

## **Treatment of bilge and oily wastewater from ships as part of the national realisation of the MARPOL-Agreement for the prevention of pollution from ships**

The MARPOL-Agreement includes guidelines for the members of the EU, which make sure that all European harbours provide sufficient storage capacities to take over bilge and oily wastewater from ships.

The P+B Öl Recycling GmbH in Bremerhaven/Germany for this reason operates since 1993 a wastewater treatment plant. By this, since conversion of this guidelines into national law there are sufficient capacities available at the Bremen harbours. The P+B Öl Recycling GmbH additionally offers with its three tank ships and the tank ship of its mother company P+M Petrotank GmbH a quick offshore disposal during the first phase of the disposal of the oil/water mixtures.

Regarding the increase of the quantities to dispose which can be expected with the ratification of MARPOL II a concept for the optimisation and extension of the existing treatment capacities has been worked out by P+B.

The main features of this concept are:

- continuous operation instead of batch operation
- extension of storage and treatment capacities
- reduction of the specific operating cost to improve competitiveness
- compliance with German environmental laws (BImSchG) even at extended treatment capacities
- reduction of the specific energy consumption by effective heat recovery
- improvement of oil quality in order to improve sales of recycling oil
- higher oil retention at wastewater treatment and safe compliance with German limit values for wastewater quality.

By this, the concept of P+B regards ecological as well as economical requirements, which ensures a long-term security for this enterprise location. Furthermore, preconditions were given to finance this project by money from the ecological fund of the Bremen government. The conversion of the measure catalogue could be accelerated by the subsidy granted on the part of the senator for building and environment..

### **Main processes of the wastewater treatment system**

By a pumping station the intermittent amounts of bilge and oily waste water are transferred into a storage tank after a first physical oil separation. The continuous withdrawal of the waste water from the storage tank takes place at a height of 1,2 m. above the tank bottom. By this any settled sludge, which gets dewatered and disposed separately, stays in the tank.

The next step of the separation of floating matter and particles is a multi-phase separator with a following belt filter system.

For the separation of emulgated oils the pretreated water gets clarified by a **SAB-Ultrafiltration Plant**.

During the final treatment, remainder pollutants are treated by desorption. In a desorption column the dissolved volatile compounds as for example hydrogen sulphides are driven out and treated together with the exhaust air. The downstream degradation of the pollutants by bioreactor and bio filter takes place without additives or chemicals. The process is environmental fair and without hazardous side effects.

## SAB-Ultrafiltration Plant



As all other equipment on the site, the ultrafiltration plant was designed as a ready-to-go system, installed in a isolated and heated weather resistant 40ft container. It includes the filtration system as well as the upstream equalisation tank and the entire electrical installation with PLC and SCADA system.

The piping of the plant is designed for operational temperatures of 60 °C and a nominal pressure of 10 bar and constructed from PVC-C and PP for chemical resistance. The container bottom is watertight and implemented as catch volume, in order to be able to take up the complete contents of the buffer tank in case of emergency.



The ultrafiltration unit is divided into three strands. This allocation secures a high availability also during revision work on individual strands. In addition different membrane materials were installed, so that higher retention rates can be achieved with varying influent qualities.

Design capacity of the plant is 10 m<sup>3</sup>/h at fully automatic continuous operation. The pre-treated wastewater gets into the UF-system by continuous operating feed pumps. The feed pumps are equipped with frequency converters. For membrane protection, each strand is equipped with a single filter unit.



Every single strand has an independent recirculation pump to generate the necessary cross-flow on the membrane surface. The permeate is transferred into the desorption column as the concentrate is treated by distillation.



Process control is done by a SIEMENS Simatic S7 PLC, operation of the plant happens by a St270 touchpanel, which is integrated into the electrical cabinet.

By remote control via modem, the manufacturer Schünemann Anlagen GmbH is able to take control of the plant in any case of emergency, error or defect. By this, reaction time is minimized and service intervals can be arranged very economically..

### **Bremen is prepared for MARPOL II.**

This pilot project is proof for the successful co-operation between senate and economics in the state Bremen and shows once more that Bremen offers an extensive potential at future technology for disposal of waste and recuperation of valuable material.