Conceptual Design of LNG FSRU Topside Regasification Plant

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ABSTRACT

The concept of an offshore floating, storage and regasification unit (FSRU) has been proposed as alternatives to conventional onshore LNG import terminals. The advantage is that risk to the public is negligible and it could be remobilized at any time. The regasification plant design is to be integrated with the cargo handling, regasification unit, power generation, auxiliary system and control system. The design of the regasification system is to ensure equipment availability and reliability. The LNG vaporizer technology is designed with consideration for marine motions by the regasification unit location. Gas metering is expected to be of custody-transfer accuracy. In abnormal and emergency operation, the flare system is provided for the safe disposal of hydrocarbon vapors from the LNG-FSRU. The capacity of the flare will be sufficient to handle vapor from operational upset conditions in the storage and vapor handling areas. This paper outlines the concept of the design and features of LNG FSRU topside regasification plant. We also show the engineering aspects associated with the topside regasification system design.

KEY WORDS: LNG; FSRU; BOG; Regasification

NOMENCLATURE

BOG boil-off gas
FSRU floating, storage and regasification unit
HP high pressure
IFV intermediate fluid vaporizer
K.O. knock out
LNG liquefied natural gas
LP low pressure
MTPA million tonnes per annum
ORV open rack vaporizer
PFD process flow diagram
RAM reliability, availability and maintainability
STV shell and tube vaporizer
TDR turn down ratio

INTRODUCTION

The capacity of the hull of the FSRU provides a nominal 270,000 m$^3$ LNG storage capacity. The deck space available for the topside equipment is 300 m by 50 m. The FSRU is anchored to the sea bed by an internal turret mooring system which allows it to weather vane. Transfer of LNG from the tanker to the FSRU is in a side by side arrangement in mild environmental sea conditions while in hostile conditions a tandem arrangement.

Process and utility facilities are located above the storage tanks. Generation of electric power and some utilities are necessary. LNG vaporization equipment needs to operate with FSRU moving with winds and waves. The shell and tube vaporizers which are not motion sensitive are used. Gas export to shore occurs through the turret mooring system. The system includes internal that swivel which allow the high pressure gas to pass from the process area to the export pipeline on the sea bed while allowing the FSRU to weather vane. Onshore equipment spacing standards can not be applied due to lack of space and risk analysis is used to determine of the design is acceptable.

Figure 1  Conceptual Layout of LNG-FSRU

The FSRU topside facilities comprise of process modules for cargo sendout, regasification, metering and boil-off gas handling system. LNG is exported from the cargo tanks by submerged LP pumps and HP pumps elevate the pressure to the required level before regasification.