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The logo for HUNTSMAN, featuring the word "HUNTSMAN" in a bold, dark blue, sans-serif font. The text is centered within a white rectangular box that is bordered by two horizontal red lines, one above and one below the text.

**HUNTSMAN**

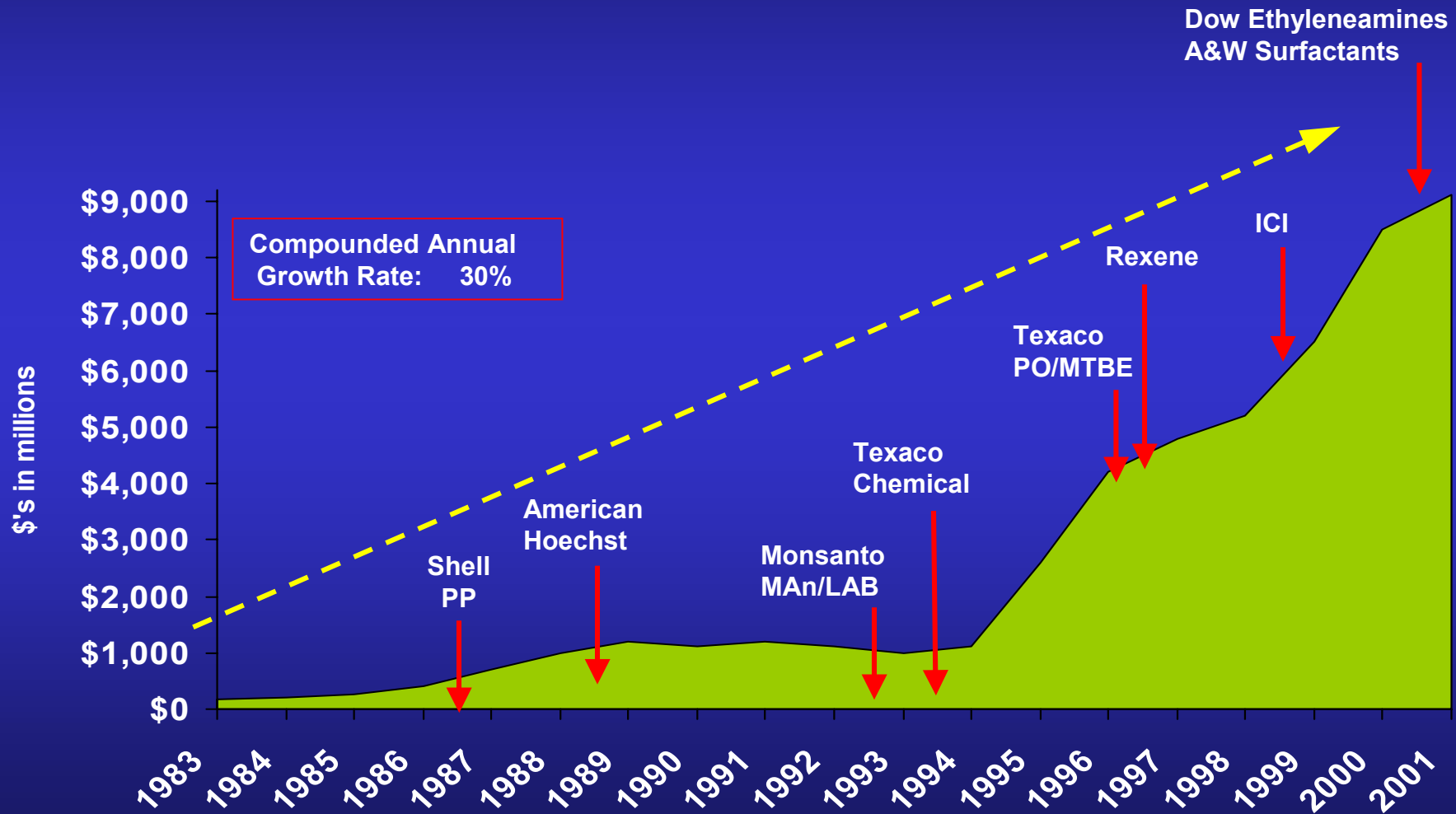
# **Raw Materials and Developments**

**PDA Presentation  
December 2002**

## Who is Huntsman?

- ◆ **Huntsman is the largest privately held chemical company in North America**
- ◆ **Huntsman is one of the fastest growing chemical companies in the world – C.A.G.R. of around 30% since the first acquisition of a chemical plant in 1982**
- ◆ **Huntsman and its predecessor companies (ICI and Texaco Chemical) have been involved with polyurea and the raw material chemicals to produce polyurea for several decades**

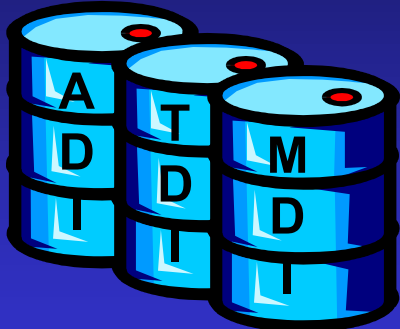
# Huntsman Revenue Growth



## Huntsman and Polyurea

- ◆ The Huntsman companies and its predecessors hold some of the earliest and most significant patents relating to polyurea
- ◆ From the beginning, the Huntsman companies have been an aggressive investor and supporter of both the development of polyurea and in the manufacturing of the raw materials to produce polyurea
- ◆ The Huntsman companies maintain its belief that the polyurea industry will continue to grow impressively and continue to find innovative uses for this versatile product line
- ◆ Huntsman is probably the largest seller of raw material chemicals into the polyurea industry

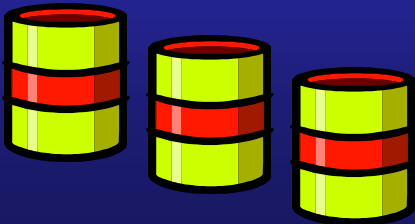
# Making Polyureas



Isocyanates



Amines



Additives



Polyureas



## Interesting Aspects in the Development of Polyurea

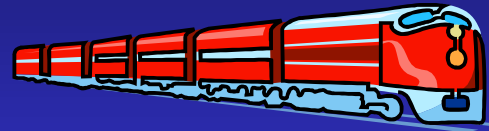
- ◆ All of the raw materials and chemicals to produce polyureas were not originally intended for polyurea usage
- ◆ Most of the raw materials and equipment to process polyurea manufacturing were originally intended for the close cousin of polyurea, polyurethanes
- ◆ While polyureas at first were “extensions” of polyurethanes, and used as a substitute for or an addition to polyurethanes, it in recent years have started to develop its own identify and innovative applications unique to polyurea
- ◆ Chemicals and equipment modifications tailored for polyurea usage are greatly enhancing the attractiveness of polyurea as a material of choice in its own right

# Innovation and Development

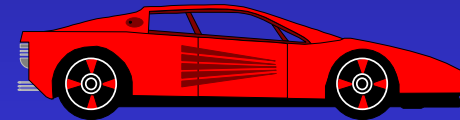
- ◆ **The wonders of the free enterprise system**
  - Risk/reward
  - The pace of change
  - Survival of the fittest
  
- ◆ **The test of time/willingness to adapt**
  
- ◆ **Market focus – opportunity creation**
  - Innovation in problem solving and solution providing
  - Anticipation, discovery, and understanding of marketplace needs/desires
  - Listening

# Looking Back – The Pace of Change

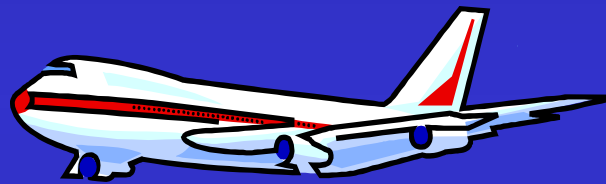
◆ Railroads



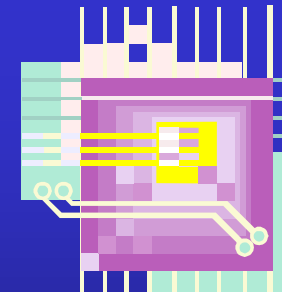
◆ Automobiles



◆ Planes



◆ Electronics



◆ Oil & Gas



◆ Chemicals



## Polyurea Raw Materials – A Chronology

- 1937 – 1940** Polymers were first produced and processed from diisocyanates with glycols and/or diamines
- 1940 – 1950** Development of polyurethanes elastomers and adhesives into commercial applications
- I.G. Farben
  - I.C.I.
  - DuPont
  - Germany
  - United Kingdom
  - USA
- 1953** First flexible polyurethane foam commercially produced using a high pressure machine and the reaction of a polyol and a diisocyanate

## Polyurea Raw Materials – A Chronology

- 1957** First commercially available MDI (isocyanate) is introduced for rigid polyurethane manufacture
- 1960 – 1965** Rigid polyurethane foam begins to enjoy commercial success as blowing agents and other additives are introduced for use with spray guns and melding into uses for insulation and construction
- 1968 – 1973** RIM (Reaction Injection Molding) polyurethane is commercialized using high pressure mixing machines to mold large parts

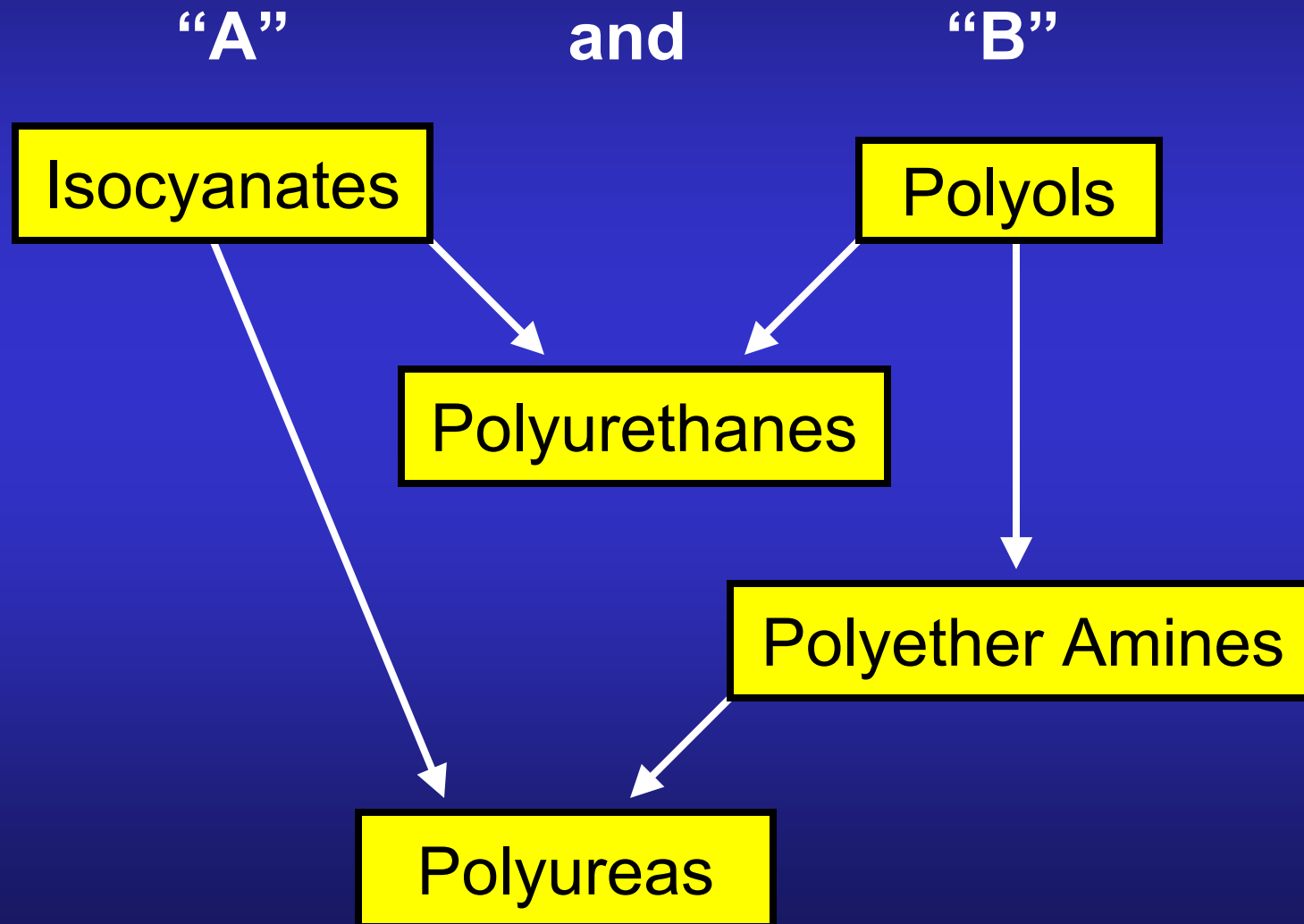
## Polyurea Raw Materials – A Chronology

- 1970 – 1980** JEFFAMINE® (polyol amines or polyether amines) products are commercially introduced and find acceptance in the epoxy industries
- 1978 – 1985** Polyurea patents and inventions began to emerge creating the first commercially viable uses for JEFFAMINE® polyether amines and polyureas in the RIM application areas
- 1985 – 1990** Polyurea spray applications become commercially accepted and begin to grow into several novel uses

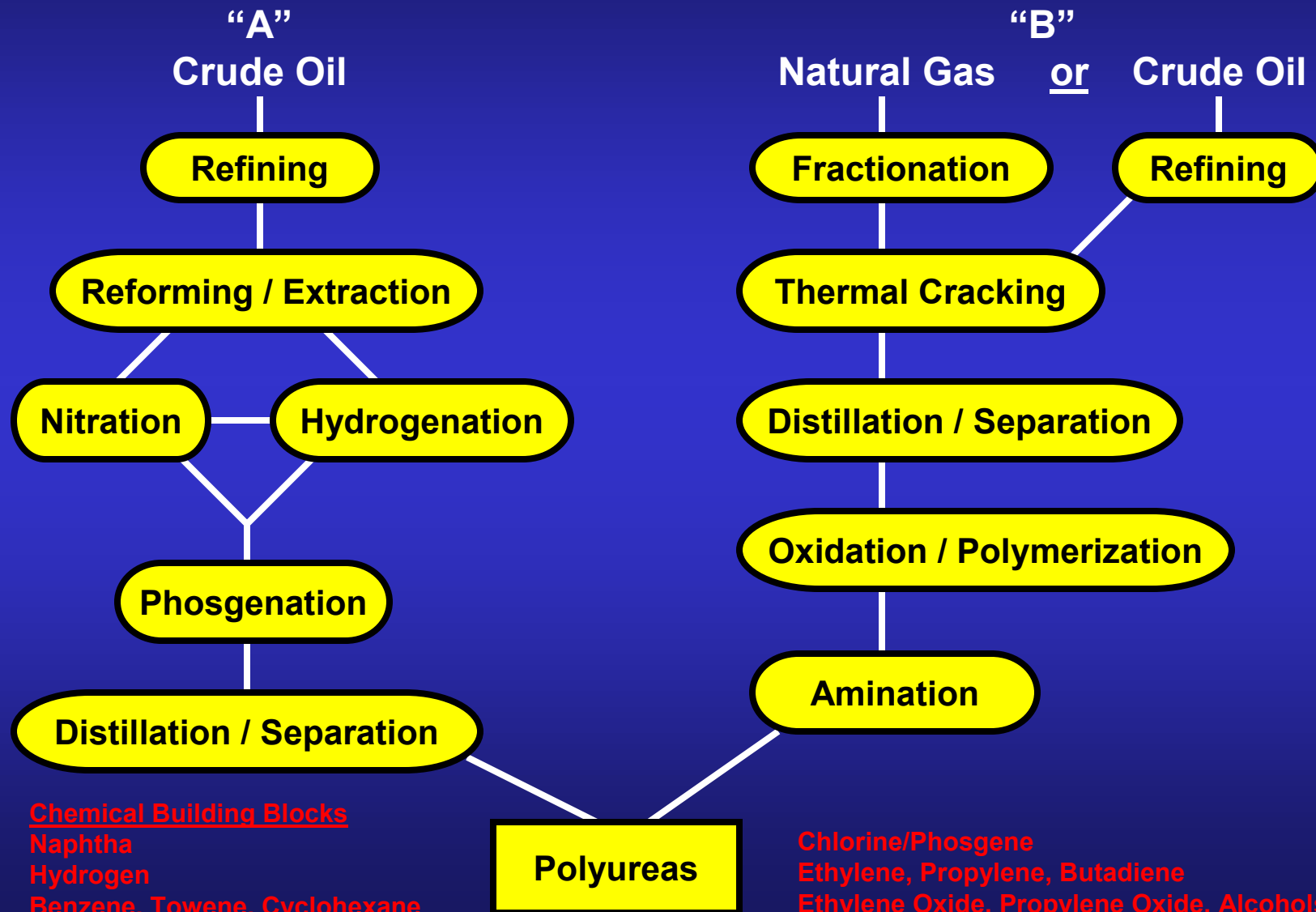
# Polyurea Raw Materials – A Chronology

- 1990 – 2000** Polyurea development continues as more uses emerge, as the technology goes global, as processing capabilities continue to improve, and as more end use companies and raw material supplier companies support its further growth
- 2000** 1<sup>st</sup> Annual PDA
- 12/2002** 3<sup>rd</sup> Annual PDA – polyurea growth expanding further

# Polyurea Raw Materials



# Raw Materials / Supply Chain



Chemical Building Blocks  
 Naphtha  
 Hydrogen  
 Benzene, Towene, Cyclohexane  
 Ammonia

Chlorine/Phosgene  
 Ethylene, Propylene, Butadiene  
 Ethylene Oxide, Propylene Oxide, Alcohols, Glycols  
 Polyols, Polyether Amines, Isocyanates

# Raw Material Characteristics

- ◆ Capital intensive

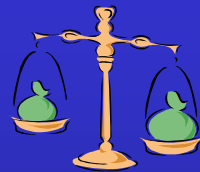


- ◆ Usually based on petroleum/petrochemical origin



- ◆ Plentiful supply

- ◆ Stable pricing



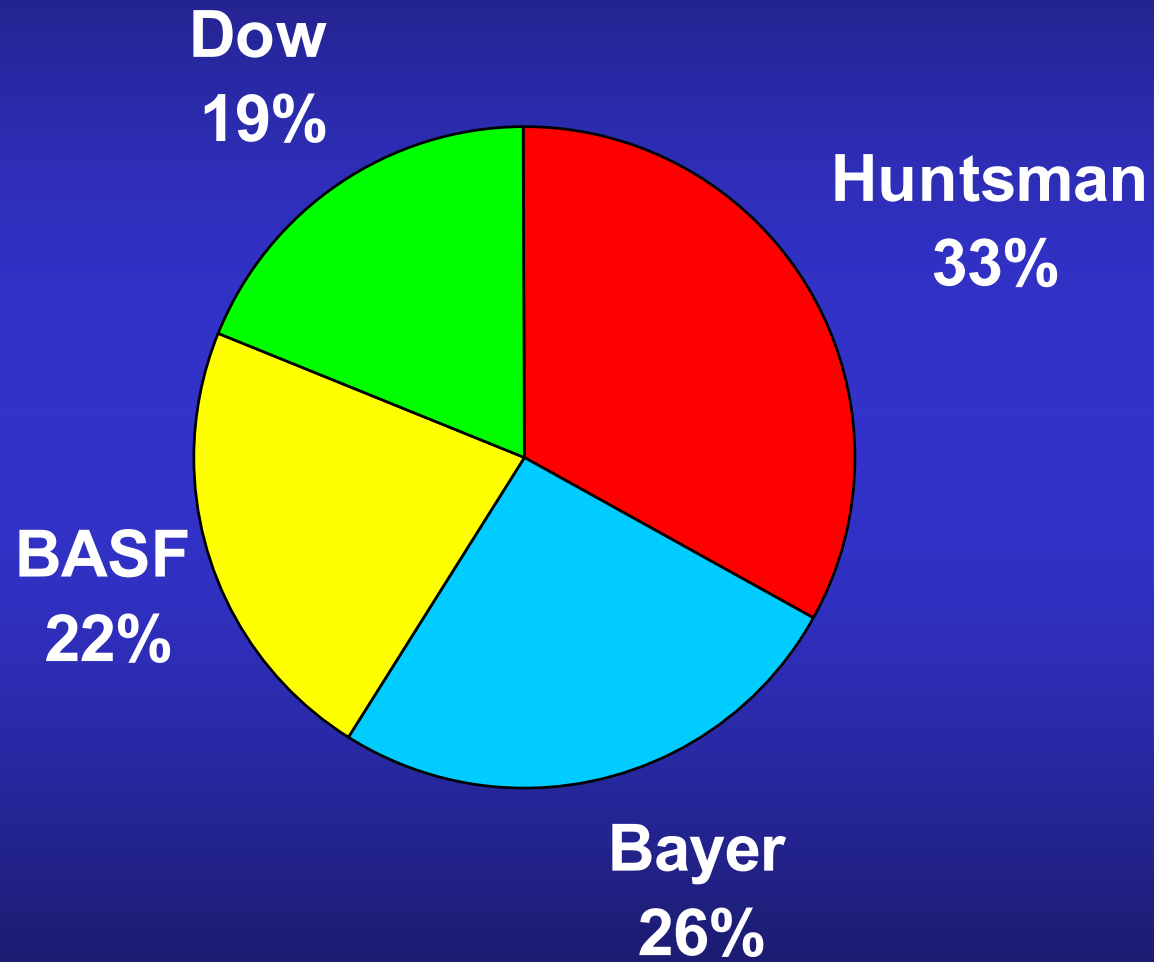
- ◆ Technology intensive

- ◆ Careful product handling and stewardship required



- ◆ Growth in demand continues to be well above GDP

# Americas MDI Capacity



**MDI****Huntsman  
(million pounds/year)**

	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2006</u>
<b>UK</b>	18	60	70	130	0	0
<b>Holland</b>	0	0	70	150	550	700
<b>European Sub Total</b>	18	60	140	280	550	700
<b>Geismar, Louisiana</b>	0	70	150	250	800	850
<b>China<sup>①</sup></b>	0	0	0	0	0	150
	<b>18</b>	<b>130</b>	<b>290</b>	<b>530</b>	<b>1350</b>	<b>1700</b>

① Joint venture facility planned with BASF. 150 million pounds will be Huntsman's share.

CAGR:

# Polyether Amines

## Huntsman (million pounds/year)

	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2006</u>
Austin, TX	0	0	2	4	5	0
Conroe, TX	0	0	0	10	100	100
Wales, UK	0	0	0		10	10
Asia	0	0	0	0	0	10
	0	0	2	14	115	120

From 2 million pounds/year capacity in 1980 to 119 million pounds/year in capacity in 2000

CAGR:

# Huntsman's Commitment to the Raw Materials Supply and Availability

- ◆ **Proven track record of re-investment in the raw materials**
  - MDI capacity has grown from 130 million pounds/year in 1970 to approximately 1.4 billion pounds/year today (10.7 fold increase in MDI capacity)
  - Polyether amine capacity has grown from 2 million pounds/year in 1980 to approximately 115 million pounds/year today (57.5 fold increase in capacity)
  - Current capacities in this supply chain represent well in excess of a billion dollars of capital
  
- ◆ **Investments planned in Asia for both isocyanates and amines**
  
- ◆ **Continued investment in R&D to further improve**
  - Safety and handling
  - Cost
  - Process improvements