

# Three stages of contamination management tackled with ease

Seen by the naked eye, oil floating on water is merely the tip of the iceberg in the treatment of water contamination. The National Water Act 1998 (No 36 of 1998) refers to prevention and remedying effects of pollution and control of emergency incidents. It goes on to prescribe the discharge limit to any natural water source to below 2,5 mg oil/litre. To comply with the regulations, oily-water separation systems need to be able to process three phases of oil in contaminated water.

**P**rocon Environmental Technologies' environmental engineer Jacques Steyn describes the three phases as the free phase, emulsified phase and dissolved phase, each of which impacts on the quality of water. "To clean the water, a specific strategy for each phase is required."

The free phase refers to free-floating oil or oil droplets greater than 150 micron, and the oil in this phase can be separated by gravity. The new phase is emulsified oil, and this includes oil droplets between 2 and 150  $\mu\text{m}$  in size, which subsequently requires a separating process that is more powerful than the force of gravity. Finally, the dissolved phase refers to oil droplets that are less than 2  $\mu\text{m}$ , where the oil is physically dissolved in water. "Dissolved oil cannot be treated by conventional gravity and plate pack-type systems," he confirms.

Established some 16 years ago, Procon Environmental Technologies specialises in systems that minimise the impact of contamination on the environment. Expertise, combined with exclusive partnerships with international leaders in environmental equipment enables the full scope of water management solutions to be offered.

"Our systems are aimed at addressing all three phases of oily water contamination, which is why Procon can guarantee a good quality of discharge," Steyn says, adding that the company offers two main technologies, Ultraspin hydrocyclone and MyCelx filtration.



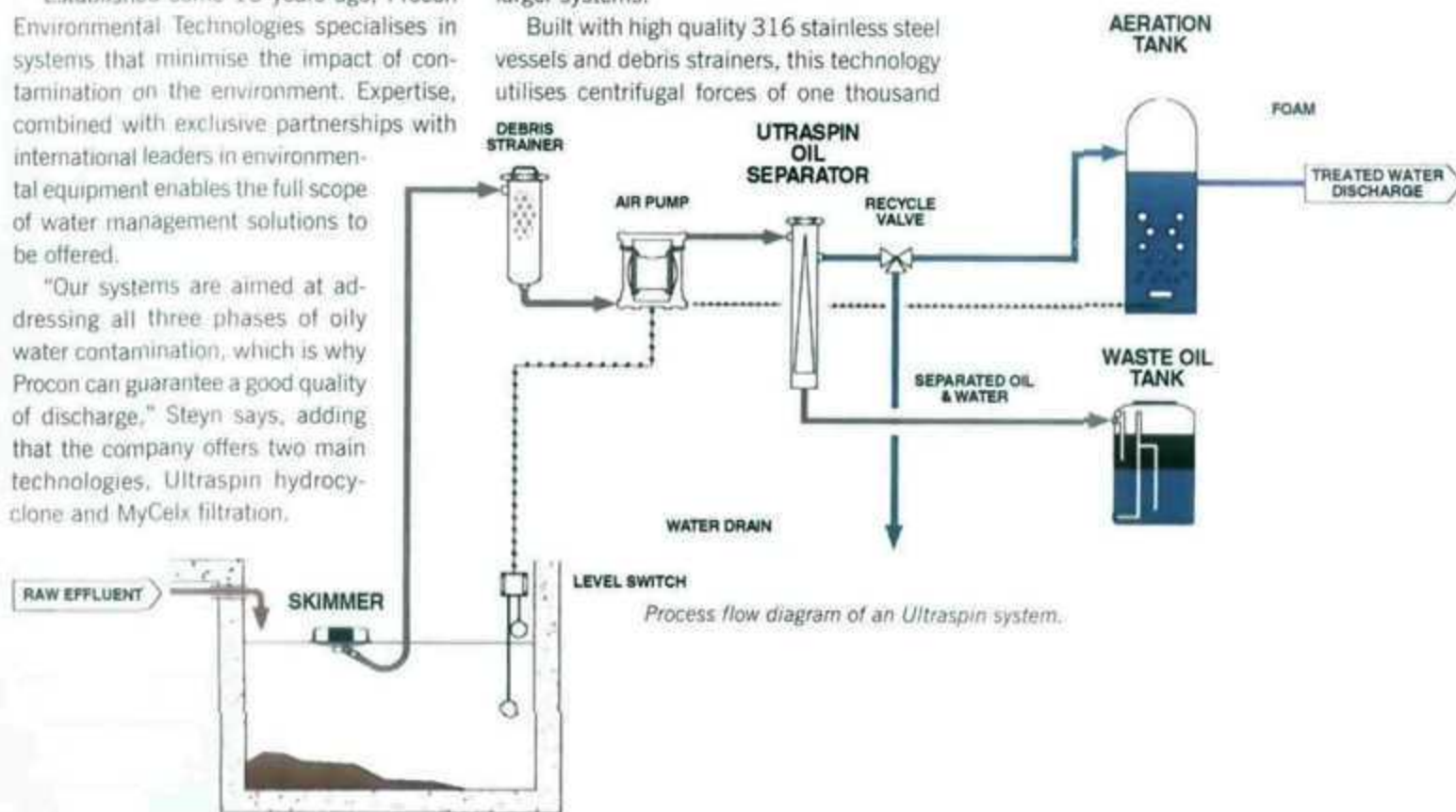
Three types of oil that are removed via the Ultraspin system.

- Free oil:** Free floating oil or oil droplets greater than 150  $\mu\text{m}$ . Free oil can separate by gravity.
- Emulsified:** Oil droplets less than 150  $\mu\text{m}$  and oil droplets greater than 2  $\mu\text{m}$ . Emulsified oil must be treated with a more powerful separator.
- Dissolved:** Oil droplets less than 2  $\mu\text{m}$  or physically dissolved in the water. Dissolved oil will not be treated by conventional gravity, plate pack-type systems.

**Ultraspin hydrocyclone technology**  
This enables the separation of oil from water at any flow rate, from the smaller system that operates at 3,5 m<sup>3</sup>/hour up to and above 1 000 m<sup>3</sup>/hour with specially designed larger systems.

Built with high quality 316 stainless steel vessels and debris strainers, this technology utilises centrifugal forces of one thousand

times the force of gravity, which separates oil as well as other contaminants from water. Once separated, the oil is then removed through an orifice located on top of the system. Where traditional oily-water separator



Process flow diagram of an Ultraspin system.

systems use plate pack mechanisms, which can only guarantee removal of oil droplets that are greater than 160  $\mu\text{m}$  in size, the Ultraspin system can achieve a 95% success rate with oil droplets less than 15  $\mu\text{m}$  in size.

#### MyCelx filtration

MyCelx filtration is a polishing technology based on removing any form of hydrocarbon in the water, and then polishing the water to an acceptable discharge limit for storm water discharge.

Steyn explains that the National Water Act requires industry to clean this water to levels of below 2,5 parts per million, but MyCelx filtration ensures 1 ppm or less. Depending on the requirements, Procon's MyCelx systems can process anything from 4 542  $\ell$ /hour to 84 000  $\ell$ /hour. He says MyCelx coated materials instantly bond with organic compounds, including the full range of aromatic hydrocarbons, and prevents them from separating and emulsifying. "Procon can design a system that removes 100% of the oil from water, and is the only company to achieve this."

For the past 18 months, Procon's team of experts have been working on a project commissioned by one of the world's leading ferrochrome producers, which has a reverse osmosis water treatment plant that uses membranes to ensure good quality potable water.

"The membranes in osmosis units are extremely sensitive to hydrocarbon in the water, which limits the lifetime of the membranes. Our survey showed five areas upstream from where the pollution was emanating, and that using the MyCelx and Ultraspin systems in each site would remove the oil at source and help prevent damage to the membranes," he explains.

The Ultraspin system – using a powerful



The Procon Ultraspin system.

but simple vortex principle – removes the hydrocarbons to 220 ppm and can, in some instances, achieve less than 2,5 ppm; after which the MyCelx can remove the hydrocarbons to non-detectable levels in many cases. Customised to suit the ferrochrome producer's particular needs, installation is set to take place shortly.

Steyn says that implementing these two systems in a reverse osmosis plant can extend the lifespan of membranes by around 50%. "It's worthwhile spending R2-million

on hydrocarbon pollution prevention when the alternative is replacing a R20-million membrane system." Of the companies that pitched for the business, Procon was the only one that could provide a guaranteed discharge of below 1,0 ppm.

In offering turnkey solutions like this, Procon's engineers survey every site to develop systems for the most complex and challenging waste water problems. "Each site is unique and part of our survey must include entire bodies of water – upstream



Oily water discharge before the installation of Ultraspin.



Clean water discharge after the installation of Ultraspin at coal mine.

and downstream – as well as reviewing the chemicals in use at the site,” he says.

Procon and its Ultraspin partner then employ scientific computer models where the team can determine the output criteria of each site by using the input parameters from the survey. “This way we can alter parameters and, with further testing to determine the particle size distribution analysis of the oil droplets, we can see exactly what the hydrocyclone efficiency would be, and the results or discharge quality under those conditions.”

The company has been providing this type of service and guarantee since 2000. In addition, the engineers sometimes find other measures its clients can take to prevent water pollution. “Some years ago, we began assisting a coal mine in Ellisras, developing a strategic hydrocarbon pollution prevention plan in which 12 pollution-generating points were determined and a strategy for each set up. We found the mine was using unfriendly materials in the washing process – degreasers with a pH of 13,8, which makes it very difficult to separate the oil and water,” Steyn says.

On Procon’s recommendation, the operation changed its soaps and degreasers, which also helped it move in the direction of compliance with both the National Water Act and the Department of Minerals and Energy regulations.

In the past two years, Procon has seen a significant improvement in the way that



*The Procon Ultraspin system at coal mine.*

mines deal with water pollution prevention and treatment. “People are more aware now, regulations are monitored more closely, and they can see that proper oily water treatment benefits their operations, and communities in which they operate and the country as a whole.

“By and large, our clients are completely satisfied with our solutions,” Steyn confirms.

He adds that having the best available equipment in the market, and a professional team dedicated to its craft, means that Procon can offer massive savings in maintenance costs and that the savings will pay for the system within a five-year cycle. “It’s a win-win situation – our clients benefit, the environment benefits and we grow our business,” he says. □