



# ABB Process Makes Oily Wastewater Clean Again

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ABB has developed a new water treatment technology that cleans oily wastewater – by far the largest waste product in oil and gas production - quickly, cost-effectively and energy-efficiently, ready for discharge with zero environmental impact.

## The Solution

Developed on behalf of a leading national oil and gas company, the solution is installed at three oil and gas fields in North Africa where it has achieved some remarkable results and exceeded the customer's targets in terms of the quality of water treated and released as effluent. Oily wastewater, also known as produced water, is brought to the surface from underground formations during oil and gas production. It is by far the largest source of waste produced by the oil and gas industry, and its management presents considerable challenges and costs to operators. About seven to ten barrels of produced water are generated for each barrel of oil. The water can be highly toxic and typically contains oil, grease and other hydrocarbons, as well as high levels of salts, metals and suspended solid elements. Compared to the existing technologies for treating produced water, the ABB solution has proved more effective not only in terms of process results but in critical areas like cost, energy efficiency, footprint, speed of installation and ease of operation.

Developed and patented by ABB, the process has exceeded the customer's specifications for hydrocarbon content and suspended solid concentration in the outlet water by seven and 55 times respectively. This is a huge improvement in the results of alternative water treatment methods that are currently used by the oil and gas industry, and is thought to be the only treatment method that meets the rigorous requirements of proposed European legislation on produced water.

Other benefits of the solution include compact footprint, the use of chemical that can be easily produced on site using inexpensive base ingredients, ease of installation (it is built on skids and then transported to the site for installation and commissioning), and ease of operation (it uses standard equipment and requires no complex skills or operator experience).

The solution also saves energy through its compact footprint, minimal use of chemicals and innovative use of gravity.



## The Water de-oiling plants

From 2000 to 2006 ABB has studied and built in North Africa water de-oiling plants in three different locations for a primary oil and gas company:

- no. 3 plants in the Hassi R'Mel region (total of 3.400 m<sup>3</sup>/day)
- no. 3 plants in the Haoud Berkaoui region (total of 4.800 m<sup>3</sup>/day)
- no. 1 plant in the Gassi Touil region (total of 2.400 m<sup>3</sup>/day).

Construction of these seven plants has been performed by ABB in partnership with Sarpi (joint-venture ABB/Sonatrach).

After handover, the plants were operated and maintained locally until 2007 when, because of a change in policy, it was decided to outsource the related services.

ABB and SARPI were selected to perform both operation and "full service" activities for a period of 5 years on the following 4 water de-oiling plants:

- three plants in the Hassi R'Mel region since March 2009
- one plant in the Gassi Touil region since February 2009

## Plants Description

The three water de-oiling plants located in the Hassi R'Mel region are named "North", "Central" and "South" based on their relative geographical location.

The largest is the Central plant with a daily treatment capacity of 2400 m<sup>3</sup>/day, while the other two are significantly smaller with a treatment capacity of just 500 m<sup>3</sup>/day.

The plant in Gassi Touil has the same capability of the Central plant in Hassi R'Mel and was built in the same period (start-up in 2001) while the two smaller units had their start-up in 2006.

Both the Gassi Touil and the Hassi R'Mel Central plant have undergone a major revamping in 2008 as part of the present project, in order to improve both effectiveness and efficiency.

## Process Technology

Schematically it is possible to distinguish three separate treatment cycles:

- Water treatment cycle
- Oil treatment
- Mud treatment

The water treatment process is similar for Hassi R'Mel, Gassi Touil and Haoud Berkaoui plants and it consists of 5 main phases (see Fig. 2):

1. Storage
2. Physical separation
3. Flocculation (chemicals)
4. Flotation
5. Thickening and Dehydrating

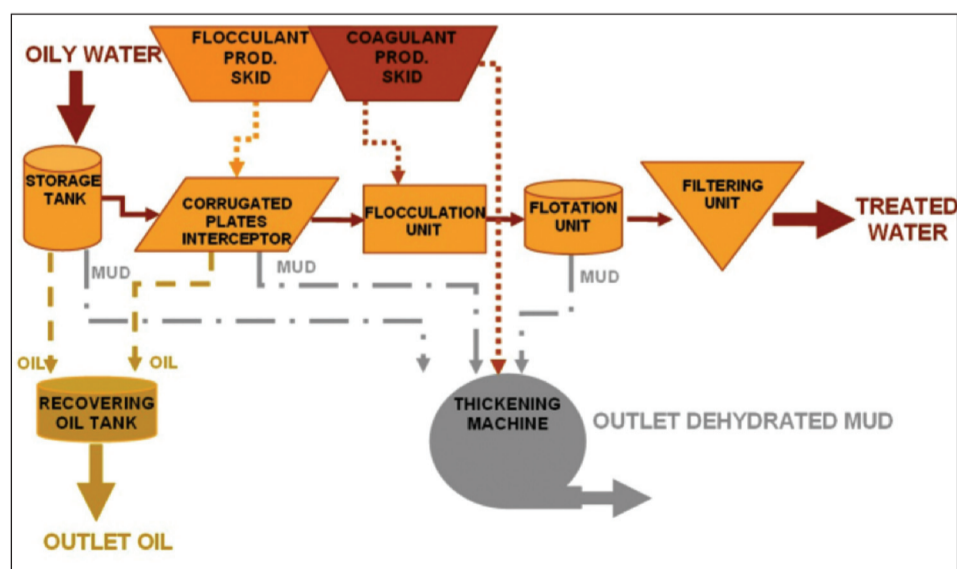


Figure 2

## Advantages of the Innovative Implementation

The innovative approach and equipment are patented and present the additional advantage to be relatively cheap and potentially able to significantly remove heavy metals through an ionic exchange-like procedure.

The water treatment process has been selected because of some striking advantages inherent in its implementation.

In fact the proposed approach:

- can be adapted to treat oily water with high salinity
- is not dependent on the pH of the wastewater
- is not dependent on the temperature of the wastewater
- has full flexibility of flow (0% to 100% of max inlet water flow)
- improves energy efficiency by minimising the number of pumps through the use of gravity flow.



Water before, during and after treatment at ABB de-oiling plants