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New Challenges in the Arctic Offshore: A Classification Society Perspective

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Abstract

Significant oil and gas activity in the Arctic dates from the seventies, but this came to an abrupt halt in the mid-eighties. As traditional sources of energy are slowly being exhausted there has in recent years been a renewed interest in the energy reserves in the Arctic and other ice-covered waters. While valuable lessons have been learned from operations off Sakhalin Island, the Caspian Sea, and elsewhere, there is now serious interest in the High Arctic and other areas offshore with more severe climates. Temperatures are lower, ice thicknesses are greater, and climatic changes are introducing greater variability.

Several drilling projects have been proposed and despite the general reduction of ice cover in the Arctic, designers face many challenges in designing offshore structures that strike the right balance between safety and economy. For example, the climatic data that designers require are sparse and uncertain. Designers need to account for low temperature effects on structures and equipment, and also on operations. In designing the hull the quantification of ice loads is problematic especially in environments dominated by thick multi-year ice and those in which icebergs are active. The limited experience with such structures presents a further challenge in deciding on levels of structural response that should be considered acceptable.

Apart from technical challenges there are several other broader issues that concern designers and operators. For example, the regulatory environment is stricter today as a result of society's growing intolerance of pollution and other accidents, especially in the sensitive Arctic environment.

This paper presents a Classification Society perspective on the challenges faced by both designers and operators of offshore installations in the Arctic. The work ABS is undertaking, often in cooperation with others in the industry, in developing technology, tools, rules and guides is described. Also discussed how risk methods can assist in the task of assessing structures that are novel or for which there is limited historical experience.

Introduction

As easily accessible energy resources diminishes, the search for oil and gas is shifting to more technically challenging areas. The most prominent such areas are deeper waters of the ocean and ice-covered areas. In regard to the former in recent years many records, in terms of water depth, have been broken in areas such as the Gulf of Mexico and off the coast of Brazil. In several senses ice-covered areas are the "final frontier" as far as liquid and gaseous forms of energy are concerned. While the challenges faced by designers of offshore platforms destined for deep waters are formidable, a sizeable body of experience has been accumulated. This is not the case for offshore structures in the Arctic and other low temperature regions of the world. This paper is concerned with the challenges that the industry faces in regard to facilities that are used for drilling and producing oil and gas in ice-covered regions, particularly as it relates to a classification organization such as ABS. There are a broad range of challenges, far too many to be discussed in a single paper. The focus here is on the demands the ice makes on the structure. The important subject of foundations is not discussed.

While there was some drilling activity in the Canadian and US Beaufort Seas and elsewhere in the seventies and eighties the number of offshore structures built and installed was very limited. More recently there has been activity on the Eastern coast of Russia and also in the Caspian Sea. Again, the number of installations in these waters is limited. Furthermore, the installations differ considerably in configuration. Hence, the experience base upon which to develop standards is very limited. In addition, the Arctic environment appears to have become