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How the use of Cryogenic Piping can Reduce the Impact of LNG Transfer Terminals on Environment and Local Communities, While Increasing Site Safety and Security

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Abstract

Environmental considerations play an important part in the permitting process for new LNG facilities.

Ports are generally overworked whilst coastal green-site areas are often protected and populated by local communities.

An attractive alternative to conventional solutions can be achieved by the installation of subsea Cryogenic Pipe-in-Pipes (C-PIP) to a near shore transfer post, and by displacing the process facilities inland. This avoids the installation of a jetty and brings significant savings to the project, whilst improving the operational aspects of site safety and security.

The same C-PIPs can be buried onshore to totally avoid visual impact.

There are 2 key elements required for such near shore LNG marine terminals.

Firstly the Cryogenic Pipe-in-Pipe

Standard pie-in-Pipe technology for oil production and transport is not new and has now been extended to large bore long length cryogenic Piping.

It provides a robust, straight line Pipe, with no expansion loops, which is installed using conventional Pipe laying methods and equipment, both onshore and offshore. The use of alloyed steel with a high nickel content, such as Invar[®], gives a virtually expansion or contraction free Pipeline. Double containment can also be offered by using a stainless steel outer Pipe. Full insulation significantly reduces Boil off Gas which in turn leads to considerable asset savings over long term operations.

The subsea section can be concrete coated for stability and protection whilst trenching or extra covering will protect against anchors or fishing trawls. In addition to or in lieu of the extra covering, an innovative mechanical protection can be efficiently provided, as presented in the paper.

The second key element is the marine offloading post. This will be located in water depths of 15 to 20m to accommodate the largest LNG carriers presently under construction. This also avoids costly and repetitive dredging operations. In such water depths a small fixed platform (again using standard oilfield methods) can be installed and fitted with rigid PIP risers.

As the LNG carriers will be exposed to more dynamic movements due to metocean conditions, the marine terminal will be fitted with a set of cryogenic flexible transfer hoses to ensure operations can continue in up to +/- 5m significant wave height.

This paper will details these 2 key elements, their installation as a fully integrated system, and also addresses the savings in both CAPEX and OPEX which can be achieved.

Introduction

The use of alternative technology in the LNG Industry whether it is new or proven will always provide a challenge, and solid justification for its choice will be needed.

Respect of the environment, linked closely to safety and security, are items of prime importance during the permitting phase of any proposed new LNG terminal and the use of modern technology to address these issues will assist in obtaining all required permits.

Positive impact statements, supported by detailed engineering and certification, relative to the operability of the LNG chain and the reduction of costs are an integral part of the engineering package to be supplied.

During the development phase of new equipment and methods the overall picture must always be considered as the knock-on effect of upgrading one "link in the chain" may lead to further modification of associated equipment. This has been the case