Operational Conditions Maintaining Technique for COSL’s Aged MODUs

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ABSTRACT

After the mobile offshore drilling units (MODU) construction boom of the 1980s, there are lots of aged MODUs which have been operated more than 30 years. Maintaining the operational conditions of the aged MODUs is very important for security of offshore operation. Some research was carried out on this problem. Firstly, transducers were mounted on the aged rigs to monitor working parameters or stress/strain of primary application structures. Second, structural/fatigue assessment plan were scheduled for each aged rig, and the assessment finite element model were updated timely when reinforcement were performed or damages were found. Thirdly, novel methods are introduced continuously, for example, calculation methods for judging damage quantitatively, welding methods for repairing jacking pinions. Finally, old tools were replaced by advanced equipments to increase working efficiency. By these means, the average equipment integrity of aged rig in COSL is kept as high as 99.47% and the downtime is as low as 1.26 hour/rig-month, which is same competent with newer MODUs.

KEY WORDS: aged MODU; real time assessment; laser cladding; efficiency.

INTRODUCTION

From 1890s, human being began to look to offshore energy exploration. Mobile offshore drilling unit (MODU) seemed to be an essential and most efficient tool since its emergence. The Breton Rig 20, which might be claimed as the first MODU, built in 1949 and retired in 1962. The first purpose-built offshore rig, Mr. Charlie, was built in 1954 and retired in late 1986, with an effective life of more than 32 years. Then, after Middle-East energy crisis, a great number of MODUs were constructed, as shown in Fig.1, and most of which are in service at mean time. Now with another rig construction tide and more high-spec rigs coming into use, the old question that whether the aged MODU should be retired was proposed again (Stewart, 2003).

About 35 jackups has been removed from the market since 2004. But no contractor would like to give up a MODU in vain. Also, there is not a standard that urges an offshore rig to retire. When scanned on Rigzone web, one would find that nearly 100 rigs are cold stacked, but none was retired. In fact, most of the so called aged MODUs are in use. For example, Deepwater Navigator, a drillship built in 1971, is operating successfully in deepwater.

Although some of the operators would accept the reality that every capable rig could be contracted as long as it was verified by the Class, the performance of aged rigs is not as good as new ones. And, rig damage in the hurricanes of GOM in 2002 to 2006 bothers both the operators and the contractors.

Fig.1 Rig constructing booming years of 1980s(Source: Balley and Sullivan, 2009)

COSL (China Oilfield Services LTD.) has a fleet of 40 MODUs with 17 of these being more than 20 years old. Thus, COSL has a deep interest in an efficient inspection, maintenance and repair system to minimize rig downtime.

STATE CONDITION ASSESSMENT

State condition assessment is a series of detailed investigation, checking, performance testing and FEM simulation on the rig to evaluate whether the real condition of the rig could satisfy the requirements of Class Certification Approval. The assessment also includes technique documents and adaptable modification designs based on the above said process.

State condition assessment includes two kinds of evaluation: technique condition assessment and structural strength calculation with design parameters and site specific conditions. The first step is to inspect the MODU visually, measure thickness, detect erosion and perform non destructive test on the spot to evaluate the real condition of the rig qualitatively. The second step is to investigate the real stress condition...