

MATURITY IN THE PETROCHEMICAL INDUSTRY

FEATURES, MOTIVES & COMBATING

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ABSTRACT

Petrochemicals give the highest value from crude oil and natural gas but suffers from maturity like any other business. Petrochemicals companies are promoting their business in the direction from oil & gas commodities. Specialities and life science. Reasons of maturity are expired patents, low demand, over capacity, intense competition. Actions to combat maturity are to restructure capacity achieving mega sizes, do downstream, and restructuring business practices. Strategies followed by some companies to combat maturity include exit, focus on core business and exploit a competitive advantage.

1.0 OVERVIEW

The petrochemical industry had its perception 90 years ago with the production of ISO propyl alcohol from propylene. The term “ petrochemical” was to describe chemicals other than fuel obtained directly or indirectly from natural gas and petroleum hydrocarbons and utilized in the chemical market. The production of petrochemicals is one of the dominant industries of developed countries and is the driving force and future goal for developing countries especially for oil and gas producing companies of the Middle East. Demand of basic chemicals had increased by World War II and its production from coal tar or some agricultural products was not sufficient, led to major development of its production from petroleum origin.

Petroleum Importance is not only because of being a vital energy source but as a raw material to obtain daily

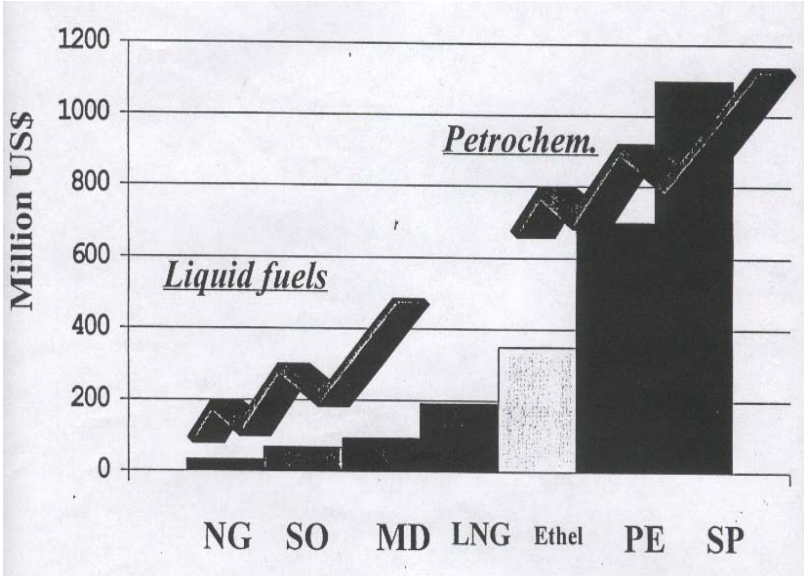
Important materials used in every life fields, call “petrochemicals” like plastics, rubbers, fibers, surfactants, pesticides, fertilizers, pharmaceuticals, dyes, solvents, lubricating oils , some food and food additives

The value of crude oil in petrochemical processing differs due to technologies and economic environments but generally speaking it is the highest among other applications: -

Value of oil	X
Fuel application	2X
Basic petrochemicals	13X
Final products	55X

Natural gas value increase is illustrated in Fig. 1,

FIGURE 1
CREATING VALUE FROM NATURAL GAS



1.1 Characteristics of Organic Chemical Industry

- The industry is mature but far from static. Maturity of serious results in Europe and Japan.
- The industry continues to undergo restructuring.
- Profitability depends on specialties companies.
- R & D expenditures decreased.
- No new chemicals but stretching “Old chemicals.”
- Manufacture of basic chemicals is proliferating to other countries other than U.S.A., Europe and Japan, e.g. Saudi Arabia, Gulf States, South East Asia.
- Strong interest in speciality chemicals as it is proliferating (Engineering, high temperature polymers). Drug industry is still the most profitable of all the chemical sectors.
- Toxicity, ecology, environment are the new buzzwords.
- Ec-92 is restructuring the chemical industry in Europe.

1.2 Petrochemical Industry Characteristics

- Intensive investments
- Advancement in technology, i.e high expenditure in R& D searching new products.
- Dominance of multinational companies.
- Produced by chemical reactions under different conditions of temperature, pressure in the presence of catalysts.
- Highest value for crude oil and natural gas.
- Highest technological, managerial and marketing capabilities..

1.3 Petrochemicals Classifications

Different classifications are recognized: -

- In groups
- Standard industrial classifications (SIC)
- Classification in stages of productions

Classification in stages is the most prevailing in the petrochemical industry: -

- Basic petrochemicals, including methane, ethane, ethylene, propane, propylene, butane, butylene, butadiene, styrene, aromatics, alcohols, ethylene oxide, propylene oxide in addition to gases.
- Intermediate petrochemicals including :-
 - Plastics, PE, PP, PS, PVC and their types.
 - Rubber; PB, SB, Polyisoprene.
 - Solvents; alcohols, betones, esters,& glycols.
 - Surfactants raw materials; LAB, alkyl phenol condensate.
 - Paints raw materials; epoxy, alkyds.
 - Synthetic fibers raw materials; nylon, polyacrylic.
 - Plastic softening and filler materials.
 - Rubber chemicals, antioxidants.
 - Fertilizers (nitrogenous).
 - Acids; phthalic acid.
 - Polyurethane, isocyanates.
- Finished petrochemicals, including all types of paints, synthetic fibers, detergents, thinner mixes, plastics, sponge, tyres, packing and industrial plastics.

1.4 Petrochemical Industry's Requirements

- Feed stock suppliers in reasonable quantities at suitable prices.
- High capital investment for infrastructure include utilities, shipping and storage facilities beside investment for establishing integrated complexes for utilizing economy of scale.
- Technological and scientific capabilities lead to strong R & D .
- Local and international markets.

As far as feedstocks are concerned, in special cases production of some selected petrochemicals depending on imported raw material under the following conditions: -

- Raw materials are either liquid or solid.
- It is produced by several sources in quantities sufficient to cover world demand.
- It is produced by independent producers, i.e. not integrating with subsequent industries and competing with them.
- Its markets are not subject to major fluctuations in short period relatively.
- Available local markets for products.
- Low labor and utilities costs.

e.g. products are PET, PTA

2.0 Organic chemical Industry Structure

Structure

Organic chemical industry as part of chemical industry comprises petrochemical industry includes commodities and specialties. Specialties include performance chemical and fine chemicals as

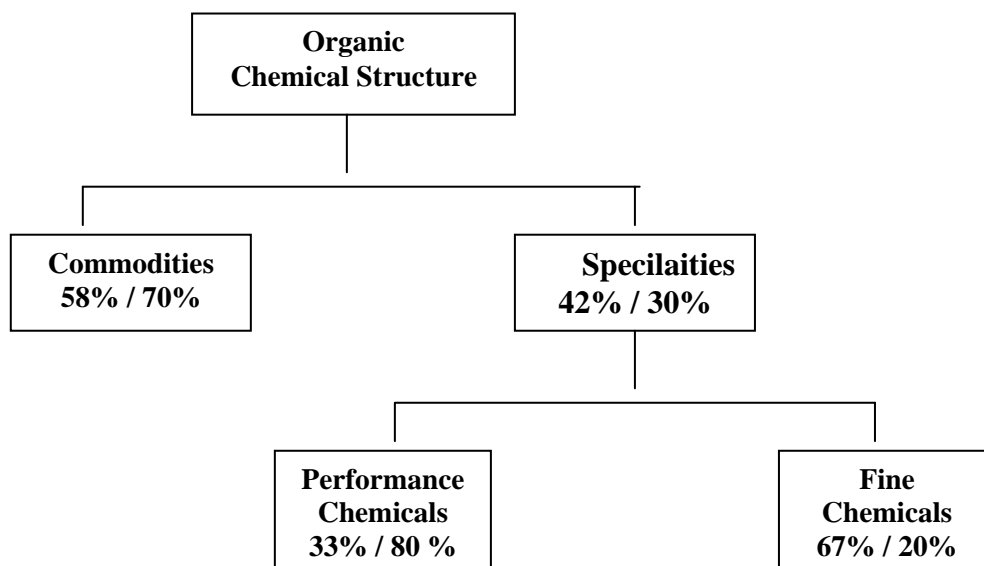
Illustrated by Fig, 2

The products and business belongs to each of the industry fields have the following tendency with passage of years life

Life science → Specialty chemicals → Commodity chemicals → oil & gas

For example engineering plastic ABS (specialty polymer) in the past but mass production and cost reduction progressed with the passing years so that now it belongs to commodity chemicals.

FIG 2 ORGANIC CHEMICAL STRUCTURE



- | | |
|-----------------------|---|
| - Mature | - Fast growing |
| - Explosives | - Pharmaceuticals |
| - Agricultural | - Pesticides |
| - Paint additives | - Intermediates |
| - Petroleum Additives | - Others (flavors,
Photographic, Food, etc.) |

Each company is promoting its business field in the direct opposite to the arrows of the product stream. If they stay in the same business field, their product and business would suffer a drop of profitability and would be swept away. So it is aiming at the

Opposite direction of the product arrow in order to maintain and improve profitability performance and is heading the upstream direction otherwise would come into typical commodity chemicals range.

Specialty Chemicals Characteristics

- Low volume
- Above average growth
- High prices
- High profitability
- Relatively low capital investment – Batch processing.
- Use of multipurpose equipment
(Not universal)
- High R & D.
- High level of technical capabilities.
- Extensive use of formulations (for performance chemicals)
- Often dependent on patent protection.

3.0 Maturity Features

- Over capacity.
- Intense competition,
- Low profitability.
- Loss of control of margins.
- Limited new capital investment.
- Few new “Big” areas for development.
- Commodity companies try to switch interests to specialty chemicals.
- Choice of R & D projects is difficult (e.g. specialty polymers).
- Shift in emphasis away from chemicals.

- Strong interests on part of large companies in acquiring pharmaceutical companies- the industry's most profitable segment.
- Sites of manufacture of basic chemicals are proliferating.
e.g. Performance chemical becomes low volume commodity (mature products) because of: -
- ❖ Patents expire
 - competition arises
 - The user back integrates
- ❖ Technology changes
The product generally is mature because of: -
 - Competition – product life cycle.
 - Technology changes.
 - Widespread knowledge of the technology

4.0 Combating Maturity

In general value added action is the way to combat maturity. Value is generated by serving customer needs, customer's concern with competitive cost/performance not with absolute product costs. "Bundled" packages and high service content create relatively high switching costs (often costs are a relatively low proportion of the final product total cost).

- Restructure capacity
- Restructure business practice.
- Achieve mega size.
- Emphasize core business, esrexitperipheral businesses and go down stream.
- By innovative technology:
 - Invent a new product or process
 - Achieve shutdown economics.
 - Find new applications.

- Be the low cost producer.
- License.
- Globalize.
- Restructure R & D.
- Change the culture of the company.
- Take lesser profits.
- Shoestring operation.
- Liquidation.

4.1 How to Combat Maturity

- By Marketing:
 - Trade and conquer
 - Shed-losers; buy winners
 - Combine marketing with technology
 - Do what you can do best
 - Go downstream
 - License
 - Globalize
 - Go where the action is
- By Financial Management
 - The financial incentive for reorganization task.
 - Lesser profits shoestring operation liquidated.
- By Changing the Culture of the Company
 - Monsanto, American Cyanamid, ICI, Union Carbide,
- By innovative Technology.
 - New processes
 - New applications
 - High technology

4.2 Creating Value with Commodities

- Integration/cost position – to date, the most important.
- Scale.
- Pseudo commodities.
- Global presence.

4.3 The Drive Towards Mega Size (Fig.3)

❖ SHELL-MONTEDISON MERGER – POLYEFINS

(Million tones/yr.)

3.3 of P.O

0.7 of P.E.

5 Total

6 18% of world pp capacity

Amoco the second largest has 5%

❖ METHANEX – METHANOL

Bought Methanol Plants in Cape Horn , New Zealand, and Canada (Nova)

(Million tones)

Total Production Capacity 4.6

Marketing Rights 1.4

Total 6.0

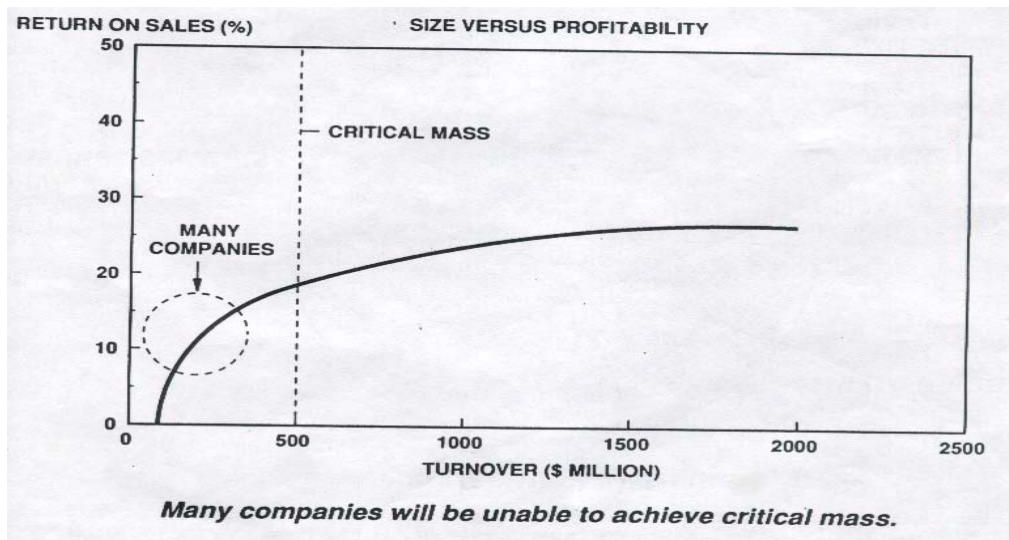
Thus methanex has 46% of the world market

❖ DU PONT-Nylon

By taking over ICI's nylon operations, DU PONT controls 15% of the world's nylon capacity.

In addition they are investing 750 million to one billion Dollars in Nylon Facilities in Singapore and are considering capacity in other countries such as Taiwan and India.

Fig. 3 Importance of Critical Mass



4.4 Specialty Chemicals' Competitive Advantage can be created by: -

- Product innovation, using innovation to develop new applications and /or service.
- Using service to create customer loyalty in market orientation.
- Maintain contact with marketplace in order to spot new opportunities.

4.5 Problems in Entering Specialty Chemicals Businesses

- Cultural conflicts e.g. drum versus tank car.
- Limited flexibility, e.g. interpretation of health and safety laws.
- Rigid policies for control and decision making, i.e. need for pragmatism.
- Under-estimation of level of commitments, e.g. orders within 24 hours, with Email.
- Lack of understanding of service concept “ I have the best of product you buy It “ versus “ I have a solution to your problem “ .

STRATEGIC OPTIONS

Improve Business Position

- Leadership: Low cost
 High market share
 Proprietary
 technology

- Differentiation: High-margin niches
 R&D and Tech
 Service
 Marketing

- Globalization: Pursue growth
 Feedstock
 advantages
 Leverage technology/
 market knowledge

Reposition

- Integration: cost positioning
- Diversification: specialities
- Develop portfolio of related businesses
- Joint ventures, strategic alliances
- Exit weak segments
- Acquire competitors

Exit

- Harvest “
business”:
Manage for cash

- Sale or spin off.

4.6 Restructuring as Means to Combat Maturity

- By making personnel redundant.
- By restructuring capacity
- By restructuring business practice.
- By integration with refining

4.7 Strategic Options for Petrochemical Companies

Strategies for Combating Maturity:

Strategies for Combating Maturity

- Focus on Core Business

	Core business	Divested/De-emphasized
Union Carbide	Polyethylene] Ethylene Glycol Oxo Alcohols	PVC, Polyo;s Cumene/ Phenol
Du Pont	LDPE, Vinyl Acetate and Poly (Vinyl Acetate) Nylon	Chlor-Alkay Methanol, Acrylic's
Quantum	Polyolefins	Ethylene Glycol

Exit

Companies divesting commodity petrochemicals or demerging them to move into higher margin specialties include MONSANTO,HERCULES, ALLIED – SIGNAL, AMERICAN CYANMID, FIRESTONE AND ICI

Exploit a Competitive Advantage

	Competitive advantage	Growth businesses
Occidental	Feedstocks, Scale	Olefins, PVC
Shell	Refinery Integration, Scale	Olefins, PP, Glycols
EXXON	Refinery Integration, Scale	Olefins, PE

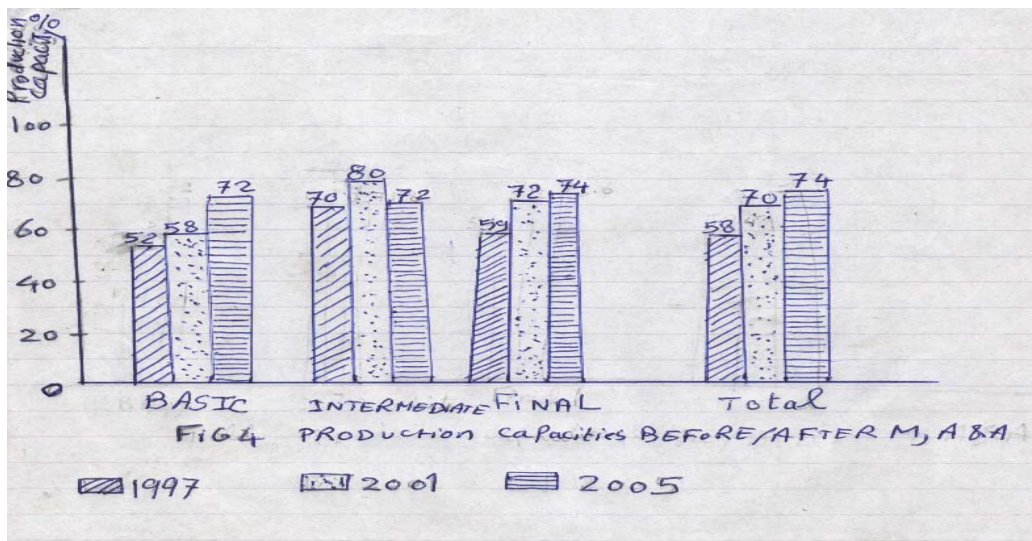
4.8Merging

Alliance and Acquisition (M, A&A)

For restructuring capacity & business practice Table 1 indicates M, A&A activities in different ore business while Fig. 4 indicated production capacities before and after M, A&A

TABLE 1: MA & A ACTIVITIES

	Features	Driving Force	Future Trends
Oil & Gas	<ul style="list-style-type: none"> • Mega mergers 	<ul style="list-style-type: none"> • Big capital required • Pressure to cost 	<ul style="list-style-type: none"> • No further development to down stream from petrochemicals
Commodity Chemicals	<ul style="list-style-type: none"> • Man MA & A • Subsequent joint ventures to MA & A 	<ul style="list-style-type: none"> • Reduction of players • World scale plants • Synergy between businesses 	<ul style="list-style-type: none"> • New investment with scrapping plants • New joint ventures in petrochemicals
Specialty Chemicals	<ul style="list-style-type: none"> • Spin-offs • Acquisitions of smaller specialty companies 	<ul style="list-style-type: none"> • Focus on core competencies • Global presence in the market 	<ul style="list-style-type: none"> • Further strengthening core business • Further integration of core business
Life Sciences	<ul style="list-style-type: none"> • Mega mergers but small number • Acquisition driven by technology 	<ul style="list-style-type: none"> • R & D costs and business risks. • Obtaining of augmentative technology 	<ul style="list-style-type: none"> • Consolidation & reduction of players • Further focus on business from overall life science.



5-0 Conclusions & Recommendations

- In order to establish petrochemical industry requirements must be met (Capital, feedstock, market, labor)
- Strategic planning is dominating practice to create petrochemical industry (replace imports, export, new products) including developing criteria for selecting products/projects.
- After the two oil crisis, it becomes necessary to cope with new environment of “reduced product demand globally”. This is done through developing “new growth markets” and “curtailing costs and reducing the effect of business cycles” i.e. combating maturity.
- Because of that restructuring was directed towards “ diversification of business “ and “ expanding the scale of business “
- To combat maturity it is needed to restructure the business (capacity business practice, go downstream, emphasize core business).
- Merging, alliance and acquisition is the dominating practice to combat maturity as one of its major activities. Other strategies are exit, focus on core business and exploit a competitive advantage.

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