Hazard Analysis of Failures on the Substructure of Stationary Offshore Platform

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ABSTRACT

The objective of the Hazard Analysis of failures possible at the substructure of stationary offshore platform is identification of hazardous elements and constructions of the substructure of platform and impacts on them which may be a cause of substructure failure.

The main goals of the Preliminary Hazard Analysis are:

- to develop an as full as possible list of scenarios of failures possible at stationary offshore platform;
- to rank the scenarios of failures possible at stationary offshore platform according to their levels of risks to platform staff, population, property and the environment;
- to choose and substantiate the scenario of failure causing the most severe consequences (most severe failure) and the scenario of the most probable failure possible at the substructure of platform;
- preliminary estimation of probability (annual frequency) and consequences of the most severe and the most probable failures of the substructure of platform.

In the development of the list of failure scenarios possible at the substructure of stationary offshore platform, features of substructure arrangement prescribed by the main project technical solutions, construction, installation and operation conditions for the substructure, and climatic conditions of field were taken into account.

The list of failure scenarios possible at the substructure of stationary offshore platform considers features of the platform construction period (delivery and fitting of processing equipment, habitation units, helideck and so on) and its operation period.

KEY WORDS: Reliability; risk; hazardous event; platform; foundation; response; random quantity; hazard analysis; scenario of failure.

INTRODUCTION

The object of the analysis and estimation of risk is the substructure of stationary marine gas and condensate production platform. It is a concrete gravity base structure consisting of the support caisson and four vertical legs (see Fig. 1) which have freeboard equal to clearance of +24.0 m. The integrated deck with processing equipment, auxiliary systems and habitation modules is supported by the legs.

In addition, there is an element of the structure — the soil foundation of the substructure the bearing capacity of which determines strength and stability of the substructure and the platform as a whole.

The platform is located on the continental shelf of Sakhalin island. Water depth at the platform location is 48.2 m from the lowest astronomical tide (LAT).

There are no ridges and troughs on the sea bottom at the site, the seabed is even. There are single boulders up to 3 m high on the seabed. Sea bottom relief is flat and slightly waved, inclined to the east, consists of siltstone and sand. There are a lot of active tectonic faults in the region of the site directed longitudinally.

The site of platform construction is located on leveled seabed with tilts not higher than 0.002 outside of boulders area. Detrimental impact of sea bottom relief on the stability of substructure is not expected.