OTC 19343

Arctic Offshore Projects and Technologies: Alaskan Beaufort Sea Exploration and Production Islands — Civil Design and Construction

J.C. Lucas, Sandwell (Alberta); D.M. Masterson, Chevron Canada Resources; J.D. Hall, Pioneer Natural Resources Alaska; C.J. Perry, Perry Group

This paper was prepared for presentation at the 2008 Offshore Technology Conference held in Houston, Texas, U.S.A., 5–8 May 2008.

A civil engineering perspective is presented on the design and construction of exploration and production islands in the nearshore Alaskan Beaufort Sea. Pioneer Natural Resources' 2003 Thetis exploration ice islands and the subsequent 2006 Oooguruk production island in East Harrison Bay are highlighted. Engineering design issues are discussed including special techniques required for the severe ice, wave and permafrost environment. The effectiveness of using frozen gravel foundations, which must be designed for seabed settlement, gravel thaw-settlement and creep settlement, are discussed. Construction techniques and schedules have been developed to make use of the readily available ice and gravel. Monitoring performance is an important post-construction activity. Potential issues are identified with preventative and remedial solutions described.

Three offshore exploration wells were drilled using conventional land-based equipment from grounded ice platforms during the course of one winter. Subsequently, a gravel production island was built in the same area using material hauled from shore. Seabed settlement and the thaw instability of frozen gravel are uniquely addressed in the design and construction of the island.

An economical approach has been described for building temporary exploration structures and permanent production structures in shallow, protected nearshore waters of the Alaskan Beaufort Sea. The methods have applicability for accessing smaller offshore oil and gas fields in the Alaskan Beaufort Sea and in other cold regions of the world where similar marine conditions exist.