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Enhancing Tubular Running Operations by Automation and Validating the Proof of Value in Well Construction Through an Intelligent and Autonomous Tong Solution

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Abstract

Recently, the petroleum industry has been inclined towards automation, digitalization, and remote operations, however, these technological advancements are still struggling to validate proof of value in well construction.

During the tubular connection make-up, the intelligent and autonomous tong system not only maximizes operational safety and efficiency, increases efficiency gains, and reduces personnel on board in the "red zone", but also contributes to reducing carbon emissions and further decreases the overall operational cost. The industry's only truly single-push button, fully automated tong allows the operator to execute, verify, and validate every connection make-up optimizing connection integrity. The flexibility to be operated by a single tablet or the driller's control chair allows the driller to oversee the connection make-up process which reduces personnel and hazards with enhanced operational safety. The tong is coupled with intelligent connection make-up software, which applies machine learning and artificial intelligence to verify every connection in real-time autonomously. The tubular connection make-up process is not only disposed of through programmable algorithms but is also compared against millions of connection data sets ensuring enhanced connection integrity.

The main driver of this technology is its proven capability in validating operational time savings, increased operational efficiency, reduction of personnel during the tubular running operations, enhanced rig floor safety, and carbon emissions reduction leading toward a cleaner energy transition. This intelligent autonomous solution was deployed offshore in the North Sea to prove these industry values. Data gathered during the two years of comprehensive operational runs concluded that the system delivered the operational results with a 40% reduction in connection make-up time while improving efficiency with a 50% personnel reduction. This translates to about USD 1.9 million in annual cost savings. Furthermore, any avoidable remedial measures such as recordable incidents, non-productive times, and non-value-added operational costs are eliminated. In addition, the environmental benefits of fewer personnel and crew transportation significantly reduced carbon emissions from operational activities. Field deployment showed that the autonomous tong system use can result in a reduction of approximately 146 tons of carbon emissions per year. With the key performance indicators mentioned above, this autonomous intelligent tong solution is the only way to authenticate the technology value to the well construction industry. This solution not only enhances the industry's experience with improved service quality and reliability, but it is also a paradigm shift that revolutionizes the tubular running process providing a fully autonomous solution with a purpose – the purpose of achieving operational excellence through a Digital Solution. This paper will deliver comprehensive details on the novelty of this technology and the solution offered to the industry..
