

After over five years of development, BPP-TECH, in cooperation with BHP Billiton and Dantec, has developed a ground breaking, high pressure cryogenic hose suitable for practical applications such as the ship-to-ship transfer of Liquefied Natural Gas (LNG).

From first principles, a team of BPP-TECH design engineers have developed the precise combination of materials and quality, required to manufacture a ground breaking cryogenic flexible hose.

BPP-TECH subjected the hose to a rigorous qualification programme as, not only is the hose itself a novel design, but the assembly also required a completely novel solution for the end fittings. Both the unique designs have been patented.

The hose has been put through its paces in Dantec's facility on the Wirral – the primary location for all the testing conducted on the various prototypes since the project began. The majority of these tests have involved the use of liquid nitrogen, as several certification bodies only require testing with this cryogen (an inert substance), in order to achieve full certification. BPP-TECH however, believed that using LNG during the qualification programme would better reflect the proposed operating conditions, and more accurately demonstrate the hose's capabilities – the objective being to prove it would perform reliably and safely when deployed in the field. This LNG test was the first of its kind.



There are inherent hazards when handling cryogenics in a test environment. BPP-TECH therefore decided to employ a remote test management system, which would allow the engineers to conduct the test from the relative safety of a remote control cabin. The monitoring and control system used a data acquisition card as an interface between the sensors, and a central computer. The central computer was located in the same remote control cabin as the test engineers.

All the sensors and control lines interfaced to this system via a set of zener barriers, to ensure isolation between the safe area control cabin and the hazardous area test site. The monitoring systems included several methane level sensors. These were placed around the testing vicinity to monitor methane levels in the atmosphere. The hose elongation was monitored with extensometers positioned along the length of the hose.

In-house BPP-TECH software, specially designed for the project, provided a user friendly control panel which allowed engineers to open and close valves during the testing, via a touch screen display. The pneumatically operated valves ensured the intrinsic

safety of the test site. The remote control system allowed BPP-TECH to conduct the tests safely despite the use of potentially hazardous cryogenic fluids. The cryogenic hose met, and indeed exceeded, its design requirements.

This project clearly demonstrates BPP-TECH's commitment to providing innovative solutions to complex problems, and its ability to convert cutting edge R&D into viable commercial products.

Key Features of the High Pressure Cryogenic Hose

- bend radius of 1.5m for a 16" bore
- bend radius of 1m for an 8" bore
- working pressure of 20 barg
- operating temperature range of +45 to -196°C
- flows of up to 10,000 m³/hr

The relatively small bend radius, coupled with the 20 barg working pressure, makes the hose ideal for use in ship-to-ship, ship-to-shore, or any other dynamic application requiring a highly engineered flexible hose. In addition to its use for LNG, the range of operating temperatures at which the hose can function also makes it appropriate for use with many other fluids.