

Biological Wastewater Treatment

Shell CAPSA Refinery

Argentina

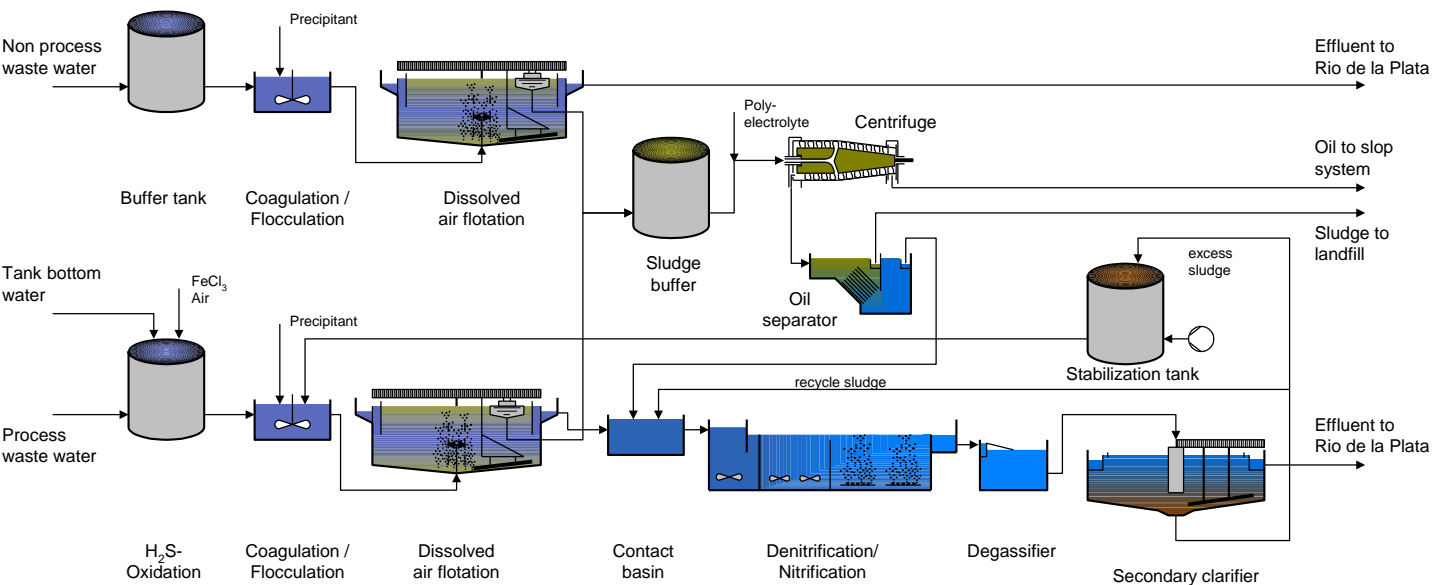


The wastewater treatment plant operated at the Shell Refinery in Buenos Aires / Argentina receives and treats the effluent from the complete refinery. The treatment process was specially developed for typical refinery waste water and is successfully applied in more than 20 plants around the world.

The plant is designed as two lines for extended treatment of 11,500 m³ of waste water per day, making an essential contribution to curbing the pollution of the Rio de la Plata, into which the treated water is discharged.

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1. Objective

Treatment of the process and non-process effluents from the refinery

- Design data

240 m³/h process effluent

COD 4,500 kg/d

NH₃-N 720 kg/d

H₂S 1,150 kg/d

Solids 865 kg/d

Oil 865 kg/d

240 m³/h non-process effluent

Solids 865 kg/d

Oil 865 kg/d

- Treatment criteria

COD < 100 mg/l

total N < 40 mg/l

H₂S < 0.05 mg/l

Solids < 15 mg/l

Oil < 3 mg/l

2. Plant concept

- Process steps

Process Stream:

Neutralisation, H₂S Oxidation, Coagulation / Flocculation, DAF, Activated Sludge Process, Nitrification / Denitrification, Clarifier, Sludge buffering, Dewatering

Non-process stream:

Buffer Tank, Coagulation / Flocculation, DAF

- Brief description

The process effluent is first neutralised with NaOH and pumped to the H₂S oxidation tank, where

under addition of FeCl₃ and aeration the sulfide is oxidised to sulfate.

The quality of the incoming effluents is monitored online for detection of overload to the treatment plant. The off-spec waste water can be diverted to a holding tank for intermediate storage and later treatment at a controlled rate.

The non-process water is collected in a buffer tank for flow equalisation. Solid and oil removal are achieved in the two lines of the coagulation / flocculation and dissolved air flotation stage.

After this physical-chemical treatment the non process effluent meets the effluent conditions and is discharged to the Rio de la Plata.

The pre-treated process effluent is further biologically purified.

In two parallel biotreater lines the organic compounds and the ammonium in the waste water are oxidised and the formed nitrate is removed in the denitrification stage.

After final clarification the treated water is discharged to the Rio de la Plata.

The Sludge produced in the effluent treatment plant is dewatered with a centrifuge.

3. Characteristic plant data

- H₂S oxidation:

Volume 6,000 m³

Retention time 16 - 24 h

- DAF: 2 Units

Diameter 9 m

Depth 3 m

Surface Loading 15 kg/m² h

- Biotreater: 2 Units

Volume 5,445 m³

Contact Basin 125 m³

Denitrification 2 x 860 m³

Nitrification 2 x 1,800 m³

Loading rates:

COD 0.75 kg/m³ d

Nitrogen 0.13 kg/m³ d

Sludge loading rate:

COD / dry solids 0.15 kg/kg d

- Clarifier: 2 Units

Diameter 19 m

Depth 4 m

Surface Loading 0.45 m³/m² h

- Sludge Treatment:

Sludge Storage: 900 m³

Centrifuge capacity 10 m³/h