Challenges in Arctic Petroleum Exploration and Extraction

Arctic Petroleum Potential

During the 1950's and 1960's, exponential increase in demand for petroleum and unstable oil prices forced the exploration of new areas for petroleum reserves. A US Geological Survey estimated around 25% of the world's untapped hydrocarbon reserves in the Arctic offshore regions. These reserves are situated in remote locations. Extreme weather conditions, severe storm and year-round ice cover made exploration, extraction and further field development in this region more technically challenging and uneconomical than in any other environment encountered. By late 20th century, global warming resulted in the melting of the ice caps which improved the accessibility in the region. Latest technological developments in drilling and further discovery of vast reserves provided sufficient incentive to proceed with the field development and the production. However, this region presents specific uncertainties that are not applicable in other regions of the world and hence, require concept solutions and facilities which are both economical to build and safe to operate.

Challenges:

Health and Safety:

Extremely low temperatures, severe storms and thick ice cover render the Arctic inhabitable. Working in this type of environment is a treacherous task and poses high safety risks. Stringent health and safety policies have to be enforced.

Logistics:

Remoteness of the region has resulted in the lack of infrastructure, planning and managing the logistics at the production site is a complex task. The sea transport has a very small weather window of 3 – 4 months throughout the year.

Environment:

The presence of rare and endangered species, fisheries, and the slow environmental impact recovery makes the arctic an environmentally sensitive area.

Technical and Design Challenges:

Apart from the safety, logistics and environmental challenges, there are many technical issues which make the design and installation of these plants unique to the installation in any other region in the world. Due to the lack of experience of the international petroleum industry in the Arctic offshore exploration and development, conventional technology and processes have to be reassessed and upgraded to improve the reliability in technically challenging environment. These require special attention to design, construction, operation, maintenance, inspection and repair of the entire system.

BS Stainless Limited Contribution:

Being involved in the oil and gas industry supplying jacketing products for the pipelines around the globe for over 10 years, BS Stainless had an opportunity to work on some very difficult plant installations and provide products and solutions for the same. Pipelines are the most secure and economically viable source of transportation of the hydrocarbons from the extraction/processing plant to the end users. Metal jacketing system act as a protection for an insulated pipeline against weather conditions and mechanical abuse.

Over the years we have realised that there exists a gap in innovation on the metal jacketing systems for oil and gas pipelines, same product and processes have been re-specified repeatedly for a few decades.

In recent times, since the start of the petroleum exploration in the arctic, it has become imperative for the industry to look at new designs and improved products as the conventional methods are incapable of dealing with the harsh climatic conditions and uneven terrain of the Arctic. Hence, the industry requires new innovative processes more than ever.

At BS Stainless, we looked at this as an opportunity and dedicated ourselves in a 2 year collaborative R&D project with Sheffield Hallam University to research new products for the industry, not just for the Arctic developments but for the global metal jacketing industry. The research was mainly focussed on the improvement of efficiency, life expectance, corrosion under insulation (CUI) prevention and economic viability of the systems.

After 2 years of constant efforts, we have developed new products for the jacketing systems; SoundMet® and DryMet® are new BS Stainless' inventions. These products, standalone or in conjunction are capable of addressing any challenge faced by the pipeline installation in any region of the world.

SoundMet®:

SoundMet® is an acoustic insulation jacket; it is an integrated metal jacketing which acts as a weather projection for the outside and acoustic barrier on the inside. SoundMet is a combination of metal (Stainless steel and Aluminium) and a vinyl products bonded together to enhance sound attenuation from the conventional systems and also reduce the application time.

For conventional applications, operating temperature range is –20 ^{0}C to 93 ^{0}C beyond this range, the sound damping properties of damping layer deteriorate exponentially. However, understanding the challenges of the Arctic, we have developed SoundMet to perform at its best even in temperatures as low as – 50 ^{0}C, which we believe is a key advantage for Arctic installations.

In harsh climatic conditions, time reduction in the installation is highly desirable for personnel safety and cost reduction. One of the motivations for the development of SoundMet was its faster application, it can actually allow 10 – 15 % time savings helping the field developments to be completed in less time and more economically.

CoolMet:

CoolMet is a metal jacket painted on the topside. The paint is an innovative Polyvinylidene Fluoride which exhibits an emissivity of over 0.90 helping to radiate heat maximum heat away from the system.

Other properties of CoolMet are High scratch resistance, abrasion resistance, moisture resistance and corrosion resistance. All of these properties will enhance the life expectancy of the system in harsh climatic conditions of the Arctic.

CoolMet can also be supplied on SoundMet, this makes one jacket solve multiple challenges.

Research and development at BS Stainless is a continual process and a core part of companies' new business model, we will be looking to introduce new improved products and processes for the industries to help them become more efficient, economical and achieve excellence.

References:

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