

Refrigerant pipes for the gas field on the sea bed Time presses, and new technology is called for. The Åsgard gas field, around 50 km off the Norwegian coast and at a depth of 250 to 325 meters, is running out. Statoil commissioned MAN Diesel & Turbo to develop compressors for the sea floor. They will increase the gas pressure in the underwater pipeline, and so ensure continued production. The compressors come with Angst + Pfister's expertise.



© photo: Eiliv Leren, Statoil

Norway's Statoil also operates a natural gas plant on the island of Meløy. New technology for which MAN Diesel & Turbo is supplying the compressors should make it possible to exploit reserves to the fullest.

It's a daring project, the professionals think, and Norway's Statoil company has a big stake in it. The important Åsgard field produces more gas than can be consumed in several countries the size of Switzerland. To maintain their yield of fossil fuel an innovative and economical new production solution was created. This same technology can later be deployed to more effectively exploit new fields. At the core are new compressors being installed at the Åsgard gas field in an

underwater station 75 meters in length and weighing 4800 tons, supplied with external power via marine cables.

An order was placed with an international leader in this field; MAN Diesel & Turbo are commissioned to produce four state-of-the-art hermetically sealed compressors. The new electrical engines and integrated compres-



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Both new and conventional technologies call for expertise in handling fluids.

sors are being built and tested in Zurich before delivery. It is an ambitious time line as commissioning is scheduled for 2014.

A pipeline that is both robust and flexible

Angst + Pfister's top engineers are focusing their efforts on the connections between the bearing supports and the engine housing of this new compressor. The refrigerant gas line could not be designed as a solid pipeline; while it needs to be solid and robust, the connection must be flexible as well. These are the properties offered by the all-metal ASSIWELL® type hoses from Angst + Pfister. The specifications were worked out by Angst + Pfister together with MAN's project team leader, designer and physicist. Based on the initial load specifications, they compiled a detailed list of exact technical requirements and added further parameters step by step: limited space for the installation, a hole drilled into the engine housing for insertion of the pipe, and no relative movement between the two connections. Of course they also took the application's punishing environment into account. This pipeline would be coming into contact not just with natural gas but also with

nitrogen, and in flood conditions with sea water for short periods. And it must be capable of withstanding temperatures from -30° to +120 °C, as well as coping with vibrations and currents.

"We computed the pressure losses for the prescribed operating values, and derived the required nominal width from this", says Jesus Moreno, Senior Engineer for Fluid Handling Technology at Angst + Pfister. "The pipeline diameter is widest at the sleeves that close off the steel braiding. We exactly planned this external diameter in keeping with the conditions of installation."

With a rigid pipe section – and a sophisticated design

Jesus Moreno points out another important aspect: "A flexible pipeline does not adjust to the prescribed geometry, but independently chooses the line of least resistance. To determine the course it takes, we are designing the straight section that is needed in the drill hole not as a hose but as a rigid section of pipe." Considering the vibrations, this needs to be fixed both in the drill hole

and at the lower connection point. Moreover, it must be possible to insert the all-metal hose line through the narrow diameter of the drill hole. Jesus Moreno describes the solution: "We emboss the pipe section and attach a collar at the lower end which is designed as a fitting. In this way we can insert the pipe securely and fix it in place."

At the upper end the pipe needs to be connected to the adapter. To do this, Angst + Pfister is equipping the hose line with a special threaded unit, which notwithstanding the confined space can be passed through the drill hole and through the narrow gap by the fitting. Jesus Moreno says: "We have created a dedicated manual for the special assembly sequence of these individual elements." Taking into account the functionality, contact media and manufacturing process, he determined the most suitable material, hose design and the prior thermal treatments required.

The pipeline must be solid and robust, but flexible as well – a property offered by the all-metal ASSIWELL® hose from Angst + Pfister.

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