Factsheet 1

How does Twister work?

The Twister™ Supersonic Separator is a unique combination of known physical processes, combining aero-dynamics, thermo-dynamics and fluid-dynamics to produce an innovative gas conditioning process. Condensation and separation at supersonic velocity is the key to achieving a significant reduction in both capital and operating cost.

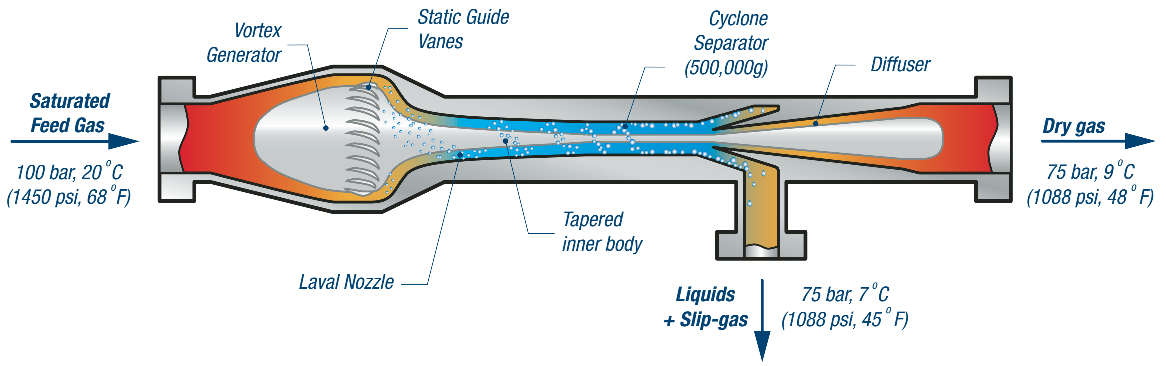


Figure 1 shows a cross-section of a Twister tube with typical process conditions

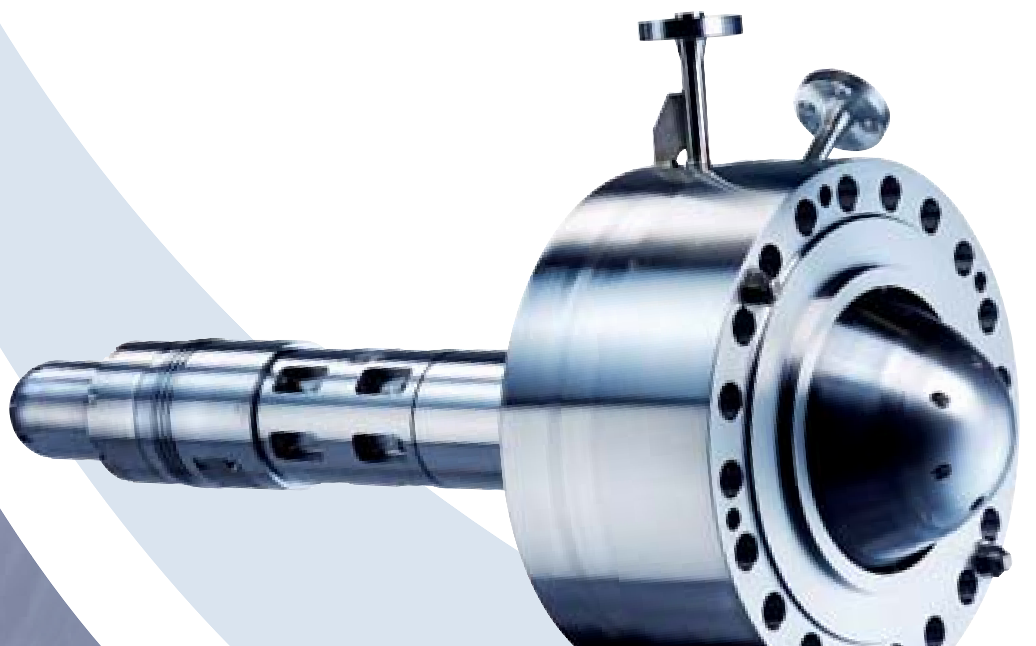
The Twister Supersonic Separator has thermodynamics similar to a turbo-expander and combines the following process steps into a compact, tubular device:

- expansion,
- cyclonic gas/liquid separation,
- re-compression.

Whereas a turbo-expander transforms free pressure to shaft power, Twister achieves a similar temperature drop by transforming pressure to kinetic energy (i.e. supersonic velocity).

Figure 1 shows the basic concepts:

- Multiple static inlet guide vanes generate a high vorticity, concentric swirl (up to 500,000g)
- A Laval nozzle is used to expand the saturated feed gas to supersonic velocity, which results in both low temperature and pressure.
- This results in the formation of a mist of water and hydrocarbon condensation droplets.
- The high vorticity swirl forces the droplets to the wall.
- The liquids are removed from the gas using a cyclonic co-axial separator.
- The separated streams are slowed down in separate diffusers, typically recovering 80-85% of the remaining free pressure.
- The liquid stream contains slip-gas, which is removed in a compact liquid de-gassing vessel and recombined with the dry gas stream.



How does Twister work?

Comparison

Figure 2 compares the thermo-dynamics of Twister with conventional Joule-Thompson expansion. In this example, the same feed conditions (100 bar/1450 psi, 40°C/104°F) and the same pressure drop (30%) have been assumed for both processes.

- Twister is a highly efficient, near isentropic expansion process, achieving more than 60°C (110°F) cooling with the 30 bar pressure drop available. Process performance will normally be optimised by inlet cooling using gas/gas cross exchange. Since Twister can condition wet gas without hydrate inhibition chemicals, inlet cooling is typically limited to just outside the hydrate regime.
- Joule-Thompson expansion is a relatively inefficient, isenthalpic expansion process, achieving only limited cooling with the pressure drop available. Upstream dehydration or injection of chemicals will be required to prevent hydrate formation and allow for maximum inlet cooling using gas/gas cross-exchange.

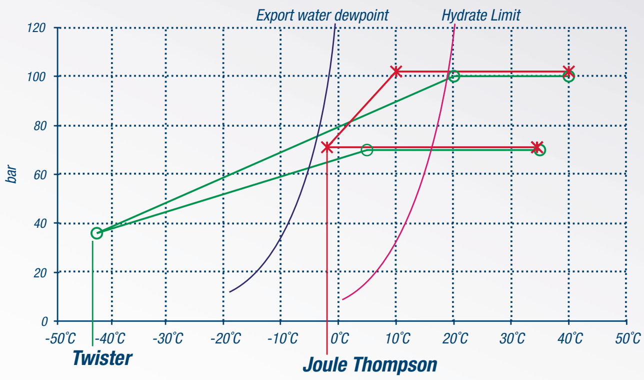


Figure 2 compares the thermo-dynamics of Twister with conventional Joule-Thompson expansion

Benefits

Gas processing at supersonic velocities ensures a compact and low weight design. A Twister tube designed for 1 million Sm3/d (35 MMscfd) at 100 bar (1450 psi) is approximately 2 meters (6 feet) long (See figure 3). The residence time inside the cold Twister Supersonic Separator is only milliseconds, ensuring that hydrates have no time to form and avoiding the requirement for hydrate inhibition chemicals. The elimination of chemical regeneration systems avoids harmful BTX emissions to the atmosphere. The simplicity and reliability of a static device, with no rotating parts and operating without chemical regeneration systems, ensures a simple facility with a high availability, suitable for unmanned operation, even in an offshore environment.

Applications

Twister can be used to condense and separate water and hydrocarbons from natural gas. Current applications include any combination of the following:

- Water Dewpointing (Dehydration).
- Hydrocarbon Dewpointing.
- Natural Gas Liquids Recovery.

Figure 3 shows a typical Twister tube

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

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