DEPARTMENT OF CIVIL ENGINEERING AND GEOLOGICAL SCIENCES
UNIVERSITY OF NOTRE DAME

Spring 2010 Seminar Series

CHALLENGES AND INNOVATION IN CIVIL AND ENVIRONMENTAL ENGINEERING

Battling the Bad Vibes: Fluid-Structure Interaction Phenomena in the Offshore Oil and Gas Industry

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B.S. Aerospace and Mechanical Engineering,
University of Notre Dame, 1993
M.S. Civil Engineering, University of Notre Dame, 1997
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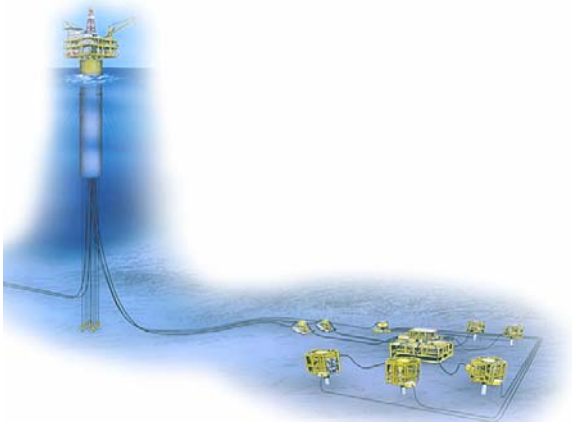
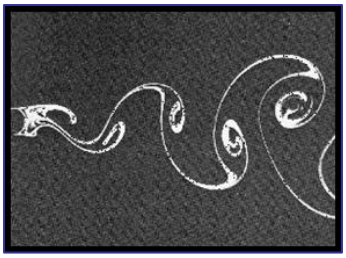
Wednesday, February 24, 2010, 4:30pm
129 DeBartolo Hall



Designing for operations in the offshore environment presents a broad range of interesting fluid-structure interaction problems. Among these are the global response of floating structures to wind, waves and currents and a phenomenon known as vortex-induced vibrations (VIV). VIV occurs when vortices are shed harmonically in the wake of cylindrical structures in a steady flow, exciting one or more natural frequencies of the structure. This is a problem of practical significance to the offshore oil and gas industry, where ocean currents passing by cylindrical hull forms, subsea tubulars or mooring lines cause VIV. This produces fatigue damage in tubulars and mooring chains and can lead to large platform offsets or excessive deflections due to the enhanced drag on the apparent cross-section of the vibrating structure. VIV is a complex fluid-structure interaction that is difficult to predict accurately. The consequences of both excessive over- or under-conservatism may be costly. Thus, industry applies an arsenal of approaches to address VIV, while we continue to strive to understand it more completely. This presentation will briefly overview floating systems employed in offshore drilling and production operations, then introduce the VIV phenomenon as it affects some aspects of the offshore hydrocarbon, including state-of-the-art design, analysis tools, model testing, in-field monitoring and mitigation methods.



Mike earned his PhD in civil engineering from the University of Notre Dame with a dissertation on the response of offshore structures to extreme environmental loads. In 1999, he began his professional career at Exxon Production Research Company in Houston, working primarily as a researcher and analyst in support of worldwide offshore drilling operations. From there, he moved briefly to CSO-Aker/Technip Offshore Engineering, addressing various analysis and testing aspects related to the technological development of novel floating offshore platform and riser concepts. He played a key role in the development and execution of proof-of-concept hydrodynamic tests of the first-ever cellular spar platform hull. In 2002, he returned to ExxonMobil's Upstream Research Company. There, he gained even greater depth in hydrodynamic model testing focused on challenging, real-world fluid-structure interaction problems. Chief among his achievements were contributions to multiple testing programs on vortex-induced vibration of risers in high currents, vibration mitigation devices, and sloshing of liquefied natural gas in tankers during transportation. In 2006, Mike moved to his present role as a floating systems and risers engineer at BP America, Inc. There, he continues to support deepwater offshore development and operations, both leading a research program and providing technical guidance to projects in a range of matters related to design for and mitigation of flow-induced vibration and fatigue of subsea equipment.

A reception and an opportunity to meet the speaker will take place at 4:00pm in the CE/GEOS office conference room, Fitzpatrick 156, before the seminar