

The Next Step for Modern Well Service

KCC Power System AS (KCC) is associated with engineering, manufacturing and services targeting demanding customers, particularly within the oil and gas industry. KCC is well reputed for the design and modifications of special lifting and handling equipment used in riser-less well operations. Furthermore, KCC has also made a strategic move into modern aquaculture and innovative environmentally friendly concepts. In addition, KCC is the Norwegian distributor of KAMAT, the German supplier of high quality pumps which are famous for their reliability, high quality materials and low maintenance costs.

MONSRIG - New modular rig concept

Complementing KCC's experience in designing and servicing offshore intervention and handling equipment for coil and wireline, the company decided two years ago to develop their own modular rig based on in-house operational and service experience. This rig is aimed to meet known requirements for effective and safe infill drilling, well intervention and abandonment plugging of a platform supported offshore wells. Since many of the existing host platforms are without applicable drilling derrick, the normal way of performing additional drilling and / or heavy well intervention has been to rely on the use of a full-scale J/U rig cantilevering their facility over the well bay of the platform. However, the use of such J/U can sometimes be difficult because of unsafe and unconsolidated soil conditions under piles of cuttings, and/or much added subsurface piping and cabling preventing safe leg installation of spud canes and legs. Alternative use of rig less wireline and coil tubing facilities has been proven effective under certain conditions, but such application very much depends on the actual well configuration, and is often limited by the need for cementing and necessary lifting power. In addition, the need for reliable well control and ability to access severed deformed tubular by large eliminates the use of rig less application. Therefore, many operators maintain a policy

of using J/U or modular rigs with well control capacity and sufficient pull for prudent intervention and/or

simultaneous P&A with ongoing production. The KCC's modular rig concept named MONSRIG is planned to support both traditional and anticipated future well operations which very often requires a flexible facility with low weight combined with fast mobilization and

removal times. It shall be a suitable, less expensive alternative to normal bespoke J/U applications when the need for accommodation is not critical. The installation of the rig requires installed skid rails in way of the well bay(s), and a majority of targeted platforms have such rails. MONSRIG is particularly designed also to accommodate non-standard rail spans. Challenges like limited lay down area, limited crane capacities and weight restrictions have been accounted for in the design, and the configuration of the rig can be tailor-made to meet both these space and weight limitations and at the same time be specified to meet specific well requirements.

The need for modularity

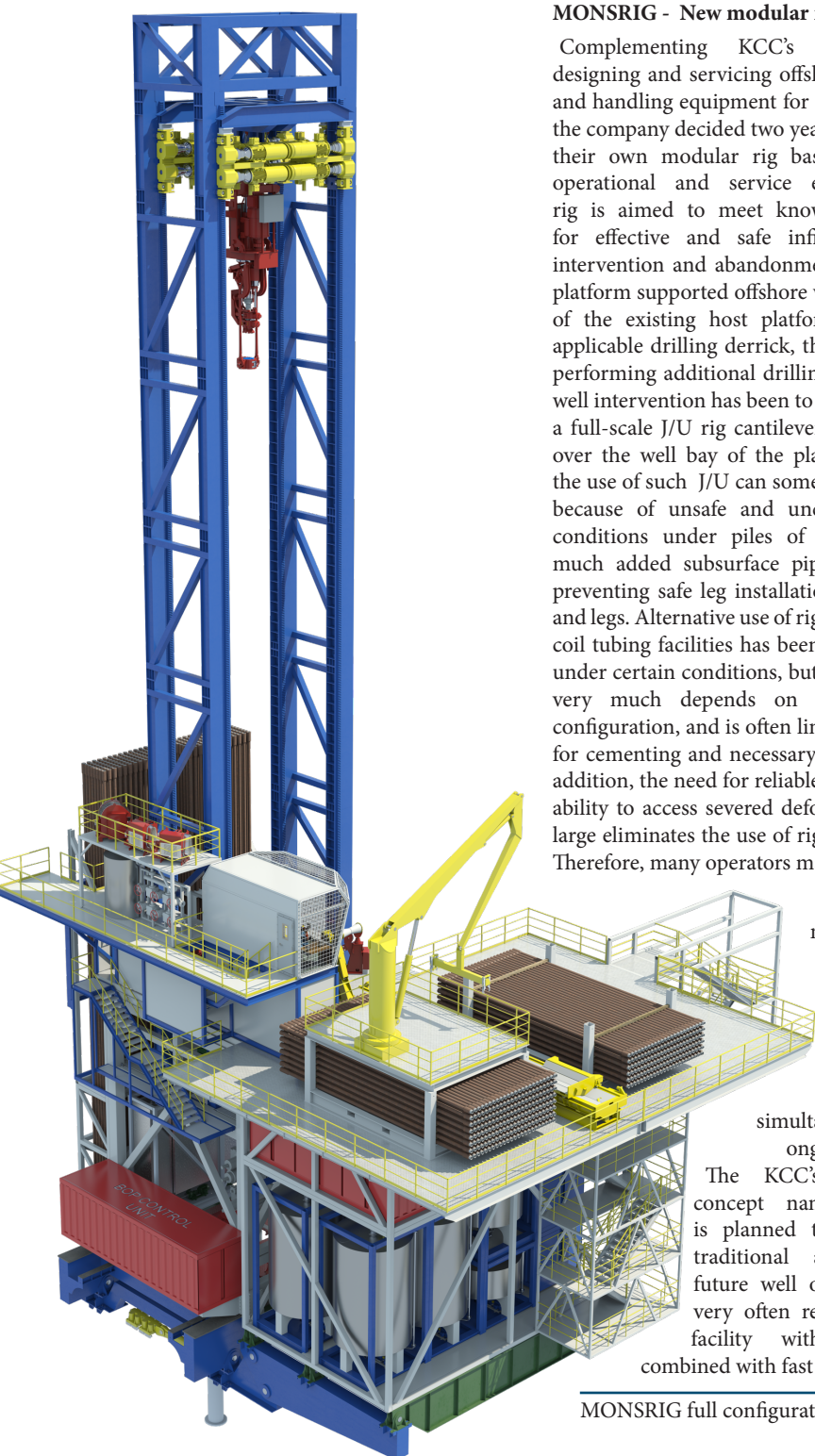
Limiting crane facilities on many of the host platforms are met by purposely designing each of the self-contained and lift able modules to be handled by standard platform cranes, many of which having max lifting capacity within the 10-15 MT range only. The patent applied self-erecting system for the derrick is essential to avoid topping lifts beyond the capacity of the platform cranes, and even more important from a HSE point of view is the elimination of any manual installation support during the erection, commissioning and normal operation. Termination and demobilization of the rig is likewise not dependent on direct personnel assistance in rider belt or scaffoldings maintained from drill floor level.

The derrick can be configured for single or multi-joint operations. The latter is supported with 36 m fully erected derrick with added pipe setback. A basic single joint operation without setback facility can be carried out within a 24 m derrick frame. The setback capacity is planned for about 3500 m, 5- 5 ½ in. drill pipe.

From the outlined basic configurations, the rig can be arranged in a comprehensive configuration with own supplied power generation and full standalone mud package. H/V pipe handling can be arranged with own pipe deck and storage.

Electrification

Electric motors constitute prime power applied for the rack and pinion traveling



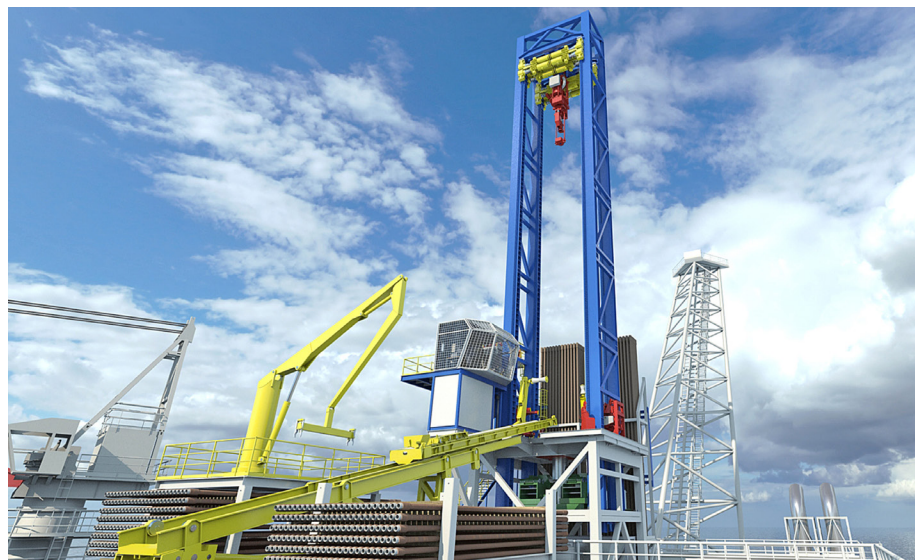
MONSRIG full configuration.

system, and in general, electric power is utilized in lieu of hydraulic drive for most of the handling, drilling and well control systems. The main reason for electrification is the premised interface with the integrated control systems. The design team expect a future with more and more automation and robotizing, leading to future autonomous control basis which will enhance the effectiveness and finally provide the remote and hands-free operation which current HSE regulations long have been aiming to achieve. Already the premised operation is in compliance with the recommended standards for safe remote pipe handling and cyber-based integrating drilling, circulation and well control.

Capacity and weight

In its basic configuration with 1500 kW hoisting power and a lifting capacity of 350 MT, MONSRIG is equipped for pipe handling, lifting, rotation and pumping. Tanks, pumps and manifolds are sufficient for full circulation and well control in compliance with governing rules and recommended standards typically for infill and TTRD, drilling within capacity, various well interventions, and all P&A operations. The basic configuration premises utilizing existing platform pipe deck, with a simple interface to the existing bulk system and power supply from the platform. Complementary cementing system is assumed rigged on cantilevered platform. Designed mud system is based on a flow rate at 300 cum/hr with max working pressure 690 bars. The tare weight of the basic assembled rig configuration is less than 500 MT, excluding BOP, power pack, cementer and any bulk/liquid storage tanks. This low weight allows also alternative mobilization as single lift if such from heavy crane vessel should be available.

A combined package weight for an operating rig with stacked piping, active mud system with fluid of 1,65 SG, cement unit and power generation, is estimated to about 1350 MT for about 3500 m well operation and single joint run. The extra weight for a double joint run is about 100 MT. The accurate weights will depend on final configuration, selected contingency and type of operation.



Qualification

The functional requirements and outlined design of the MONSRIG have been assessed and verified against relevant laws and directives valid for facilities operating in the UK and Norwegian waters. The fundamental requirements related to HSE issues are expressed in the EN directives which require a general risk based design approach in practical planning and construction. Such design philosophy has been applied to the preliminary concept and basic design of the rig. Technical and operational issues have been discussed and selected based both on the applied risk design methodology, and also supported by input from experienced operators and service providers. In addition, selected suppliers of suitable equipment have all been consulted in order to achieve a unit representing state of the art level for such installations.

The modularization is studied in details to facilitate a mobilization of self-containing modules which can be lifted, landed, assembled and secured without direct manual assistance. Estimated installation time depends on many parameters, but with normal interfacing and testing, the total time should be within three

weeks from start.

The core mechanism of double rack and pinion is qualified through known application of similar lifting devices, and the characteristic lightweight U-shaped portal configuration which is raised on the drill floor allows effective static load transfer through the structure. Further, by adapting the portal style the well center is accessible from wide angles on both sides. This wide area provides large working space for presenting and assembling tools, and provide ample space for receiving severed tubing and cables from abandoned wells.

Operation Ability

Technical capacities and performances are in line with expectations from NORSOK D-001 with cyber-based remote/automatic operation control. The multi-purpose design solution is capable of drilling, work over and plug and abandonment operations. The drilling capacity is mainly aimed for cased drilling with associated complex completions. The 350 ton lifting capacity will be sufficient to provide any additional pull power which might be necessary in the case of heavily damaged tubing being stuck in the PBR.

The rig can be working as a sole replacement unit for unavailable platform rig or cantilevered J/U; but more likely the operation will be planned with the MONSRIG working together with a wireline unit which by large can optimize the operational capacities of each installation. In assuming that contractor have available cross trained crew that can operate both the MONSRIG and any supplemented wireline skid, the operation is premised being run with a core team of 2 x 8 men plus team leader, based on 24 hour operation.

The MONSRIG is a highly flexible modular rig with low weight, fast mobilization and removal time. It is a profitable and safe alternative for effective infill drilling, well intervention and abandonment plugging of platform supported offshore wells. To conclude, MONSRIG is the next step for modern well service. •

If you would like more information on how KCC Power System AS can help you operations please contact us at:

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Design philosophy and goals.

