Schlumberger

Case study: Acid Gas Treatment

Location: Queensland, Australia

Aligned with United Nations Sustainable Development Goals:
12—Responsible consumption and production,
13—Climate action.

Hydrocarbon Recovery Rate at Gas Treatment Facility Increases to 96%, Improving Economics

Apura membranes reduce flaring and provide a durable solution for acid gas removal, with flexibility to handle the higher throughput forecast

Emissions Reduction:
Reduced hydrocarbon loss from 33% to 4%, enabling operator to actively pursue carbon capture, utilization, and storage (CCUS) for the high-purity CO_2 outlet stream

Denison Gas replaced deteriorating 3rd-party membranes at its gas treatment plant with robust Apura® composite membranes, increasing natural gas recovery, and hence revenue, by >40%.

Operator wanted to improve gas treatment plant performance

Denison Gas acquired a gas treatment facility that receives natural gas from several sources. Four banks of primary membranes treated the feed stream, reducing CO_2 content from a typical 30% to 10%. The nonpermeate stream is mixed with dehydrated gas from other fields, containing approximately 13% CO_2. The combined gas undergoes compression and further pretreatment before entering two trains, each containing three banks of final membranes to reduce the CO_2 concentration to a sales gas specification of 3%.

The existing third-party cellulose acetate (CA) spiral-wound membranes were experiencing accelerated degradation. Of the just over 7 MMcf/d processed, almost half—3.5 MMcf/d with 47% CO_2—was lost through flaring, resulting in a low hydrocarbon recovery of <67%. With new wells being brought online, facility throughput was expected to increase in the near future. The operator wanted a robust membrane technology that is capable of continuous long-term operation and would deliver the required product specification. Minimizing flaring and venting of permeate gas and using the existing membrane infrastructure were other key requirements.

For the final stage of processing, the treatment plant uses two trains, each containing 84 membranes arranged in three banks.

Apura membranes provided greater durability and enhanced removal of acid gas in water-rich conditions

After thorough assessment and site inspection, Schlumberger proposed Apura gas separation membranes from FUJIFILM®. Continuing its efforts to advance acid gas treatment technologies, Schlumberger has entered into an agreement with FUJIFILM to further develop and market the Apura membrane. The durable spiral-wound multilayer composite membrane promotes higher gas throughput, provides excellent CO_2 removal, retains maximum hydrocarbons in the product gas, and has a longer operating life. It enables simple plug-and-play replacement of CA spiral-wound membranes, without any skid modifications. With an extended life in water-rich conditions, Apura membranes are also ideal for the varying levels of upstream gas dehydration handled by this facility.

Membrane replacement increased recovery rate of saleable hydrocarbons from <67% to 96%

Initially, Denison Gas replaced two banks of primary and two banks of final membranes. This change almost halved the volume of gas flared, reducing it from 3.5 MMcf/d to 1.8 MMcf/d, while the concentration of CO_2 in the permeate stream increased from 47% to >87%. The result was a vastly improved hydrocarbon recovery rate, which rose from <67% to a notable 96%, significantly increasing the operator's gas revenue and enabling them to recoup the cost of the membranes within just 6 months. Additional membranes were replaced a year later, expanding capacity to meet the demands of increased drilling and production.

Schlumberger was chosen due to

- **improved durability of the Apura elements, particularly with wet gas**
- **ability to directly replace the existing elements with no plant modification**
- **quicker delivery due to the large inventory.**

The new elements have greatly increased our plant's profitability, and still performing well after 2 years of service.

Tim Petersen, Chief Operating Officer, Denison Gas

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