Product Definition

Frames has extended their product portfolio with a new member in the family of physical separators: the SwirlSep. This product results from the marriage between two technologies and offers cost effective inline separation solutions in a wide range of applications. The SwirlSep is the solution for separation processes where compactness, controllability, and a large turndown range is required.

Product Description

The SwirlSep is a compact separator and is the combination of a special axial flow valve, the SwirlValve, and an inline separator, both complementary in their advantages.

SwirlValve

The SwirlValve is a low shear valve that can be utilized as a choke valve and/or (level) control valve. The SwirlValve is similar to an axial flow valve, however, having one distinct feature: the design of the trim cage is such that a swirling flow (a vortex) is created downstream of the valve.

The major advantages of the swirling flow compared to the intense mixing and chaotic flow created by conventional valves are:
- Smaller pressure drop over the valve
- Minimized shear on the fluid
- Droplet/bubble break up is reduced
- Coalescence is promoted
- Drainage is stimulated
- Erosion is minimized

The design of the piston is such that the pressure is balanced. The actuator is therefore much smaller compared to conventional valves.

SwirlSep

The SwirlSep extends the SwirlValve with an inline separator unit. The advantages of the SwirlValve are fully exploited in the downstream inline separator.

In addition, the centrifugal acceleration that results from the swirling motion is directly utilized by the inline separator to facilitate separation of the phases.
Process Description

Control valves and choke valves are commonly used in the Oil & Gas industry to control pressure, temperature, and flow. Fluids expand in a control valve due to the pressure drop over the valve. This process normally results in a flashed liquid or a condensed gas, which needs to be separated further downstream.

In the SwirlValve, the pressure drop is partially over the trim cage and the remainder over the downstream vortex. The pressure drop over the SwirlValve itself is therefore smaller compared to a conventional valve. Turbulence and shear are greatly reduced, resulting in:

- Larger droplets/bubbles
- Less foaming
- Less formation of emulsions

Moreover, the droplets / bubbles coalesce into larger ones making downstream separation more effective. Replacing a conventional valve by the SwirlValve (without inline separator) already has a positive impact on the performance of downstream separators, and could therefore be a technology for debottlenecking applications.

Additionally, if solids are present, erosion is less pronounced compared to a conventional valve due to the smaller impact angles of particles.

Separation

The centrifugal acceleration that results from the swirling motion created in the SwirlValve is directly utilized by the inline separator to facilitate separation of the phases. Because of the larger droplets and bubbles, the separation efficiency of the SwirlSep is proven to be very high.

Turndown

The flow rate through the SwirlSep is regulated by controlling the position of the piston in the swirl trim cage. For a certain pressure drop over the SwirlValve, the centrifugal acceleration that results from the swirling motion is independent of the flow rate. In contrast with other inline separators, this unique feature of the SwirlValve allows the SwirlSep to maintain sufficient swirling strength at low flow throughput, thus providing a far larger turndown (down to 5% of the design flow).
Technical Details

- Large turndown range
- Compact & inline
- Robust and reliable design
- Optimized using advanced computational fluid dynamics
- 2-phase separation

Added Value Frames

- A family of expertise in the Oil & Gas industry
- Customized design according to the clients’ unique requirements
- Solutions fully integrated into conventional separation trains
- Design optimization based on in-house knowledge
- Robust and reliable units designed with lean engineering methods, using high-end materials

References

The demisting and solids removal SwirlSep has extensively been tested in the field (NAM, Groningen, The Netherlands) in 2014.

Results have shown very efficient removal of liquids and solids at various flow conditions.

Project Management

At Frames, we know that dedicated project management is only the starting point for completing complex oil and gas projects. Our clients can rely on sharp thinking and a deep understanding of their operating conditions to find the best solution.

Our quality management system focuses on a process of continuous improvement, and our team is always looking for new solutions that improve productivity, cut operating costs, and give our clients a competitive edge.

In a challenging industry, we understand that safety is a priority. We also know that in order to deliver maximum value to our clients we must complete each project on schedule, in spec and within budget.

At Frames, our close-knit team of engineering experts is open, honest, and focused on delivering you the best possible outcomes. We are passionate about the oil and gas industry, and have been a leading provider of safe, highproductivity systems for more than 30 years.
Frames Family Tree

Onshore

Oil & Water
- Multiphase Separation
  - Production Separators (High & Low Pressure)
  - Test Separator
  - Degasser & Knock-Out Drum
  - Water Oil Separator (WOSEP)
  - Compact Inline Separation

- Electrostatic Coalescers
  - Dehydrator
  - Desalter

- Produced Water Treatment
  - Deoiling & Desanding
  - Hydrocyclones
  - Gas Floatation
  - Media Filtration
  - Sand Cleaning

- Separation Internals
- Heat Exchangers

Offshore

Gas
- Gas Separation
  - Demisting
  - Scrubbers
  - Filters

- Heat Exchangers
  - Shell & Tube Heat Exchangers

- Air-Cooled Coolers

- Gas Sweetening (H₂S & CO₂)
  - Amines
  - Thiopaq O&G
  - Solid Bed Scavenger
  - Membrane
  - Molecular Sieve

- Gas Dehydration
  - Glycol (TEG)
  - Molecular Sieve

- Dew Point Control
  - Low Temperature Separation (LTS)
  - Solid Desiccant

- Hydrate Inhibition
  - MEG/DEG Recovery
  - Methanol Recovery
  - MEG/DEG Desalination

- Light Hydrocarbon Recovery
  - Condensate Stabilization
  - Fractionation

- Fuel Gas Treatment

- Hydraulic Systems
  - Wellhead Control
  - Subsea Hydraulic Power Units
  - Hydraulic Power Units
  - IWOCs (Intervention Workover Control Systems)
  - TUTU (Topside Umbilical Termination Unit)
  - Cargo Ballasting Systems

- Safety Instrumented Systems
  - High Integrity Protection Systems (HIPS)

- Chemical Injection
  - Chemical & Methanol Injection Systems
  - Chemical Distribution Systems

- Valve Automation Center
  - Actuators and Actuated Valve Packages
  - Control Systems

- Automation
  - Buoy Control
  - Tank Farm Control & Safeguarding

Floaters

- Total Plant Solutions
- Industrial CO₂ Modules
- Early Production Facilities
- Wellsite Packages
- Biogas

Services

- Asset Life Cycle Management
- Maintenance & Field Services
- Commissioning
- Spare Parts
- Operator Training
- Engineering Studies
  - Conceptual
  - FEED and Basic

Frames Separation Technologies
Glazenmakersweg 3
3449 JK Woerden
The Netherlands

+31 880 033 300
separation@frames-group.com
frames-group.com

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