

Twister for Dewpointing

Twister *simultaneously* condenses and separates water and hydrocarbons from natural gas by efficiently forcing the liquid droplets to the outer wall of the Twister tube and removing the dry stream in a simple pipe-in-pipe separator.

Benefits

- **Commercial Advantage:** Twister offers reduced life cycle costs (LCC) and increased revenues via simultaneous dehydration and hydrocarbon dewpointing.
- **Smaller Size & Lower Weight:** The compact and lightweight Twister system facilitates smaller platform size and reduced overall project cost.
- **Lower Operating Cost:** The lack of moving parts enables demanned (or not normally manned) operation even offshore and in remote locations. Twister also offers chemical-free processing which means lower operating cost and reduced logistical problems.
- **Green & Safe:** Twister gas conditioning provides a simple, safe, closed, environmentally-friendly process which allows operating companies to meet their stated corporate responsibilities in achieving Health & Safety targets and protecting the environment.
- **Operational flexibility:** Twister provides on-demand gas delivery and is considerably easier to operate than conventional TEG systems, avoiding typical TEG equilibrium (ramp up/ramp down) delays. Twister systems can be easily scaled up to handle increasing gas flow rates by simply adding additional tubes and/or modules. Twister is not operating pressure constrained and can be optimised for either dehydration and HC dewpointing applications at minimum pressure drop, or for NGL recovery applications at higher pressure drops.
- **Reliability:** Due to the simple design and lack of moving parts, Twister systems can achieve high availability performance. Operation feedback to date has demonstrated zero downtime caused by Twister supporting the elimination of need for sparing on future projects with the associated CAPEX reduction.
- **Proven:** To date (2007) over 55,000 hours of operating experience have been accumulated on Twister systems.



Figure 1 shows a Twister module for Petrobras



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Fuel gas

Twister BV has been awarded a contract by Shell Petroleum Development Company (SPDC) for an onshore 120 MMscfd fuel gas conditioning application at its new Okoloma Gas Processing facility in Nigeria, supplying gas to the SPDC owned and operated 970 MW Afam V1 Power Plant. Twister BV has supplied a single module containing a Twister Hydrate Separator, six Twister tubes, as well as all associated valves, piping, instrumentation and control.

This installation has the key operational advantage over conventional gas processing systems of avoiding the need for chemical purchase and associated logistical supply problems, plus reduced maintenance due to no moving parts.

Calorific Value Control

The LHV and HHV in sales gas must be controlled to ensure that the Calorific Value (CV) of the gas is within specification. If the gas is too rich, it can be blended with nitrogen to achieve the correct CV. However care must be taken to also meet the specified Wobbe index number.

Alternatively, Twister can be used to extract the heavy hydrocarbons and ensure that the gas meets the required heating value specification.

Underground Gas Storage

Underground gas storage (UGS) is a large and growing market driven by the need to secure strategic energy supplies. Due to the storage of gas at high pressure in either salt domes or in depleted oil and/or gas fields, gas from storage can be let down to grid supply pressure across a Twister system, thus

utilising available pressure drop to process the gas delivered in order to meet sales gas specifications. Gas extracted from storage in salt caverns or depleted reservoirs needs to be dehydrated before delivery to the grid. Twister can efficiently dehydrate the gas whilst simultaneously achieving the required pressure let down for gas delivery.

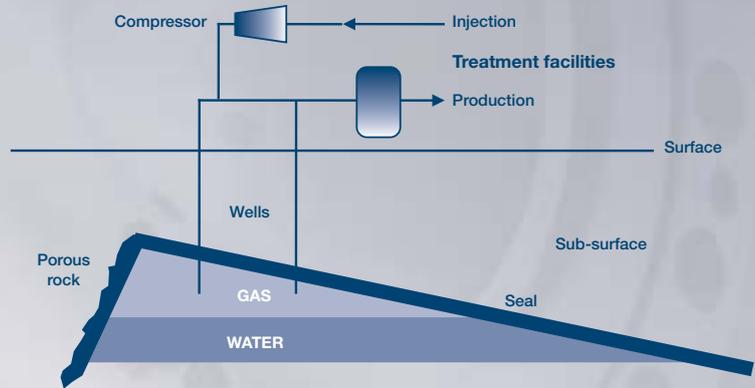


Figure 2 shows a typical UGS concept

Reduced chemical dehydration

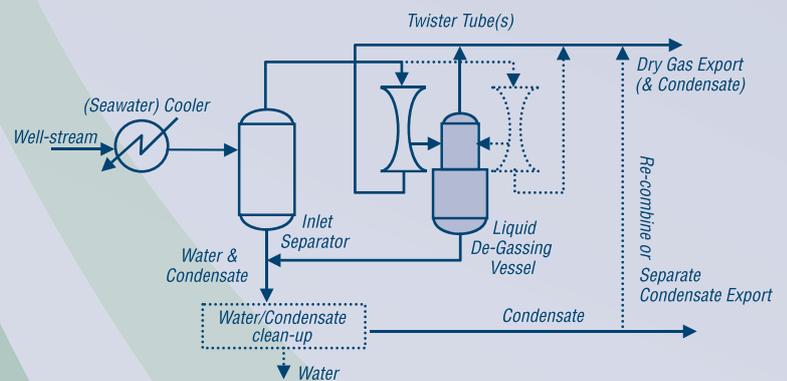
Although Twister can operate chemical-free, its performance can be further optimised when chemicals are also used. Typically this results in reduced pressure drop and/or the ability to meet tighter dewpoint specifications.

This option can make good sense for brownfield applications where chemical inhibition systems are already installed.

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