

MALAYSIA- GUMUSUT – FPS OIL DEVELOPMENT PROJECT

PROJECT	EQUIPMENT	WEIGHT
OFFSHORE	L600 - L750 STRAND JACKS	22,000 TON 45,000 TON

Shell's multi-billion dollar Gumusut-Kakap oil development project is located in deepwater, offshore Sabah, Malaysia. The development will employ the region's first deepwater Floating Production System (FPS), with a processing capacity of 150,000 barrels of oil per day. Fagioli, in close co-operation with the main contractor, performed detailed engineering studies, design and planning activities in addition to the hire and operation of strand jacking equipment for the following operations:

- **Superlift of the Topside;**
- **Side Skidding of the East and West Hull sections beneath the Topside;**
- **Lowering and mating of the Topside and Hull;**
- **Loadout of the completed structure onto a semi-submersible heavy lift ship**

The lifting system utilized to raise the **22.500 tonnes Topside**, involved the use of pairs of outer jacking legs per Topside section which were stabilized by a frame positioned between them. These carried the outer sets of jacks. Four rectangular jacking towers were positioned, one in each corner of the 'Moonpool' and again stabilized together with additional frames, to hang the internal jacks. The jack spread consisted of **No. 36 L600** and **No. 20 L750** (respectively with 600 and 750 tonnes capacities). In each case fixed anchors were connected at the top of the supports and the jacks were connected to carrier beams (lifting beams) underslung beneath the topside sections. Each of the jacks worked on a fully configured **55m long lifting cable** to cover a **lifting distance of 43 metres**. Both sets of L750 and L600 jacks were powered by L1/6-30E and L12/8E electric operated HPU with variable displacement capability. Once the entire system was connected and commissioned, the hydraulic oil flow rate of the L1/6-30E variable displacement HPU's was set up to match that of the fixed displacement L12/8E HPU's with regard to jacking speed. Because of the problems associated to both high temperature and humidity, each of the HPU's had fitted with a hydraulic oil cooler mounted on the roof of the HPU to maintain a reasonable working temperature for all hydraulic systems. The Topside actually comprised of four separate 'box sections'. Structurally, these sections were independent of each other although that they share services, i.e., power, air, water, communications, etc. Because of this, the Topside had to be lifted as one complete unit subject to a global **50mm maximum out of level tolerance** between the four sections.



Once the lifting operation was completed, the Side Skidding operation started by means of **No.8 L600** strand jacks powered by No.4 L4/35D diesel HPU's.

The Hull was constructed by four separate parts, the East and West Hull sections inclusive of the Topside support columns and the North and South pontoon sections. Each Hull section weigh approximately **8,500 tonnes**. Because the North and South pontoon sections needed to be brought in with SPMT from the West side of the structure, the East hull section was skidded into position beneath the Topside first. The West hull was only skidded under the Topside once the 2 pontoons were in position. In each case fixed anchors were connected to reaction brackets positioned at ground level beneath the topside and the jacks were connected to support brackets mounted at the ends of the loadout skid shoes travelling along the skid tracks with the Hull sections. Each jack worked on a 200m long full pulling cable. Both East and West sets of skidding equipment were set-up at the same time, however, the West side fixed anchors and cables remained unable to be connected to the reaction brackets until the North and South pontoon sections have been positioned beneath the Topside. Again, each of the HPU's were fitted with a hydraulic oil cooler mounted on the roof of the HPU to maintain a reasonable working temperature for all hydraulic systems. The whole jacking system was also connected via cable umbilical to a second computer control room located adjacent to the structure below the Superlift control room at ground level. For control purposes all jacks were connected to a single computer. The operator started and finished each increment of skidding on verbal command from the Fagioli Engineer in charge of the operation. Fagioli Supervisors and operators who were on skid tracks during the skidding operation remained in constant contact with the control room team via radio.



In continuation to Fagioli's successful completion of the topside superlift operation in 2012, the eagerly awaited record breaking loadout operation has finally been completed. This project had broken two records in Malaysia, one(1) for the heaviest structure to be lifted at 22,500tons and two(2) for the heaviest structure to be pulled offshore at 45,000tons. The loadout operation was performed by means of Fagioli strand jack system composed of 16nos of L600 strand jacks and 8 nos of L2/70 D power packs. The strand jacks were mounted at the back of the hull to facilitate easy removal after completion of loadout operation and the fixed anchor mounted on reaction bracket on the Transport Vessel. The whole loadout operation was fully computer controlled from the control cabin.

