

Utilizing phased array ultrasound technique to examine seal surface contact status in premium connections

Chunmeng Tian¹, Jianchun Fan¹, Jinqiu Hu¹, Kaizhe Wei¹

¹College of Safety and Ocean Engineering, China University of Petroleum (Beijing), China

Premium connections are commonly employed in wells subjected to high temperature and high pressure (HTHP) conditions. The key parameter in evaluating the sealing capability of premium connections is the contact condition between the sealing surface. This paper presents a method based on phased array ultrasound testing (PAUT) technique to examine the metal-to-metal contact states of the seal surface in premium conditions, and presents experimental work on contact status of the seal surface in premium tubing connections using PAUT, testing impacts of torque, seal surface defects and thread compounds dosage. The experimental findings demonstrate an inverse relationship between the observed ultrasonic reflection amplitude and the applied torque on the premium. Additionally, there is a robust exponential correlation manifested between the ultrasonic reflection amplitude and the torque exerted on the premium. The ultrasonic reflection amplitude at the defect of the seal surface increases. Under equivalent make-up torque conditions, the ultrasonic reflection amplitude on the sealing surface of premium connections escalates as the dosage of thread compounds diminishes, and the importance of precise control of the amount of thread compound used was confirmed. These data demonstrate that PAUT provides a reliable detection technique for performance assessment on premium connections, both in quality control and field inspection.