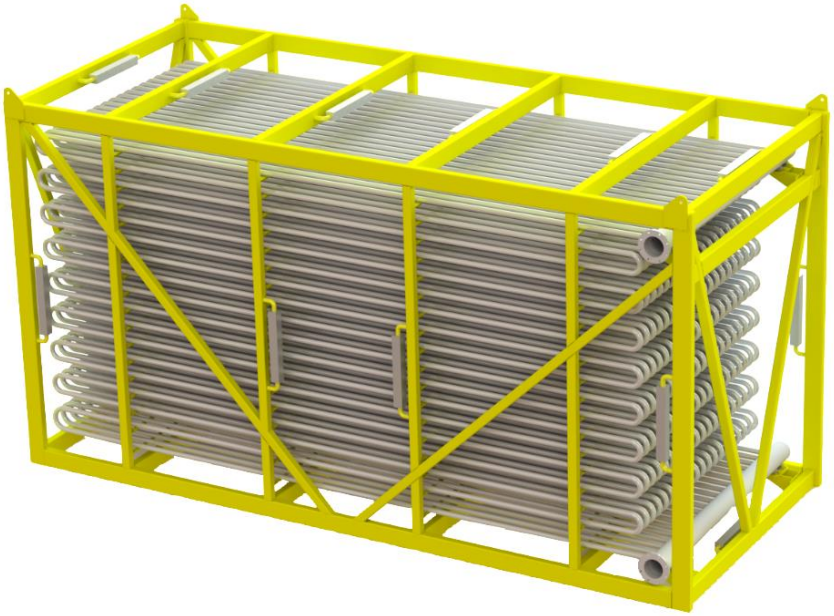
FSCC OFFSHORE WIND

***FSCC** is a reliable, compact and cost efficient subsea cooler*

***FSCC** offers an improved solution to the cooling requirements on HVDC converter platforms*

***FSCC** is passive, has no moving parts and uses well-proven principles to operate*



WHY FSCC (Future Subsea Controllable Cooler)?

Future Technology AS has developed FSCC, a compact, efficient, and reliable subsea cooler which offers an improved solution to the cooling requirements on HVDC converter platforms.

HVDC (high voltage direct current) technology is often the preferred choice for transferring power from large offshore wind farms or wind farm clusters located far from shore. Offshore converter platforms are needed to convert the AC power generated by the wind turbines into HVDC. In the conversion process, part of the power is lost to heat, which introduces the need for an efficient cooling system.

Conventional cooling systems for HVDC platforms are designed with three cooling loops connected in series. The tradition is to use an open seawater system comprised of submerged seawater pumps and filters, as well as heat exchangers and ancillary systems/equipment located on the platform deck. The open seawater cooling systems are susceptible to clogging due to fouling, sand and mud, which results in frequent and extensive maintenance needs and subsequently high costs and poor reliability.

FSCC OFFERS REDUCED CAPEX AND OPEX

Using FSCC to meet the cooling requirements on HVDC platforms significantly reduces the complexity and increases the overall robustness of the cooling system. Furthermore, it minimises the need for maintenance and repairs and dramatically reduces the energy consumption on the platform.

The subsea cooler is passive, has no moving parts and operates in a closed loop where a mixture of glycol and water is circulated through the cooler. It eliminates the need for an open seawater system for cooling applications. This allows for a significant reduction in the capacity and complexity of the seawater pumps and accompanying power supplies, as well as negating the need for filters, topside heat exchangers, water treatment systems and associated equipment. The added benefits are:

- **Optimised** | size and weight is minimised compared to existing technology
- **Passive** | no energy consumption and negligible maintenance needs
- **Scalable** | it can be tailored to accurately meet different cooling requirements using SIMCOOL – our internally developed design tool, proven through large scale field-testing
- **Bio-fouling resistant** | equipped with proven anti-fouling technology

FSCC can be placed on a subsea frame installed on the HVDC platform jacket or pontoons, depending on type of platform. The system is modular and highly flexible, and can be tailored to fit the client's requirements in terms of cooling capacity and system redundancy.

FSCC installed on pontoon of HVDC platform (illustration by Aibel – CAV)

FSCC exploits the natural flow of seawater around the cooler tubes to maximise the cooling rate and minimise the overall size and weight. FSCC is designed to operate in an environment with stagnant seawater, yet the presence of sea currents will further increase its cooling performance.

Accurate sizing of FSCC is an important factor for reducing the overall cost of the cooling system. Future Technology AS has developed a flexible design tool (SIMCOOL) which predicts the cooling performance of FSCC. SIMCOOL calculates the heat exchange rate to the surrounding seawater by considering all relevant effects, thus enabling detailed design output and optimisation of the unit based on project specific input data.

SIMCOOL combines state-of-the-art simulation techniques with well-proven methods into a novel and proven simulation technique. SIMCOOL is based on the knowledge from years of experimental and numerical research on passive subsea coolers and has been verified through large-scale tests.

To ensure the performance throughout its lifetime, FSCC has been developed with proven solutions to eliminate issues related to marine growth. Hence, regular cleaning of the coolers to maintain sufficient cooling capacity will not be required.

Technical specification	
Process inlet temperature	Up to 150°C (higher on requests)
Cooling capacity	Up to 50 MW
Scalability	High flexibility
Process Media	Water, MeOH, MEG, and other
Operating Depth	Down to 100 m
Material	Several options available
Dimensions and weight	Dependant on required cooling rate and seawater temperature
Design life	>25 years

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