

# Biological Waste Water Treatment

## Shell Malaysia Refinery

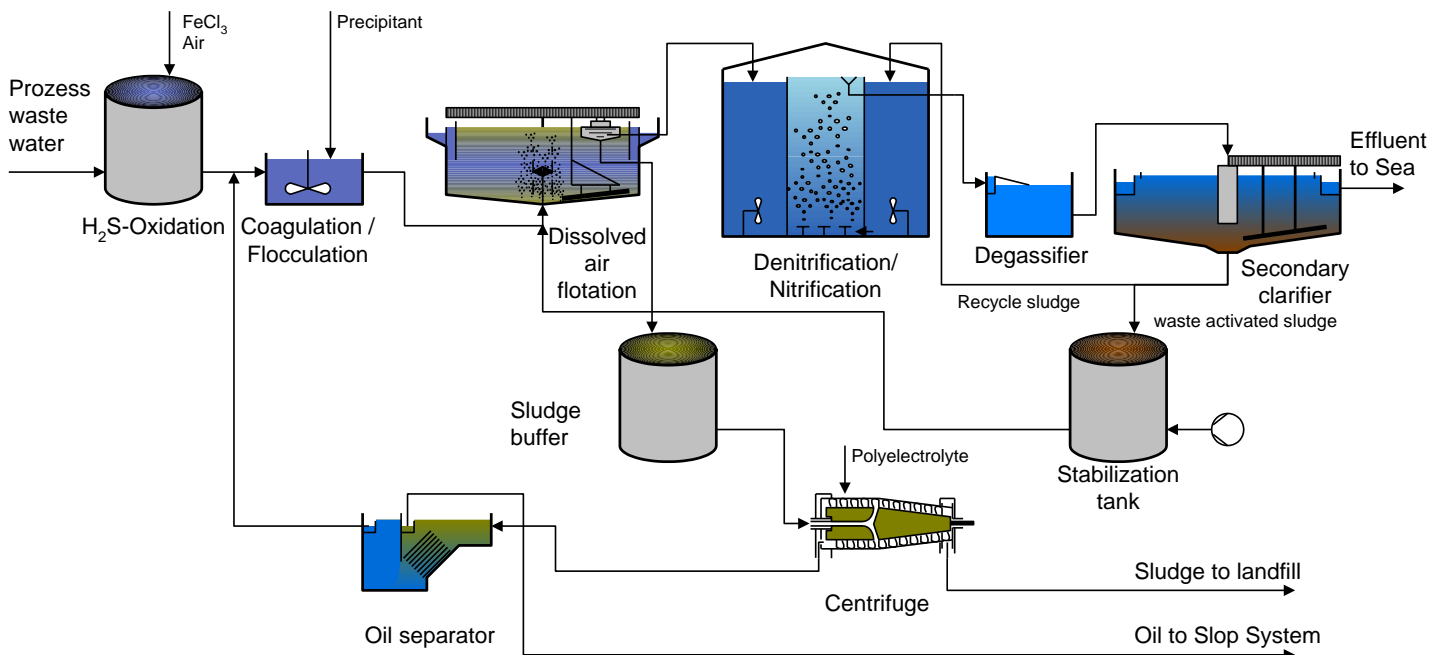
Treatment of the  
effluent from the  
new LRCC Units  
Port Dickson / Malaysia



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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 for extended treatment of 2,200 m<sup>3</sup> of waste water per day, making an essential contribution to curbing the pollution of the strait of Melaca, into which the treated water is discharged.



### 1. Objective

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

#### - Design data

90 m <sup>3</sup> /h process effluent	
COD	2,200 kg/d
NH <sub>3</sub> -N	220 kg/d
H <sub>2</sub> S	440 kg/d
Solids	330 kg/d
Oil	660 kg/d

#### - Treatment criteria

COD	< 100 mg/l
BOD <sub>5</sub>	< 20 mg/l
total N	< 40 mg/l
H <sub>2</sub> S	< 0.05 mg/l
Solids	< 20 mg/l
Oil	< 3 mg/l

### 2. Plant concept

#### - Process steps

Neutralization, H<sub>2</sub>S Oxidation, Coagulation / Flocculation, DAF, Activated Sludge Process, Nitrification / Denitrification, Clarifier, Sludge buffering, Dewatering

#### - Brief description

The process effluent is first neutralized with NaOH and pumped to the H<sub>2</sub>S oxidation tank, where under addition of FeCl<sub>3</sub> and aeration the sulfide is oxidized 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.

Solid and oil removal are achieved in the coagulation / flocculation and dissolved air flotation stage.

After this physical-chemical treatment the pre-treated process effluent is further biologically purified.

In a deep tank biotreater 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 sea.

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

### 3. Characteristic plant data

- H <sub>2</sub> S oxidation	
Volume	2,880 m <sup>3</sup>
Retention time	16-24 h
- DAF Unit	
Diameter	6 m
Depth	3 m
Surface Loading	15 kg/m <sup>2</sup> h
- Deep Tank	
Volume	
Denitrification	450 m <sup>3</sup>
Nitrification	1,140 m <sup>3</sup>
Loading rates	
COD	1.00 kg/m <sup>3</sup> d
Nitrogen	0.14 kg/m <sup>3</sup> d
Sludge loading rate	
COD / dry solids	0.20 kg/kg d
MLSS	5 kg/m <sup>3</sup>
- Clarifier	
Diameter	17 m
Depth	3 m
Surface Loading	0.40 m <sup>3</sup> /m <sup>2</sup> h

- Sludge Treatment  
Sludge Storage  
Centrifuge capacity

200 m<sup>3</sup>  
10 m<sup>3</sup>/h