

Case Study

As oil and gas exploration moves into deeper and more remote waters, the use of Floating Production, Storage and Offloading (FPSO) vessels continues to grow. With this growth comes the need for reliable, compact FPSO systems, an ideal fit for Sundyne equipment. Here we analyze a Sundyne Compressor deaeration stripping gas application inside the Minox™ deoxygenation system on board the Chevron Agbami FPSO.

BACKGROUND

FPSO units are designed to take all of the oil or gas produced from a nearby platform, process it, and store it until the oil or gas can be offloaded onto tankers, or sent through a pipeline. The Agbami FPSO, in service off the coast of Nigeria, is one of the largest vessels of its kind in the world, and is moored in a water depth of about 5000 ft (1524 m). It can process 250,000 barrels of oil per day with a storage capacity of 2.1 million barrels.

Sundyne customer Grenland Minox, a subsidiary of Norway's Grenland Group, supplied its Minox™ two-stage deoxygenation system to the Agbami FPSO.



Photo: Chevron

PROCESS OVERVIEW

The Minox system utilizes a patented technology that deaerates or removes oxygen from seawater via a nitrogen gas stripping process. The oxygen is stripped from the water by the nitrogen. The nitrogen is then catalytically purified and recycled. As a result, the residual oxygen content is less than 10 parts per billion (ppb).

What is the main purpose of this treatment on FPSO vessels and offshore platforms? In these locations, seawater is used for injection in oil wells for enhanced recovery and also for different types of open and closed industrial water circuits. The removal of oxygen from the water reduces corrosion in pipes, and prevents bacterial growth and clogging of the oil reservoirs. One important thing to note is that this is an environmentally clean "green" process.

The Minox two-stage deoxygenation system is based on a gas stripping system of the seawater with co-current contact through static mixers in a two-stage system, while the stripping gas flows counter-currently from stage to stage. A Sundyne compressor is the heart of the system: it transports the stripping gas from the second stage separator and over to the first stage static mixer. The stripping gas, being nitrogen, is regenerated through a catalytic combustion process, the products of which dissolve in the deoxygenated water.

On the Agbami platform there are two Minox deoxygenation systems, each equipped with one running and one spare Sundyne Compressor model LMC-333. Sundyne sold these machines as bare units to its channel partner in Norway, Ing. Per Gjerdum, who executed the complete package, including the base plate, lube oil system and other key components.

In addition to the deaeration of seawater, the Minox system can be applied to other services where dissolved oxygen in liquids is problematic. These include the deaeration of lighter hydrocarbon feeds and hydrate inhibitors like ethanol and methanol, and the deaeration of ventilated produced water.

TYPICAL PROCESS CONDITIONS

DEAERATION STRIPPING GAS COMPRESSOR

Flows: 450–900 ACFM (800–1500 m³/hr)

Inlet Pressure: 32-40 psia (2.2–2.8 bar)

Head: 1,900–2,500 ft-lb (5,700– 7,400 n-m)

MW: 28

PROCESS GAS: N₂ with traces of H₂O

TYPICAL COMPRESSOR DESIGN

DEAERATION STRIPPING GAS COMPRESSOR

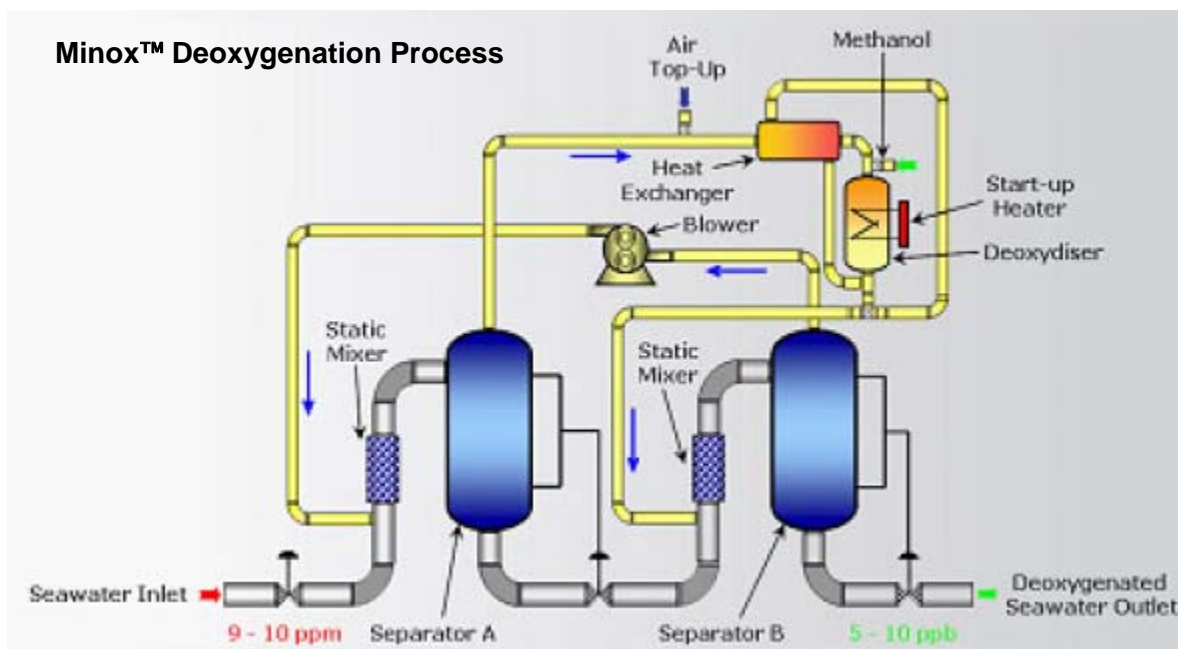
- LMCs are normally offered
- Stainless steel construction is adequate
- Dimensions of each package: footprint 1.5m x 1.5 m (5ft x 5ft), height 2.4m (8ft) including motor
- Single dry gas seals are typically used
- Small base plate
- No control panels
- Vertical stand is typically supplied for all motor sizes to provide stability required by offshore installation (wind, waves, etc.)
- Minimal fit for the purpose lube oil system and seal support system – No external reservoir, the oil sump is in the gearbox itself
- Normally Sundyne standard is accepted

SUNDYNE BENEFITS

- Sundyne integrally geared machines are compact and available with compressor, driver, lube and seal system on a single skid.
- No other centrifugal machines can match Sundyne performances for the required flow/head combination.
- Salt deposits tend to appear on the impeller over time, which would damage a gear, screw, or reciprocating compressor. Sundyne higher tolerances, however, can handle these deposits which can then be washed away by flushing with hot vapor from the seal housing and case drain.
- Sundyne integrally geared machines are more reliable than Roots or other rotary lobe-type compressors.
- Sundyne Compressors are oil free and pulsation free.



Source: Grenland Minox



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