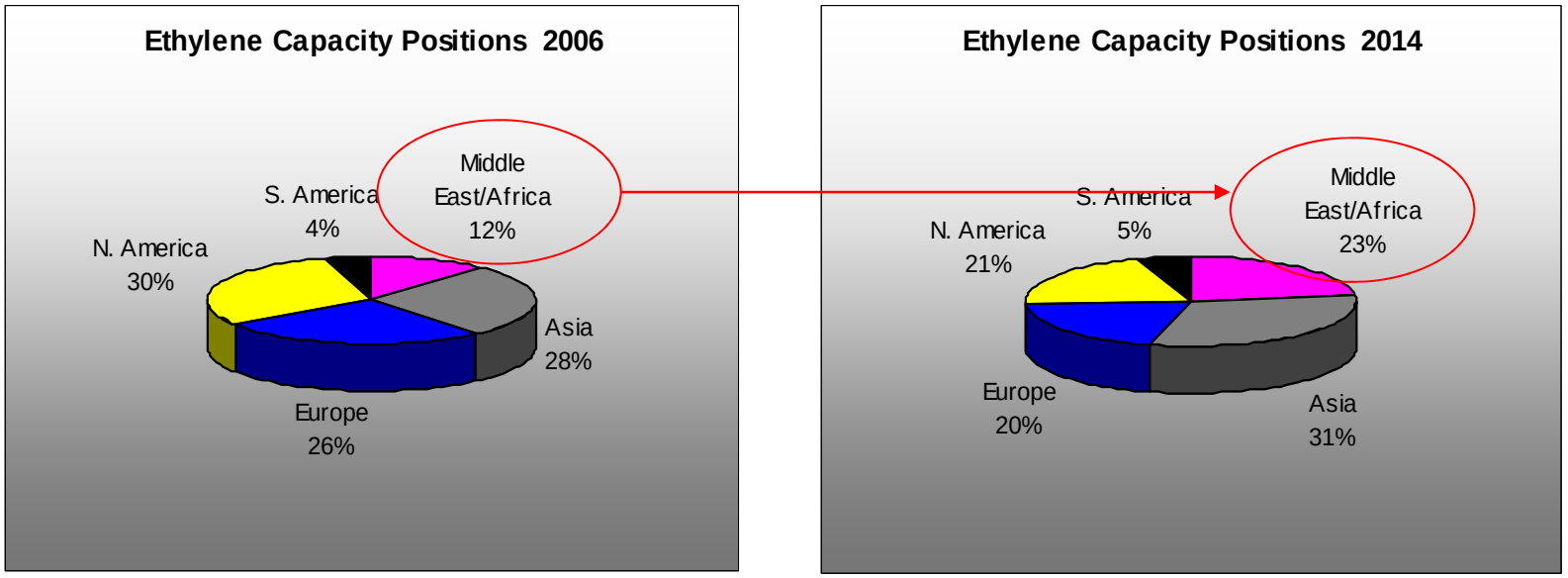
- Excess natural gas in the world
- Terms often used
  - Stranded gas
  - Waste gas
- Most of the "Waste/Stranded" gas is in the Middle East
- Countries trying to exploit low cost gas by developing
  - Ethylene business
  - LNG

Value of Gas in Middle East is Essentially Zero

Ethylene/PE Competitive Factors

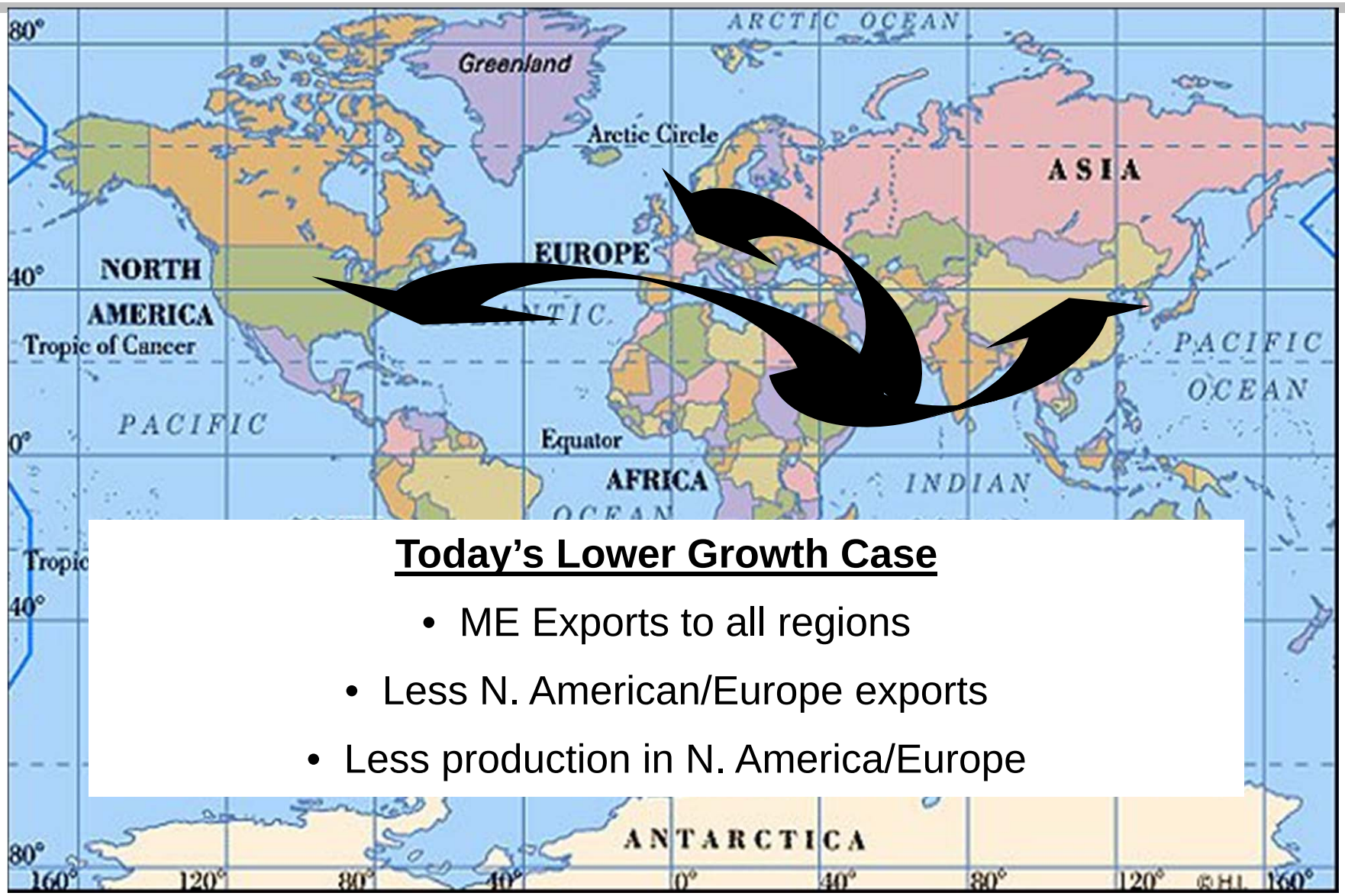


Capacity Position Perspective



- Western world capacity positions decline
- Developing regions slightly grow positions – S. America, Asia
- Africa/Middle East significantly increase capacity positions – well beyond demand growth

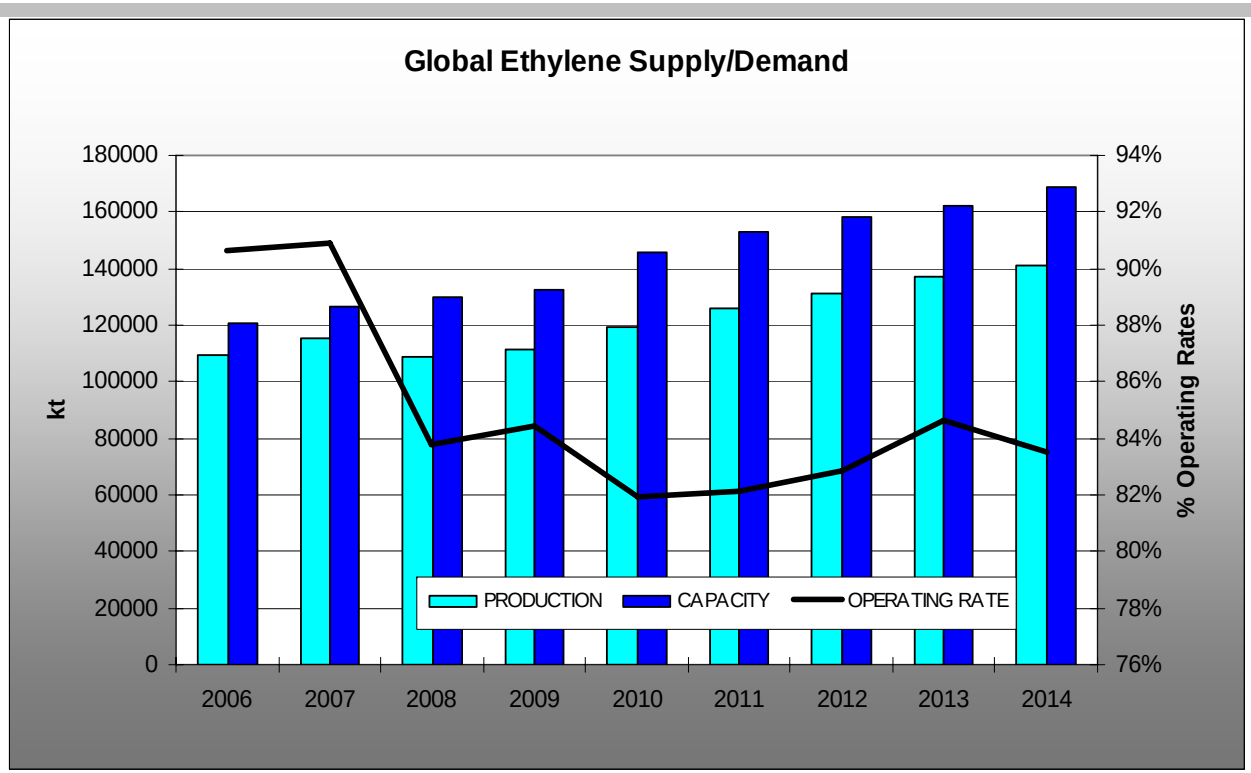
Middle East Exports



Today's Lower Growth Case

- ME Exports to all regions
- Less N. American/Europe exports
- Less production in N. America/Europe

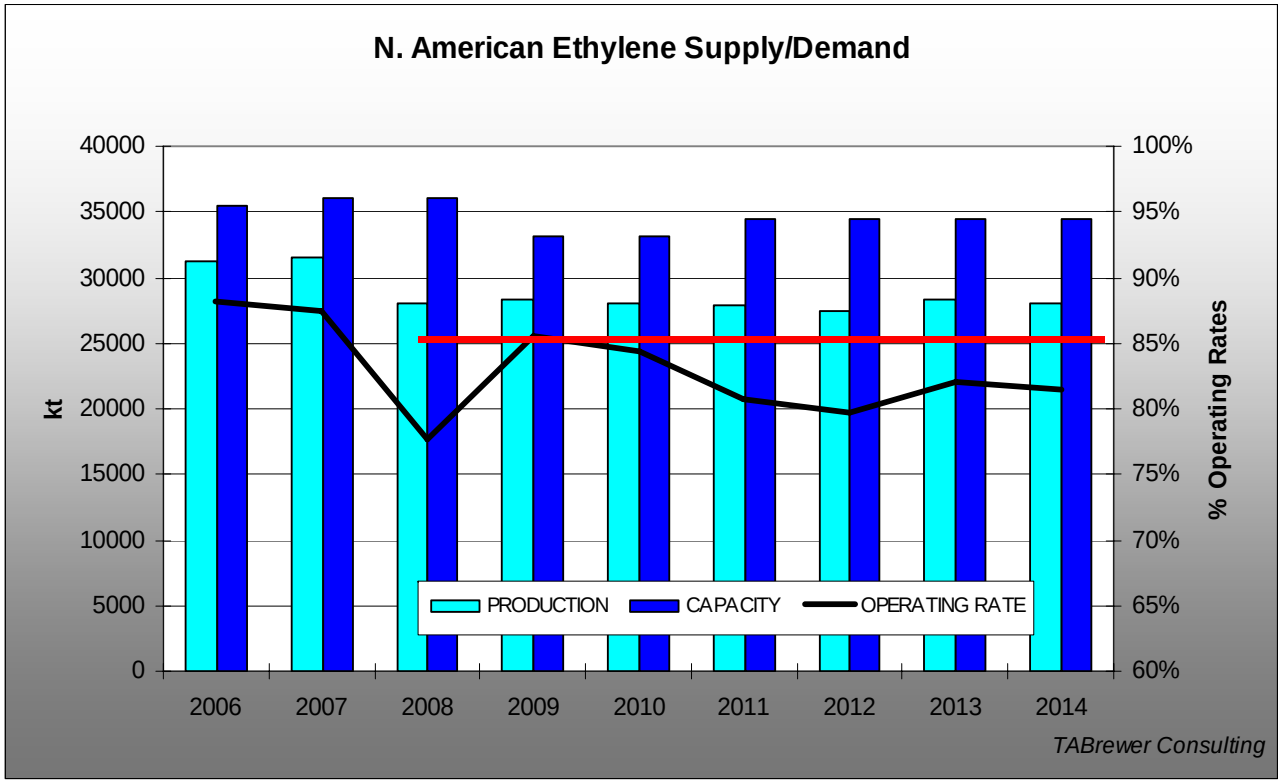
Global Ethylene



- Operating rates expected to be 8% lower than 2006/2007
- Expect capacity rationalization in Western World and Japan to raise operating rates
- 2009-2014 Growth assumed to be 5%, which indicates a global GDP 3%

Growth Rate Is A Critical Assumption

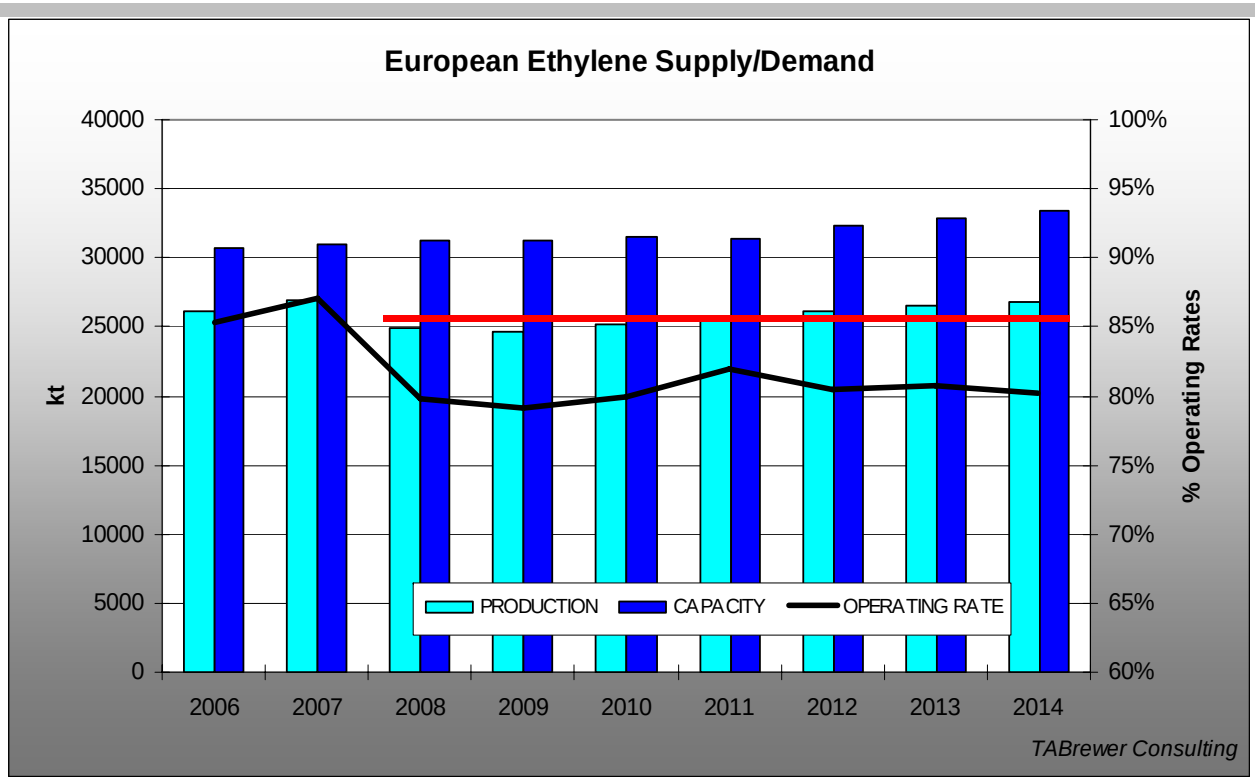
N. American Ethylene



- Typical operating rate is 85% - shown in the red line on graph
- No rationalization reflected in data shown, but expected – small, less flexible liquid crackers most vulnerable
- N. American demand will remain flat as Middle East low cost material takes export business
- Some future risk of more Middle East imports, less domestic production

Less Production Expected

European Ethylene Supply / Demand

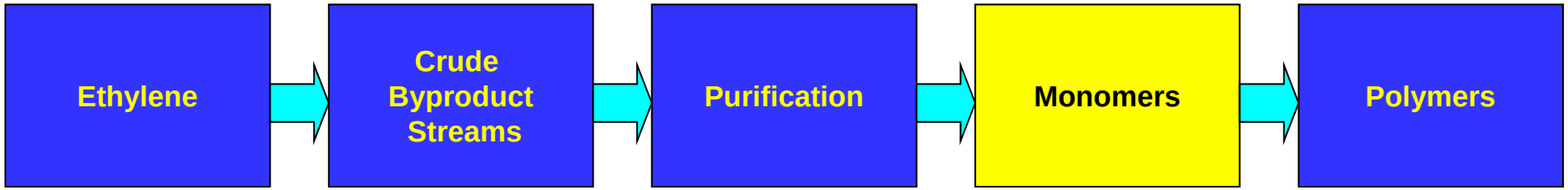


- European region includes Eastern and Western Europe
- No rationalization included the graph, but expected – smaller, less flexible crackers to be most vulnerable
- European region expected to be the region most impacted by Middle East imports
- Assumption is that Western Europe has no growth
- Some future risk of lower production should Middle East producers get more aggressive

No Production Growth in W. Europe

Ethylene Summary

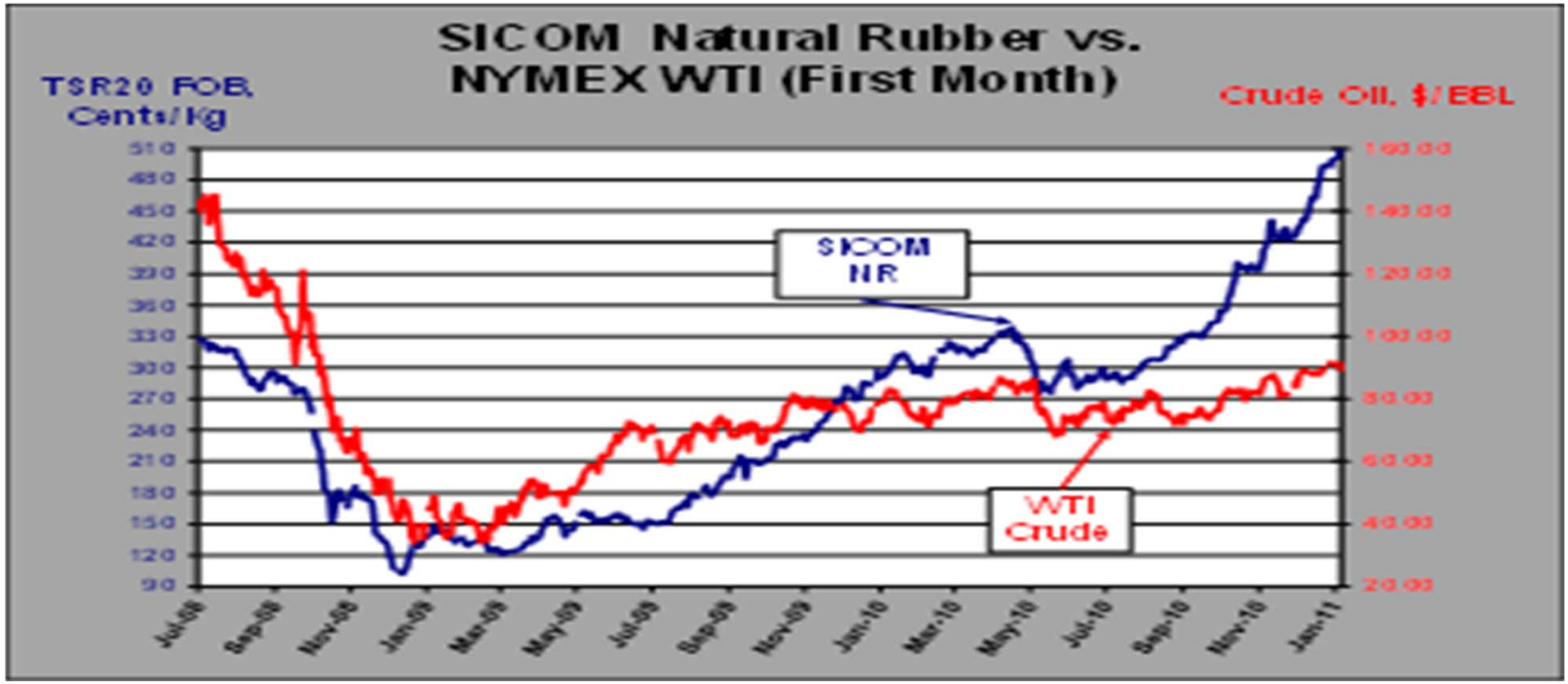
- Gas is bad for byproduct production, liquids are good
- Byproduct production has been reduced in N. America
- Caused by the ethylene cracking slate going lighter to more gas cracking
- Expect to see some additional ethylene capacity rationalization in N. America
- Expect to see some “creep” in cracking more gas in N. America – 10% in five years
- This will make most byproduct consumers increasingly dependent on imported butadiene or imported SBS from Asia



Butadiene & Rubber Supply

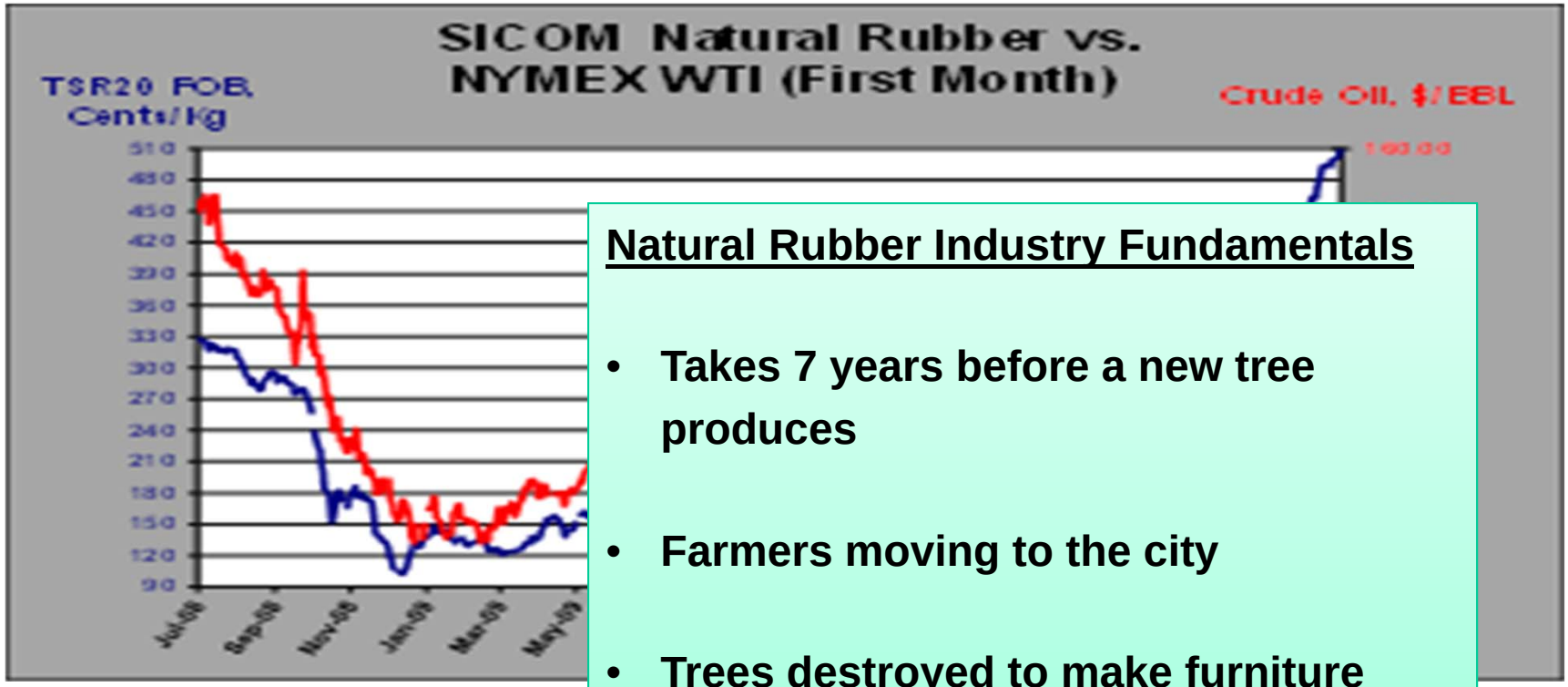
Perspective

Natural Rubber Shortage Makes Things Worse



- Natural rubber is a harvest crop that is in short supply and prices have skyrocketed up
- Reasons for price increase demand growth, weather limiting harvest, and speculation
- NR fundamentals don't bode well for future Bd supply

Natural Rubber Shortage Makes Things Worse



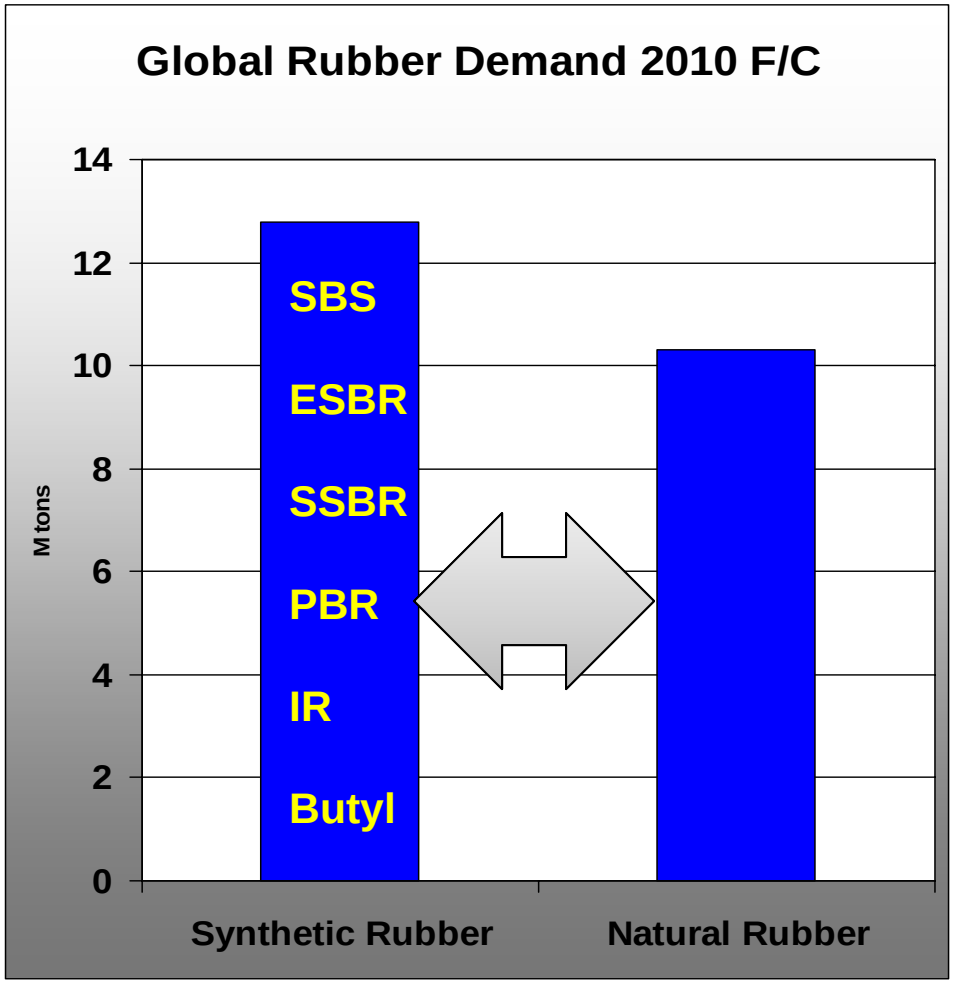
Natural Rubber Industry Fundamentals

- **Takes 7 years before a new tree produces**
- **Farmers moving to the city**
- **Trees destroyed to make furniture**
- **Renewed tire demand growth exceeding production growth**

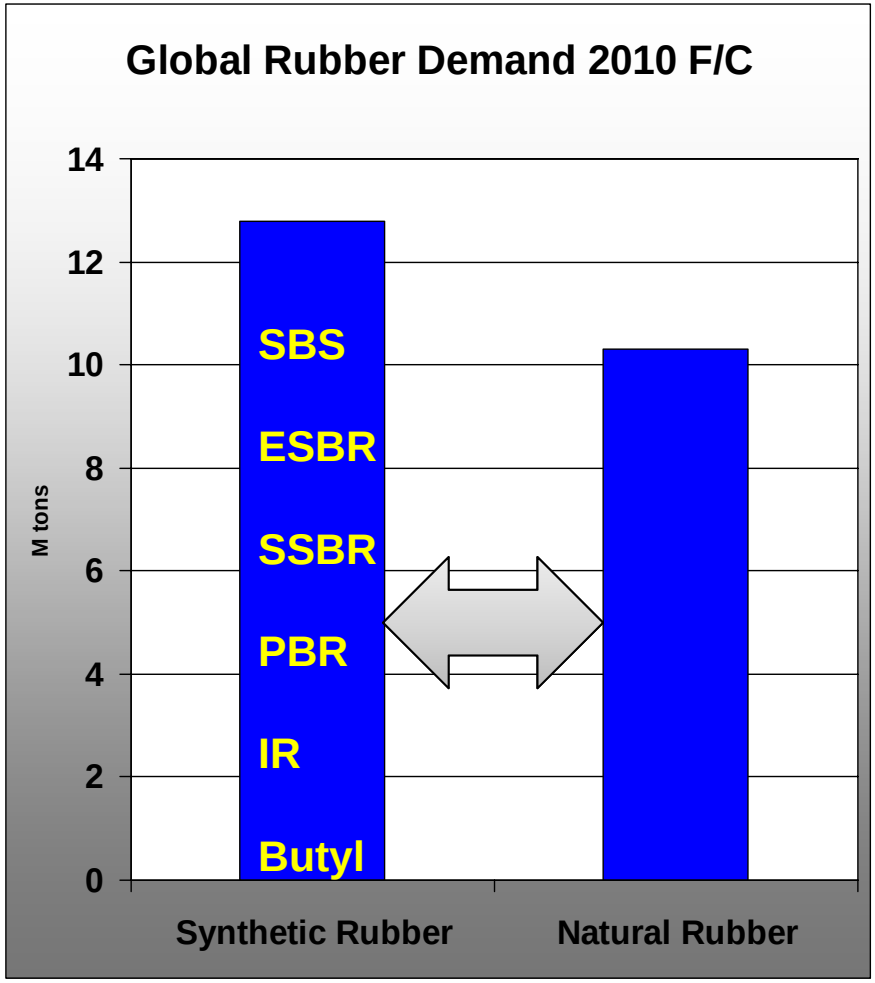
- Natural rubber is a harvest crop … up
- Reasons for price increase dem … on
- NR fundamentals don't bode well for future Bd supply

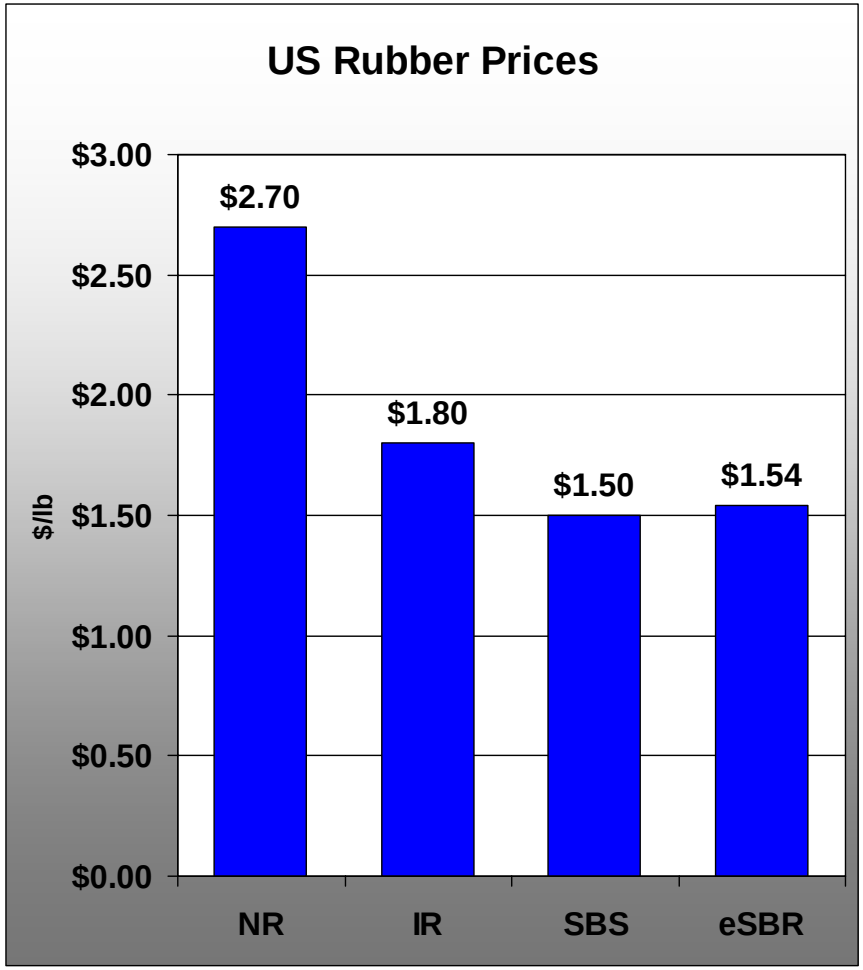
Global Rubber Perspective

- Global 2010 forecasted rubber demand is ~23 M tons
- Demand is forecasted to be up 3-6%
- Largest applications are Tires & Autos
- Most synthetic rubbers based on Bd



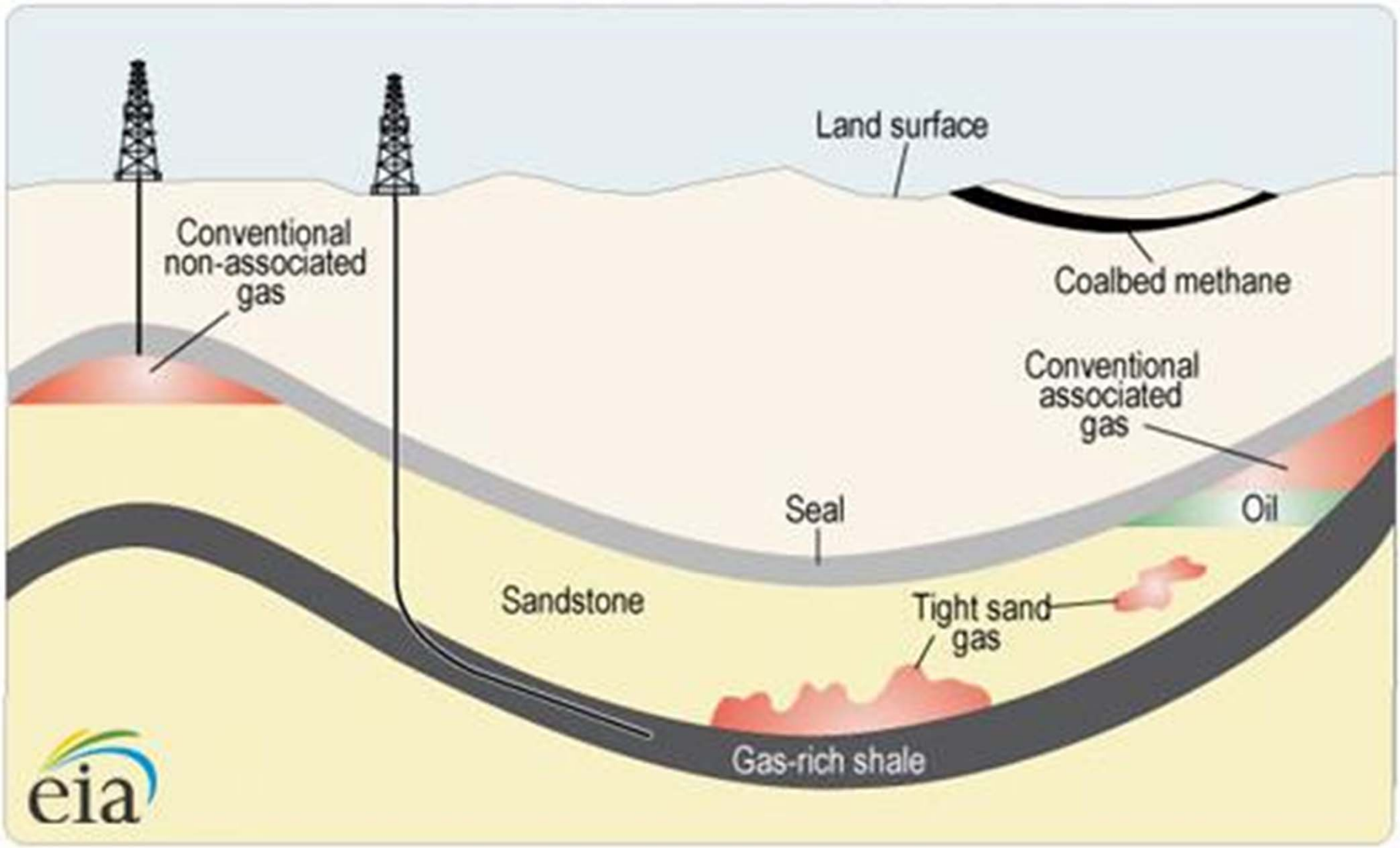
Relative Rubber Pricing





Significant Cost Driver to Switch

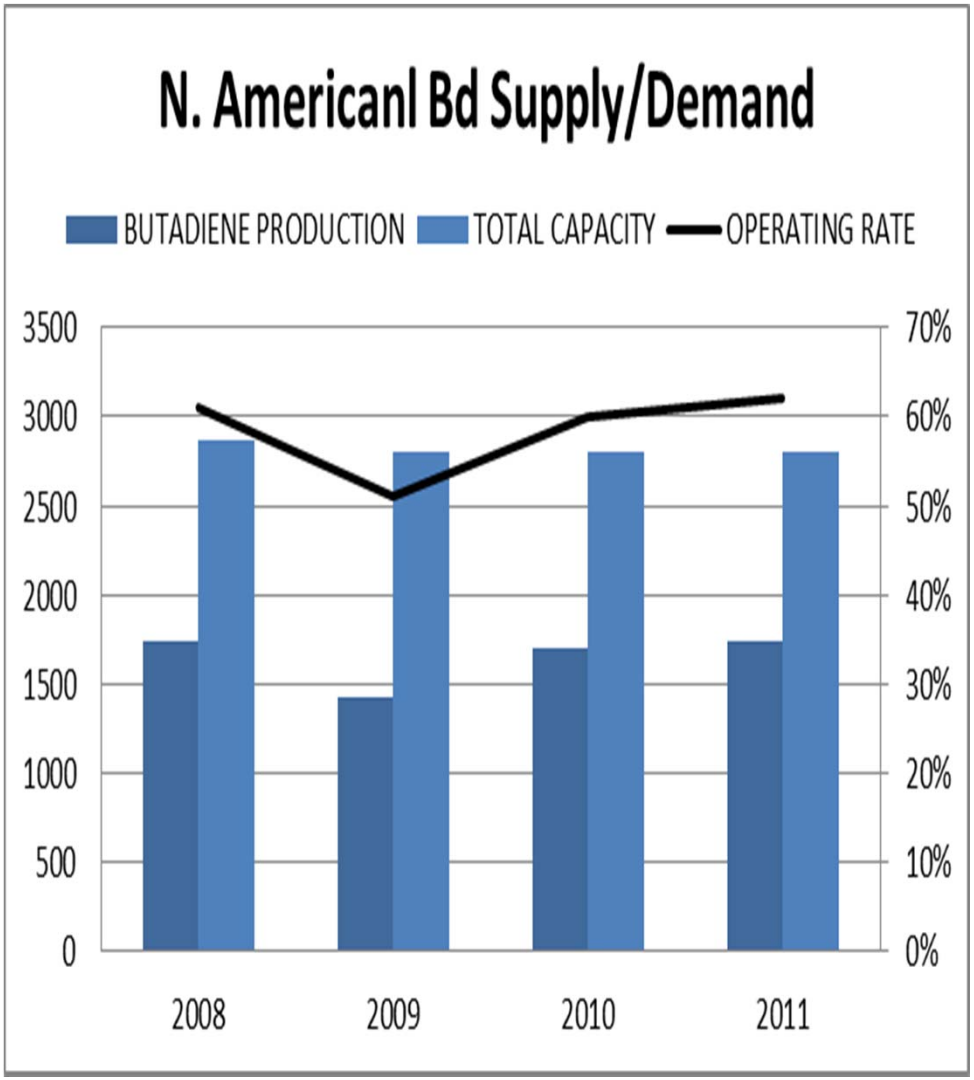
Shale and New Recovery Technology



Butadiene

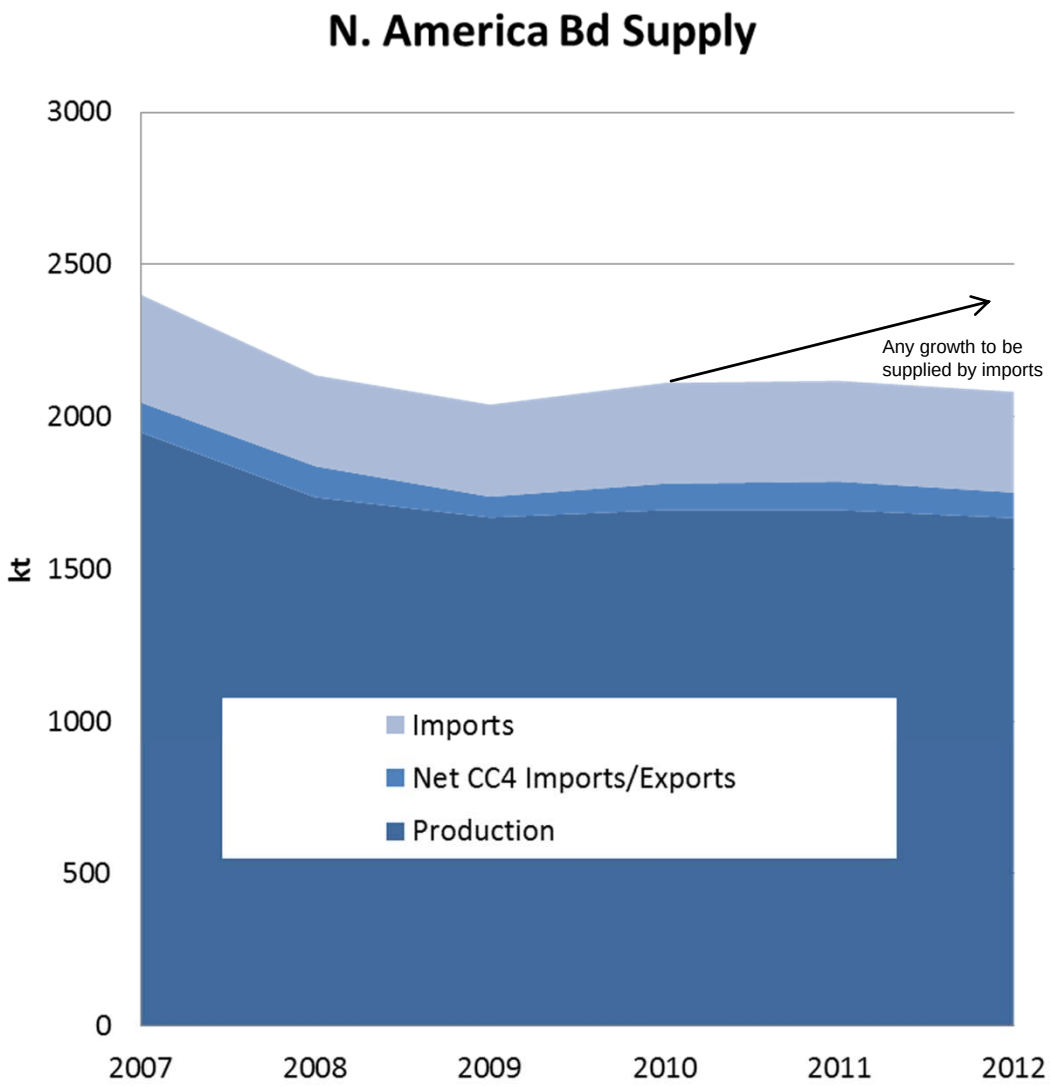
- Comes from liquid cracking
- Suffering under same lighter, gas, cracking supply issues – no crude butadiene
- Europe has been surplus in crude butadiene
- US was the biggest buyer of crude butadiene to fill up their spare purification capacity
- Europe went to a lighter cracking slate and there was less crude to export to US
- US now imports butadiene from Asia at a premium
- Import costs are $300/ton or 12-14 cents/lb

N. American Butadiene Supply/Demand



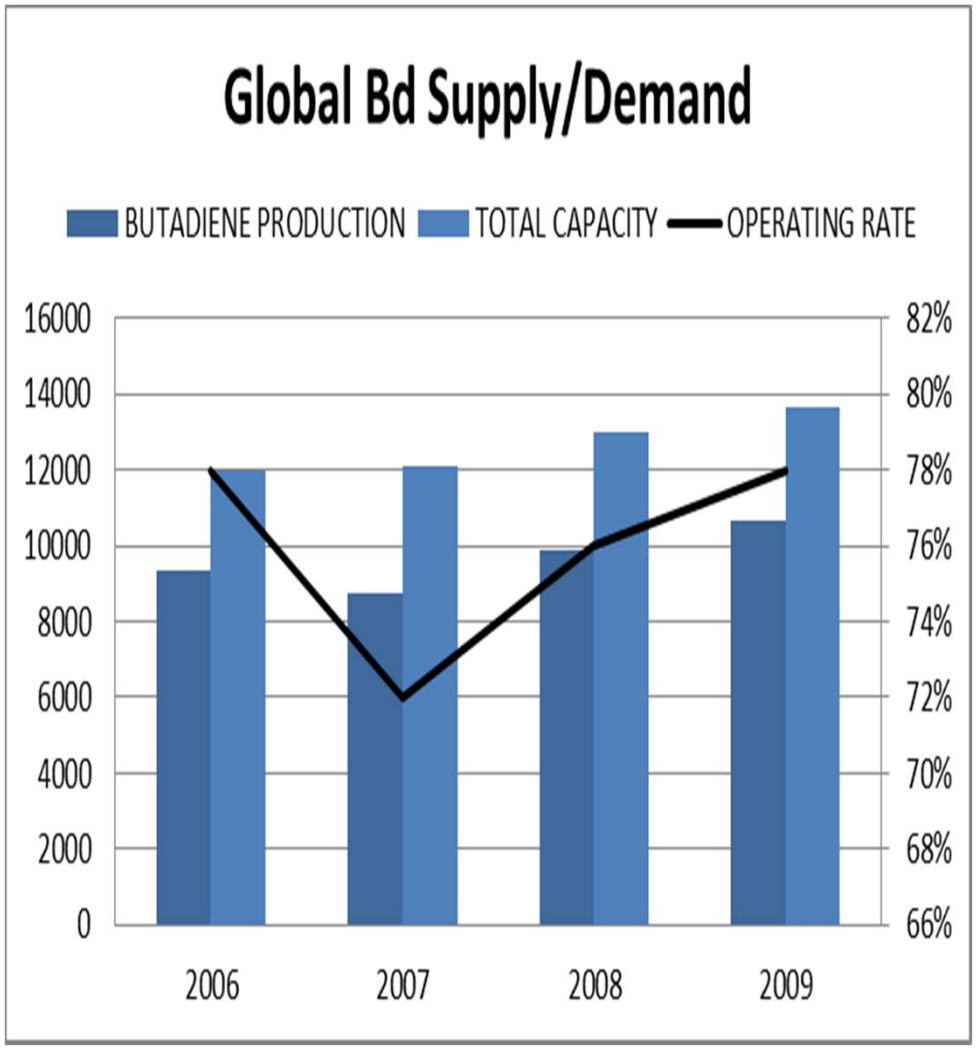
- Production flat
- Capacity flat
- Crude Bd limited from crackers
- Low operating rates

N. American Butadiene Supply Picture



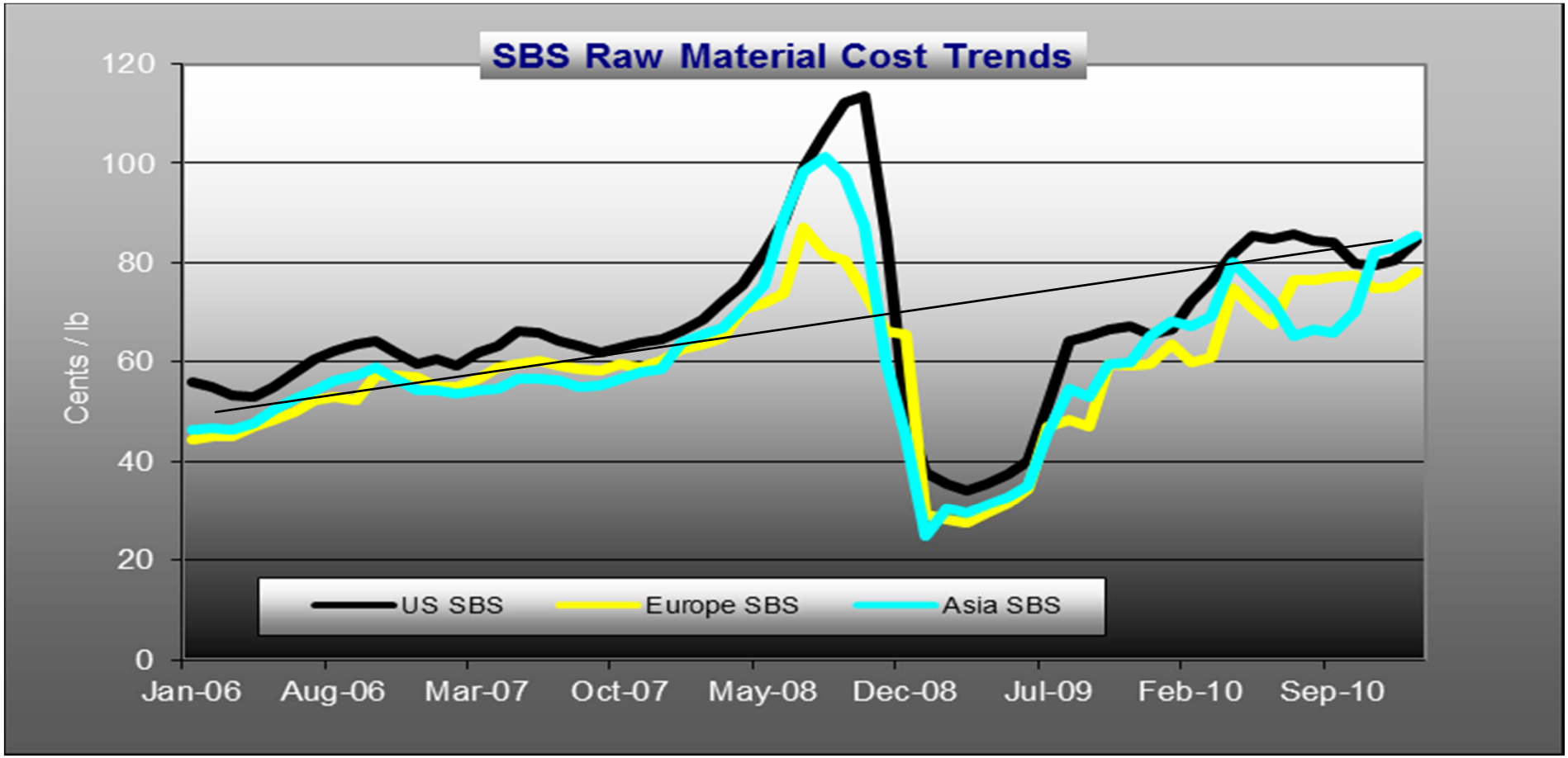
- Based on early 2010 ethylene/Bd assessment
- Best case projected to be flat
- Potential for 5-10% less production over next 5 years
- Imports now account for 15%
- No impact from ME ethylene included

Worldwide Bd Supply/Demand



- Growing supply
- Growing production
- Low operating rates
- Deceptive picture

SBS Raw Material Cost Trends



- Prices peaked with crude oil in 2008
- Prices plummeted with low demand due to global recession
- Now moving back onto the increasing cost trend line

Butadiene Summary

Major Factors Affecting Butadiene Supply

- Lighter cracking creating less supply of domestic crude Bd
- Less crude Bd to import to purify as the world goes to lighter cracking
- Higher than anticipated US tire production to Chinese tire tariffs
- Global crude Bd supply not keeping up with demand in a recovering economy
- Natural rubber creating a big crossover opportunity for Bd based rubbers

US Price and Supply Implications

- More dependent on imports
- Prices set by natural rubber in other regions of the world
- US prices set by overseas prices plus freight