Dolwin-A and Helwin-B for Tennet

Offshore HVDC trafo stations

Version 30/3/2021

InterDam designed, supplied and installed:

	Dolwin 1	Helwin 2	Total
G21 external walls:	9.080 m²	7.650 m²	16.730 m²
G21 internal walls:	6.880 m²	11.680 m²	8.560 m²
EMC walls, floors and ceilings:	3.370 m²	4.095 m²	7.465 m²
Underdeck Insulation:	14.400 m²	19.365 m²	33.765 m²
IDM ext. hinged and sliding doors:	26 nos	8 nos	34 nos
Internal hinged doors and shutters:	122 nos	139 nos	261 nos
Blast relief hatches:	3 nos	51 nos	54 nos

Project description

Large parks of offshore windturbines are being installed in the North Sea. The power generated by these turbines has to be transported over long distances to shore. In order to avoid excessive power losses, converter platforms are required close to the turbines to convert the generated electricity from AC to HVDC (High Voltage Decent Current) before it enters the transport cables. Two of the largest HVDC platforms in the German sector are Dolwin A and Helwin B. These are essential hubs in the offshore power grid rolled out by Tennet. ABB (Dolwin A) and Siemens (Helwin B) are the main contractors and Heerema Zwijndrecht built both platforms.

Project challenges

Much experience-based information regarding the design and operation of oil- and gas platforms in the North Sea is widely available. HVDC platforms are faced with the same, well-known external climatic conditions, but the equipment inside demands an internal environment that differs greatly from that needed for hydrocarbon-processing equipment. This affects the following performance requirements for walls and doors:

Durability

Wind power is endlessly available; oil and gas is not. Thus, equipment that produces wind energy is designed for the longest possible technical and economical lifetime.

Tightness

HVDC equipment is very sensitive to salt-laden atmospheres. Therefore, the internal climate has to be actively controlled with minimal leakage through the external envelope.

EMC compatibility

The HVDC platforms are constructed from steel and therefore act as "Faraday cases" around the transformers and converters. For the reliable operation of the equipment, the electromagnetic properties of the walls and doors must therefore be optimized and taken into account in the overall design.

Fire resistance

As no large volumes of combustibles are stored on these platforms, the fire resistance requirements are less onerous then on oil and gas platforms.
However, the use of incombustible and low-smoke emitting materials is very important to limit fall-out due to a relatively small local fire.

Thermal insulation

A stable temperature is to be generated by a controlled balance between the heat generated by the equipment and the cooling capacity of the climate-control system. For the walls and doors, it is important that the insulation value is predictable and without thermal leaks that may cause condensation.

Compliance with rules and regulations

On the one hand, HVDC platforms must comply with the marine regulations. On the other hand many countries consider them to be permanent buildings on their continental shelves and they consequently apply their building regulations to HVDC platforms as well. This quite often requires additional testing and certification for walls and doors.

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InterDam solutions

The challenges were analyzed and standard solutions were selected and modified to suit the extra requirements. This resulted in the following cost-effective solutions:

External walls

For these the InterDam G21 firewall 1200-mm-wide, 120-mm-thick panels were utilized. Panel joints were limited by the application of up to 14-(!)-meter-long panels. Further, connection details were designed using "curtain wall" technology from the building facade industry in order to be able to guarantee a maximum tightness. The wall system is A60 fire rated by nature and is composed of inert materials like stone wool and stainless steel 316L for an unlimited life expectancy. An interesting feature is also the use of bolted, lightweight, cold-formed rails as part of the system, instead of the welded, heavy, hot rolled ones usually used.

Internal walls

These were also made of G21 Fire Panel walls, but with panels that are 600 mm wide and 100 mm thick. Hereby, the weight of the individual panels was greatly reduced, which allowed man-handling of them during installation inside the platform. Many doors and penetrations were framed and sealed in accordance with specially developed and fire-tested details.

Underdeck insulation

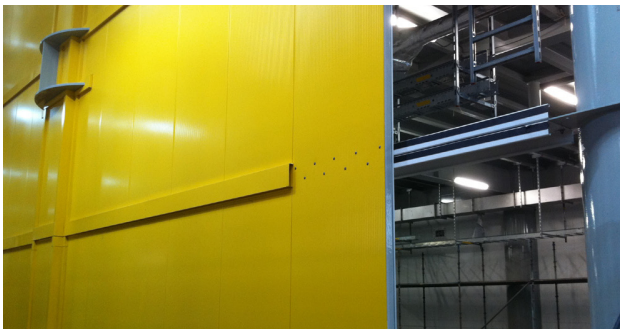
In order to create a completely firesafe and insulated envelope the decks were insulated at the underside with ceramic wool insulation, fixed with welded pins. The exposed lowest deck was additionally clad with stainless steel sheeting that is corrosion free for weather protection.

Doors

The external doors were made as InterDam heavy-duty fire doors with full stainless steel hardware. The internal doors are A60-rated steel doors and are provided where required with EMC strips to form a continuous electromagnetic cage.

Relief hatches

An active fire protection system is installed on the platforms to suppress fire from the start by injecting compressed Halon into the affected room. After having its effect, this Halon has to be released as quickly as possible. Therefore the external wall system was provided with a number of remotely operated relief hatches.



Third party verifications

The entire process of design, manufacturing, installation and commissioning was controlled by InterDam's in-house QA/QC department. A design verification report was produced containing test data and calculations to prove compliance with every requirement. This report was witnessed and accepted by the different parties involved under coordination of Det Norske Veritas.

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