

## Reuse of treated wastewater at an oil production facility in the Sahara

Repsol Oil Operations has a production facility based in the Sahara region, where a wastewater treatment system not only treats the wastewater from its accommodation, engineering and office blocks, but also permits reuse of the treated effluent for irrigation purposes. The water treatment and reuse solution chosen was the HiPAF system with a WPL sand filter. WPL is a British company that has been designing and manufacturing wastewater solutions for over 20 years and it has installations in over 27 countries.



This project was carried out by Zual Water Technology, a Libyan based company with its headquarters in Tripoli, whose primary focus is providing turnkey water and wastewater solutions. They work closely with British wastewater solutions manufacturer WPL, who specialise in bespoke, biological wastewater treatment solutions.

Repsol's permanent site in the Akakus region of the Sahara provides accommodation and offices for the workers at the nearby oil production facility. Being in the middle of the desert, it is a very remote location. The site was set up over 15 years ago in 1998, when WPL supplied the original wastewater treatment solution.

Since then, the workforce doubled and in order to meet the increased flows and loads a second wastewater treatment stream with the capacity to treat the wastewater of a population equivalent of 500 was added to the existing plant. There was also a requirement for the treated wastewater from the second stream to be used for irrigation purposes. This requirement was driven by the need to create an oasis in this desert location in order to provide a green environment for the workers. But with limited water resources in a location like this, the obvious solution was to use reclaimed water.

Zual Water Technology chose the same WPL HiPAF wastewater treatment system with sand filter for the second stream but with a few changes to the specification.

The system comprised of a primary settlement tank, three 'biozone' treatment tanks, a humus tank and a final sand filter. The tanks were bespoke made, with cream coloured lids to blend in with the local environment. They can, in fact, be any colour to suit whatever the local environment may be.



Due to transportation issues the primary and humus tanks were made “flat packed” to be assembled on site and the biozone was split into three sections which made handling much easier. WPL sent their production manager and production supervisor to work alongside local contractors to build and install the plant, as well as to provide training for on-going operation and maintenance.

The primary tank has an integral sludge storage tank, and this is where 30% of the solids settle out. The settled liquor then flows into the biozone, by displacement, for treatment. The biozone uses SAFF (Submerged Aerated Flooded Filter) technology to treat the wastewater biologically. This section is segmented and filled with high-voidage plastic filter media.

Carbonaceous and nitrifying processes occur in the biozone, mitigating process risks associated with variable flows. This is an advantage when there may be significant variation in the flow, for example if the site shuts temporarily for any reason.

Air to oxygenate the influent is required for the treatment process and to also scour the filter media periodically. The air is supplied through a diffuser in each biozone segment via blowers housed in a separate kiosk, together with the control panels. This means there are no mechanical or electrical components within the hostile environment of the below ground treatment zone.

The project required the system to cope with flows of 200 L/day and achieve results of BOD 20mg/L, and Suspended Solids of 30mg/L increasing to 10mg/L per day after passing through the final sand filter.

As the WPL HiPAF and sand filter can achieve such high levels of treatment the final effluent meets World Health Organisation (WHO) irrigation consent standards. This means that levels of faecal coliform do not exceed 100mpn per 100ml.

A packaged pump station is used to pump the treated wastewater into a water storage tank. It first passes through a UV filter which removes up to 99% of any remaining bacteria, and is then stored ready for use via the automated sprinkler system to maintain the green areas and to minimize the impact of sand storms regularly encountered in these areas.

The sprinkler system was set up before the wastewater treatment plant was commissioned. It uses PC software to regulate when and where the sprinklers are turned on and off.

Water reuse is important in these remote desert areas as natural water resources are below ground and need to be extracted and treated before use. By reusing the treated effluent for irrigation this saves drinking water and also creates a pleasant environment for the workers.



A further benefit of this type of wastewater system is that regular maintenance can be carried out without having to shut down the plant.

Sections of the tank can be isolated whilst the work is carried out, without affecting the treatment process.

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