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OilPaq

Fracking flowback and produced water treatment in the US

Creating new revenue streams and providing substantial cost containment for customers, the OilPaq automatically increases the customer's profitability. This article looks at how the system is strategically designed to meet future environmental legislation.

Presently, in the United States alone, there are around 1.1 million wells producing oil and gas. The U.S. oil and gas industry is growing at a rate of 13,000 wells every year. On average, three to five barrels of water are produced with each barrel of oil. Produced water and fracking flowback are by far the largest waste streams associated with oil and gas production. Water associated with oil spillages, water from oil contaminated land remediation and water from oilfield production and frack flow-back processes are environmentally hazardous wastewater streams that are very difficult to treat. These wastewater streams contain free oil, emulsified oil, dissolved hydrocarbons, suspended solids and numerous salt and mineral contaminants. Depending on the well location and depth, other toxic substances such as heavy metals and natural radioactive materials (NORM) may be present. The oil and gas industry recognises ultrafiltration (UF) membrane technology is the most effective technology to recover oil and recycle production water and fracking flowback. But due to oil particles and light density solids adhering to the membrane surfaces and thus clogging the membrane pores, previous large scale attempts to apply this technology in the oil and gas industry have failed miserably. The current remedies are expensive equipment costs, extensive energy consuming devices and increase disposal costs created by hydro-cyclones, centrifuges and sock filtration.

Recently, Luxembourg clean tech venture APATEQ launched the OilPaq, a system designed to utilise readily available ultrafiltration membranes for oil-water separation. APATEQ's new technology advantage is their process to feed the "specially conditioned" membranes with water. By means of their proprietary process technology, APATEQ can utilise, without membrane clogging, cost effective UF membranes for oil-water separation. Operation costs of the OilPaq are between 50 cents to less than $1.00 per barrel. With long intervals between the CIP (clean-in-place) procedures, the UF membranes long lifetime is greater than five years. Because the process requires no chemicals, the recovered oil is immediately ready for refinery processing. The resulting chemical-free effluent water can be reused for SWD reinjection, new fracking and drilling processes and, if conditions are favourable, industrial cooling applications, livestock feed water or irrigation.

Meeting the highest international standards, including North American certification and ATEX, the OilPaq is designed to operate safely in potentially hazardous areas and potentially explosive environments. Its safety features include, for example, the entire system being blanketed with nitrogen to suppress explosive gases. Continuously monitoring environmental gases, sensors for light gases, heavy gases and oxygen are installed in the plant. If gas levels inside the OilPaq approach potentially hazardous levels, the plant immediately shuts down all systems automatically. Remote monitoring and communications, for both safety and operational alarms, automatically inform the operator. The OilPaq's critical operational sub-systems are redundantly duplicated to avoid processing disruptions. In the unlikely event a critical

The fully automated OilPaq is controlled by means of a touch screen and is housed in aerated office containers.

The OilPaq decreases the present treatment costs by reducing the need for chemical additives.

sub-system experiences operational failure, the OilPaq's software is programmed to take immediate action by switching from the defective device to its redundant backup counter device.

In early 2014, APATEQ initially sold a pilot OilPaq to one of the largest oil and gas producers in Europe. With only process control parameter adjustments of its Programmable Logic Control (PLC), the pilot OilPaq continuously treated alternating produced waters from 30 different wells in a Northern European gas field. The fully automated OilPaq is controlled by means of a touch screen and is housed in an aerated 40' office container. The raw produced water or fracking flowback is first cooled to a temperature below 130°F and held in a storage tank. The delivered OilPaq is a combination of a primary treatment system and an UF membrane system. While the primary treatment system recovers nearly 100% of the free and emulsified oil, the primary treatment stage simultaneously separates over 90% of the heavy and light suspended solids from the water. The primary treatment stage effluent water is then pumped to a buffer tank before entering the ultrafiltration (UF) membrane stage. The UF membrane module operates in an internal cross-flow pattern to achieve a low cover layer on the membranes' surfaces. The ceramic UF membranes are conditioned to exhibit strong hydrophilic characteristics that reject free oil drops, emulsified oil droplets and other hydrophobic substances. The UF membrane conditioning prevents membrane pore wetting and clogging by free oil, other hydrophobic substances and low gravity suspended solids. The UF membranes produce a concentrate (waste), a backwash (waste) and a permeate (final product). Backwash is achieved by a combination of pulsating, short-burst back flushing, which lifts the micro-debris from the UF membrane surfaces, and a timed conventional backwashing cycle to discharge micro-debris from the UF membrane columns. Both the UF concentrate and the backwash are cycled back to primary treatment stage to be reprocessed.

Without the need of any further treatment (sock filters or similar processes), the OilPaq's permeate water (final product) typically contains less than 1 ppm free hydrocarbons and suspended solids; therefore, the permeate water is suitable for SWD reinjection. Should the conditions allow it, with an additional post treatment system the OilPaq's permeate can be recycled and reused as frack process water, directly discharged into the environment or used for irrigation.

OilPaq operational costs are approximately one-fifth of present market solutions. The OilPaq decreases the present treatment costs by reducing the need for chemical additives or completely eliminates the use of chemical additives for the treatment process. With a long lifetime (more than five years) the ceramic membranes substantially reduce operational costs. Manpower costs are reduced by the long intervals between its efficient, in-process cleaning procedures. The permanent presence of a plant operator is not necessary. Manpower costs are further decreased because the OilPaq is fully automated and a single service technician can simultaneously supervise, operate and maintain several OilPaq sites.

APATEQ is currently running a program of on-demand, on-site produced water treatment in the USA and Canada. In addition to the already existing North America clientele, the program is open to new participants by a no-engagement subscription. In the second half of 2015, APATEQ will establish its first subsidiary in the Houston, Texas region to directly serve the North American market.

www.apateq.com