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Chemical Market Associates, Inc.

EXECUTIVE SUMMARY

from

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Prepared for

Tractebel Asia Co., Ltd.

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CMAI USA
11757 Katy Freeway,
Suite 750
Houston, TX 77079
Tele: 1-281-531-4660
FAX: 1-281-531-9966

CMAI Europe
1st Floor,
14-16 Waterloo Place
London SW1Y 4AR
Tele: 44-0207 930-9818
FAX: 44-0207-930-9819

CMAI Asia
69 Duxton Road,
Level 2
Singapore 089528
Tele: 65-6226-5363
FAX: 65-6226-5157

CMAI Middle East
Building 4, Office 215
Sheikh Zayed Road
Dubai Internet City, Dubai, UAE
Tele: 971 4 391 2930
FAX: 971 4 391 6476

Project # SC-000498-SIN

www.cmaiglobal.com

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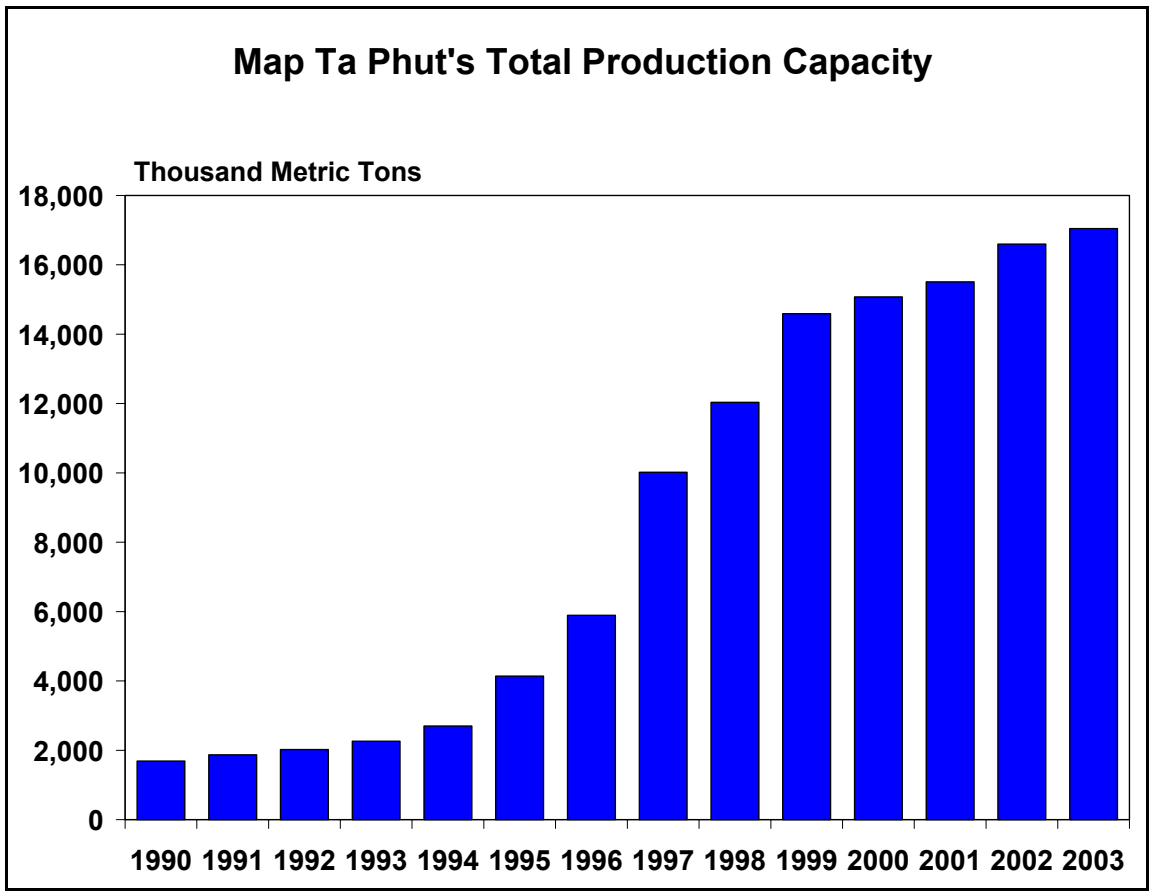
EXECUTIVE SUMMARY

The Map Ta Phut petrochemical complex has increased its total petrochemical production capacity rapidly since 1990. The fundamentals behind this rise in capacity are still valid today, and as such, continued growth in the petrochemical industry at Map Ta Phut is expected over the coming years.

From the end of 2003 through to the end of 2008 there are 35 base and intermediate chemical projects spread across 14 companies that CMAI believes have a strong probability of being completed. These projects are in various stages of planning and construction, and are a combination of new facilities and expansions to existing ones.

At the end of 2003 the total petrochemical capacity of the Map Ta Phut region was estimated to be just over 17 million tons, comprising 52 products in total. If all of the above announced expansion plans go ahead then the petrochemical production in Map Ta Phut by the end of 2008 is estimated to be just over 22.6 million tons of capacity, with 57 products in total. This represents a total increase of 30% above the end of 2003 production capacity. No further oil refining capacity is expected to be built over this timeframe due to current excess capacity. However, new gas separation plants are expected which will allow the Thai petrochemical industry to leverage further this cheap feedstock.



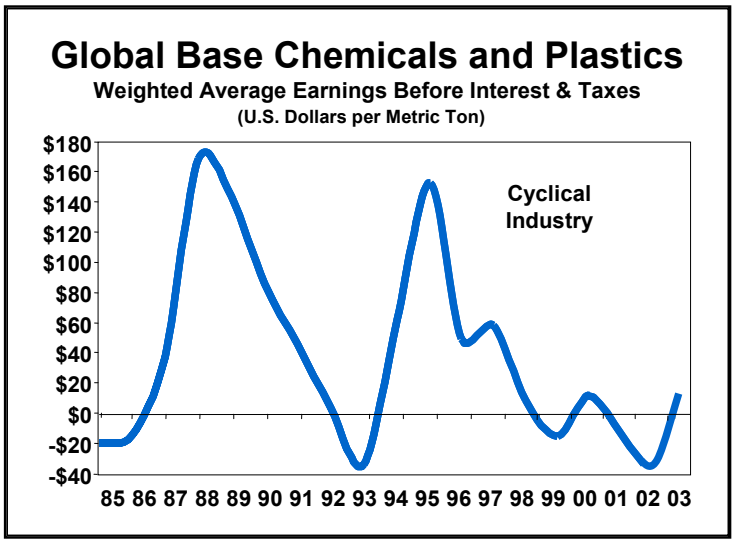
Of these probable projects, ethylene production and terephthallic acid production are the largest additions based on supply both the domestic market but more so the expanding Chinese market. Ethylene and its derivatives will be the main driver for expansion in Map Ta Phut over the coming years, as it has been since 1990.

The Petrochemical Industry

The petrochemical industry is capital intensive and margins in this industry have historically been cyclical. Changes in demand and supply balances and the resulting changes in average utilization rates are key drivers influencing the petrochemical industry cycle and margins.

Demand is typically reflected by general economic activity whilst supply is reflected by industry capacity additions, which are typically in large increments. As a result, the cycles are characterized by periods of tight supply, leading to high utilization rates and peak margins, followed by periods of oversupply primarily resulting from significant capacity additions, leading to reduced utilization rates and margins. In the past the petrochemical cycles typically last between seven to nine years from peak-to-peak, with the next cyclical peak expected in 2006.

The last petrochemical cycle peak was back in 1995, and since then the global and regional economies have been through significant upheavals and periods of oversupply. Despite this, the Thai petrochemical industry has continued to attract investment, with a steady increase of capacity buildup throughout these times, an indication of the attractiveness of Map Ta Phut for petrochemical investment.



The fundamentals that have supported the Map Ta Phut region's rise in production capacity through the 1990's continue to make investment attractive today. These fundamentals can be summarized as follows:

1. Market Conditions - favorable market conditions in Thailand and/or surrounding regions
2. Cost of Production - favorable cost of production due to feedstock cost advantage
3. Site characteristics - favorable site-specific characteristics such as cost of labor, government incentives, and logistical access to the Asian markets.

It is the favorable market conditions, the feedstock cost advantage, and a low labor cost that continue to be the driving forces behind the high number of probable projects being completed between the end of 2003 and the end of 2008. There is no reason why investment in the Map Ta Phut region will not continue, should these conditions remain.

Market Conditions

Strong economic growth historically and forecast for future years is the basis of strong petrochemical demand for Thailand. Prior to the Asian financial crisis, Thailand as well as the other Southeast Asian

(SEA) counties experienced greater than 8% growth per year, leading to strong demand growth for petrochemicals. After the Asian financial crisis, Thailand has led the SEA countries in terms of GDP growth in the Asian region, with the exception of China.

The forecast GDP growth for Thailand is expected to remain above the SEA regional growth rate, and well above world growth. China is forecast again to have the highest GDP growth through to 2010.

This historical growth has led to a number of industries setting up in Thailand that consume significant quantities of petrochemicals. These include automotive manufacturers, electrical and electronic goods manufacturing, as well as wide variety of packaging industries. The expected good economic growth should see continued investment by such industries in Thailand. The outlook for petrochemical demand is thus very positive.

Strong demand growth in many of the base petrochemicals, and their major derivatives, has helped justify investments in previous years and this is expected to continue to attract investment in the future.

Petrochemical demand growth above the global average for the Thai domestic market allows current investors to base load their petrochemical facilities with domestic demand. For some of the petrochemicals produced at Map Ta Phut, the total capacity exceeds domestic demand, therefore to supplement the base load, these producers export into both Northeast Asia and Southeast Asia. Both of these regions have exhibited good petrochemical demand growth, and their demand is expected to remain strong in the coming years.

Of particular importance is the continued strong demand for polyethylene, of which Map Ta Phut is a substantial exporter. This demand has been above the global average over the past five years, and its demand growth is expected to remain so over the coming years. Paraxylene has also shown solid growth in previous years, and its demand growth rates are also expected to continue to be above the global average as a result of the continued growth of polyester.

For the other base chemicals produced at Map Ta Phut, and their major derivatives, the market outlook is in general favorable, with above global average demand growth rates expected for these derivatives both in Thailand, and in Northeast Asia.

China is dominating the demand growth within the Asia region for the vast majority of petrochemicals. China continues to remain undersupplied in a number of base, intermediate and finished petrochemical products. This trend is expected to continue even as China adds domestic petrochemical capacity. Thailand producers of petrochemicals currently export into the Chinese market, and future investment at Map a Phut will look to China as demand center outside of the Thai domestic market.

This expected solid demand growth both in the Thai domestic market, and in the surrounding regions implies that current and future investors located at Map Ta Phut have ready markets within the Asian in which to sell their products.

Cost of Production

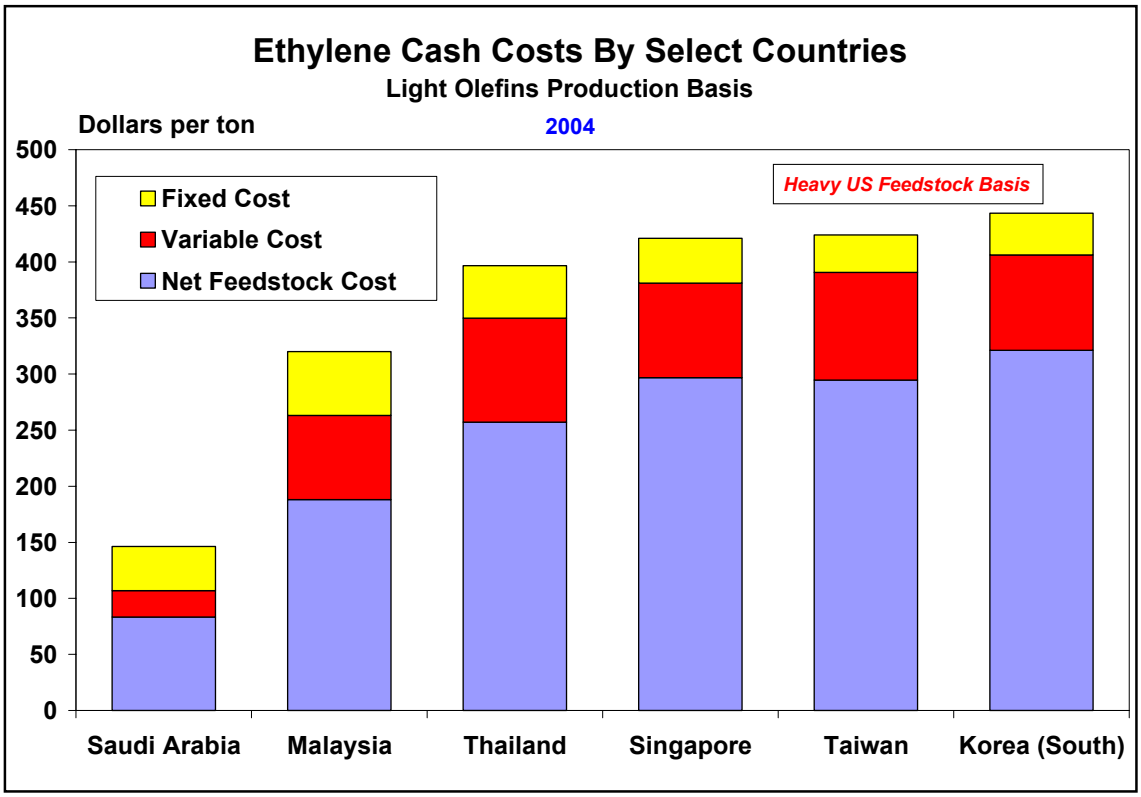
The cost of production of Thailand's petrochemicals is probably the most important fundamental supporting the current and future investment in the Map Ta Phut region. In the production of petrochemicals, it is the cost of production of the base chemicals that will determine the competitiveness of the derivatives and thus the complex as a whole.
For the large majority of petrochemical processes, the feedstock comprises between 40 – 70 percent of the total cost of production, and as a result, competitively priced feedstock is very important. Map Ta Phut has the distinct advantage of having access to natural gas fields. These fields, along with supplying natural gas for fuel purposes, supply a relatively cheap feedstock, ethane, to the ethylene production units.

Ethylene is the base chemical which is used to produce a vast array of derivatives, but in particular it goes on to produce polyethylene, which is consumed both in Thailand but is also exported into Asia in

substantial quantities. At Map Ta Phut, ethylene is the largest base chemical produced with an installed capacity of 2 million tons, almost four times the capacity of the next base chemical benzene.

The majority of ethylene units in Asia are based on naphtha feedstock, an oil derived product. Ethylene units not integrated into refineries must import this feedstock. Being directly related to the oil price, as well as an ever increasing number of ethylene units vying for the traded naphtha, the feedstock cost per ton of ethylene produced for these naphtha based ethylene units is high.

Thailand's ethylene units are currently a mix of feedstocks, both naphtha and ethane. With this mix of feedstocks, the effect on the cost of production of ethylene compared to other Asian countries is noticeable. Only Malaysia, which also has access to domestic natural gas reserves and thus ethane feedstock is able to produce ethylene at a lower cost than in Thailand, as the majority of the Malaysian ethylene units are ethane based.



Currently the ethylene units in Thailand are at various stages of increasing the amount of ethane feedstock they utilize. This increase in the amount of ethane used as feedstock will drive down Thailand's average cash cost production even further in future years. Any new ethylene units that may be built in Thailand in the future will more than likely be based on ethane feedstock, as it is this low feedstock cost and subsequent low cost of production of base petrochemicals where Thailand has the distinct advantage over other petrochemical hubs in the region, with the exception of Kerteh Malaysia. However there is some uncertainty surrounding the future availability of more ethane at Kerteh.

The Middle East countries are continuing to emerge as a major force in the global petrochemical industry. Their petrochemical facilities are all predicated on very low cost ethane from their vast reserves of oil and gas. An investor looking to set up a petrochemical facility in the Middle East must way up the political instability of the region and the distance from the largest and fastest growing region – Asia. Currently only the oil & chemical majors and domestically controlled petrochemical companies have invested in the Middle East. With continued political unrest, the amount of investment

is likely to slow. Politically stable countries with gas reserves and located in Asia could see an increase in investment as a result.

The other base chemicals that are utilized to a lesser extent at Map Ta Phut, namely benzene, paraxylene and chlorine, compared favorably on a regional comparison of their relative costs of production. Thailand's aromatic base chemicals, benzene and paraxylene, are neither advantaged nor disadvantaged in terms of cost of production to other petrochemical hubs, as a direct result of regional producers sourcing feedstock from refineries. All regional refineries must purchase crude oil, so the resultant feedstock cost for aromatics is comparable across the region. Thailand does have two distinct advantages however, which will increase the likelihood of further aromatics expansion. The first is an abundance of refinery capacity and thus an abundance of aromatics feedstock available for future production increases. The second is that Thailand has a growing domestic demand for the aromatics derivatives such as terephthallic acid and polyester producers who require paraxylene, and polystyrene and polycarbonate producers who require benzene.

Thailand's other major base chemical, chlorine, remains comparatively competitive within the region, but currently lacks economies of scale. One advantage that chlorine production in Thailand does have in Thailand however, is a domestic supply of salt, which is required as a feedstock in the production of chlorine.

Site Characteristics

The third fundamental that has led to the rise of the Map Ta Phut region in terms of petrochemical investment are those characteristics that lie outside market and cost of production advantages, but still combine to add to an overall favorable environment for investment.

- Scale
- Feedstock Availability
- Capital costs
- Operational Costs
- Proximity to Markets
- Operational Competence
- Political stability
- Government Incentives

In terms of scale, the Map Ta Phut region is now large enough to facilitate greater levels of product integration with any potential new unit. As a result, it is less likely that any new facility will have to import feedstock, thus reducing the logistical cost of its raw materials. This also allows any potential investor the flexibility for future diversification of product line.

In addition to the integration benefit is the support services that are located in the region. Map Ta Phut has now reached a size that specialist engineering and maintenance companies are located close by. Smaller petrochemical hubs within the region in general do not have sufficient critical mass to ensure that these support services are readily available, as they are remotely located.

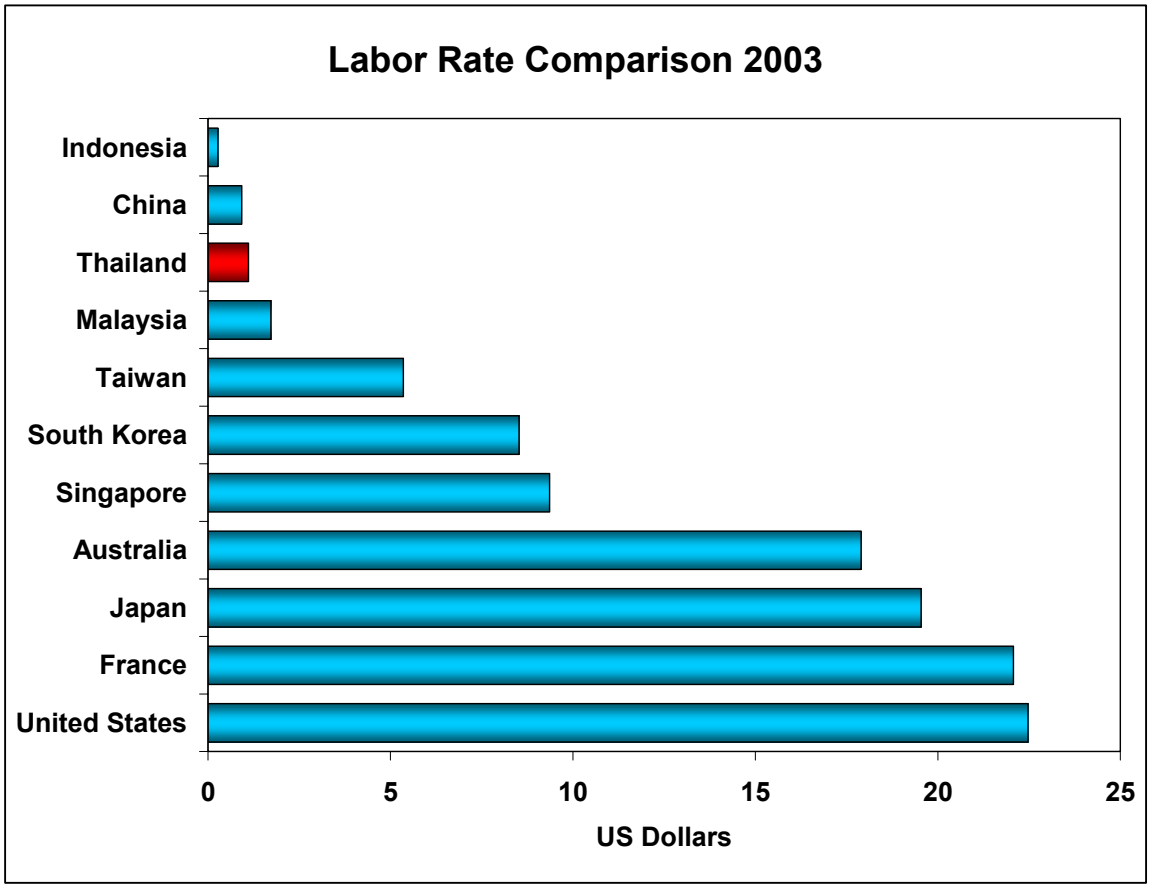
Apart from having competitively priced feedstock for the base petrochemicals as a result of the natural gas fields, these fields and the oil refineries located at Map Ta Phut ensure that the complex has feedstock availability and security both now and in the future. This means the base petrochemical producers at Map Ta Phut are less dependant on imported material, and feedstocks for these base chemicals from both the natural gas reserves and from the refineries appear to be in excess of demand, thus ensuring continued supply for future years.

The capital cost of building a new facility at Map Ta Phut has declined over the years, with more and more specialized engineering firms located in and around the area. Compared to the petrochemical hubs of Taiwan and South Korea with their heavy industry sector, and more mature petrochemical

industry, Map Ta Phut can not compete, however it is competitive when compared to the other petrochemical hubs in the region.

Negating the slightly higher capital cost of construction at Map Ta Phut compared to the NEA petrochemical hubs, is Thailand's low cost of labor. Labor costs for a petrochemical facility will impact the bottom line of an operation throughout its life. Thus the slightly higher one off capital cost can be countered in terms of a lower ongoing labor cost.

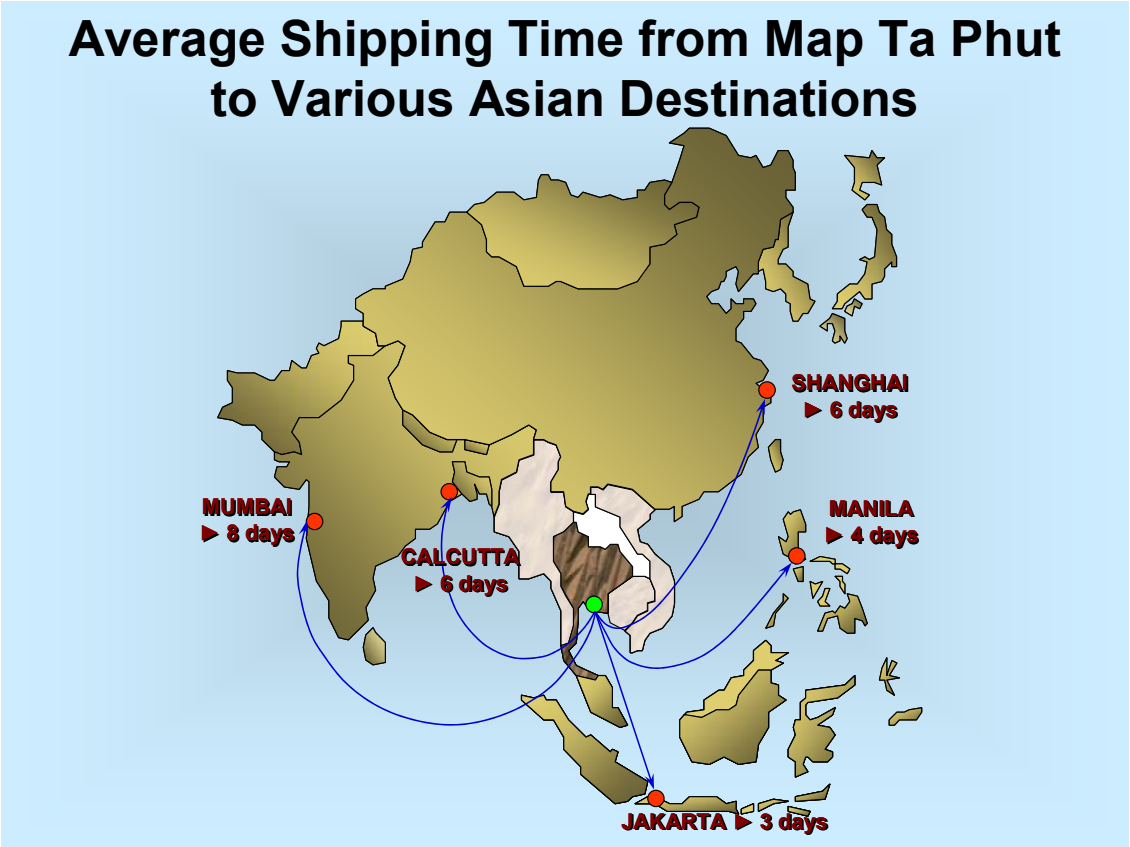
The low cost of labor in Thailand is attractive for potential investors; however the labor force supplied must be of sufficient operational competence to ensure that the facility is run effectively. Taking the number of years that each petrochemical hub has operated the largest and most complex of chemical process units, an ethylene unit, as a measure of operational competence, then Map Ta Phut has almost 15 years of experience. This is sufficient time to build up a competent work force from which new investors can benefit.



The other major operational cost for the petrochemical industry is fuel. Fuel costs at Map Ta Phut are generally lower than the other petrochemical hubs as a result of the domestic natural gas reserves

Apart from the operational costs, one of the key fundamentals for Map Ta Phut that keeps attracting investors is its proximity to the two fastest growing markets in the world In terms of petrochemical demand, namely China and India. Both of these countries are less than 8 shipping days away, which allows for timely delivery of customers orders.

In addition to these two countries, the remainder of SEA is within a 4 day sailing radius.



The Thai market itself is a growing market for petrochemicals as its manufacturing base continues to grow, particularly in the automobile sector. This growing market is readily supplied from Map Ta Phut due to road and rail links.

Over the years, the road and rail access that Thailand has with Cambodia, Laos, Myanmar and Vietnam will become ever important, as these countries develop and their petrochemical demand continues to increase from current levels.

The final characteristic that helps maintain petrochemical investment in Map Ta Phut is support from the Government of Thailand, and it does this in two main ways. The first is by simply providing a stable democratic and capitalist society. Both the Middle East and to some extent China could suffer from a lack of these political characteristics. Investors in petrochemical facilities are putting large amounts of capital into these countries for a long period of time, and they would prefer to have a politically stable system of government, one that is well established, and free of corruption.

The second way in which the Thai government has helped maintain investment in Map Ta Phut is through both tax and non-tax incentives for investors. Similar incentives are offered by other petrochemical hubs in the region, however Thailand has the most extensive list of incentives, and the government of Thailand is known to help investors where possible. For investors that meet the minimum requirements, and who are locating petrochemical operations in the Industrial Estates of Rayong, these incentives include:

- A corporate tax holiday for 8 years, and a 50% reduction for an addition 5 years
- Import duty exemptions on machinery
- Duty exemption on raw materials for export products
- Land ownership rights for foreign investors

Conclusions on Investment

Thailand's strong economic growth coupled with the with a number of industry specific fundamentals have propelled Map Ta Phut to a world scale petrochemical hub over the last twenty years. These fundamentals still remain valid today. In particular, the complex's:

- Feedstock advantage → cost advantage
- Access to the Asian market & Thailand's growth as a manufacturing hub
- Low cost of labor
- Government incentives

have attracted investors to Map Ta Phut and be competitive

Apart from the high number of probable projects that are scheduled to be implemented by the end of 2008, these fundamentals should continue to attract investment.

Each petrochemical process has a specific electrical power and steam demand to produce a ton of product.

Overall, the gross electrical power and energy consumption of the petrochemical industry at Map Ta Phut is forecast to increase in line with the expected continued investment of new capacity to take advantage of the market conditions and access, cost advantaged feedstock, and low labor costs and government incentives.