UNIVERSITY of HOUSTON

CULLEN COLLEGE of ENGINEERING

Department of Civil & Environmental Engineering

CIVE 6111 Graduate Seminar

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Structural Dynamics and Monitoring
2H Offshore Inc

Soil Model Assessment for Subsea Wellhead Fatigue using Monitoring Data

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2:45 pm - 3:45 pm
CBB 120

Abstract: A significant effort is made by the offshore oil and gas industry through analyses and field monitoring to ensure delivery of safe and reliable wells. Fatigue analysis is an important aspect of well integrity assurance. Structural fatigue damage arises from stress changes caused by environmental cyclic loads acting on the riser system. In practice, the conductor-soil interaction under cyclic loading is modeled using the soil resistance-displacement (P-y) springs. Use of an appropriate soil model is essential for accurate determination of the fatigue damage. The American Petroleum Institute (API) recommendations for P–y curves, which are often used for conductor–soil interaction analysis, have originally been developed for piled foundation and are inappropriate for well fatigue analysis. To that end, a new approach was developed by Zakeri et al. to derive P-y curves specifically for well fatigue analysis. Ultimate performance of each soil model can be determined and verified with field monitoring. This paper presents results of a field monitoring campaign for a well drilled in 354 ft water depth within a complex seabed stratigraphy comprising sands (loose to dense) and clays (very soft to stiff). The effect of soil modeling on wellhead fatigue is discussed and predictions made with the API and Zakeri et al. (2015) soil P-y springs are compared to field monitoring data. The results indicate that the BOP stack motion response is significantly affected by the soil stiffness and modeling methods. The predictions made with the Zakeri et al. (2015) model provided BOP response similar to those observed in the field. Whereas, the analyses done with the API model significantly overestimated the 'measured' conductor fatigue life above the mudline and underestimated it below. The results of this monitoring program are a step forward in better understanding system behavior of offshore wells.

About the speaker:

Bulent Mercan is an engineering specialist on structural dynamics and monitoring at 2H Offshore Inc. in Houston. He received a BS degree in Civil Engineering from Istanbul Technical University, MS degree from the University of Houston and PhD degree from the University of Minnesota. Dr. Mercan has seven years of industry experience as a structural engineer in Skidmore, Owings and Merrill LLP, Chicago and as an engineering specialist in 2H Offshore, Houston. He also taught Structural Analysis course as a part time lecturer in the University of Houston during Fall 2016 semester. His current research interests broadly include structural monitoring of drilling and production risers for offshore oil and gas developments and fatigue assessment of wellhead and conductor systems under current and wave induced motions.