SUKAD

Case Study | Innovative in Megaprojects

A. Project Characteristics

- Megaproject: the approved budget was about (~) $700 million US (early 1990's).
- This megaproject had two main sub-projects:
  - One sub-project was modifications to an existing refinery (~$100 million), and
  - The second sub-project (~$600 million) was new facilities (grassroots/greenfield).
- The project was on an island, in a country where there were limited labor and technicians.

B. The Project Owner

- The Project Owner was a joint venture consisting of three companies:
  - 50% (N. America),
  - 40% (N. America),
  - 10% (Asia).
- The 10% company was a joint venture between the 40% company and a government of an Asian country.

C. The Service Providers

- Project Owner awarded a global contractor (main contractor) an Engineering, Procurement, and Construction (EPC) contract.
- The contract was reimbursable (cost plus), incentive contract.
- The main contractor was ultimately responsible for engineering, procurement, and construction management (UK); construction was awarded to a general contractor.
- The construction's general contractor ended up being a joint venture between three companies (Europeans – mostly Germans).
- Construction labor came from Asian countries, senior construction staff was mostly European and Asian.

D. The Challenges

The following are some of the challenges related to this project.

- The project was on a small island, with an existing refinery and limited space for the new plant. As a result, we had to reclaim land from the sea to increase the plot space

12714 Sunset Dune Dr
Houston, TX 77082
+1 346 762 7957
info@sukad.com
www.sukad.om

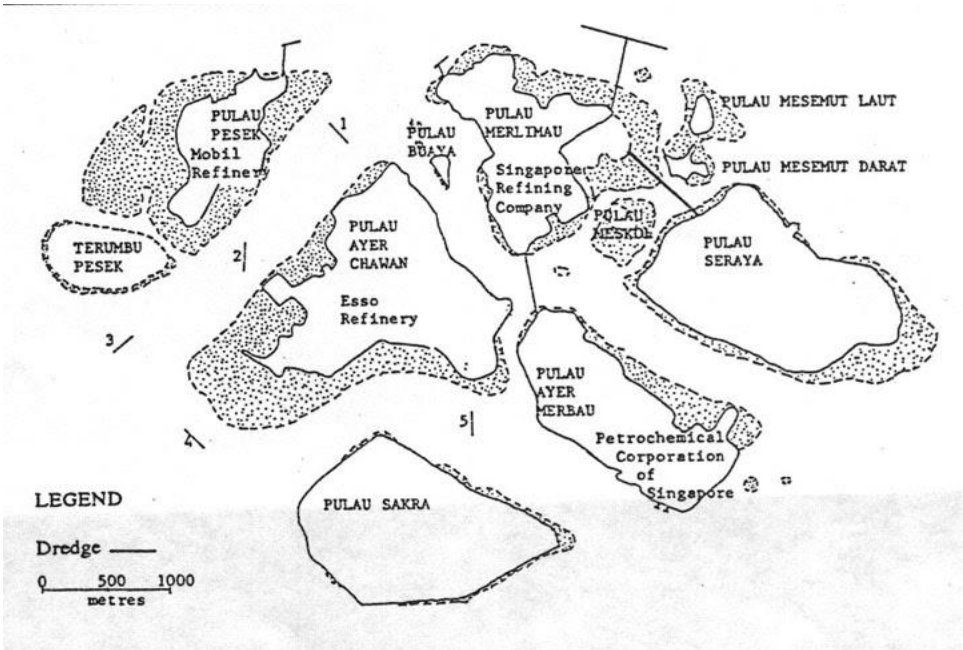

Figure 1: The Cluster of Islands andf the project site

- The government wanted to connect all of these islands (see figure) into one large island; reclamation was ongoing while our project was in progress; which means we had to finish before they close the shipping channel on us
- Another difficult challenge was the lack of qualified laborers in the area, which meant that we would have to bring from other countries, which led to another problem: housing them.
- A typical project of this size would require more than 500 people on site, which was not possible in our case.

E. Possible Solutions

Option 1

- Build the plant's central process units on barges,
- Float the barges to a partially prepared site,
- Build a dike around them,
- Fill the barges with concrete to settle them on the shallow seafloor,
- Fill around them (reclaim from the sea), and
- Build the rest of the facilities around them.

12714 Sunset Dune Dr
Houston, TX 77082
+1 346 762 7957
info@sukad.com
www.sukad.om

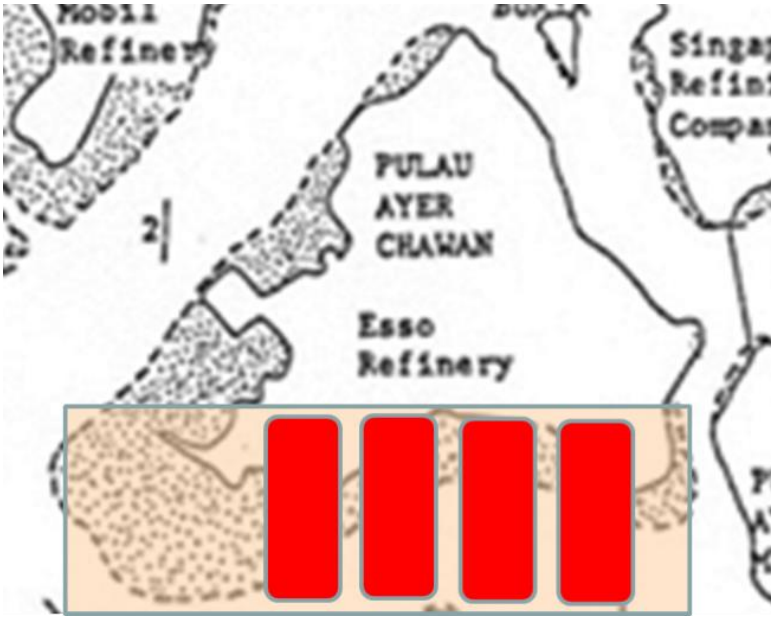

Figure 2: Option 1 with the process units on barges

Option 2

- Use modular construction techniques,
- Build the central process units as modules at fabrication yards in the region,
- Ship them to the site on barges,
- Install them one after the other – like Legos,
- This was the selected option,
- Resulted in close to 200 modules, including:
    - Process units module (2nd picture below),
    - Pipe racks modules (1st picture below),
    - Large vessel modules (similar to the 3rd picture), but in our case, the vessels came with insulation, paint, pipe, instruments, electrical, etc., already installed.
- Many of the modules were the size of a four-story building, which required heavy lifts.

F. Secondary Risk

The above solutions solved the island's limited space and labor challenges but created numerous other challenges. However, the team felt the other challenges are manageable, and accepted them. Some of these secondary risks were:

12714 Sunset Dune Dr
Houston, TX 77082
+1 346 762 7957

info@sukad.com
www.sukad.om

- Shipping risks,
- Installation risks; safety, fabrication defects, construction sequencing …
- Splitting the management team; multiple locations, and
- Availability of crane large enough to lift the modules; had to book in advance.

G. The project Results

Despite the challenges, the project was considered successful in term of:

- The success of the product,
- The success of project management,
- The overall success of the product delivery, and
- Business success is another subject, and outside this case study.

In closing, the modular concepts worked well with minimal issues, although not without challenges.

End of Case Study

12714 Sunset Dune Dr
Houston, TX 77082
+1 346 762 7957
info@sukad.com
www.sukad.om