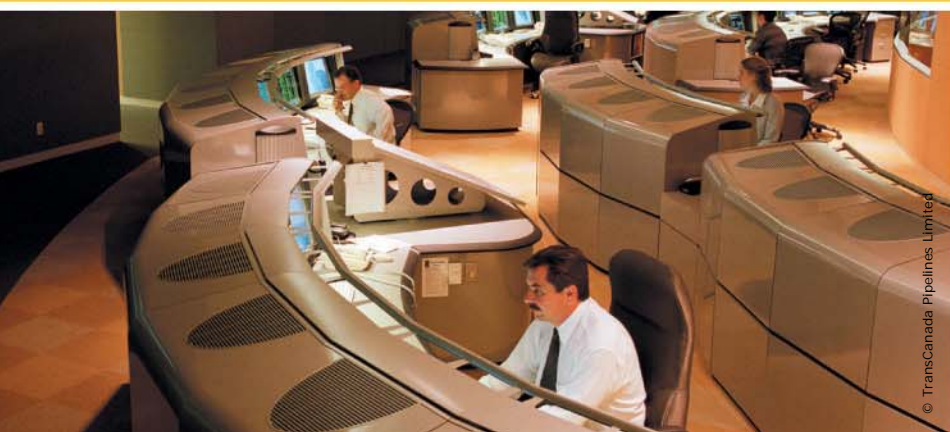




The Making of Three Energy Complexes - Integration at Work

March 2007



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Value-added Energy Complex Models

In 2006, Alberta Government visited 3 integrated refining and petrochemical sites in Asia:

Taiwan:

Formosa Petrochemical Corporation's No. 6 Naphtha Cracking Plant

India:

Reliance Industries' Jamnagar Refinery

Singapore:

Jurong Island Petrochemical Complex

Integrated Energy Complexes

	Formosa #6 Naphtha Cracking Plant	Reliance Jamnagar Refinery	Singapore Jurong Island
Project Timeline	1994 - 2007 in 4 phases	1996- 1999 Phase I; 2008 Phase II on stream	1995 reclamation, 2000 open. Ongoing
Investment	USD\$17.5 bil	USD\$14 billion	US\$16 billion
Area	6430 acres	7500 acres	7880 acres
Crude Oil supply	Imported	Majority Imported	Imported
Output	Refined petroleum products, petrochemicals and power	Refined petroleum products and petrochemicals	Refined petroleum products and petrochemicals

Formosa No. 6 Naphtha Cracking Project



Formosa Project Overview



- Land reclamation: 2603 ha of new land
- Port Construction
- Environmental protection: 16.7% of total cost
- Refining 540,000 barrels per day (bpd).
- Ethylene (Naphtha crackers) 2,935 kilotonnes per annum (kta).
- Co-generation 2.82 gigawatts
- 2005 profitability: Operating Income Ratio to Capital: 68.44%

Formosa Fundamental Belief:

Diligence and Simplicity

Petrochemicals and Utilities have higher profitability

Formosa No. 6 Naphtha Cracking Plant 2005 results (millions of US dollars)

Division	Revenue	Operating Profit
Refinery	9,351 (69.2 %)	1,114 (60.3 %)
Petrochemicals	3,403 (25.2 %)	518 (28.0 %)
Utilities	751 (5.6 %)	216 (11.7%)
TOTAL	13,495 (100 %)	1,848 (100%)

Challenges

Government:

1973

Denied permission due to Government monopoly policy

1986 - Permission granted by Government

Site Selection:

Taiwan Yilan County

Taiwan Taoyuan County

Mainland China Fujian Province

1992

Secured offshore site near Mailiao– **Land Reclamation!**

Dreadful Climate:

Half a year Monsoon season; Earthquakes; Typhoon

Skilled Labour:

Established work camps and temporary dormitory

Peak Foreign workers: 18,500

Feedstock Supply

Formosa – Government's Support

- Favorable land tax
- Approved exclusive case for acquirement of foreign workers
- Modified rules to approve the application of Mailiao port
- Built external road to connect the facilities
- Approved application of using water and electric power

Reliance Jamnagar – World's Largest Refinery



Reliance Jamnagar Project Overview

- Combined 2 phases will be the largest refinery in the world. Crude oil processing capacity 1.2 million b/d
- A complex refinery with Petrochemicals, Power, Port and Pipelines, which has vertical and horizontal integration within Reliance Industry
- Ability to process low cost feedstock
- Phase II same design and contractors as Phase I.
- Achieved International refinery operating and safety benchmarks
- Greenbelt for environmental protection
- Export oriented
 - Phase I exports 70-80% to Middle East and Africa
 - Phase II 100% high value added products to US and Europe

Reliance Fundamental Belief:

Growth is Life

Jamnagar – Challenges

- Markets
 - Limited domestic market opportunities: Government maintains control over gasoline/diesel retail pricing, even though the prices were officially de-controlled in April, 2003.
 - Distance from major world energy consumer markets
- Site Selection
 - Barren desert
 - Lack of infrastructure
- Weather
 - Cyclone in 1998 killed 550 people in the province
- Crude Oil Supply
 - Heavy crude from Middle East and Africa



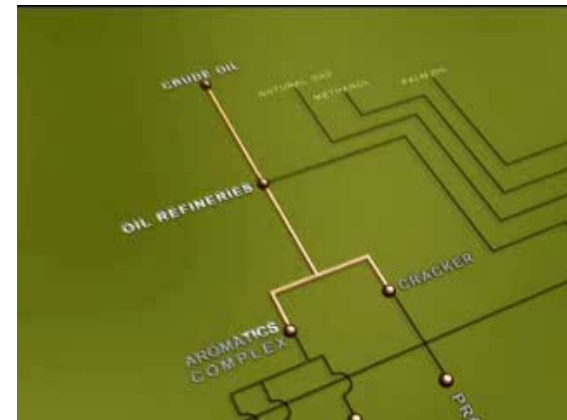
Jurong Island Project Overview

- Man-made island based on 7 small islands, reclaimed land more than 60%
- Almost 90 petroleum, petrochemical, specialty chemical companies.
 - Inc. top 50 global companies like Air Liquide, Air Products and Shell.
- 3rd party service providers of utilities, tankage, terminal facilities, warehouses, maintenance and repair centres.
- 2 logisparks provide full spectrum of integrated logistics, supply chain support.
- ChemGallery: public education & learning centre.
- Institute of Chemical Engineering Sciences – ICES
 - On site R&D
- Chemical Process Technology Center – CPTC
 - Dedicated training facility to contain a real life chemical process plant

Spirit of Jurong Island: **Synergy and Integration**

Jurong Island Highlight

- Plug and Play Infrastructure
- Well Connected
- Highly Integrated
- Strong Capabilities
- Safe and Secure Environment



Singapore Economic
Development Board:

Integration is the only way to
stay competitive

Jurong Island – Challenges

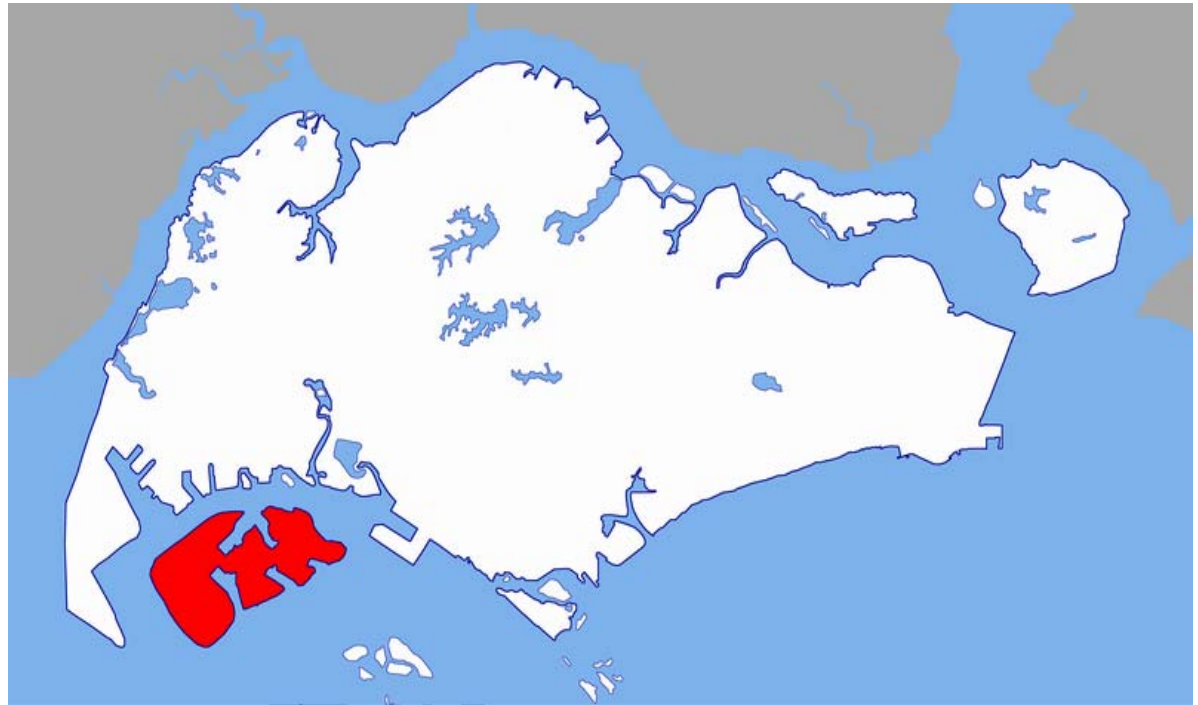
Land Availability

Skilled Labour

Feedstock Supply

Utility Cost

Attract Downstream
Companies

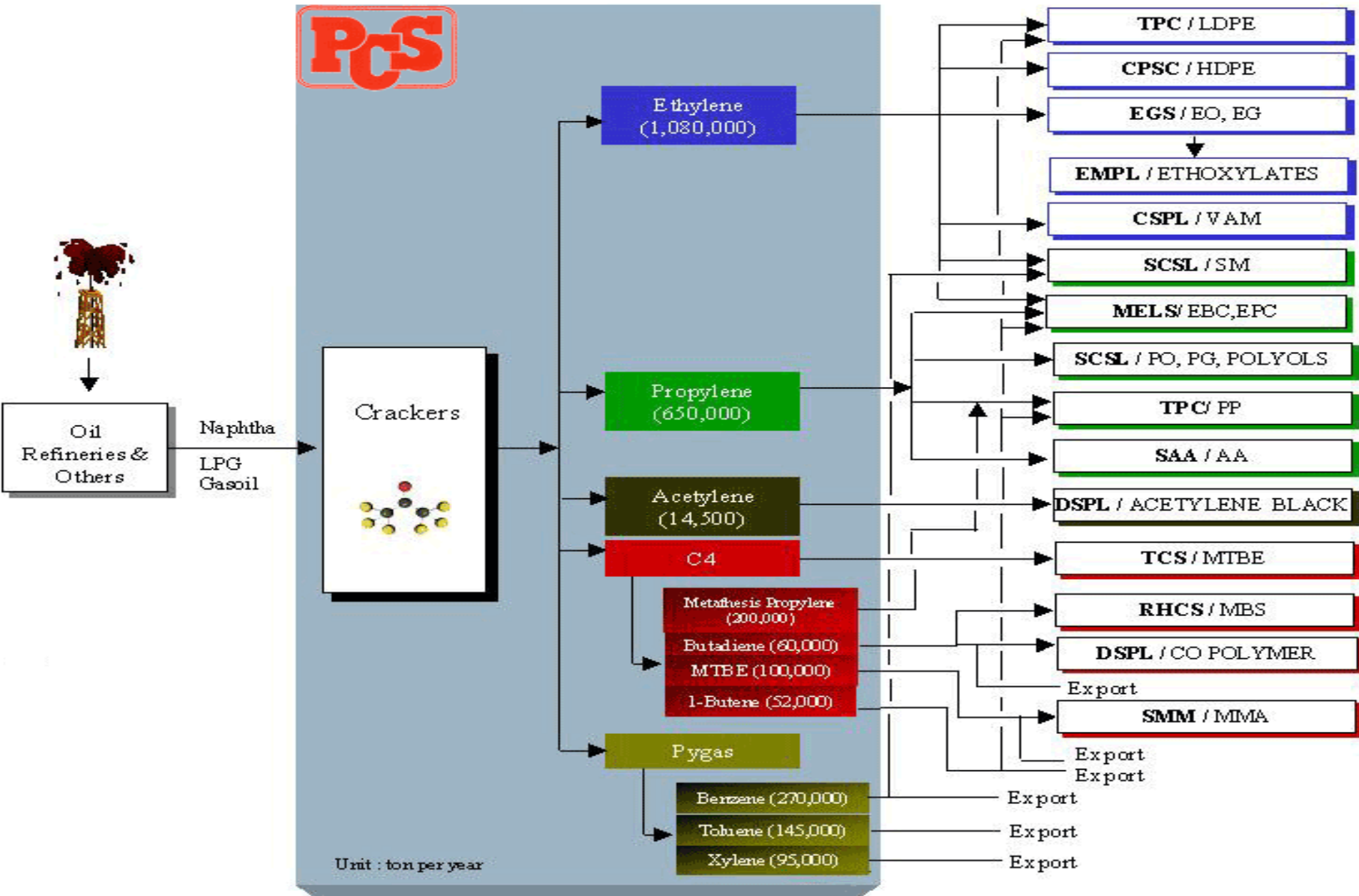


Jurong Island - Government Support

- Leadership, vision and clear plan.
 - Infrastructure: land reclamation, road and causeway, waste water treatment
 - detailed development plan
 - Targeted Promotion - specific companies that fit value chain.
 - Help prospective clients to remove challenges
 - Attract as a cluster, rather than individually
 - Low tax: 20% overall (2nd only to Hong Kong).
 - Seed funding with clear exit mechanism (20-30% max).
- Government owns the island and plays the developer's role, companies are renters.
- Government now looks at new areas for development – such as biotech and digital media

Upstream Company

Downstream Companies



What Did We Learn ...

- World-scale integrated refining and petrochemical operations can deliver superior financial results:
 - Even if paying world price for crude oil and other feedstocks then selling products into wholesale markets.
- Higher value products deliver higher margins.
- Importance of integration and synergies
- Alberta faces some of the similar challenges that need to be addressed
 - Skilled Labour, Attract downstream companies, etc

Best Practices

Internal Factors

Land Availability	<input checked="" type="checkbox"/>
Logistics	<input checked="" type="checkbox"/>
- Electricity	<input checked="" type="checkbox"/>
- Water	
- Rail & Pipe	
Competing Suppliers	
Labour Availability	<input type="checkbox"/>
Project Cost Competition	<input type="checkbox"/>
- Feedstock	<input checked="" type="checkbox"/>
availability	<input checked="" type="checkbox"/>
relative cost	<input checked="" type="checkbox"/>
Access to Markets	<input checked="" type="checkbox"/>

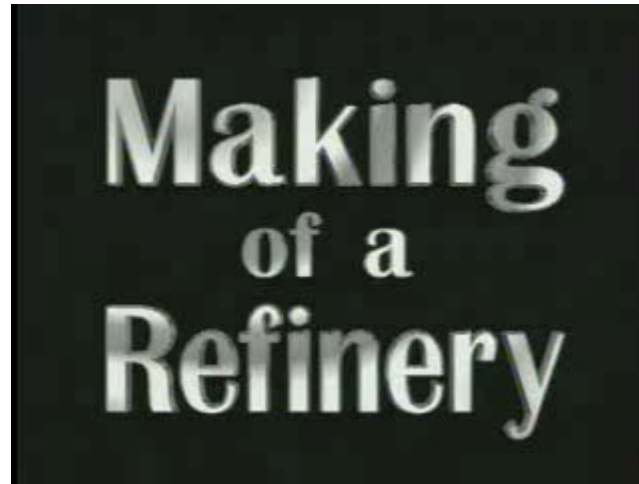
External Factors

Site Management Structure	<input checked="" type="checkbox"/>
Regulatory Certainty	<input checked="" type="checkbox"/>
Government Assistance	
- Infrastructure	
- Subsidies	<input type="checkbox"/>
- Permitting	<input checked="" type="checkbox"/>
Public Support	
Industry Organization	
Environmental Requirements	<input checked="" type="checkbox"/>
- Strategic Public Policy	<input checked="" type="checkbox"/>
International Trade Agreements	<input checked="" type="checkbox"/>
Integration with Education and R&D	

Source: Implementation & Advisory Group Ltd

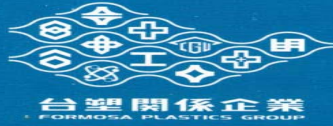
What Did We Learn ...

Making of an Energy Complex – Key Factors



- Vision and Leadership
- Clear, Detailed Planning
- Determination and Perseverance
- Government Can Have a Significant Role

Vision



No. 6 Naphtha Cracking Project and Economic Development

A Land Expansion Project that Will Elevate National Economic Competitiveness

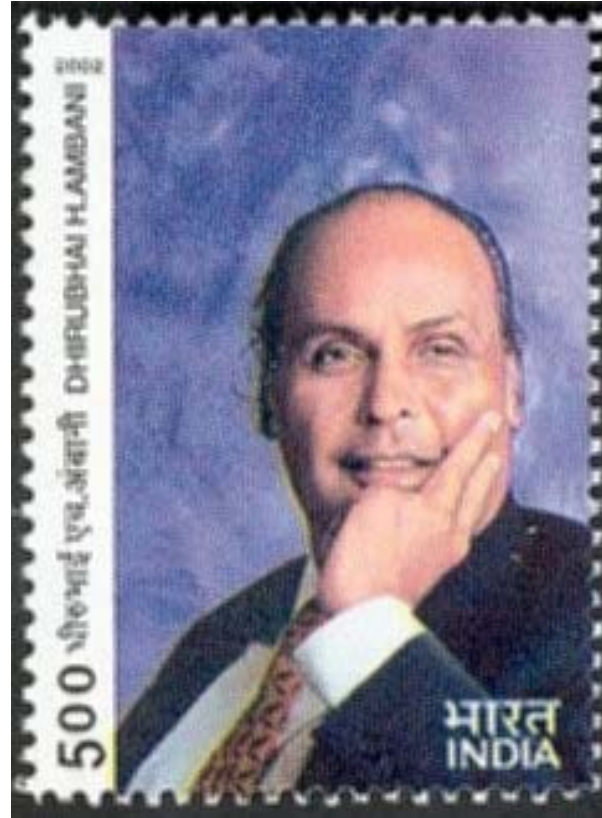


Leadership



Mr. Wang Yung-Ching

Formosa



Mr. Dhirubhai Ambani

Reliance



Mr. Lee Kuan-Yew

Singapore