

Impact of Natural Gas & Crude Oil on Plastics “Volatility”

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Dow Wire & Cable

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Ladies and gentlemen,

Thank you all very much for allowing me to be here and represent my colleagues in Dow Chemical. It is a real honor for us to participate in this type of venue with some of the most strategic customers for us in the world.

At Dow we are in a stage of evolution looking at how we move downstream to become more intimate with customers, to understand their needs, how we change the dynamics of the market and how we introduce new technology.

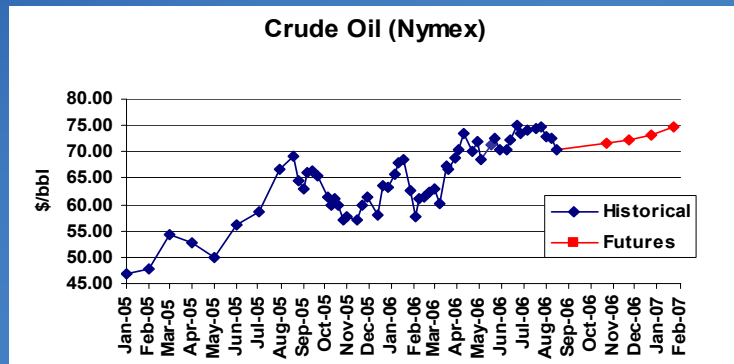
One of the things that I am going to look at is the value of the raw materials and I had hallmarked my presentation “volatility”. I looked up the definition of volatility and found “easily evaporated at normal temperatures and pressures” and “easily vaporized”. Then I thought maybe my presentation should be hallmarked “deluge” or “overflow of water”. But when looking at the price of crude oil and natural gas recently, I thought “volatility” is the right characterization.

My agenda for this presentation is:

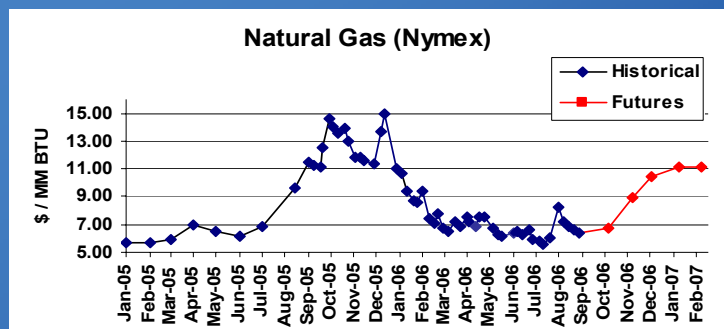
- Oil and natural gas overview
- Polymer building blocks
- Polymers
- Summary

Feedstock Pressures / Oil & Natural Gas

- Crude oil prices are up 5% since the end of March 2006 and up 2% compared to August 2005



- Natural gas pricing is down 15% since the end of March 06 and down 44% compared to August 2005.



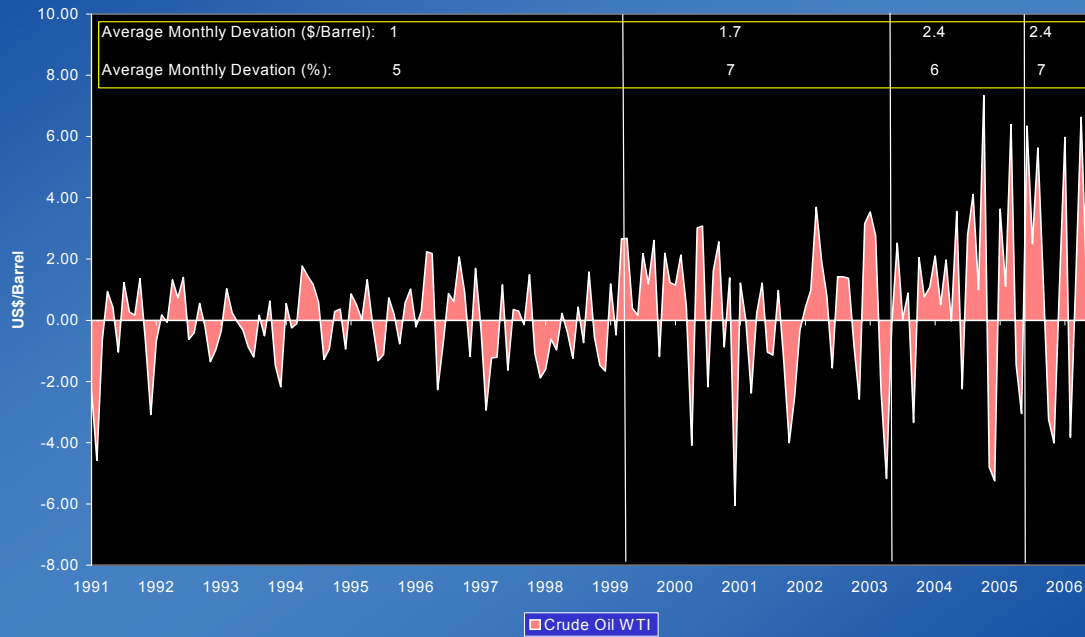
SOURCE: Dow HC&E

These charts were put together several weeks ago. You all know, crude oil has taken a precipitous drop. Yesterday in Doha OPEC got together and they decided to cut production by 1.2 million barrels. Crude went up 85 cents to \$58. Crude is now on a race back closer to these numbers than what was perceived 24 hours ago. The 1.2 million barrels a day represents about 4.4% of OPEC's production, about 1.2% of global consumption. These are the types of dynamics in the world that we are living in right now.

The same thing happens to natural gas. It dropped close to \$4.50 per MMBTU on the spot basis. Yesterday it traded up 32 cents above \$7. So volatility is demonstrated here and now.

Feedstock Price Volatility - Oil

Crude Oil WTI Spot (North America)

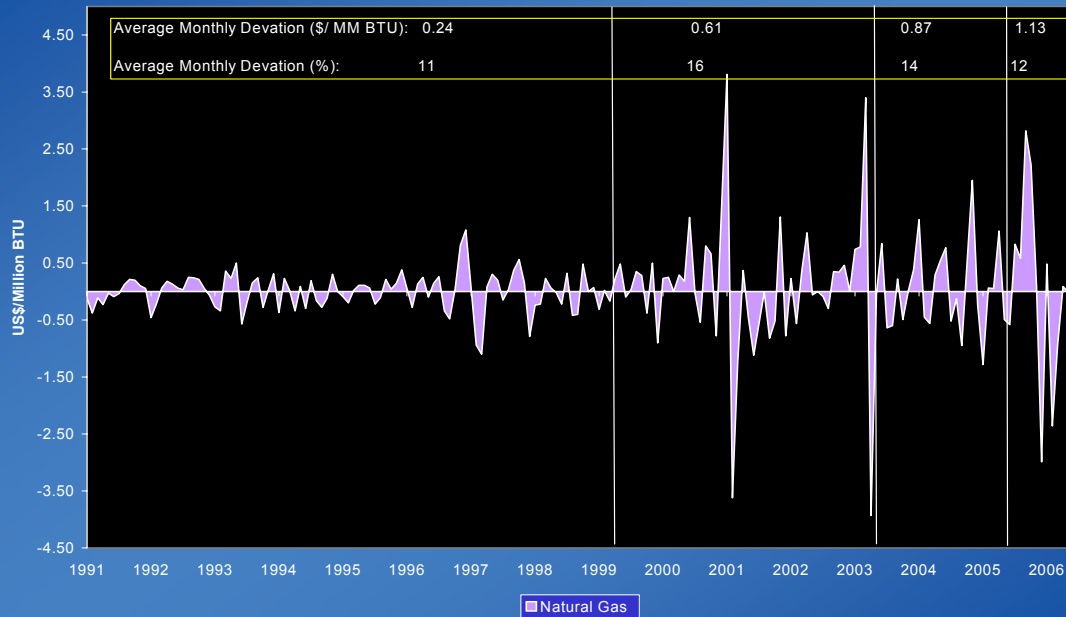


Source: CMAI

Here are some slides to exemplify the volatility. Until early 2000 the volatility of crude oil was on the down side. But then in 2003 and 2004 the demand in China increased dramatically and the volatility was going every which way.

Feedstock Price Volatility – Natural Gas

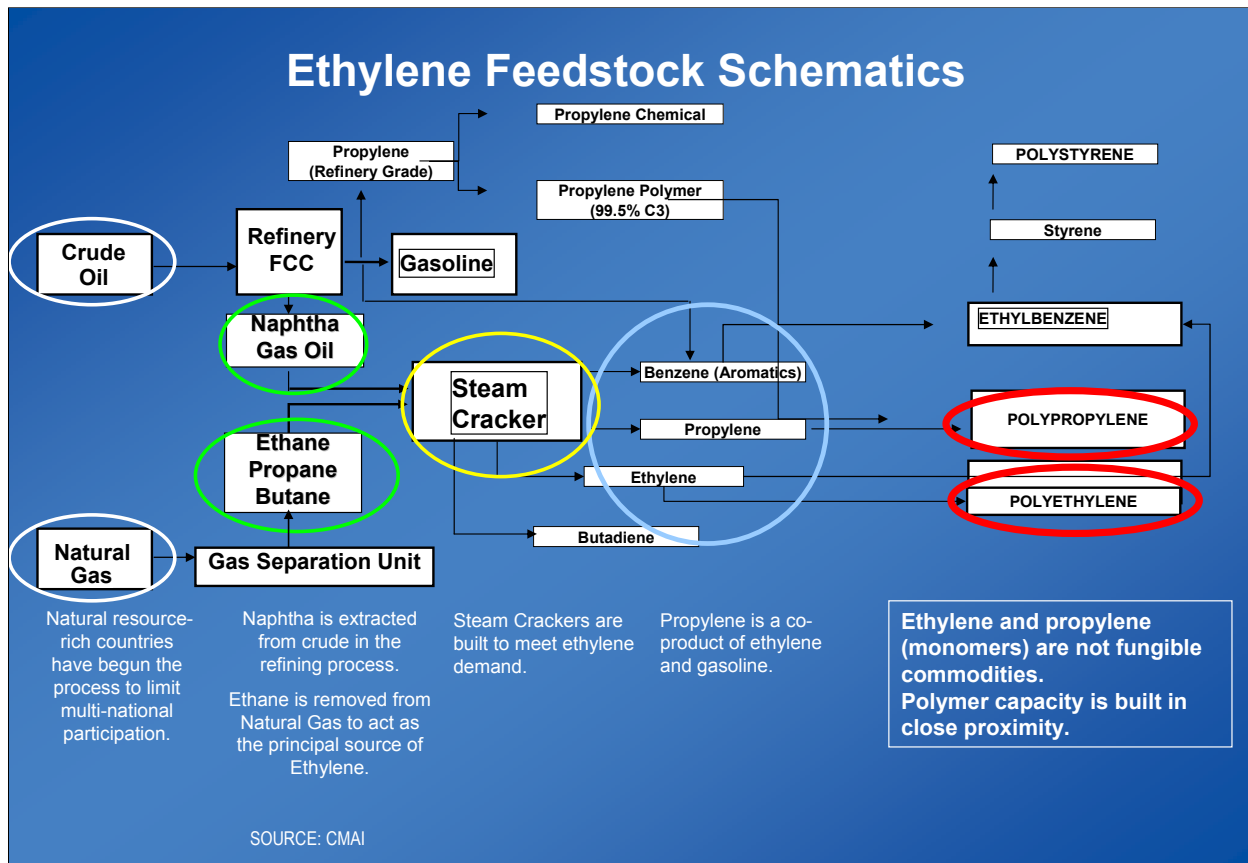
Natural Gas Contract Burner Tip (North America)



Source: CMAI

Volatility in natural gas - this is predominantly oriented around North America - has been in place for some time. It is a direct consequence of the inability of the industry to store natural gas. In North America we store less than 3% of our overall consumption of gas, but the demand is extremely seasonal.

Now I will discuss the building blocks and try to explain the capital intensity and what drives the true cost of polymers.

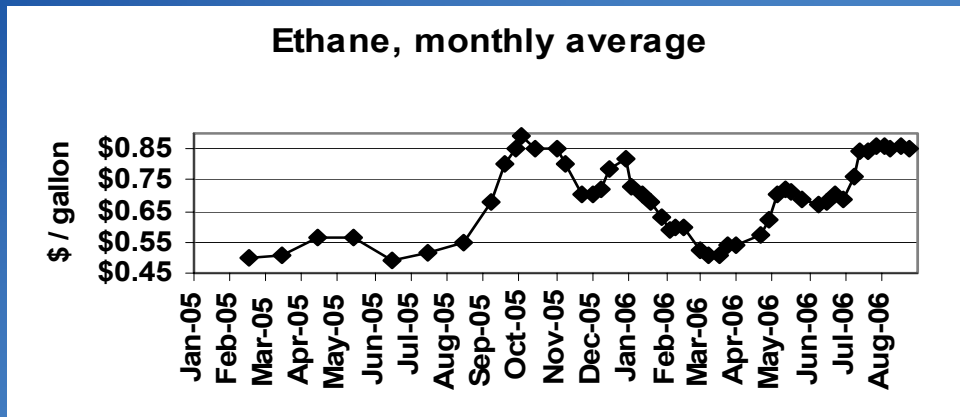


This is a relatively complex model as you look at it. It takes all these dimensions to provide one pound of polyethylene or of PVC to produce cable. We don't often have one specific product. The unit ratios are variable, depending on the quality of the feedstocks we bring in to our crackers. That is very similar to a refinery infrastructure. 5 years ago many places were privatizing natural resources, now they are nationalizing. With that you get a loss of transparency. You get significant issues associated with multinationals and their inability to go into countries, and those multinationals typically provided some transparency to the market. This is something which could induce more volatility as we move forward.

As you go from crude oil or natural gas, which are the fundamental building blocks, you go either to a refinery to get Naphtha, which is a co-product in producing gasoline and jet in the distillation column, or you punch a hole in the ground and you get natural gas and associated liquids like ethane, propane, butane and C5. Those are fractured out. Typically those were byproducts and that was the hallmark of the petrochemical industry in the US gulf coast. Ethane is not fungible like natural gas, very expensive to distribute. As a consequence the petrochemical industry developed a technology to take ethane to produce ethylene.

When you put Naphtha in a cracker you don't get a lot of ethylene, you get a lot of propylene and benzene. If you put ethane in to a cracker, you get a lot of ethylene. Those ratios change, based on what the initial investment was and what the dynamics are in the market, as relates to the value of those monomers.

Feedstock Pressures –NA Ethane



Ethane pricing is up 57% since the end of March 2006 and up 18% compared to August 2005.

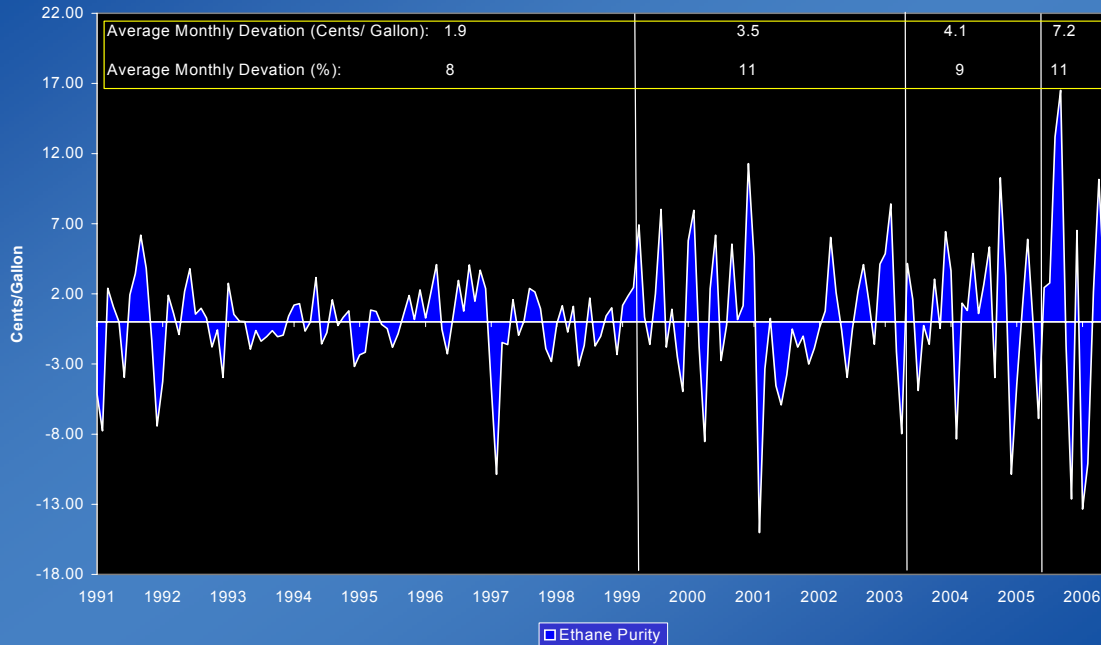
SOURCE: Dow HC&E

From the building blocks you then go further downstream, where you would extract the benzene and the propylene. Propylene can be extracted either through the steam cracker or out of the gasoline pool. Propylene is a very fungible material.

It is very important to understand in the context of these feedstocks, there is alternate value for them at all times. For example, ethane can go back into natural gas, methane, to about 8%. Because ethane is not fungible, you find that, where it is produced is where it needs to be converted either into ethylene or polyethylene or vinyl or PVC.

Feedstock Price Volatility – NA Ethane

Ethane Purity Spot (North America)



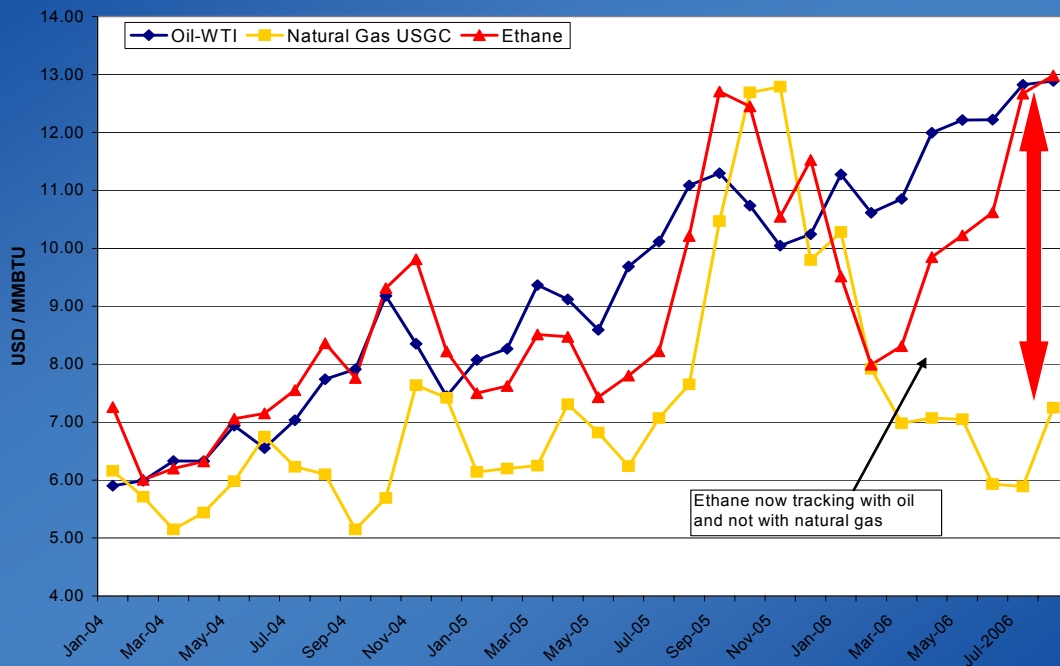
Source: CMAI

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The US gulf coast had a tremendous amount of ethane, when we had an abundance of natural gas. You see a migration of production to the Middle East, because there is a lot of stranded natural gas.

You then go from the building blocks to the polymers. They are truly fungible in nature and they can be shipped around the world and arbitrated much easier than many of these monomers. Ethylene cannot be arbitrated, benzene is a fairly fungible commodity, propylene is not as fungible but more than ethylene.

Feedstock Prices



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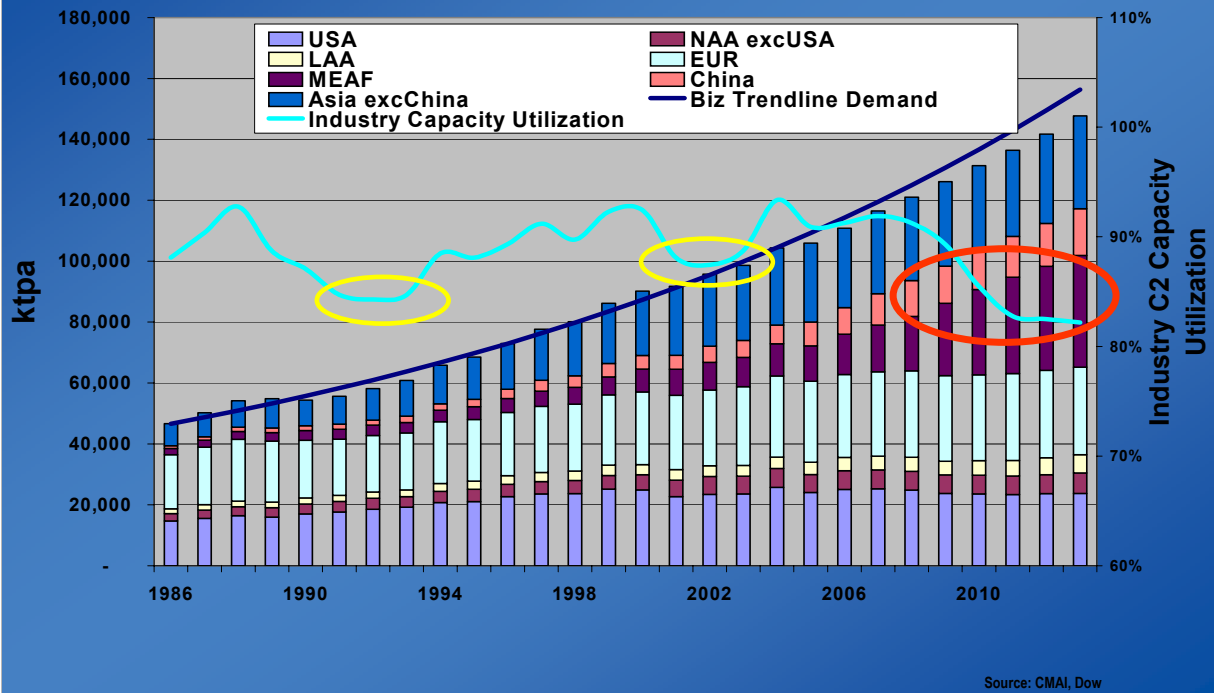
Source: CMAI

As you take a look at ethane there has been some significant dynamics. Ethane is the fundamental building block that goes into steam crackers in the US gulf coast. There are people who have gas crackers or Naphtha crackers, but the predominant feedstock is ethane. In Europe it would be natural gas or Naphtha, in Asia Pacific it is Naphtha, which is crude oil related, and in the Middle East you get an ethane building block. Ethane has historically tracked natural gas to the US gulf coast. Over the last 6 to 9 months there has been a significant disconnect.

If you take a look at that you see in the yellow graphic, that is natural gas, it cost money to fracture ethane out of natural gas. When you leave the ethane in, it goes at natural gas parity. Typically they have traded in very close proximity.

The disconnect is a consequence of the drier gas available in the US. Some of the fields out in the Gulf of Mexico, that are not operational as we speak today, were having drier gas, and there were two significant fractionators taken out. So it was a supply – demand phenomena. We don't believe it is sustainable, but it created a significant financial impact.

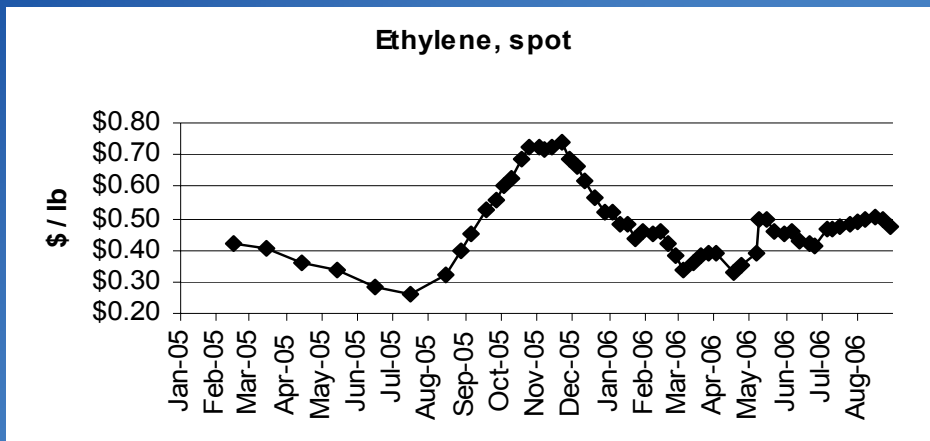
Global Ethylene Demand – 7 Region Basis



I also want to speak about ethane in the Middle East. Many people believe that there is plenty of ethane forever in the Middle East. Right now there are forecasts that Saudi Arabia will run out of ethane by 2010 and then that petrochemical base will go to Naphtha, where your capital intensity is significantly higher.

There are parts of the world that have an abundance of natural gas, whether this may be Iran or Russia. Those are areas, we think, that will also evolve with building blocks and the associated polymers.

Feedstock Pressures – NA Ethylene



Spot ethylene pricing is up 26% since the end of March 2006 and up 9 % compared to August 2005.

SOURCE: Dow HC&E

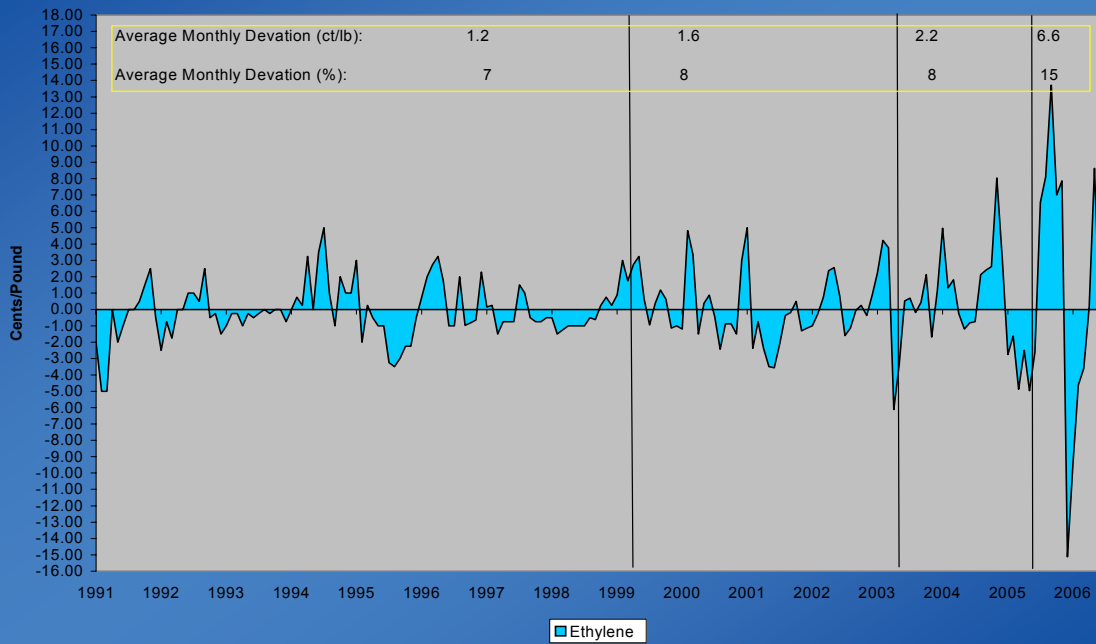
If you look at the ethylene supply and demand balance in the world and the growth you see as you go forward, a vast majority of ethylene capacity is going to be added in the Middle East. I caution this because most of this capacity is hallmarked for Iran. There are quite some questions that this will take place.

Our industry is highly dependent on ethylene operating rates. If you look at the polyethylene prices, they are oriented around the operating rates of ethylene. If you take a look at where we are right now, we are running a very tight supply demand balance for ethylene. Hence, the pricing for polyethylene move up and stay high. Some of that is raw material cost driven, some of it is due to the supply demand dynamics of ethylene. In the future there is a significant downturn in ethylene, which would mean very low polyethylene prices.

If you take a look at ethylene. It is traded on a spot basis, but it is really an incremental trade in order to optimize and balance people's crackers. These plants typically go down every 3 to 5 years for a month at a time, where you have 6000 to 7000 contractors coming to do turnarounds. The ethylene market is very thinly traded.

Feedstock Price Volatility – NA Ethylene

Ethylene Spot (North America)

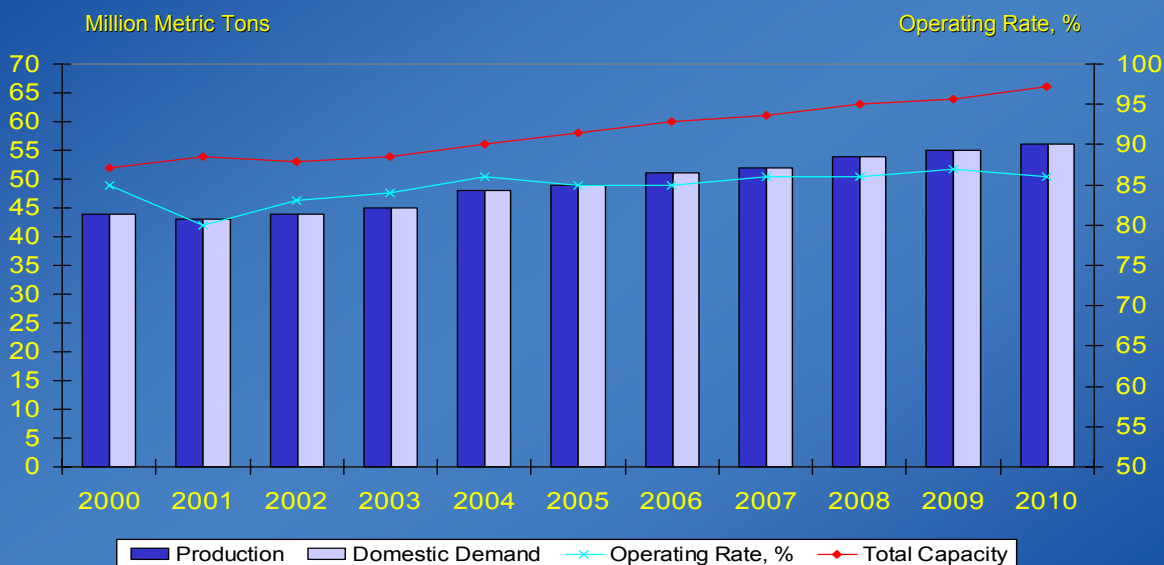


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Source: CMAI

You see the volatility of ethylene as a direct consequence of ethane and some of the dynamics which have taken place in the US gulf coast and the capacity being built in the Middle East.

World Chlorine Supply / Demand

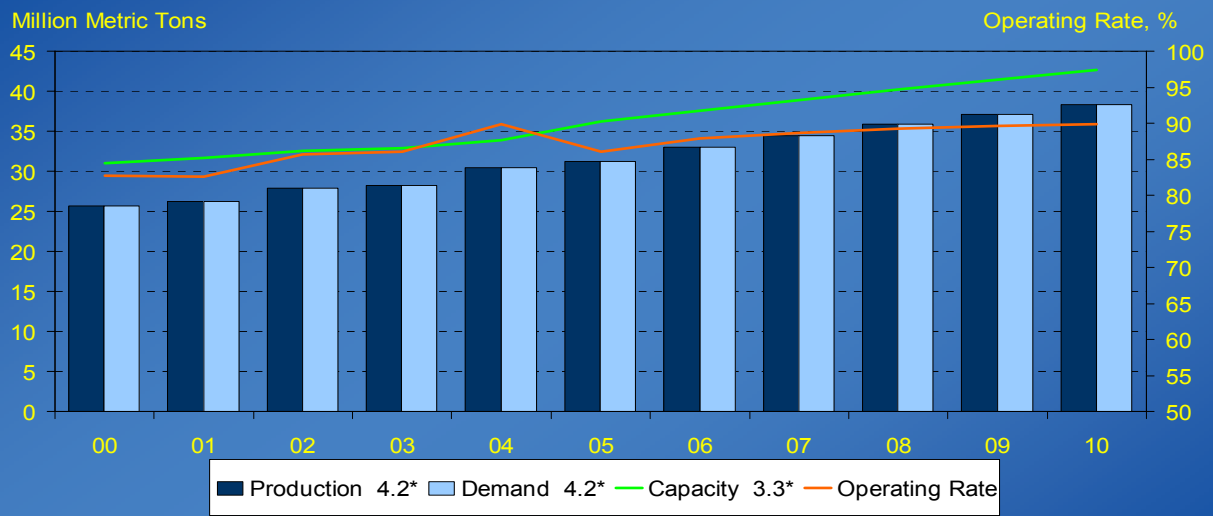


Source: Dow, CMAI, ATEC

Now I want to turn my discussions towards PVC. The fundamental building block for PVC is chlorine. It is important to note that you don't produce chlorine on purpose. You produce chlorine in, what we call, an electrolytic process, in which you produce at the same time 1 pound of chlorine and 1.1 pound of caustic soda. There is a balancing act of who is driving the relative supply demand and the needs in the market and how you optimize your assets.

The relative capacity is flat. This is being driven by the pressure that is being put on chlorine molecules. PVC is a tremendous thing for the chlorine molecule. There is a lot of rationalization of capacity and displacement of capacity.

World Vinyl Chloride Monomer Supply / Demand



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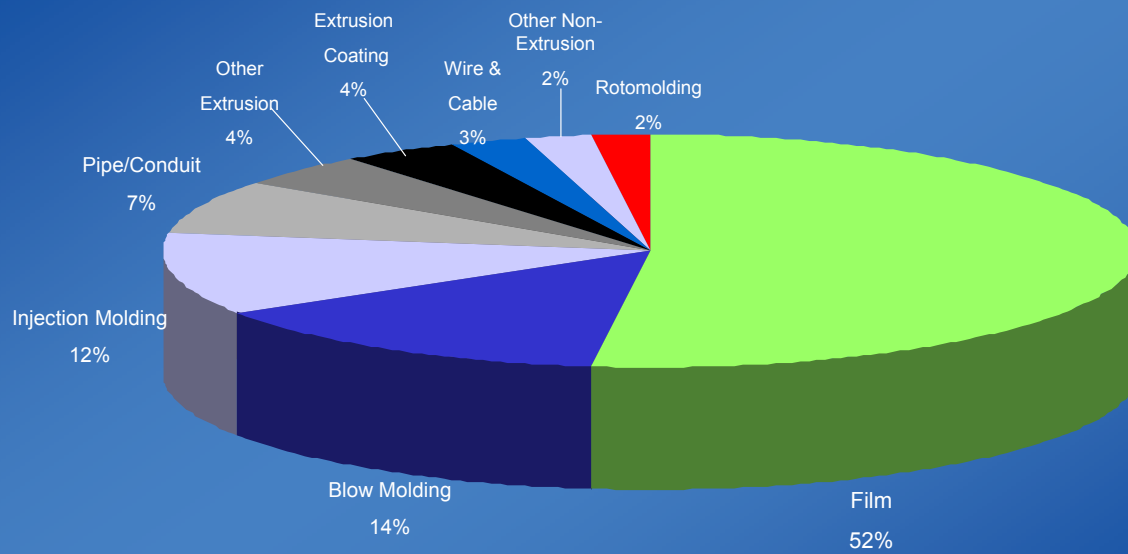
Source: Dow, CMAI, ATEC

From chlorine you then go to an intermediate, we call, ethylene dichloride, which is fairly fungible, and then you go to vinyl chloride monomer which is then polymerized to PVC.

The PVC market like the chlorine market is almost in a stalemate in where the demand is going to go. Obviously for pipes the PVC demand looks strong. We see pressure on PVC in automotive wires. I believe, that the whole PVC market is in a sit and analyze mode. The chlorine alkali infrastructure that feed this is going to rationalization and rebuilding. We, Dow Wire & Cable, do not sell PVC, but we, Dow, are the largest producer of vinyl chloride monomer and chlor-alkaline in the world. This is a market we are evaluating to get into.

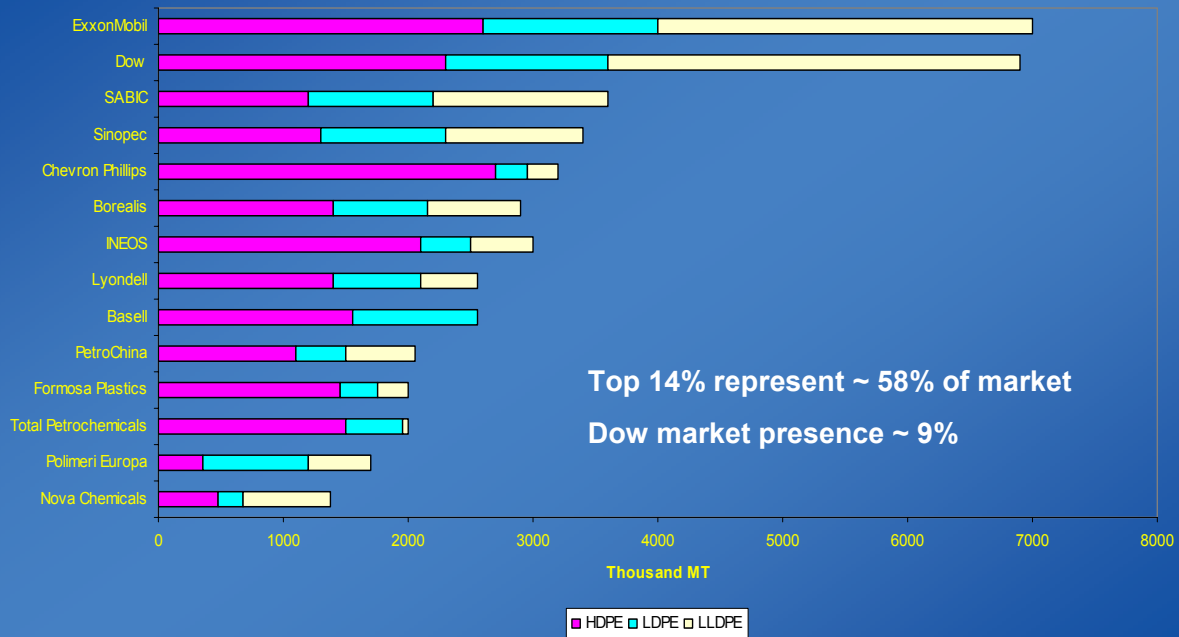
Now I want to turn to the polymers themselves.

2005 World PE Consumption Detail



If you look around the world, it is important to note, that the amount of polymers that is consumed in wire & cable applications is relatively small. It is a very special application. It typically is an increment of very large polyethylene trains where we extract the highest quality of products that is produced due to the dielectric requirements of the application. Many of the applications have been commoditized.

Top Global PE Producers - 2006

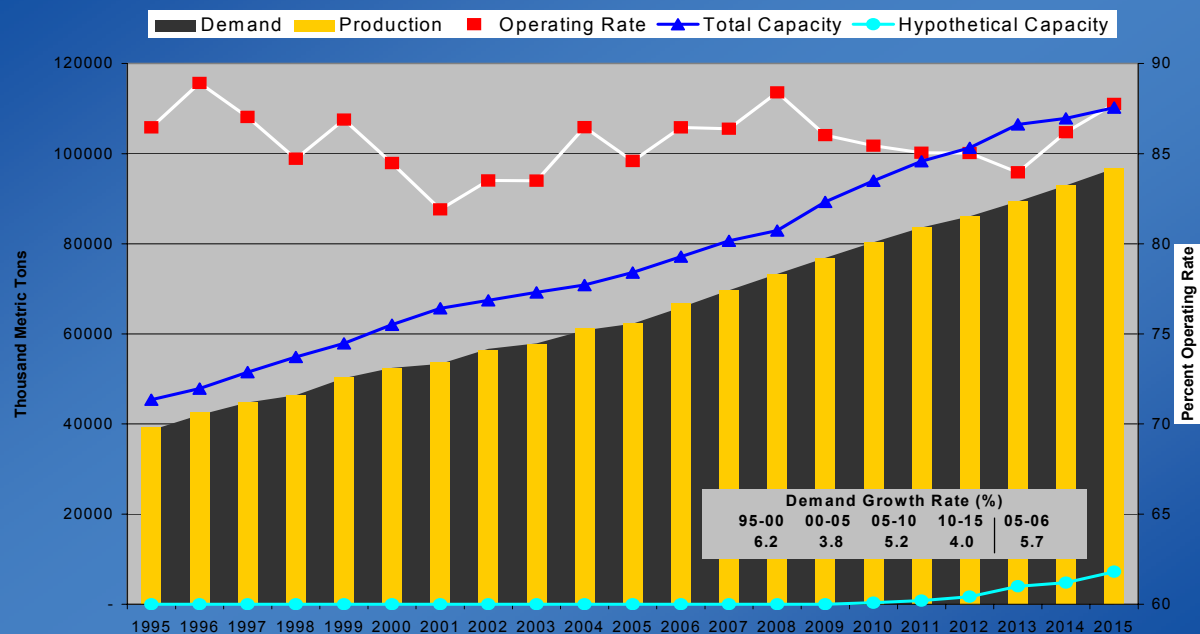


These are your largest producers. Historically, Dow has been the largest producer. ExxonMobil have been adding capacity and licensing technology in the Middle East and also in Asia Pacific. They have done this in conjunction with their refinery infrastructure.

People like ExxonMobil, who are the last major oil companies who stayed in the plastics business, view this as an integral part of their refinery assets.

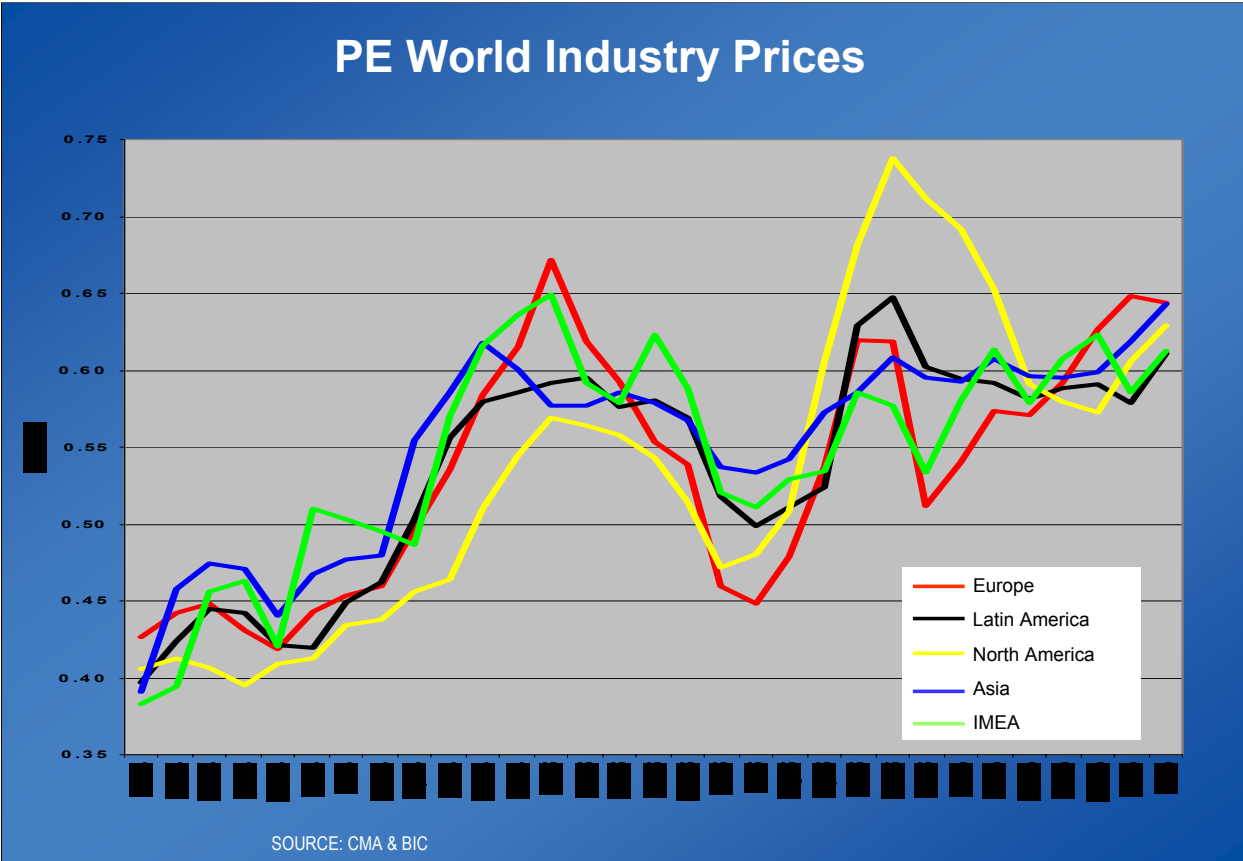
Source: CMAI.

World Polyethylene Supply / Demand



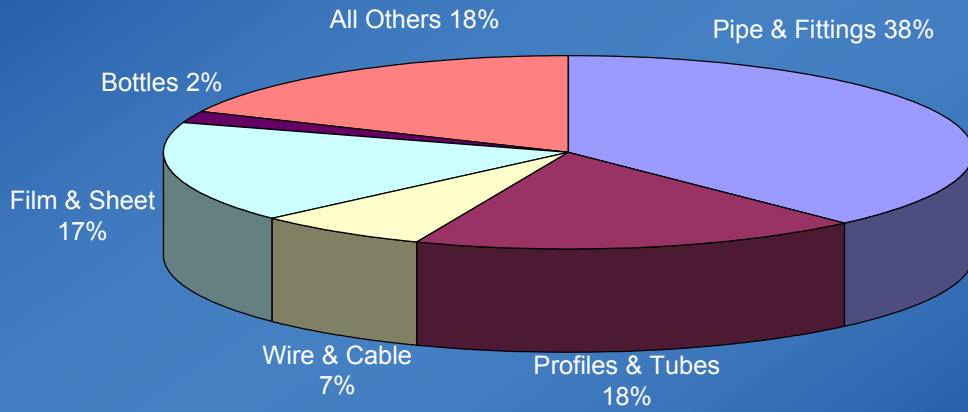
Source: CMAI & Dow (9/13/06)

If you look at the supply – demand balances of polyethylene, you find that polyethylene is very closely mirrored to that of ethylene. Typically the operating rates do not run as high, because they have to take the swings of other derivatives that are not taking ethylene. That is an inherent characteristic of the derivatives downstream. You do very rarely see operating rates much above 85% or 90% in the derivative portfolio.



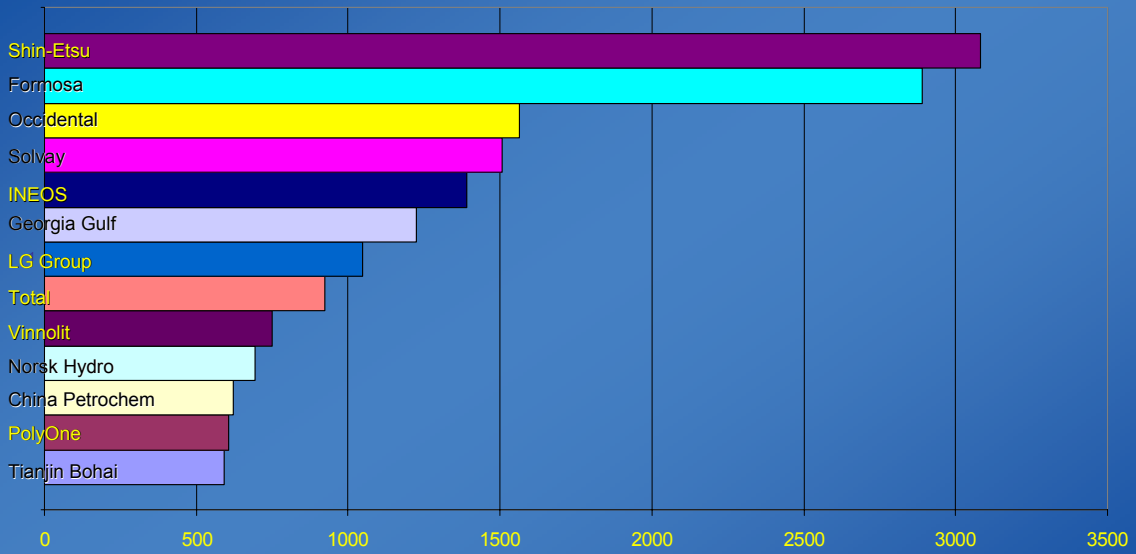
When you talk about polyethylene (PE) pricing, you see that the PE prices trade in a fairly narrow range. There have been some excursions. They are typically due to issues that take place in the given geographic region. You see here in December in North America where prices really skyrocketed. That was a direct consequence of the hurricanes. This is one of those situations where balances both on ethylene and polyethylene are relatively tight, making sure that you have your sources clearly aligned and have a multitude of sites around the world and around the US that can feed your requirements. Obviously, that particular scenario is not sustainable, because after several months you see material being arbitrated. Typically that comes in the state of the most fungible products.

2005 World PVC Consumption Detail



PVC is in a similar situation. Although you think that PVC is a major end use in building and construction, but in reality it is relatively small in the overall PVC production.

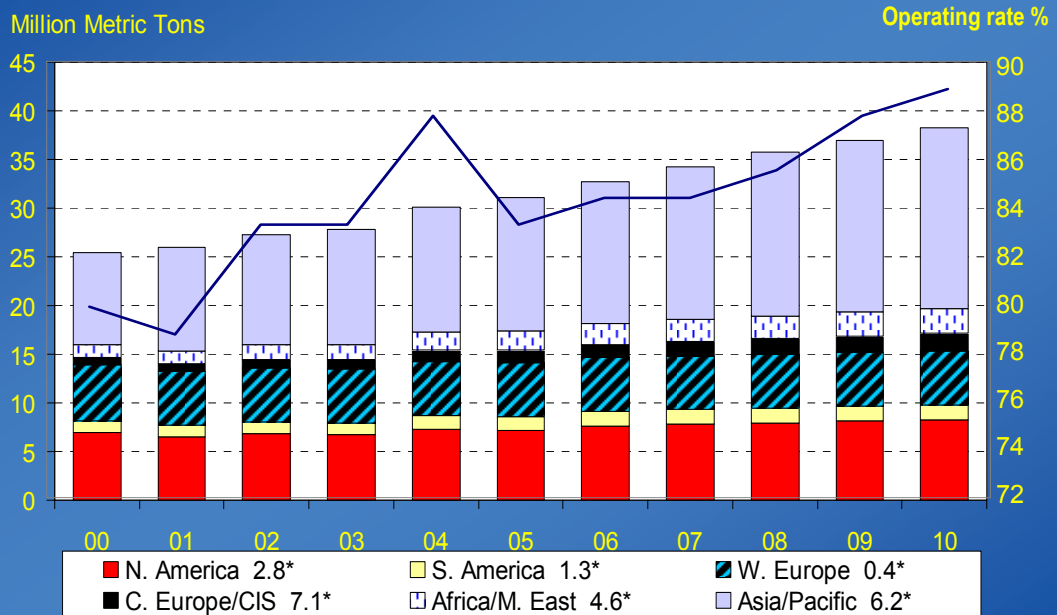
Top Global PVC Producers - 2005



Source: Dow, CMAI, ATEC

The biggest producer of PVC is Shin-Etsu. Many of you know them as Shintech here in North America. There is a tremendous amount of consolidation going on in this industry due to the dynamics that are taking place on future supply – demand balance.

World PVC Supply / Demand

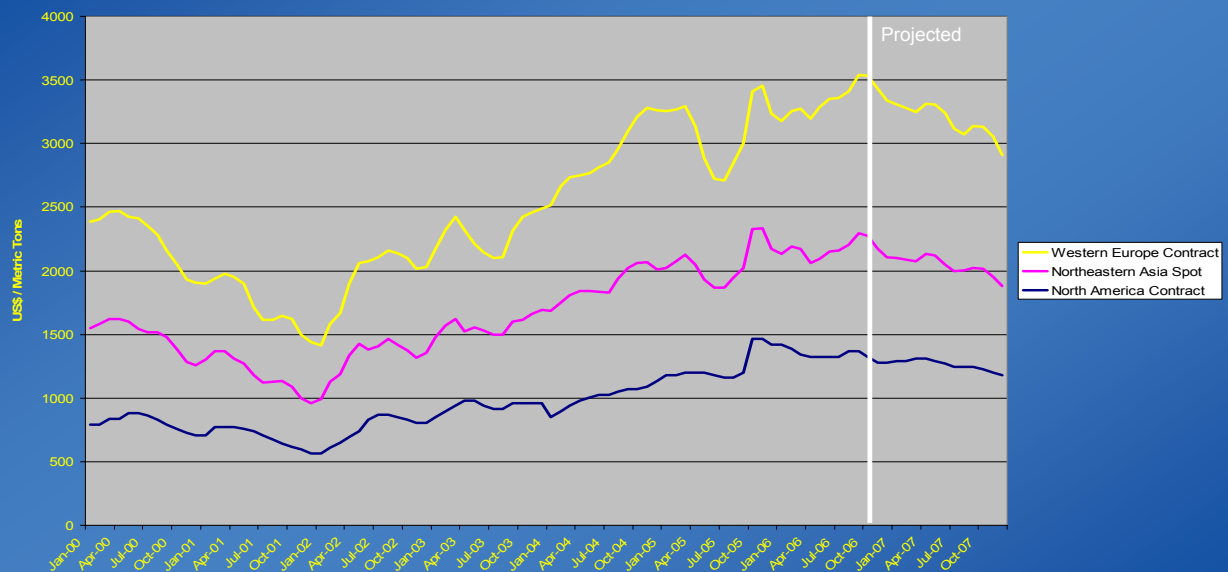


*%AAGR 2005-10

The PVC world anticipates running a higher operating rate and that is a consequence of people not adding capacity.

Once again you see that a lot of PVC capacity will be added closely to the chlorine-alkali cell, to the EDC vinyl reactors, versus putting those facilities in areas where you are feedstock advantaged.

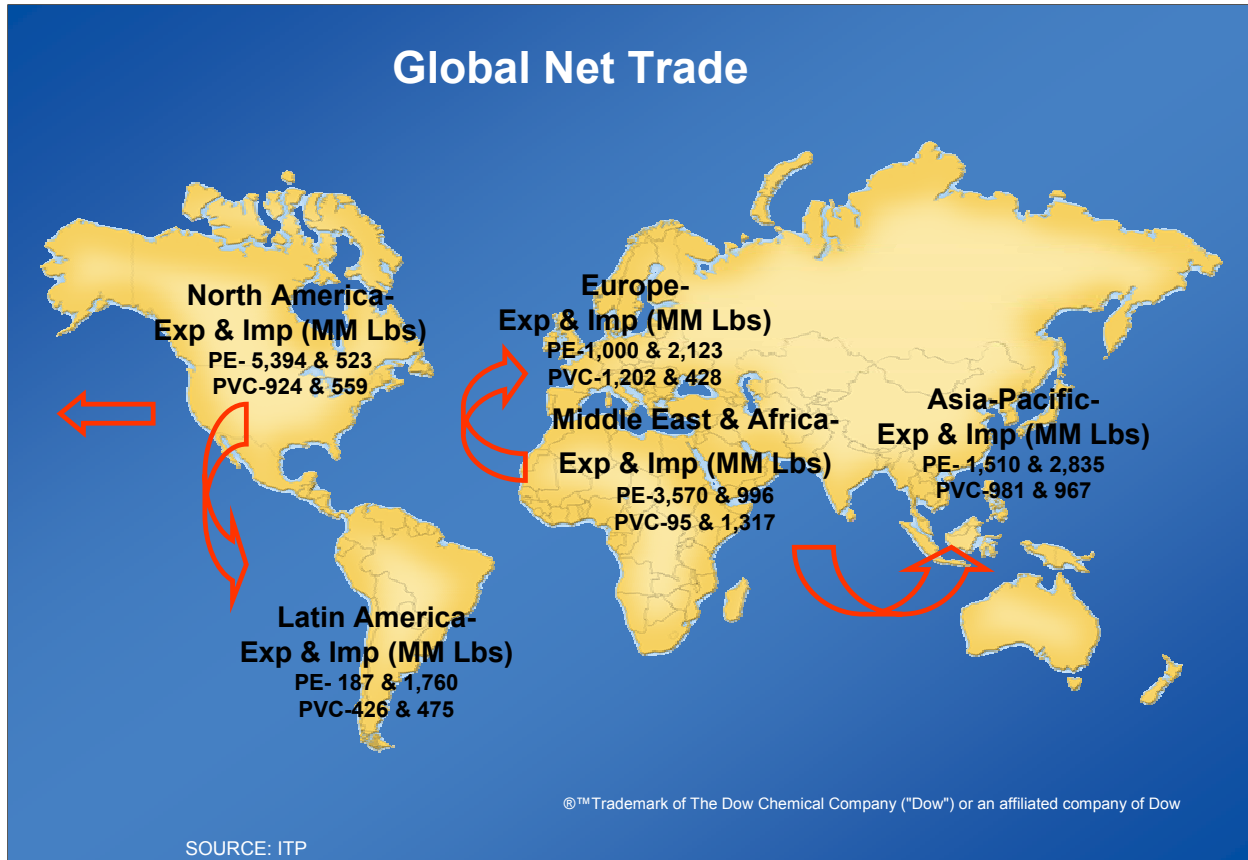
PVC World Industry Prices



Source: Dow, CMAI, ATEC

These are prices for PVC, and I have to admit that I am not a student of PVC pricing, but the prices do vary. The reason, why you have the lowest contract prices, is because the vast majority of PVC production in the world is here in North America. North America has gone through some consolidation. There are some players in Europe. There is some technology emerging in China to produce PVC.

Global Net Trade



This is the trade flow as we see it going forward. Historically, a vast majority of the world was supplied from the US gulf coast due to its abundance of natural gas and ethane. There is an onslaught of investment being made in the Middle East and that investment will then hallmark fungible components of our business being moved to other parts of the world. Especially, the Middle East will be the largest supplier to Asia Pacific and will export to Europe as well.

North America will continue to support Latin America. But Latin America will continue to invest. Incremental capacity will come out of Western Canada.

Summary

➤ Feedstock Cost Drivers

- Tight supply/demand balances
 - crude oil: growth in emerging markets
 - gasoline & naphtha: refining capacity
 - natural gas: US energy policy
 - NA ethane: dry gas and fractionation capacity
- Political uncertainty has increased volatility
- Speculation has increased volatility

➤ Polymer Price Drivers

- Monomer supply / demand balances
 - ethylene ⇔ polyethylene
 - propylene ⇔ polypropylene
 - chlorine ⇔ PVC
- Unacceptable returns in the early 2000's
- Geographic shift in production base
- Polymer supply/demand balances

Here you can see in summary the main points of my talk.
Thank you very much for your attention.