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Trends and Technologies in LNG Carriers and Offshore LNG Facilities

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Abstract

It is believed that the LNG carrier shipbuilding sector has contributed some portion to the growth of LNG industries by providing competitive and safe transportation means. The motivation of lowering the unit transportation cost of LNG for the long distance from production plant has brought substantial changes in the sizes of the LNG carriers and the propulsion systems. For these 5 years, the trend of the propulsion system has moved very quickly from the conventional boiler and steam system to higher efficiency dual fuel diesel electric system or slow speed diesel engine with onboard re-liquefaction system. The vessel size has grown from 138K (138,000m³) up to 210K or 260K class. Several large LNG carriers with re-liquefaction system and some with dual fuel engine driven electric propulsion system already started their commercial operations. The larger cargo capacity together with the higher propulsion efficiency has brought the operation competitiveness for long distance voyage. Other important trend is wide acceptance of FSRU (Floating Storage and Regasification Unit) and LNG FPSO (Floating Production Storage and Offloading) concepts. Several LNG regasification vessels are in operations, some FSRU's are under construction or planning stages, and many LNG FPSO projects are under feasibility study. This paper covers the recent status and technology developments in LNG carriers and offshore LNG facilities.

Introduction

LNG chains of gas exploration, production, liquefaction, transportation, and regasification are cross-related. Recent delays in LNG production facilities around world are impacting to the temporally surplus of LNG vessel fleet and postponement of the LNG receiving facility start ups is an example of the relationship. With the reason, understanding technologies in other sectors of the LNG industries would give better insight to the future trends and alternative solutions. Though the main function of the LNG shipping, safe transportation of LNG with competitive price, has not been changed, there have been continuous technical developments in the LNG transportation as the cases of other LNG industries. LNG carriers (LNGC) have proved their reliability through long records of the safe operation around world, and the onboard systems including the cargo handling systems are well-established.

The increase of the vessel size naturally brings the economy of the transportation. The introduction of large size LNG carrier of Q-flex and Q-max has accelerated the vessel size increase, and most of the LNG carriers being built are over 150K from conventional size of 138K. The propulsion system for recent LNG carrier is being changed to higher efficiency system of dual fuel diesel electric and two-stroke diesel engine with onboard re-liquefaction plant from the conventional lower efficiency boiler steam turbine propulsion system.

In offshore LNG facilities, there have been extensive developments in parallel to LNG carrier and oil FPSO technologies. The LNG regasification vessels (LNG RV) started their offshore operation since 2005, some FSRU's are under physical conversion or planning stages, and there are several movements for the floating LNG facilities. Offshore LNG technologies are not completely isolated but combined with existing ones from oil FPSO's, LNG carriers, and onshore LNG plants. Some world class shipyards already have sufficient experiences in hull and topside fabrication through a series of LNG carrier and FPSO constructions. So, we expect actual offshore LNG facilities would be materialized when decisions on projects are made among related business partners. The modular concept construction from shipyard would bring benefits in the overall cost and construction period.