The central wastewater treatment plant for Kaiserslautern, Germany has a capacity of 210,000 PE (approx. 14 MGD). The plant contains three activated sludge tanks with a total of 22,500 m³ (796,000 ft³) for biological secondary wastewater treatment.

**Tasks and Requirements**
Due to the age of the existing fine bubble membrane diffusers, the system needed to be replaced in all three activated sludge tanks. In addition, significant energy savings were targeted without negatively affecting the process performance of the wastewater treatment plant.

**Measures Taken**
Following a detailed examination of different suppliers and options, the decision was made in favor of RUDOLF MESSNER UMWELTTECHNIK (RMU) due to the company’s holistic and comprehensive approach.

From March to November 2008 the entire mode of operation of the wastewater treatment plant was converted from a sequential denitrification process with recirculation to RMU’s intermittent aeration denitrification process known as “Plug Flow Technology.” The existing membrane diffusers and anoxic area mixers were replaced with high efficiency MESSNER Aeration Panels.

The resulting system provided high bottom coverage of ultrafine bubble aeration in the existing tanks and eliminated all of the mixers and recirculation pumps and thus their associated energy costs. An end result of less than 10 mg/l N_{total} and a 20% reduction in energy usage by the turboblowers had to be guaranteed.

**Results and Benefits**
Because of the holistic approach of the new process concept that utilized the MESSNER control system and MESSNER Aeration Panel, the results far exceeded the guarantees given. Blower energy savings of more than 40% have been achieved. Additionally, forty-two (42) mixers were removed, resulting in additional energy savings of 420 MWh/yr, and also savings in the associated maintenance and replacement costs.

The treatment performance target of N_{total} effluent concentration of less than 10 mg/l has easily been met. Other favorable effects are: no formation of filamentous bacterial or foam, improved Sludge Volume Index, significantly reduced formation of floating sludge, better sludge stabilization and improved sludge dewatering ability.

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**Energy Consumption [MWh/a]**

<table>
<thead>
<tr>
<th>Year</th>
<th>Agitators</th>
<th>Turbo-blowers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>2900</td>
<td>420</td>
</tr>
<tr>
<td>2010</td>
<td>1700</td>
<td></td>
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