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Crude Oil Pumps from Colfax Fluid Handling

OMV Austria Exploration & Production GmbH and its predecessors have been pumping crude oil in Vienna's wine growing region for more than 50 years. Approximately 600 oil wells make up Austria's Matzen oilfield. They pump an oil/gas/water mixture (approx. 90% water) through pipelines to a centralized live oil collection station. At the station, oil is separated from water and natural gas. The oil is then pumped into the Auersthal tank farm for subsequent processing. Water is directed to the water treatment plant, while natural gas is sent to a compressor station in Auersthal.

Complete renovation

Before the centralized station came on line in 2005, 12 individual extraction stations were in use. In anticipation of pumping crude profitably for another 20 to 30 years, in 2005 the company embarked on a comprehensive renovation of its entire infrastructure, including the network of pumps and 70 km of piping. The system takes advantage of the discharge pressure of the oil wells to pump the oil/water/gas mixture through new pipelines to the centralized Matzen extraction station. The earlier individual stations are now used only as measurement stations for the live oil. Preparation and separation of the live oil now occurs only in the Matzen extraction station. Thirty-one pumps from Colfax brand Allweiler replaced pumps from a variety of manufacturers in the individual stations. The tank farm as well uses large screw pumps ("SMH“ series) from this manufacturer for all qualities of crude oil. These pumps are equipped with frequency converters to control the rate at which the oil is moved through the approximately 25 km long pipeline and into the Lobau reservoir (up to 120 m^3/h, max. 40 bar). An Allweiler progressing cavity pump of the AE series moves slop oil (waste water) out of the

tank farm. OMV invested €130 million to completely renovate the collection stations, the extraction station, and the tank farm between 2005 and 2011.

High expectations for pumps

Screw pumps used for production of crude oil must fulfill special requirements. First, they must be able to handle large viscosity differences in the crude oil. The pumps must cover a wide viscosity range with uniform and efficient performance. Secondly, they must be able to deliver high discharge pressure or high capacity, depending on current requirements. Displacement pumps are particularly well-suited for oil that contains gas or foreign objects. These pumps are relatively insensitive to oil that is contaminated with sand, rust, or paraffin. They are even able to pump crude oil that contains gas or is mixed with salt water.

Their low NPSH values make these pumps flexible in terms of installation. For example, they may be installed above the suction level. The screw pumps can handle long suction lines and completely drain tanks without compromising performance or efficiency. Low shearing forces minimize mixing of pumped liquids. In the downstream process, separating oil and water components in the crude oil is straightforward and efficient.

Materials optimized for chloride components

At the extraction station, six separators process the live oil and separate it into qualities "A" (asphalt base) and "P" (paraffin base). Tanks for the two qualities and a reserve tank each hold 1000 m^3; two water tanks hold 2000 m^3. The total capacity of the system is approximately 800,000 metric tons of oil. Water that is generated as a waste product is processed in the extraction station and treatment plant and then pumped back into the storage facilities. Six stainless steel centrifugal pumps of the CNH-B series act as circulation pumps, moving 40 m^3/h of the oil/water mixture at 2 to 3 bar. At approximately 15 cSt ("A" quality) and 200-300 cSt ("P" quality), the mixture is highly viscous. The 10 loading pumps (CNH‑B series) for the two water tanks pump 20 m^3/h at 4.5 bar. They

are constructed of Duplex stainless steel, making them corrosion-free despite the high level of chloride in the water. Salt content is between 15 and 37 g/l. For this reason, the mechanical seals on these formation water pumps are among the most critical components. Therefore, Allweiler's ability to offer a wide variety of seal types and materials is a decisive advantage. A special metal bellows seal has proven to be effective in the extraction station. Two additional pumps of this series are in service as surface-water pumps and condensate pumps. They pump salt water with natural gas condensate and are constructed in Duplex stainless steel.

All pumps from a single source

In addition to these centrifugal pumps, there are three Allweiler screw pumps of the SNH series. These oil transfer pumps move up to 60 m^3/h of purified crude oil (in both qualities) to the Auersthal tank farm at 20 bar. Centrifugal pumps of the CNH-B series are installed before these screw pumps where they serve as booster pumps moving up to 60 m³/h at 2.8 bar. These pumps move the crude oil from the tanks to the screw pumps, thereby compensating for the loss of pressure in the suction line of the screw pumps. The CNH-B series pumps are also used for pumping formation saltwater and reach a capacity of 550 m³/h at 3.5 bar. The formation water is then brought back into the storage facilities with three centrifugal pumps of the CNH-B series. The capacity of these wastewater transfer pumps is up to 800 m³/h without resulting in significant wear. Two CNH-B stainless steel centrifugal pumps move warm water for heating the system.

Continuous operation

All pumps are equipped with pressure-resistant encapsulated motors (according to EExdeIICT4). Frequency converters provide speed control. They fulfill the requirements of EX-Zone 1 "electrical and mechanical ATEX protection" (ATEX100a: II2G Zone 1 T4). Their power consumption, flow, and pressure are all monitored continuously. Before installation, all 31 pumps passed a pressure and performance test in accordance with ISO 9906 Class 2.

Nearly all of the pump/motor assemblies are redundant. This ensures that critical components in the extraction station will work without interruption. If the transfer pumps for the formation water were to fail, the station would be able to absorb no more than four hours worth of material.

Price and experience were critical

According to Peter Winkler, Project Manager for the extraction station, "Allweiler was able to fulfill all the requirements with its chemical standard pumps at a very attractive price/performance ratio. Over the years we have also had good experiences with the quality of these pumps," As a member of Colfax Corporation, Allweiler has access to pumps designed for every phase of oil transport and processing, from upstream to downstream and midstream. Pumps from the Colfax Fluid Handling brand Allweiler are used exclusively at the Matzen station. This includes not only pumping of oil but all of the secondary processes as well.

Austrian partner

Other important factors included the ability to obtain the entire set of pumps from a single supplier, the process design with straightforward maintenance, and the spacer coupling. Together these characteristics reduce expenses associated with maintenance and stockkeeping of spare parts, thereby keeping the Total Cost of Ownership (TCO) low. "OMV made it clear that they value competent on-site service. They expect rapid reaction times and straightforward communication," according to Kurt Zotter, an engineer at A.RADA GmbH, the Austrian partner who supports the entire installation on behalf of Colfax Fluid Handling. These requirements eliminated most foreign vendors, particularly those based in Asia. A.RADA not only provided all of the pumps, they also installed them on a concrete foundation, aligned the couplings with a laser tool, and commissioned the system in collaboration with OMV.

Allweiler pumps are used exclusively in the central Matzen extraction station.

The tanks for the A and P qualities and a reserve tank each hold 1000 m³. The two water tanks hold a total of 2000 m³. All of the tanks are fed by Allweiler pumps.

(from left) Engineer and MBA Alexander Gerstner / Assistant to the OMV Exectuve Management, Rainhard Kurz / OMV Head of Operations at the Matzen extraction station, and Engineer Peter Winkler / OMV Project Manager.

Allweiler pumps in the Matzen extraction station's pump house. In front a screw pump for pumping crude oil; behind that three centrifugal pumps for pumping formation water.

Centrifugal pump on working and pumping tanks for moving crude oil.

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