

DEVELOPMENT OF A CARBON-FIBER COMPOSITE REPAIR SYSTEM FOR OFFSHORE RISERS

C. R. Alexander, L. Cercone, J. Lockwood

ABSTRACT

Composite systems are a generally-accepted method for repairing corroded and mechanically-damaged onshore pipelines. The pipeline industry has arrived at this point after more than 15 years of research and investigation. Because the primary method of loading for onshore pipelines is in the circumferential direction due to internal pressure, most composite systems have been designed and developed to provide hoop strength reinforcement. On the other hand, offshore pipes (especially risers), unlike onshore pipelines, can experience significant tension and bending loads. As a result, there is a need to evaluate the current state of the art in terms of assessing the use of composite materials in repairing offshore pipelines and risers. The significance of the body of work presented herein is that this study is the first comprehensive evaluation of a composite repair system designed for the repair of offshore risers using a strain-based design method coupled with full-scale prototype testing.

This paper presents findings conducted as part of a joint industry effort involving the Minerals Management Service, the Offshore Technology Research Center at Texas A&M University, Stress Engineering Services, Inc., and several composite repair manufacturers to assess the state of the art using finite element methods and full-scale testing methods. Representative loads for offshore risers were used in the test program that integrated internal pressure, tension, and bending loads. This program is the first of its kind and likely to contribute significantly to the future of offshore riser repairs. The end result of this study was the development of a carbon-fiber repair system that can be easily deployed to provide significant reinforcement for repairing risers. It is anticipated that the findings of this program will foster future investigations involving operators by integrating their insights regarding the need for composite repair based on emerging technology.

Alexander, C., Cercone, L., and Lockwood, J., (June 2008), "Development of a Carbon-Fiber Composite Repair System for Offshore Risers," Paper No. OMAE2008-57599, The 27th International Conference on Offshore Mechanics and Arctic Engineering, June 15-20, 2008, Estoril, Portugal.