PALL

Fuels and Chemicals

Case Study

Treatment of Coal Seam Methane Produced Water with a Pall Integrated Membrane System at Origin Energy

Background

With a rich heritage in energy exploration, production and retailing, Origin Energy is one of the leading providers of energy to homes and businesses throughout Australia, New Zealand and the Pacific. After a series of acquisitions in the early 2000s, Origin's customer base had grown considerably. Coal seam methane (CSM) production emerged as a foremost technology for supporting this burgeoning customer base. In fact, in the Australian state of Queensland, CSM is expected to provide almost 90 percent of the total gas market. However, producing CSM gas is not without difficulties.

CSM Water Management Challenges

To recover the gas, water must be pumped from the coal seams to reduce the pressure and allow the large volumes of gas to flow. The water itself has historically been difficult to treat with membrane technologies. It contains a wide variety of contaminants, from metals and salts to organics and microbiological impurities, and varies considerably from well to well.

Origin recognized the requirement for sustainable management of the water associated with CSM production at their Spring Gully developments near Roma in Central Queensland. In this drought affected region of Australia, water management is especially critical, so Origin searched for the right partner to meet the challenge.

The Pall Integrated Membrane System (IMS) is Trialed

Origin engaged Pall Corporation to develop and trial an Integrated Membrane System

The Spring Gully Gas Plant is the site of the IMS installation.

Filtration. Separation. Solution.SM

The Pall reverse osmosis systems complete the process of filtering out microbiological and other contaminants.

(IMS), that utilized microfiltration (MF) and reverse osmosis (RO) systems specially designed to treat their CSM water. The IMS was fully automated and designed for extended periods of unattended operation. Data protection and capture were given the highest priority.

The primary objectives of the trials were:

- To determine the overall suitability of the membrane technologies for the desalination of CSM produced water, and
- To generate comprehensive data to enable scaling up of the systems, with detailed quantification of the capital and operation costs.

The unit contained specialized MF, interconnect and RO systems, as well as all ancillary equipment required to support these units, including air compressors and chemical dosing, cleaning and automatic flush systems. Additionally, the IMS is protected in the event of a power outage by generator changeover mechanisms. The components were housed in a portable, well lit and air conditioned/ventilated building.

The trials were conducted over two, six-month periods to cover a variety of feed water conditions and to optimize operational parameters. The data collected from the trial was very compelling, and Origin decided to take the next logical step.

Origin Implements a Full Scale IMS Facility

Pall entered into to an agreement in early 2007 with Origin to supply a full-scale IMS facility adjacent to the ponds at the Spring Gully CSM Development. Pall provided the process units, including prestrainers, microfiltration systems, reverse osmosis systems, chemical cleaning and flushing systems, chemical dosing systems, compressed air systems, motor control centers and interconnecting pipework. The company also supplied extensive engineering support and an interface design after collaborating with the overall electrical, and civil design, and other on-site contractors. Although implementation was complicated by the remoteness of the Spring Gully site and the high degree of process customization, the IMS facility was successfully commissioned and brought online in December 2007. The current production capacity is nine million liters per day (MLD) day of CSM produced water, and the IMS can be expanded to support up to 15 MLD.

A key advantage to the Pall IMS is the adaptability of the RO systems to variations

in feedwater including periodic algae blooms that can create fouling in other membrane systems. The power requirements were also minimized through use of an inter-stage boosting capability that balances flux. The RO systems also incorporate a high degree of instrumentation to enable ongoing remote monitoring and full automatic sequencing of all processes. The result is reduced operator input and maintenance costs.

Summary

The IMS facility has been operational since December 2007 and meets Origin's requirements for producing high quality water that's well within the discharge limits prescribed by the Queensland Environmental Protection Agency. Origin Energy is currently evaluating the options for the most beneficial long term use of this socially, environmentally and economically valuable asset.

Origin IMS System Specifications

Components: An Integrated Membrane System (IMS) comprising four microfiltration racks, each containing 56 x 0.1 micron Microza* modules; an RO system; a pre-strainer; chemical dosing and compressed air systems; and interconnecting pipe work and motor control centers.
Capacity: Nine MLD, expandable to 15 MLD
Implementation: March - December 2007

A view of the Pall microfiltration systems (foreground) and reverse osmosis systems.

Features and Benefits of the Integrated Membrane System

Features	Benefits
Highly modularized, skid mounted units	Minimized labor costs and installation time
	Rapid expansion to support increased production
	Reduced space requirements
High degree of instrumentation	Remote monitoring of normalized trends and full automatic sequencing of all processes
	Minimized operator input and maintenance costs
Redundant modules	Maximized uptime for critical water delivery applications
Robust MF membranes	Extremely low breakage rate* reduces maintenance time and costs
Regular air scrubbing and chemical cleaning	Minimized fouling due to variations in feed water, including periodic algae blooms from the ponds
Three-stage RO systems with interstage boosting	Balanced flux
	Minimized power requirements
	Maximum flexibility and continual adjustment of recoveries and operational set points as the feedwater varies and the membranes age

** The CalWater, Bakersfield, CA installation with more than 700 Pall microfiltration modules experienced fiber breakage of only 1 in 3,073,400 during a 40-month period.*

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