Methodical Approaches and Results of Safety Analysis for Offshore Transport & Technological Systems

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ABSTRACT

The latest developments in the marine systems intended for processing & transportation of the liquid hydrocarbons are driven by the challenges of the Russian Arctic (Prirazlomnoye, Varandei-Sea) fields, offshore fields in coastal waters of Timan-Pechora province and Ob-Taz region, as well as the Northern Caspian Sea.

In view of the unique technologies and equipment of marine transportation & technological systems (including transport vessels, platforms, berths, terminals), long life cycles, harsh operating environments (Barents Sea, Kara Sea, Sea of Okhotsk), considerable volumes of hydrocarbons to be processed, shipped and stored, the special risk assessment and safety analysis shall be comprehensive and address the full life cycle of these facilities.

The paper presents the results of risk assessment and risk management analysis performed as part of the environmental impact studies of offshore processing and transportation systems designed for the shelf of the Arctic seas.

Methodical approaches used for these purposes are analyzed the case which, case studies of technical solutions and management decisions are given.

It should be noted that in spite of overall improvement in the safety levels of offshore operations achieved over the last 10-20 years, the major accidents are still frequent and the safety barriers for efficient risk management and control remain to be an urgent issue.

KEY WORDS: safety, offshore platforms, arctic shelf, marine transportation & processing operations

INTRODUCTION

The growing volumes of oil and oil product shipments underline the urgency of safety issues including environment protection. Spillages of oil and oil products are considered to be the most disastrous accidents during offloading and transportation operations (Fig. 1 & Fig. 2).

The statistics of the recent 30-40 years indicate that the number and scale of oil spillage accidents tend to decrease demonstrating the efficiency of measures undertaken to improve the tanker fleet performance and enhance the safety of marine operations.

The prospective sites where the Russian oil and gas companies are planning to install their offloading terminals are mainly located in the circumpolar region, offshore Murmansk and Arkhangelsk, as well as in freezing seas with uncertain ice conditions difficult to forecast. For this reason in the safety assessments and risk management analysis of marine operations at offshore offloading terminals involving tankers and gas carriers, special attention should be paid to safe interaction of marine infrastructure units with tankers and auxiliary vessels.

RISK MANAGEMENT SYSTEM

Various types of Marine Transportation & Technological System (MTTS) units and complex processes of their interaction, require development and improvement of methodical approaches, their adaptation to certain objects, risk management system and consideration of features specific to certain operation areas.

The concept of the Risk Management System for MTTS (Fig. 3) presented here includes:

- the analysis of risks for the integral MTTS, its individual units, estimation of their effects on MTTS, most significant risk identification;
- assessment of risk level and possible size of damage for the MTTS units in operation;
- definition of effective risk management methods, control of risk factors, identification of sources for compensation of possible damage;
- assessment of administrative management efficiency and risks management efficiency in terms of the environment and industrial safety.