



## Wehrle Environmental UK

### Wastewater Treatment Case Study: Bertschi AG Road Tankers, Birrfelden, Switzerland

#### Treatment of road tanker waste water using advanced Wehrle MBR and RO membrane technology



In this case study we describe the improvements made to the existing wastewater treatment plant at Bertschi's road tanker washing facility at Birrfelden, Switzerland. Wastewater from the tanker cleaning system is variable in both quantity and water quality. Existing treatment technology at Birrfelden had proved unsatisfactory as biomass was periodically carried through the treatment process into the final effluent. This prevented release of the effluent to sewer at these times due to breach of consent limits.

The treatment of the tanker wastewater at Birrfelden was improved using Wehrle's advanced membrane bioreactor (MBR) treatment system. Utilising a physical membrane ultrafiltration (UF) barrier, very fine solids are removed from the wastewater. Chemical oxygen demand (COD) is also reduced, in combination with the bioreactor, to consistently achieve the required final effluent quality. The improved process at Birrfelden was installed by Wehrle after extensive on-site pilot-testing. Achievement of low specific energy consumption was demonstrated, and the final process design also reduced costs by incorporating much of the existing wastewater treatment equipment.



### Tanker wastewater Treatment at Birrfelden

Road tanker washing facilities at Birrfelden normally generate 30-100 m<sup>3</sup> wastewater from rinsing over 50 tankers daily. The tankers are used to transport over 6000 types of resins, polymers and other chemicals, resulting in wastewater that is both high in COD and variable (20000-50000 mg/l). Treated wastewater is discharged to sewer under typical license conditions that include effluent volume and final quality charging conditions. Existing treatment technology at this site consisted of flocculation/precipitation with conventional activated sludge (CAS). This was not capable of reliably treating the wastewater as biomass was periodically carried through with the final effluent under high-load conditions preventing release of treated effluent to sewer, and incurring additional effluent storage and disposal costs.

Upgrading of the wastewater treatment system was achieved utilising Wehrle's extensive international experience. The key treatment requirements were to consistently produce up to 100 m<sup>3</sup> final effluent with COD < 1000 mg/l. This was to be achieved whilst meeting a lower specific energy consumption at a specific sludge production of 0.12 kg activated sludge per kg COD. Wehrle's design solution incorporated MBR to replace the existing CAS using tubular cross-flow UF membranes.

Extensive on-site testing was conducted prior to design of the full scale system using a fully automated pilot scale Wehrle MBR system. Trials were compared against physico-chemical and biological treatment alternatives. Wehrle's MBR system proved effective at consistently reducing solids and COD to required levels. Life-time cost estimates proved favourable as compared to the alternatives, and specific energy consumption objectives were readily met.

Bertschi contracted Wehrle to install their full-scale MBR technology in December 2005. The re-designed, upgraded plant was commissioned in September 2006 by Wehrle engineers who optimised the new system and attained client acceptance by February 2007. Wehrle MBR technology has proven successful in treatment of high COD wastewater under high solids conditions across a range of industries including landfill leachate, waste oil and special waste and pharmaceutical sectors. Wehrle's technology operated extremely effectively for the treatment of difficult road tanker wastewater.

Figure 1  
COD in wastewater influent (red line) and effluent (blue line) at Birrfelden immediately after commission of upgraded plant. The horizontal line indicates the required performance, which is consistently met after initial process optimisation.

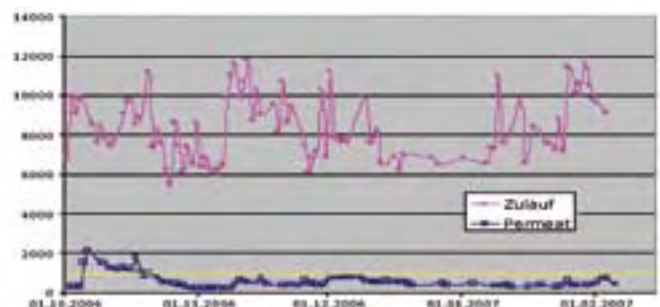




Figure 2  
Installation of Wehrle MBR system

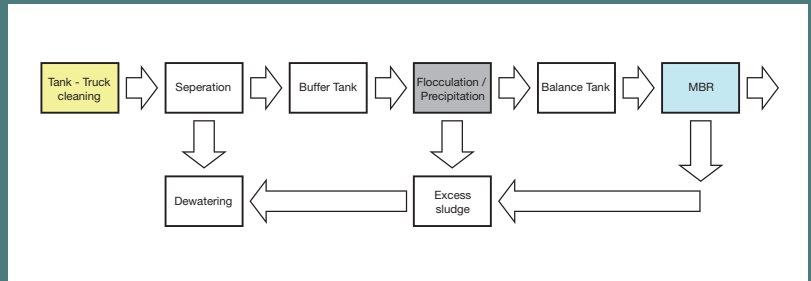


Figure 3  
Wehrle MBR process installed at Birrfelden

### Wehrle MBR technology

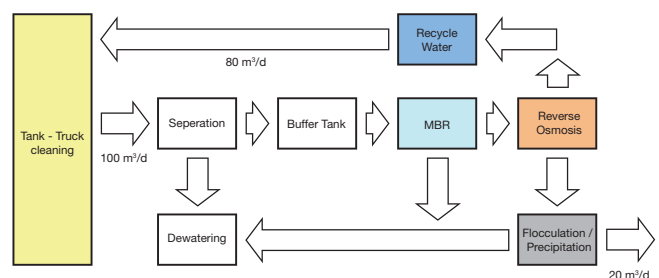
MBR technology combines efficient biomass oxidation with effective solids removal by a physical barrier. This ensures excess sludge production is low relative to CAS, and the potential for biomass leakage into the final effluent is eliminated. Wehrle MBR units are readily retro-fitted into existing conventional treatment systems, and because of their small plant footprint can be incorporated where space is limited. This minimises capital costs, as existing equipment can often be incorporated into the upgraded treatment system by Wehrle's engineers. The technology can be rapidly installed, incurring only a short plant down-time, using pre-engineered and ISO containerised units incorporating the necessary pumps and control systems. This reduces on-site civil, mechanical and electrical installation costs. MBR technology is also widely used in complete new-build treatment projects.

Key to effective wastewater treatment by MBR is choice of the correct membrane for each specific site and application. Wehrle process engineers select the correct membrane pore size for each individual site's needs to achieve the desired solids removal effectiveness, and ensure membranes are compatible with the specific wastewater characteristics such as pH or chemical corrosiveness. Effective aeration in the MBR is also important, particularly with hard COD wastewater such as at Birrfelden, having the capability to aerate with oxygen rather than air if necessary. Wehrle encourage thorough pilot testing of design solutions at each site to optimise treatment parameters and ensure that the overall treatment requirements are met.

### Advanced Reverse Osmosis (RO) treatment

Treatment of road tanker wastewater can be improved further using RO membrane technology. Permeate from the MBR process is of sufficiently high quality to allow the use of RO technology for the removal of ionic substances, for example, in applications where dissolved toxic or hazardous substances in effluent might be problematic. In this way, even highly soluble nitrates and chlorides in effluent can be removed. In certain applications, the water volumes used for rinsing are sufficiently high that implementation of water re-use strategies will improve costs significantly, both through reductions of water costs at-source and by means of reduced disposal or discharge costs as volumes of wastewater disposed are dramatically decreased. RO treatment allows recycling of a significant proportion of wastewater without contaminant build-up and concentration. The RO process can be readily added to an MBR treatment system and an additional modular component, also housed in a standard ISO container.

Figure 4  
RO incorporated into Wehrle treatment improved process design





*MBR treatment reliably aerates wastewater and removes biomass using a physical UF barrier, ensuring solids and COD in the final effluent remain within consent limits even where influent volume and wastewater quality is highly variable*

### **Conclusions**

The upgraded wastewater treatment system at Bertschi's Birrfelden plant consistently treats variable volumes of high solids, high COD wastewater from their road tanker washing facility. The treated effluent can now be reliably discharged to sewer without fear of consent breach. Wehrle designed, installed, commissioned and optimised the improved treatment system after thorough on-site pilot-testing, by incorporating their pre-engineered MBR technology into the existing treatment plant, thus reducing costs through re-use of existing equipment where possible. Ongoing operation and servicing of the MBR process is undertaken by Wehrle on behalf of the client. Membrane technology can successfully treat a range of difficult wastes, including road tanker wastewater. With additional RO treatment, treated water can be safely re-used for enhanced environmental performance and to reduce volume-based discharge costs.

### **Contact Details**

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