Membrane bioreactor systems safeguard Kashagan's service water

Kazakhstan has imposed tight discharge restrictions on offshore activity in its sector of the Caspian Sea. The area around Agip-KCO’s shallow water Kashagan development is also a nature reserve, housing breeding grounds for the protected sturgeon population. All drilling barges and accommodation facilities on the Kashagan field therefore must incorporate specialized waste water/sewage treatment systems. Treated water must emerge colorless, odorless, and at a temperature no more than 2°C (35°F) higher than the surrounding seawater, with only minimal traces of nitrogen or phosphates. It also must be reused as much as possible at the offshore facility to limit the risk of contamination.

One beneficiary of this regime is Wageningen-based process contractor Triqua, which since 2001 has supplied its membrane bioreactor technology (MemTrio) to various contractors working in partnership with Agip-KCO. These include drilling groups Sunhar, Parker Drilling, and Deutz, and offshore accommodation providers Consale, Entunga, and Rosetti Mariti.

The principles behind membrane bioreactors derive from a conventional activated sludge process, but separation of microorganisms is achieved by membrane filtration. This ensures that treated water emerges free of suspended solids and microorganisms. Other benefits of membrane bioreactors, Triqua claims, include:

- Compact design due to high biomass concentrations
- Low excess sludge production
- Stable process operation (no build-up of bulk sludge)
- High sludge age, facilitating degradation of complex compounds
- Membranes retain long-chained polymers to promote degradation.

With the MemTrio system, separation of microorganisms is achieved via crossflow filtration. The membrane modules are outside the bioreactor in a pressurized circulation loop. Shear forces created by the crossflow prevent fouling of the membranes. The system is used mainly to treat high-strength waste water and in applications where small pore sizes are demanded.

For Kashagan, the post-treatment discharge standards require the equipment to handle biological oxygen demand (BOD) of up to 15 mg/liter and chemical oxygen demand (COD) of up to 30 mg/l, and to treat suspended solids (TSS) at a rate of up to 15 mg/l.

On the surface facilities, waste water is collected from showers, baths and laundries; rinse water from household use containing detergents; and water from laundries. The latter also contains residual oil from overall.

Membrane stacks.

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An artificial drilling island on Kashagan.