To enable cost-effective subsea field development, Royal IHC and Frames have teamed up to develop a subsea compact inline separation system utilising Frames’ SwirlSep. The SwirlSep significantly reduces the size, footprint and complexity of subsea separator modules, making them more suitable for installation on the seabed than conventional separation units. The field-proven technology has been packaged in a compact and lightweight subsea system, designed with redundancy and easy intervention in mind, overcoming today’s challenges in subsea field development.

**SWIRLSEP TECHNOLOGY**

The SwirlSep is the only compact separator with full turndown capability and combines a special flow control valve, the SwirlValve, with an inline separator, both complementary in their advantages. The SwirlValve is a low shear valve that can be utilised as a choke valve and/or (level) control valve. The SwirlValve is similar to a cage valve (either axial flow or angular). However, it has 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 cage
- reduced shear on the fluid
- reduced droplet/bubble break-up
- coalescence of droplets or bubbles
- erosion is minimised.

The SwirlSep extends the SwirlValve with an inline separator unit. The advantages of the SwirlValve are fully exploited in the downstream inline separator, resulting in very high separation efficiencies. In addition, the separation efficiencies remain high, even at very low flows (10%). The SwirlSep can be used for gas-liquid, but also oil-water separation.
The subsea packaging solution has been developed to reduce installation complexity, lower maintenance and intervention costs, and ensure a long operational life. The compact subsea separation system consists of a template, which carries the foundation structure, and two modules each containing a SwirlSep assembly. The modular design allows system configuration for project specific selection of operational redundancy features and a multitude of geotechnical options.

The modules of the compact subsea separation system have been designed to be switched out and serviced individually, allowing for system redundancy, while their limited size makes them suitable to be serviced by most light construction vessels. Advanced design and material selection supports weight characteristics and helps ensure a long life expectancy.

The use of diverless connections enhances the ease of installation and operational maintenance. As opposed to conventional systems, the subsea package guarantees easy installation and high levels of uptime.

**OPERATING PARAMETERS**

- **process**: 8” inline separator unit
- The current compact subsea separation system has been designed for demisting applications. However, the SwirlSep unit can be adapted for solids removal, liquid degassing and bulk separation.
- **maximum water depth**: 1,500m
- **control system**: Electro-hydraulic through umbilical and ROV Panels

**DIMENSIONS & WEIGHT**

- **Dimensions (WxLxH)**
  - **template**: 8,085 x 9,720 x 5,578mm
  - **separator module**: 2,614 x 3,590 x 6,250mm
  - **total system**: 8,085 x 9,720 x 7,077mm

- **Weight**
  - **template**: 116 tonnes
  - **separator module**: 17 tonnes
  - **total system**: 150 tonnes