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Supersonic Gas Conditioning—Low Pressure Drop TWISTER™ for NGL Recovery

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Abstract

Twister™ is an innovative gas conditioning technology which has been under development for natural gas applications. Condensation and separation at supersonic velocity is the key to some unique benefits. An extremely short residence time prevents hydrate problems, eliminating chemicals and associated regeneration systems. The simplicity and reliability of a static device, with no rotating parts, operating without chemicals, ensures a simple, environmentally friendly facility, with a high availability, suitable for unmanned operation. Full scale testing has been completed at five gas plants in the Netherlands, Nigeria and Norway, with varying gas compositions and operating conditions. The first commercial offshore Twister application started-up in December 2003 on the Petronas/Sarawak Shell Berhad B11 facility offshore East Malaysia. The key challenges and experience gained during the B11 Twister design, and operating experience to date, have resulted in some significant new developments. This includes the low pressure drop version of the Twister Supersonic Separator which also achieves a significantly improved hydrocarbon and NGL recovery performance. This improved performance has been confirmed during testing and details will be presented to describe the development, testing and initial commercialisation.

Twister also has potential to be further developed for other specific future separation applications, such as deep LPG extraction, CO2, H2S and mercury removal, and for sub-sea gas processing.

Introduction

The Twister™ Supersonic Separator has similar thermo-dynamics to a turbo-expander, combining expansion, cyclonic gas/liquid separation and re-compression in a compact, static, tubular device. A turbo-expander transforms pressure to shaftpower, however Twister achieves a similar temperature drop by transforming pressure to kinetic energy (i.e. supersonic velocity). The Twister process is a simple, safe, environmentally friendly, quick start up, gas conditioning system which enables chemical free, high availability and unmanned operation. The compact and lightweight Twister system allows the platform size to be reduced which results in an overall lower project cost for offshore applications. The ability to operate unmanned also facilitates significant operating cost savings in allowing the de-manning of offshore platforms.

This new gas conditioning technology can be used to condense and separate water and hydrocarbons from natural gas. Significant potential has been identified for future application of this technology on various other gas processing separation applications including deep LPG extraction, bulk removal of CO2 and H2S, mercury removal and sub-sea gas processing.

Since 1998, Twister BV has obtained extensive full scale test experience with units in five different gas plants in the Netherlands, Nigeria and Norway. These test units have proved the viability of gas conditioning to typical pipeline specifications as well as the practicality of reliable, safe and unmanned operation.

In December 2003, Petronas and Sarawak Shell Berhad (SSB) successfully started up the first commercial Twister system on the B11 offshore gas processing facility (see figure 1) to dehydrate 600 MMscfd of non-associated sour gas fed to the onshore Malaysian LNG plant at Bintulu, Sarawak, in order to control pipeline corrosion.

Figure 1 – Petronas/SSB B11 Platform