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SMART LEG - FLOAT-OVER-DECK INSTALLATION

THE NEED
The installation of decks for large offshore platforms frequently require the use of large barge crane vessels because of their size and weight. However, if the platform needs to be located in a place with long period swell conditions, the cargo barge will suffer from large amplitudes that will difficult the mating of the deck’s legs with the piles.

THE TECHNOLOGY

Developed and patented by ETPM the principle of the Smart-Leg technology is based on using passive hydraulic devices to neutralize the vertical movements of the barge and to transfer the deck weight from the cargo barge to the piled jacket structure.
The Smart-Leg jacks allows the mating of each deck leg onto the corresponding jacket pile to take place at the precise time when the deck leg vertical speed is zero, therefore eliminating the kinetic energy and the risk of impact. The deck mating is completed in a few seconds less than the swell period. During the abandonment phase, the deck can be removed by reversing the operation (Labbé, 1998.). Hydraulic jack assemblies are fitted on the deck above the jacket legs. A cargo barge carries the deck on a special support called Smart-Shoes. The barge is positioned in front of the jacket. A set of devices called Smart-Fins are first deployed to establish contact at the four corners of the jacket and to contain the barge in the space allowed for mating. The Smart-Fins are equipped with hydraulic shock absorbers that will reduce the aft and fore motion of the barge to under 25 millimeters. Afterwards, Smart-Fenders are used to eliminate the sideways motion of the barge. (Labbé, 1998.)

When the cargo barge carrying the deck has been positioned inside the jacket, the jacks are activated to deploy extension pipes in order to establish contact with the jacket top of piles. The jack extension pipes extend and contract as the deck moves up and down according to the swell. A check-valve located between the jacks will close and lock the deck at the peak of its motion when the velocity of the deck legs and the kinetic energy forces are zero.
At this point the deck and barge are totally immobilized with the deck load shared by the jacket and the barge. The final load transfer is achieved by ballasting the barge and collapsing the Smart-Shoes.

**The Benefits**

- After the deck is installed all the hydraulic devices can be easily retrieved to be ready for another project. A regular float-over operation could be done in less than 6 hours.
- The Smart-Leg system should be expected to handle decks in the 3,000 tonne to 40,000 tonne range. The heavier the deck the easier the installation since the heavier decks would have less motion.
- The acceptable limit in terms of waves is usually no more than 2.8 meters in a long period of 15 seconds.
- The cost and risk of lifting and installing heavy decks in places with long swells is considerably less than using heavy-lift barge cranes.

**Status**

- A float over deck installation was successfully completed offshore Nigeria in June 1997 by McDermott-ETPM for the EKPE Gas compression platform. The barge preparation was done in 3 days. The float-over operation was done in 6 hours. This was the first operation made with the Smart-Leg Technology.
- This technology was successfully used in a totally different project. The completion of the bridge crossing the strait between Prince Edward Island and New Brunswick in Canada. On November 1996 the Smart-Leg system was used to position the heavy bridge spans (192 meters long and 8,000 tonnes weight.)
- The system won the Offshore Northern Seas Innovation Award in Stavanger in August 94.
- Saipem, an international contractor within the oil and gas industry is studying a similar system with the Danish Hydraulic Institute.

**Point of Contact**

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**Reviewers**
Peer reviewed as an emerging construction technology

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