Fabrication Technology of Offshore Fabrication Bases

1. Introduction

As a contractor of oil & gas offshore EPC works (engineering, procurement, fabrication, transportation and offshore installation), the Oil & Gas Business Division of Energy Facilities, Civil Engineering & Marine Construction Division has established a number of subsidiaries in Southeast Asia and distributed its functions among them. For the fabrication operations, it manages two overseas fabrication bases-TNS (founded in Thailand in 1987) and NS-BATAM (founded in Indonesia in 1995). Many local employees and foreign experts are properly managed there by Japanese staff dispatched from NSC. As fabrication yards of offshore platforms (hereinafter referred to as "PF"), the two overseas bases are highly reputed by customers, including Shell, Total, Chevron and other major oil & gas companies. The fabrication technology that has long been fostered through the efforts to fabricate offshore PFs with a new structure at NS-BATAM is introduced below.

2. Challenge to Fabricate New Offshore PF Structure

NS-BATAM fabricated a "Drill Ace Platform"[*1] , which is a very unique type of offshore PF in the world, under gas field project in Australia developed by Origin Energy Corporation. The fabricated offshore PF is a super-large structure 120 m in height and 8,000 tons in gross weight. Its unique structure required special fabrication and management technology that are described below.

a) The deck required sufficient buoyancy at the time of floating at the offshore site. Since the deck was of a complicated shell structure made of 12 mm-thick steel plate, it was considered that the deck would be subject to welding distortion. Therefore, experts performed appropriate straightening work according to a straightening work plan formulated beforehand. As a result, the desired shape and quality could be ensured.

b) According to the design, part of the joint between the base and the jacket was as thick as 100 mm above. Therefore, there was the possibility of weld cracks developing in the joint. In practice, however, weld cracks could be prevented by implementing strict control of preheating determined from the weld crack susceptibility composition (P_{cm}) and by maintaining the heat input and layer temperature.

c) During the process control, which involved many types of complicated work-installation of more than 60 different equipments on the deck, arrangement of piping, electrical and instrumentation connecting those equipments together, painting, pre-commissioning, etc., a detailed progress control using exclusive management software was implemented with the cooperation of the project owner. As a result, the entire project could be completed as scheduled.

d) From the standpoint of shortening the construction period, cost saving and safety reasons, it was considered appropriate to eliminate operations at elevated places. Therefore, components of the PF were prefabricated as far as possible, and the deck (3,000 t), jacket (1,000 t) and base (2,000 t) were assembled using a floating crane (lifting capacity: 3,200 t).

e) In order to move the completed offshore PF (8,000 t) safely onto a semi-submerged barge for installation at the site without causing unnecessary internal stress in the PF, a load-out by skidding was planned. With the offshore PF supported evenly by jacks installed on a "skidding shoes," the volume of barge ballast water was adjusted based on a special program according to the amount of draw-in of the PF so as to maintain the yard quay and the barge deck at the same level during the skidding operation. As a result, the 12-hour load-out work could be completed safely.

As mentioned above, the fabrication and management technology that NSC has long fostered were applied to this exceptionally large offshore PF. The semi-submerged barge on which the PF was mounted left for the installation location on February 13, 2004, whereupon all the work that had lasted for one year ended safety.

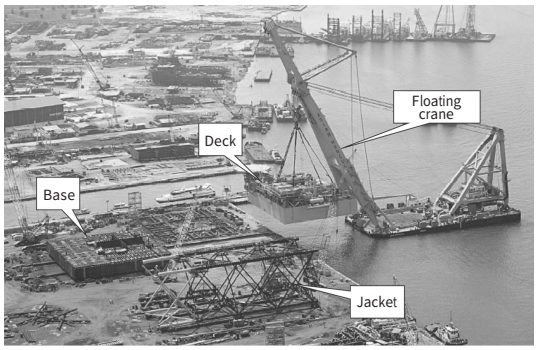

Photo 1 Yard block assembly by floating crane

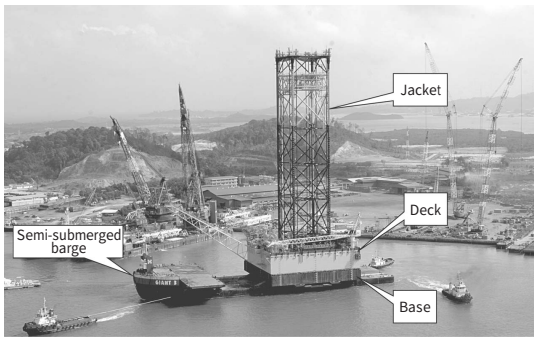

Photo 2 Sailout of completed platform from NS-Batam

[*1] "Drill Ace Platform" is an offshore PF consisting of a deck, jacket and base as a single unit. After the PF is transported on a semi-submerged barge to the installation location and floated on the water, the base is lowered using the PF's jacks and pumps to the seabed and secured. Thus, this method permits a shorter installation period and reuse of the PF.

For further information, contact
Energy Facilities, Civil Engineering & Marine Construction Division