WORLD PLASTICS MARKET REVIEW

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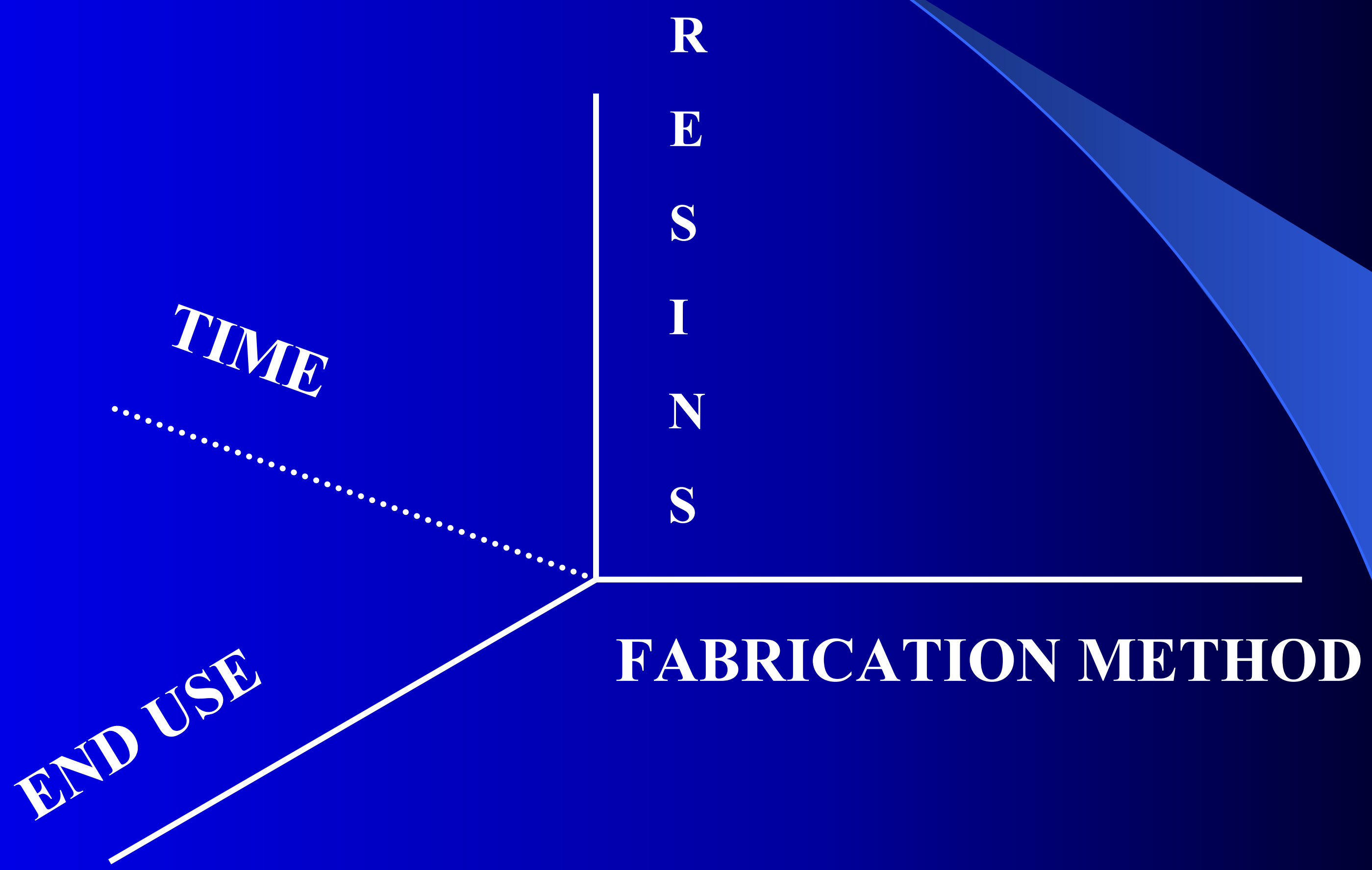
OUTLINE

- OVERVIEW OF THE PLASTICS INDUSTRY
- MAJOR THERMOPLASTICS TO BE REVIEWED
  - POLYETHYLENE
  - POLYPROPYLENE
  - POLYSTYRENE
- CONCLUSIONS

THE PLASTICS INDUSTRY



MAJOR WORLD REGIONS

- NORTH AMERICA
- LATIN AMERICA
- WESTERN EUROPE
- EASTERN EUROPE
- THE MIDDLE EAST
- THE FAR EAST

MAJOR POLYMERS

- THERMOPLASTICS
  - **POLYETHYLENE**
  - **POLYPROPYLENE**
  - **POLYSTYRENE**
  - **POLYVINYL CHLORIDE**
  - **ABS/SAN**
  - **STYRENE BUTADIENE LATEXES**
  - **POLYCARBONATES**
  - **PET**
  - **NYLON**
  - **ENGINEERING THERMOPLASTICS**

MAJOR POLYMERS

- THERMOSETS
  - **EPOXIES**
  - **MELAMINES**
  - **UNSATURATED POLYESTERS**
  - **PHENOLICS**
  - **UREAS**
  - **POLYURETHANES**
  - **POLYLACTIC ACIDS**

MAJOR FABRICATION PROCESSES

- **INJECTION MOLDING**
- **BLOW MOLDING**
- **EXTRUSION**
  - **FIBER**
  - **FILM**
  - **SHEET AND THERMFORMING**
  - **PROFILE**
  - **PIPE**
  - **WIRE & CABLE**
- **COMPOUNDING**
- **CALENDERING**
- **COMPRESSION MOLDING**
- **ROTOMOLDING**
- **OTHER PROCESSES**

MAJOR END USE MARKETS

END USE	US MARKET 2000 (kTons)	Percent of Total Market
PACKAGING (Bottles, Film, Cups, etc.)	9683	25%
BUILDING & CONSTRUCTION (Pipe, Siding, insulation, etc.)	8554	22%
CONSUMER & INSTITUTIONAL (Toys, Housewares, Medical, etc.)	5290	13%
TRANSPORTATION	1846	5%
FURNITURE & FURNISHINGS	1694	4%
ELECTRICAL/ELECTRONICS (W&C, Computers, Appliances, etc.)	1461	4%

MAJOR END USE MARKETS

END USE	US MARKET 2000 (kTons)	Percent of Total Market
ADHESIVES/INKS/COATINGS	924	2%
INDUSTRIAL MACHINERY	464	1%
ALL OTHER (Compounding, Resellers, Unknown)	5228	13%
TOTAL DOMESTIC	35146	
EXPORTS	4396	11%
TOTAL	39542	100%

ISSUES FACING THE PLASTICS INDUSTRY

1. **SUSTAINING DEVELOPMENT**
   1. **OBTAINING ACCEPTABLE PROFITS**
   2. **ENVIRONMENTAL STEWARDSHIP**
   3. **CORPORATE RESPONSIBILITY**
2. **ECONOMIC ISSUES**
   1. **CAPTIVE CONSUMPTION**
   2. **RISE OF MIDDLE EASTERN PRODUCTION**
   3. **STATE OF GLOBAL ECONOMIES**

ISSUES FACING THE PLASTICS INDUSTRY

3. **ADDRESS PLASTICS ROLE IN POSSIBLE CLIMATE CHANGES**
4. **DEVELOP NEW PRODUCTS**
   1. **For Example: Improved Packaging**
      a) **Longer Shelf Life**
      b) **Less Wastage of Products**
      c) **Improved Health and Safety**

ISSUES FACING THE PLASTICS INDUSTRY

5. **FEED STOCK SUPPLY**
6. **INTERNATIONAL TRADE**
7. **IMPROVE PLANTS**
    - A. **NEW PROCESSES**
    - B. **UPGRADE OLD PLANTS**

COMPANY PERFORMANCE

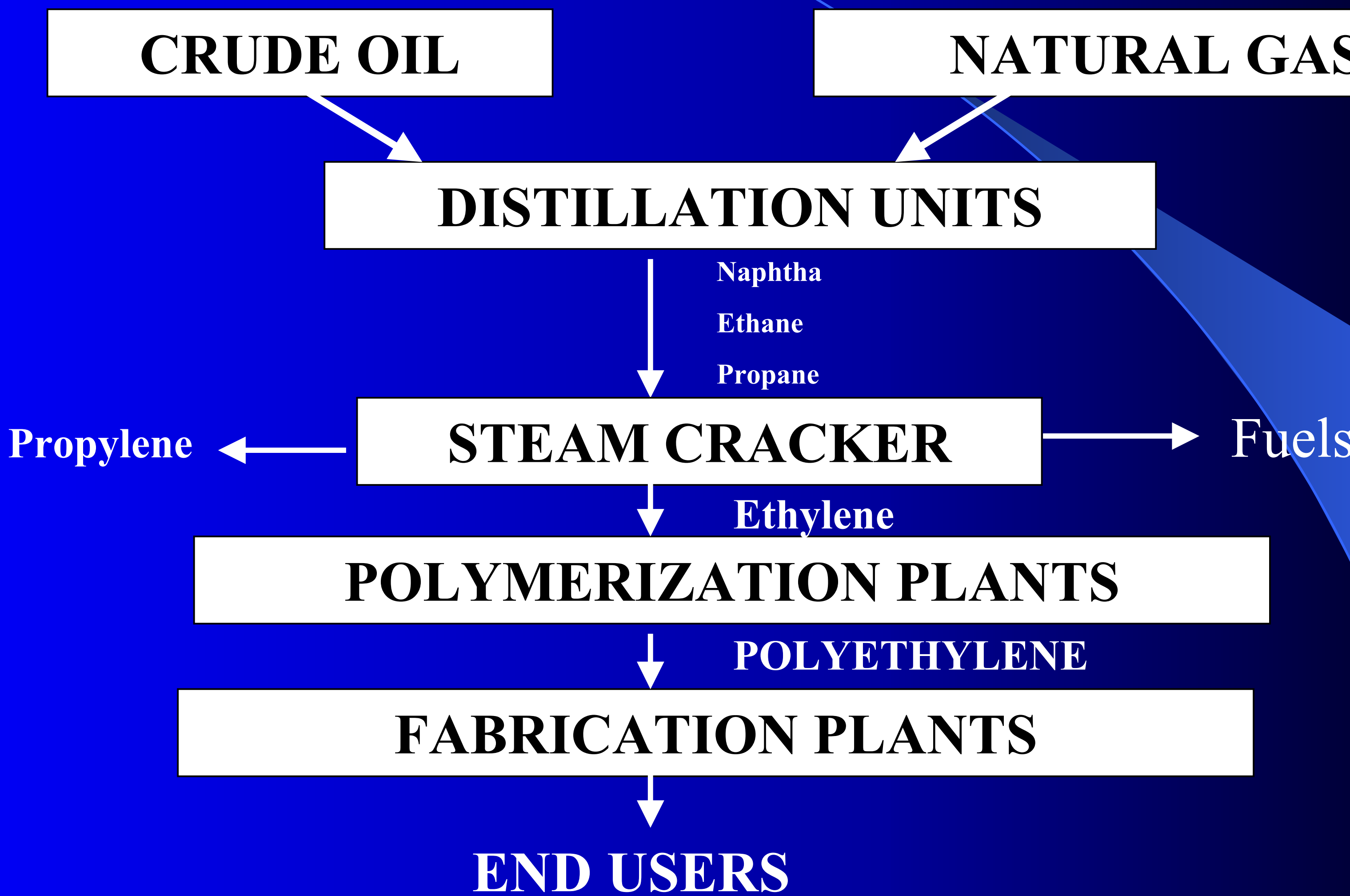
RESIN COMPANIES REPORTING POOR PERFORMANCE IN 2001 FOR CHEMICALS AND POLYMERS

- DOW
- EASTMAN
- EQUISTAR
- CHEVRON/TEXACO
- BP
- EXXON-MOBIL
- AECI
- EVC
- SINOPEC
- FORMOSA
- PETKIM
- TESSENDERLO
- ATOFINA

POLYETHYLENE

- PRODUCT TYPES
- COMONOMER TYPES
    - BUTENE
    - HEXENE
    - OCTENE
- PLANTS (REACTORS)
- CATALYSTS
- ADDITIVES AND FILLERS
- END USE MARKETS SERVED
- SUPPLY/DEMAND
- RELATIVE PROFITABILITY

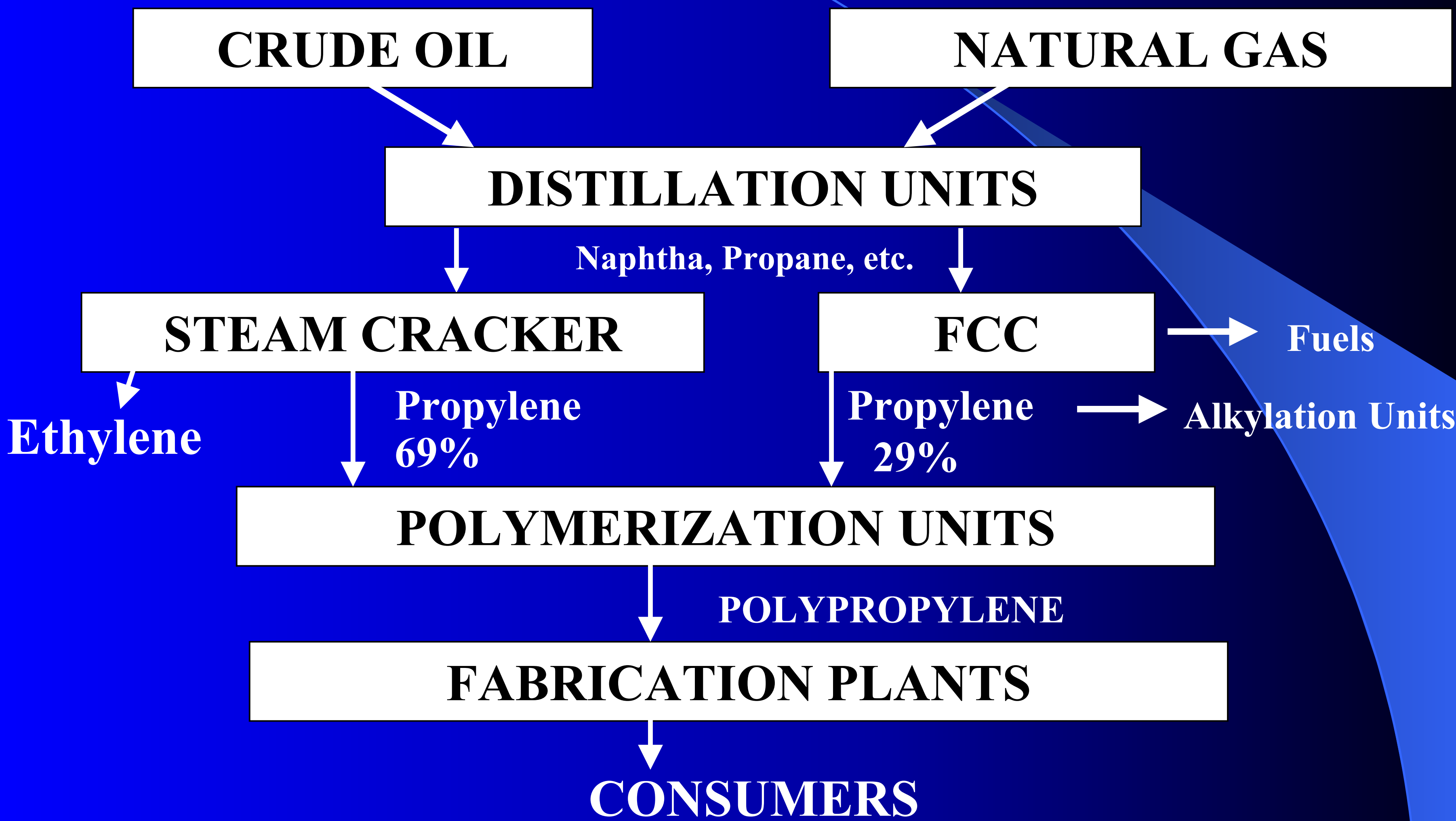
POLYETHYLENE SUPPLY CHAIN



POLYPROPYLENE

- PRODUCT TYPES
- COMONOMERS
  - ETHYLENE
  - BUTENE
- CATALYSTS
- ADDITIVES AND FILLERS
- END USE MARKETS SERVED (APC)
- SUPPLY/DEMAND
- RELATIVE PROFITABILITY

POLYPROPYLENE SUPPLY CHAIN



ON PURPOSE PROCESSES

- PROPANE DEHYDROGENATION
- METATHESIS
- DEEP CATALYTIC CRACKING
- METHANOL TO OLEFINS
  (Not Commercial)

PROPYLENE MARKETS

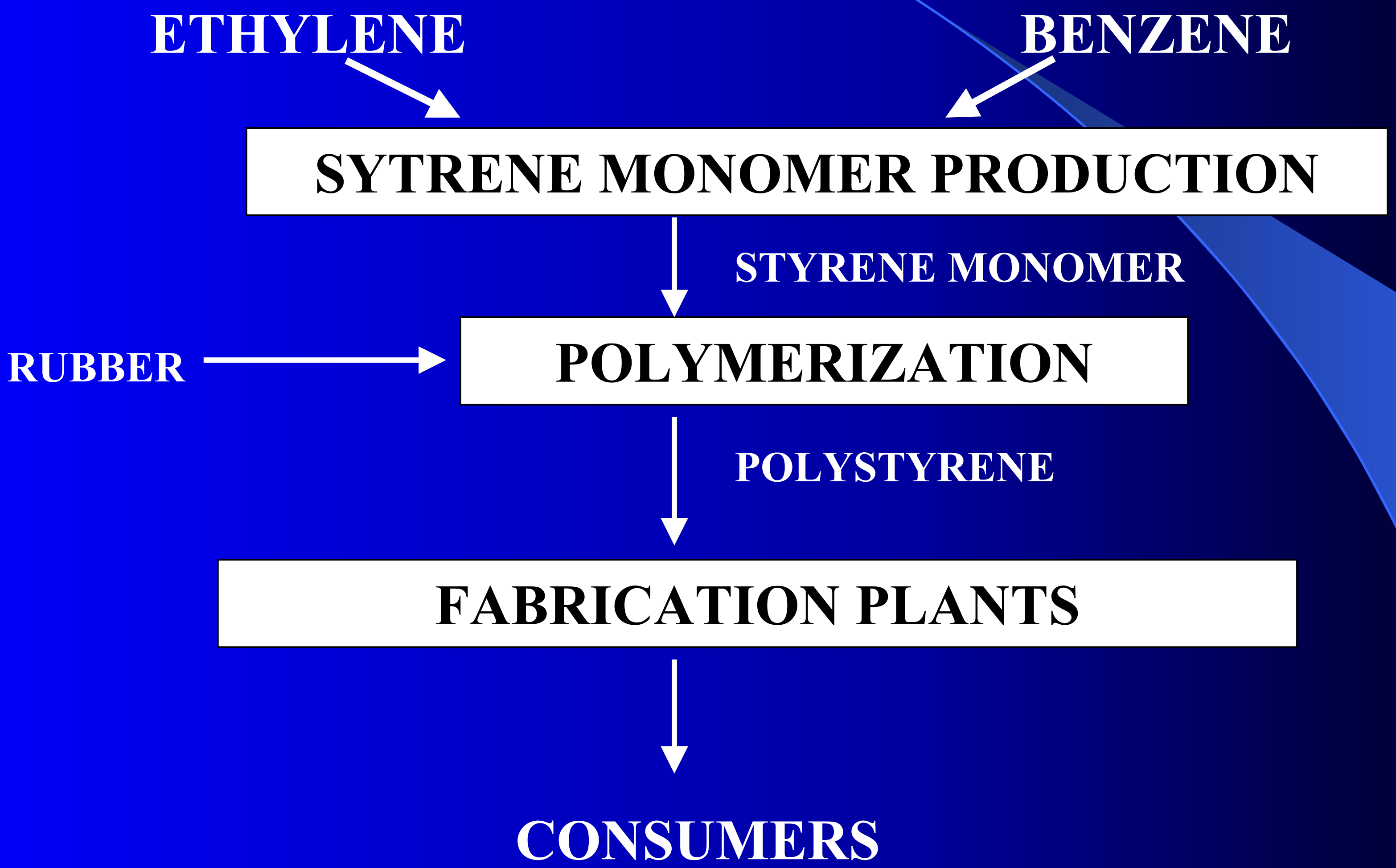
PRODUCT	Percentage of Total Production 2000	2000-2004 Forecasted Growth Rate (1)
POLYPROPYLENE	57%	6.7%
ACRYLONITRILE	11%	4.3%
OXY ALCOHOL	8%	6.2%
CUMENE	6%	4.4%
PROPYLENE OXIDE	7%	4.3%
OTHER PRODUCTS	11%	--
TOTAL - 2000	51.2 MM Tons	5.6%

(1) Petroleum Technology Quarterly 2001, page 132

POLYSTYRENE

- PRODUCT TYPES
- TYPE RUBBER
- TYPE PLANT
- ADDITIVES AND FILLERS
- END USE MARKETS SERVED
- SUPPLY/DEMAND
- RELATIVE PROFITABILITY

POLYSTYRENE SUPPLY CHAIN (SIMPLIFIED)



CONCLUSIONS

1. THE ECONOMY IS IMPROVING
2. TO IMPROVE PROFITABILITY
   A. REDUCE OVERCAPACITIES
      A. SHUT DOWN NON-COMPETITIVE PLANTS
      B. BUILD <u>ONLY</u> LARGE ECONOMICAL PLANTS BASED ON GOOD MARKET RESEARCH
   B. SHIFT PRODUCT LINES FROM SPECIALTIES TO BASE GRADES PLUS ADDITIVES

CONCLUSIONS

2. TO IMPROVE PROFITABILITY
   C. IMPROVE PROCESS/PRODUCTS
   D. IMPROVE IMAGE
   E. ENCOURAGE EDUCATION
   F. DEAL WITH CHANGING REGIONAL MARKET DEMANDS

INDUSTRY PROBLEMS

VOLUNTEERISM

INDUSTRY ORGANIZATIONS

SPE	SPI	APC
PEOPLE	EQUIPMENT MANUFACTURERS, FABRICATORS	RESIN SUPPLIERS

BUSINESS ETHICS