Tangiers-Med port (Morocco)

Overview of the project

Press visit to Tangiers

27 and 28 September 2005

Contents

Tangiers-Med port

A new economic hub for Morocco

Through its subsidiaries Bouygues Travaux Publics and Bymaro, in June 2003 Bouygues Construction won a €223 million contract (2.42 billion dirhams) for the design and construction of a new commercial port in Tangiers. The operation is being carried out in conjunction with Saipem (33% share in the consortium) for the Tangiers Mediterranean Special Agency (TMSA).

Following the international call for tenders issued by TMSA in October 2002, Bouygues Construction was appointed to build the breakwaters, dredge the seafloor and reclaim land for the logistics area of the future port at the edge of the Mediterranean. The project involves building a breakwater, a sort of vertical seawall that will protect the waters of the port and the shore infrastructures. In 2005, Bouygues Construction won an additional €32 million package for the design and construction of an oil terminal and fuelling facility, together with a grain terminal.

The groundbreaking ceremony was officiated by King Mohamed VI in February 2003. Construction is to take three years, with handover scheduled for June 2006. The new Tangiers-Med Port will start operation in 2007.

Technical innovation

Bouygues' bid for this project was chosen as a result of a technical alternative its engineering team proposed to the client: a rubble-mound breakwater consisting of 7,500 Accropodes™ in the shallower waters and around 40 precast reinforced-concrete caissons in areas where the sea is more than 20 metres deep. This alternative has a number of advantages, including an almost 18-hectare increase in the area of port waters. It also reduces environmental impact by diminishing the footprint of the works and the volumes of materials used. Additionally, it results in a shorter construction time.

The world's largest ships

The project is one of the largest infrastructure projects undertaken in Morocco. Located on the Mediterranean coast, 35 kilometres east of Tangiers, the future deepwater port and the associated free-trade zone will lend new impetus to the economy of northern Morocco. It is aimed at anchoring Morocco in the Euro-Mediterranean zone and establishing the area as a model of integrated regional development. The port lies at a strategic intersection between the Atlantic Ocean and the Mediterranean Sea, where major north-south and east-west shipping lanes meet. Bouygues Construction was appointed to dredge the inner port area to the depth of 17 metres required for container vessels to berth. The world’s largest ships will thus be able to load and unload without any loss of time. With its handling capacity of 25 million tonnes per year, Tangiers will be positioned to challenge the Spanish port of Algeciras just 14 kilometres away.

Harbour engineering

Bouygues Construction possesses valuable expertise in the construction of port infrastructures. Its most recent achievements are the Beirut Seafront project (1999), the Monaco Harbour breakwater (2002), and the Caucedo container port in the Dominican Republic which was handed over in 2004. Its engineering department has thus developed new skills in harbour engineering, particularly in terms of marine hydraulics and breakwater design. This know-how includes digital modelling of the major phenomena involved (wave propagation, ranging, currents, etc.), together with supervision and analysis of hydraulic model testing. For Tangiers harbour, tests were carried out using wave data gathered for the purpose. Carried out first by computer, then in a flume with a scale model of the breakwater, they served in particular to define the size and shape of the caissons and to check their stability and the wave loading on the structure.

Caissons breakwater

A technical alternative defying the ocean

The caissons of the main breakwater are the key elements of the project. They are immense concrete containers of unprecedented size. It was the technical alternative proposed to the client by Bouygues Construction that lies behind the construction of these enormous structures standing as tall as a 10-storey building and each occupying the area of two tennis courts.

Birth of a caisson

The 40 or so four-cell caissons are turned out at a rate of one per week. Construction of the mammoth reinforced-concrete structures starts on land, in the casting yard where the first 9 metres of caisson are poured. At this point a caisson already weighs 3,200 tonnes. Any heavier, and it would be impossible to move it into the water. This first part of the caisson is raised and moved on a special transporter to a storage yard where the concrete can age. Two days later, the caisson is again raised, placed in the water, and towed to the raising quay for the second phase of concreting. After casting of an additional 15 metres in height it weighs 6,000 tonnes and is sunk into its final position beyond the end of the rubble-mound breakwater, using a GPS positioning system and divers to guide placement under water. It is a difficult operation for the maritime engineering team, in this part of the Strait of Gibraltar which is particularly exposed to wind and to strong currents between tides. Subsequently ballasted with 13,500 m^3 of sand, the caisson stands 3.8 metres above the sea. The remaining superstructure work takes it to its full height of 35 metres and its final weight of 7,900 tonnes.

Durable structure

The caisson breakwater and the port facilities as a whole are designed to have a service lifetime of 100 years. The shape of the caissons (rounded) was designed to reduce the force exerted by waves. A special concrete was also developed in the laboratory in order to meet two stringent requirements: no ingress of chloride ions in the sea water, and reduced cracking.

Special quarry

Construction of the breakwater and of the caissons required a quarry to be opened and operated. Located near the port, it supplies aggregate and sand for concrete and also material for the rubble-mound breakwater and its rock armour. The 8-kilometre-long specially built haulage road to the port is used 24 hours a day for the 500 return trips the 50 trucks drive daily. A total of close to 10,000 tonnes of construction materials are hauled to the site every day.

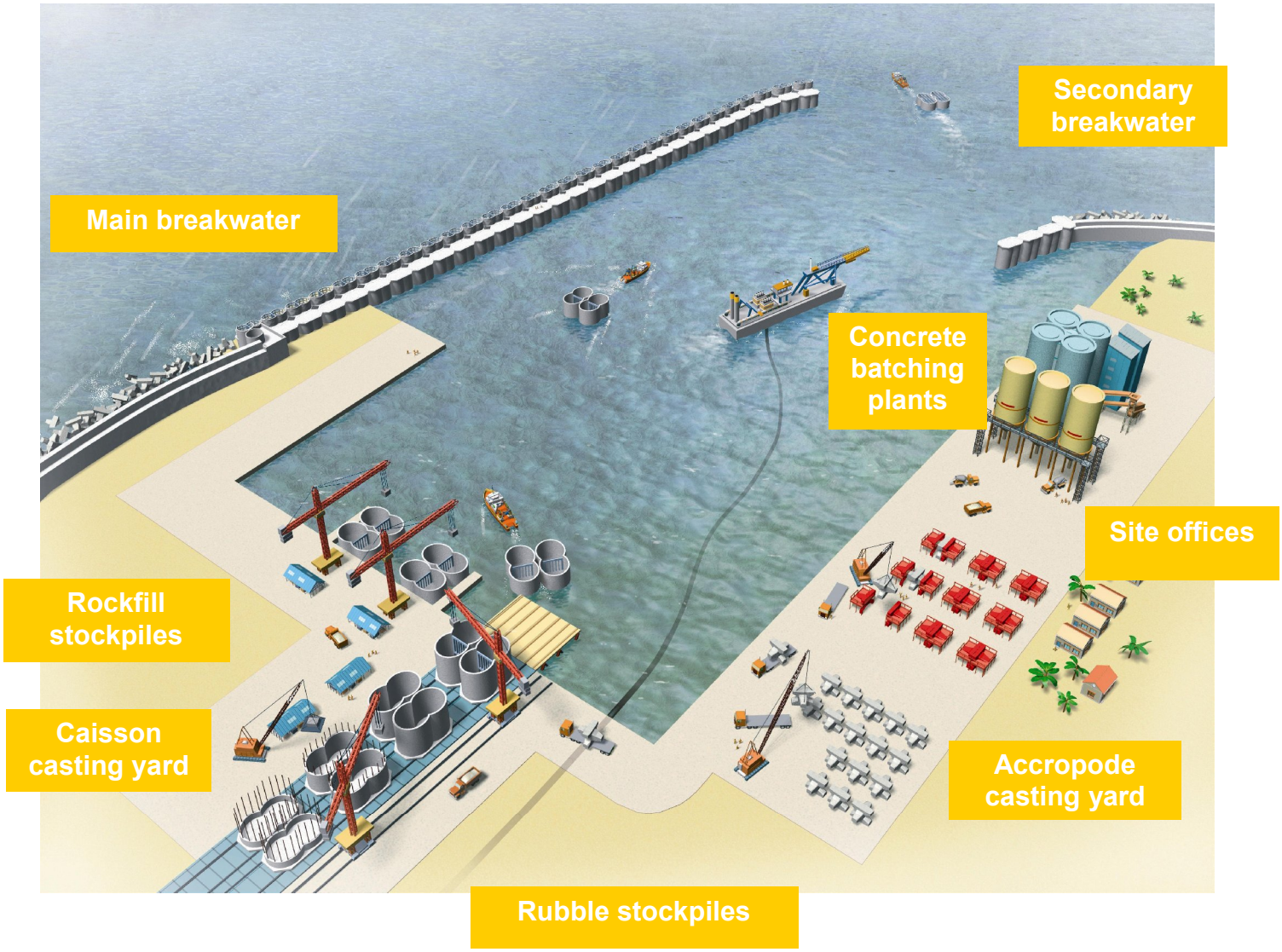
Facts and figures

The Tangiers-Med Port project is:

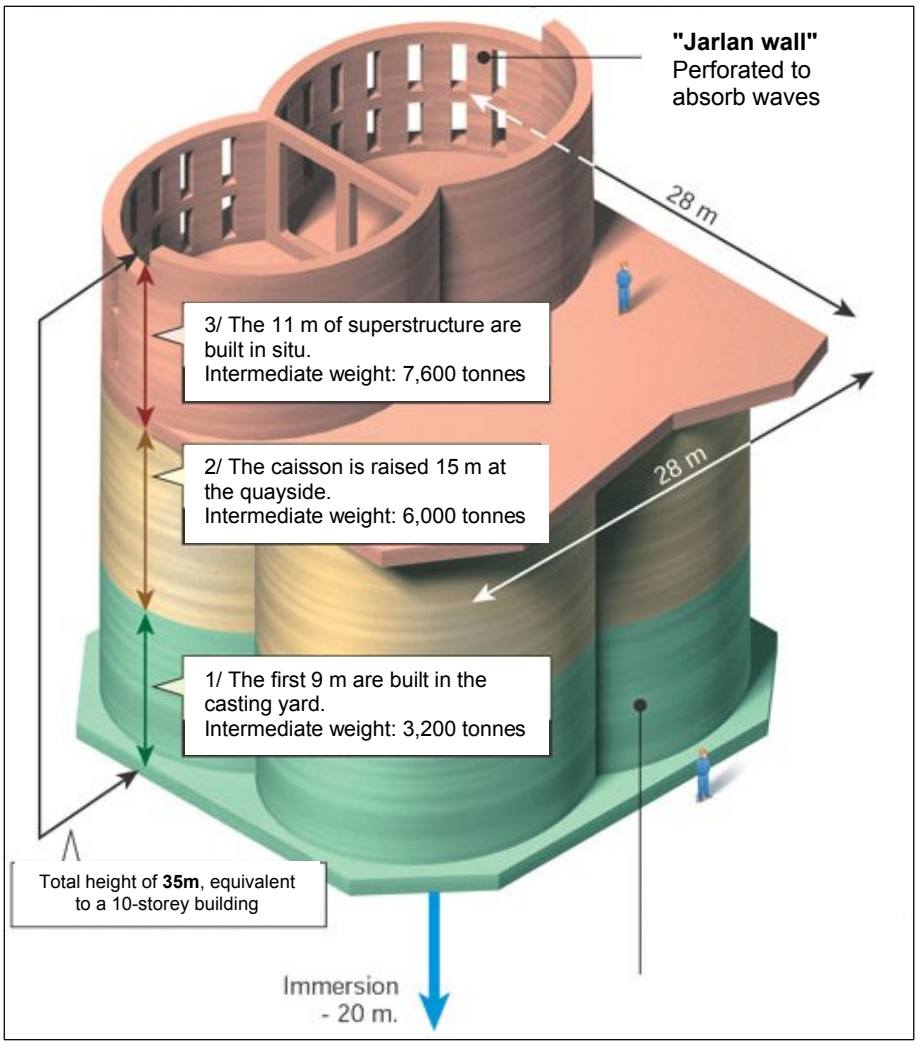
- A main contract for €223 million and an additional contract for €32 million
- 36 months of work + 6 months for the additional work
- 1,100 site workers and technicians
- More than 2 kilometres of breakwaters (Accropodes™ and caissons)
- 142 hectares of land reclaimed from the sea
- 6.6 million m^3 of rockfill and reclamation fill
- 40 four-cell reinforced-concrete caissons:
  - 28 metres x 28 metres x 35 metres high
  - 7,900 tonnes
  - 550 tonnes of steel and 3,000 m^3 of concrete
- 29 two-cell caissons, each weighing 3,400 tonnes
- 7,500 Accropode™ blocks cast at a rate of 30 units per day
- Site handover: June to December 2006
- Port opening: 1st half of 2007

Illustrations

General view of port



Construction of a four-cell caisson



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