Factsheet 4

Twister
Supersonic Gas Solutions

Twister for NGL Recovery

Twister recovers C3+ natural gas liquids. Twister expands much more deeply into the phase envelope than a turbo-expander and JT system for pipeline gas and thus recovers significantly more NGL than a turbo-expander and JT system when no hydrate inhibition chemicals are used.

Comparison to JT system

A third party simulation study to compare the condensate recovery performance of Twister and a conventional Joule-Thomson (JT) System has shown that Twister, in combination with a proprietary Twister Hydrate Separator™, consistently and significantly outperforms JT-LTS solutions thus creating a significant incremental revenue stream that quickly pays back the initial capital expenditure.

A range of gas compositions, feed temperatures (25-45°C), feed pressures (40-100 barg) and feed water contents were employed in the study, representing the typical spread of operating parameters in different NGL recovery systems in gas plants worldwide. The aim of the study was to maximise NGL recovery with chemical-free operation.

The results show that a Twister system consistently produces greater quantities of C3+ liquids than a conventional JT scheme over the whole range of compositions, feed conditions, pressure drops and upstream dehydration specifications studied. Whereas the hydrate formation temperature limits the operating temperature in the LTS for a JT-LTS system, the Twister system is only limited by the hydrate formation temperature at the inlet of the Twister tube. No hydrate formation takes place inside the Twister tube due to the very short residence time and hydrates in the secondary outlet of the Twister tube are managed in the Hydrate Separator using heat input.

With a feed pressure of 100 bar, the improvement is typically around 0.8-1.0 tonnes/MMscf more LPG and 15-20 bbl/MMscf greater NGL recovery. With a feed pressure of 70 barg, the improvement is typically around 0.4-0.6 tonnes/MMscf more LPG and 5-10 bbl/MMscf greater NGL recovery.

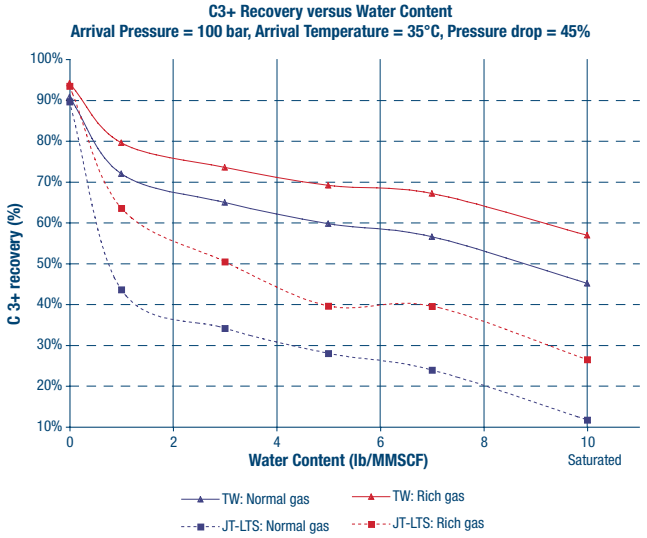


Figure 1 C3+ recovery as function of water content for Twister and JT-LTS

For lean gas, the Twister recovery is typically **five to ten** times greater than a conventional JT-LTS scheme. The Twister C3+ recovery performance can be further optimised by adding an upstream chiller. The JT-LTS system does not benefit from adding a chiller, since its heat integration is limited by the water content of the gas governing the hydrate formation temperature at its inlet.

Twister for NGL Recovery

Comparison to turbo-expander

A second Twister study looked at the performance and benefits of a Twister NGL recovery system compared to a turbo-expander from pipeline gas on an onshore project. In this project, associated gas was dehydrated at a central processing facility to 7 lb/MMSCF in a TEG contactor after which the majority of the gas was sent to a LNG liquefaction facility via a long-distance pipeline. The pipeline inlet pressure was 100 barg. The remainder of the gas was sent to the domestic gas grid, which operated at 60 barg. The available pressure drop was utilised to recover valuable NGL components from the gas, without using any hydrate inhibition chemicals. The recovered NGL was spiked back into the main gas export line and then extracted at the gas pre-treatment section of the LNG plant thus improving the overall project economics.

Similar to the JT-LTS system, the hydrate formation temperature limits the operating temperature in the LTS for a turbo-expander system, whereas the hydrate formation temperature only limits the Twister system at the inlet of the Twister tube. Thus the minimum acceptable temperature in the LTS for a turbo-expander is more or less the same as the minimum acceptable temperature at the Twister tube inlet. Therefore Twister is able to expand much more deeply into the phase envelope and recover significantly more NGL from pipeline gas than a turbo-expander without the use of hydrate inhibition chemicals (See figure 2).

The Twister C3+ recovery increases by approximately 10% (from 50-60% range to 60-70% range) when upstream chilling is applied.

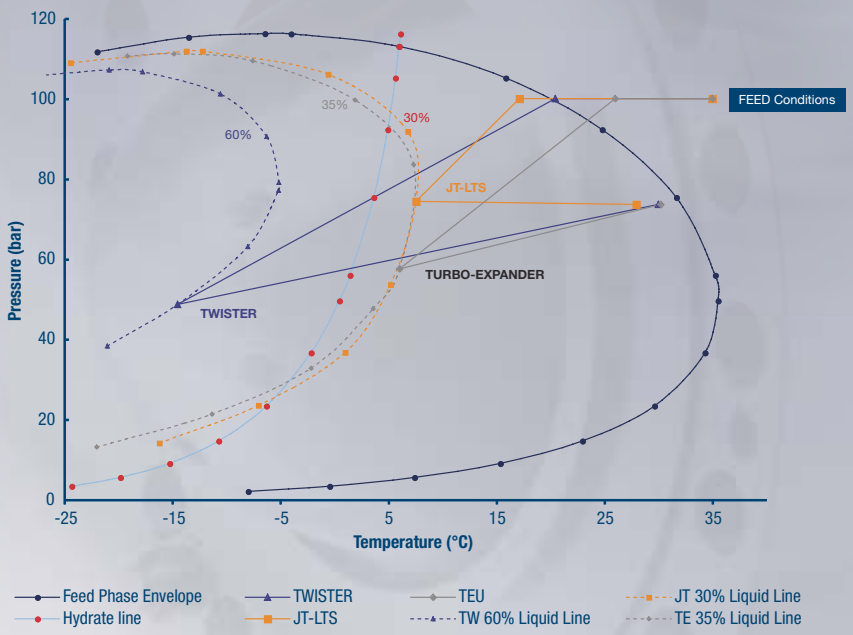
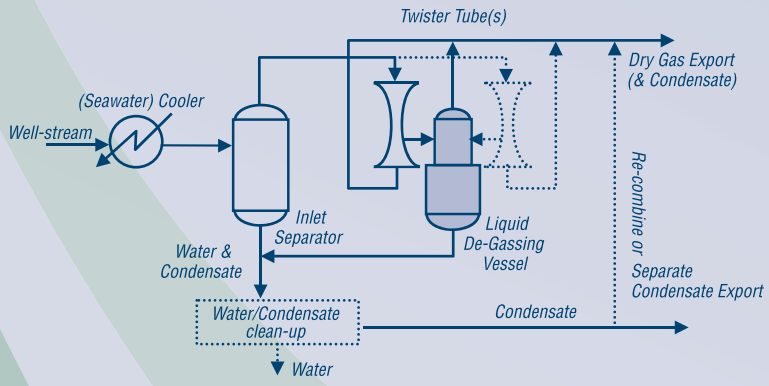


Figure 2 Comparison of Twister against JT and turbo-expander.

What is Twister?

Twister is a low temperature separation process using supersonic gas velocities, with a performance which can be optimised by improved heat integration using the cold gas exiting Twister, supplemented with air or seawater cooling if required. The inlet separator upstream of the Twister tubes is designed to remove produced liquids and prevents carry-over of slugs and solids. The following issues need to be considered when designing a gas conditioning system based on Twister technology.

- *Twister is a fixed actual volumetric flow device. The gas velocity at the throat of the inlet nozzle will always be exactly Mach 1, fixing the flow through the tube. Turndown flexibility can be achieved by adjusting the operating pressure or by taking individual Twister tubes on/off line.*
- *Twister is a pressure ratio device. For any design pressure, the gas will expand to around 30% of feed pressure mid Twister and recompress to typically 75 - 80% of feed pressure exiting the Twister tube for dewpointing the gas. For NGL recovery applications, the gas will typically expand to around 20% of the feed pressure mid-Twister and recompress to around 50 – 65% of the gas feed pressure when exiting the tube.*



Process Flow Diagram of a typical Twister System

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For further information: www.TwisterBV.com or email: office@TwisterBV.com