Meat Processing (Slaughterhouse) Waste Water Treatment Plant

• Features

There are 4 trains in this plant and the capacity is 1800m³/d (450m³/d × 4trains). Due to strengthening local wastewater regulation of BOD(<20mg/L), They installed 2 membrane modules in 2 trains. The membrane modules easily can be installed in the existing tank without remodeling the tank structure because of the compactness. It is possible to operate MBR processes at higher mixed liquor suspended solids (MLSS) concentrations compared to conventional settlement separation systems, thus reducing the BOD compared to existing conventional process.

• Information

- **Project Name** ........................................... Meat Processing (Slaughterhouse) Waste Water Treatment Plant
  SHINMEI Co., LTD. / CHIKUSEI Meat Processing Center
- **Location** ............................................... Chikusei-city, Ibaraki-prefecture, Japan
- **Operation started** ................................. April, 2014
- **Outline** .................................................. Meat Processing (Slaughterhouse) Waste Water Treatment Plant
  Mooring Pig: 1000head/Plant  Mooring Caw: 100head/Plant
  Slaughter Pig: 1300head/day  Slaughter Caw: 100head/day
- **OEM** ...................................................... Amesys
- **Capacity** .................................................. MBR: Total 900m³/d (450m³/d × 2trains)
- **Product Code** ......................................... STERAPORE 5000 Series
  50M1000OFF × 2pcs (Membrane Area: 1000m²/pc)
- **MBR driving force** ................................. The Membrane modules easily can be installed in the existing tank it without remodeling the tank structure because of the compactness. That's reason why we were awarded.

• Design condition

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRT</td>
<td>15days</td>
</tr>
<tr>
<td>MLSS (mg/L)</td>
<td>10000</td>
</tr>
<tr>
<td>Viscosity (mPa·s)</td>
<td>20</td>
</tr>
<tr>
<td>Filtration/Relaxation</td>
<td>7min/2min</td>
</tr>
<tr>
<td>Flow rate</td>
<td>300L/min-train</td>
</tr>
<tr>
<td>Static pressure/</td>
<td></td>
</tr>
<tr>
<td>Suction pressure</td>
<td></td>
</tr>
<tr>
<td>Static pressure:</td>
<td>15～18kPa</td>
</tr>
<tr>
<td>Suction pressure:</td>
<td>-40kPa</td>
</tr>
<tr>
<td>Aeration Volume for Membrane</td>
<td>4.3m³/min</td>
</tr>
<tr>
<td>Chemical Cleaning</td>
<td>Maintenance Cleaning</td>
</tr>
<tr>
<td></td>
<td>NaClO 500ppm</td>
</tr>
<tr>
<td></td>
<td>1time/week</td>
</tr>
<tr>
<td></td>
<td>Recovery Cleaning</td>
</tr>
<tr>
<td></td>
<td>NaClO 3000ppm</td>
</tr>
<tr>
<td></td>
<td>2times/month</td>
</tr>
</tbody>
</table>

• Water quality

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Raw water</th>
<th>MBR tank</th>
<th>Treated water</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD (mg/L)</td>
<td>1,000</td>
<td>200</td>
<td>&lt; 20</td>
</tr>
<tr>
<td>SS (mg/L)</td>
<td>1,000</td>
<td>250</td>
<td>&lt; 20</td>
</tr>
<tr>
<td>n-Hex (mg/L)</td>
<td>120</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>Water tempature</td>
<td>27°C in summer, 18°C in winter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>7</td>
<td>6.8～7</td>
<td>7</td>
</tr>
</tbody>
</table>

• Process flow diagram

![Process flow diagram diagram](https://www.m-chemical.co.jp/sterapore/en)
Plum Processing Waste Water Treatment Plant

- **Features**

  This is food (Japanese plum) processing factory WWTP in Japan. Existing sedimentation tank get older and MBR package system is installed in near existing WWTP together with related equipment. After performance confirmation, customer removed old sedimentation tank. This MBR package system is very compact and can be transported by truck. And MBR tank is separated and compact design. So we can reduce the chemical consumption for membrane soak cleaning.

- **Information**

  - **Project Name** .......................... Food (Japanese plum) processing factory WWTP / UMETA Co., Ltd.
  - **Location** ................................. Japan
  - **Operation started** ..................... Oct. 2015
  - **Furnished by** ........................... SUNACTIS Co., Ltd.
  - **Capacity** ................................. 200m³/d (Peak 300m³/d)
  - **Product type** ............................ 50M0750FF x 1 pc (Membrane Area : 750 m²)
  - **Advantage of MBR** ..................... No need any construction work and no shutdown of existing WWTP. Eliminate existing sedimentation tank.

- **Design and Operation Condition**

<table>
<thead>
<tr>
<th>Item</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>3.5</td>
<td>7.4</td>
</tr>
<tr>
<td>BOD</td>
<td>1500</td>
<td>2</td>
</tr>
<tr>
<td>COD(Mn)</td>
<td>1500</td>
<td>7.2</td>
</tr>
<tr>
<td>SS</td>
<td>20</td>
<td>0</td>
</tr>
</tbody>
</table>

- **Water quality**

- **Process flow diagram**

  - Raw water tank → EQ tank → Aeration tank → MBR tank → Treated water tank

- **Enduser’s comment**

  We can improve treated water quality and reduce control item of WWTP. Maintenance become easier than previous one.
Chemical Plant Wastewater Treatment Plant

• Features

Resistant organic substances such as benzene and phenol are contained in wastewater, so anaerobic biological treatment is carried out as pretreatment to improve biodegradability and then highly efficient biological treatment is carried out by membrane bioreactor. By this two-step process, organic matter of raw water is decomposed, and good quality of treated water is obtained. In addition, since this treated water can be discharged to a wastewater treatment plant in an industrial zone, it was possible to reduce the waste solution cost.

• Information

- **Project Name**: Chemical Plant Wastewater Treatment Facility
- **Location**: Taiwan Changhua
- **Operation started**: 2016
- **Outline**: Wastewater is highly processed by Upflow Anaerobic Sludge Blanket Reactor (UASB) and Membrane Bioreactor (MBR) 2 step process.
- **OEM**: Digital Technology Inc., Taiwan
- **Capacity**: 600m³/day (25m³/hr)
- **Product Code**: STERAPORE PVDF Membrane Element
- **Advantage of MBR**: Since the MLSS concentration of the aeration tank can be set high, it is possible to make the aeration tank compact and improve the treated water quality.

• Design condition

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRT (hr)</td>
<td>36</td>
</tr>
<tr>
<td>MLSS (mg/L)</td>
<td></td>
</tr>
<tr>
<td>Aeration Tank</td>
<td>4500~6000</td>
</tr>
<tr>
<td>Membrane Tank</td>
<td>5000~8000</td>
</tr>
<tr>
<td>Filtration/Relaxation</td>
<td>7min/1min</td>
</tr>
<tr>
<td>RAS Ratio</td>
<td>3</td>
</tr>
<tr>
<td>Pretreatment</td>
<td>UASB</td>
</tr>
<tr>
<td>Trans Membrane Pressure</td>
<td>5~25 kpa</td>
</tr>
</tbody>
</table>

• Water quality

<table>
<thead>
<tr>
<th>Item</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5~10</td>
<td>7~8</td>
</tr>
<tr>
<td>BOD</td>
<td>600</td>
<td>&lt;20</td>
</tr>
<tr>
<td>COD</td>
<td>1200</td>
<td>&lt;50</td>
</tr>
<tr>
<td>SS</td>
<td>200</td>
<td>&lt;</td>
</tr>
</tbody>
</table>

• Process Flow Diagram

- Inlet
- Flow Equalization Tank
- pH Equalization Tank
- UASB
- Aeration Tank
- MBR Tank
- Discharge to Industrial Zone wastewater treatment plant
STERAPORE

Topolcany STP

• Features
Total project cost is approx. 45 mil. EUR. It is most biggest municipal wastewater treatment plant with MBR in Slovakia

• Information
- Project Name: Topolcany STP
- Location: Slovakia
- Operation started: December 2016
- Outline: New municipal wastewater treatment plant invested by European Union. Our partner, AWT & Alvest Mont, have a good reputation in Slovakia. Because they have some similar experience with MBR since 2012. So end-user decided to adopt our technology about this project.

• Design condition

<table>
<thead>
<tr>
<th>MLSS</th>
<th>Aeration Tank</th>
<th>10,000 mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Membrane Tank</td>
<td>10,000 mg/L</td>
<td></td>
</tr>
<tr>
<td>Filtration/Relaxation</td>
<td>10 min. / 20sec with BW</td>
<td></td>
</tr>
<tr>
<td>RAS ratio</td>
<td>3-4 Q</td>
<td></td>
</tr>
<tr>
<td>Pretreatment</td>
<td>Screen 1 mm</td>
<td></td>
</tr>
<tr>
<td>Aeration volume for membrane</td>
<td>3.9 Nm3/min. for 2,000 m2/module</td>
<td></td>
</tr>
<tr>
<td>Chemical Cleaning</td>
<td>Maintenance cleaning</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Recovery cleaning</td>
<td>NaCIO 500 -1,000 mg/L, when only TMP increase</td>
</tr>
</tbody>
</table>

• Water quality

<table>
<thead>
<tr>
<th>Item</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6 - 8</td>
<td>-</td>
</tr>
<tr>
<td>BOD</td>
<td>300</td>
<td>25 - 30</td>
</tr>
<tr>
<td>COD</td>
<td>650</td>
<td>125</td>
</tr>
<tr>
<td>SS</td>
<td>200</td>
<td>10</td>
</tr>
<tr>
<td>T-N</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>T-P</td>
<td>7</td>
<td>1</td>
</tr>
</tbody>
</table>

• Process flow diagram

Rotery Drum Screen ➔ Anoxic Tank ➔ Oxic Tank ➔ MBR Tank ➔ Discharge
Tilburg WWTP

**Features**

Probably it is one of the biggest industrial wastewater plant with MBR in Holland.

**Information**

- **Project Name** ................. Tilburg WWTP
- **Location** ....................... The Netherlands
- **Operation started** ........... October 2016
- **Outline** ....................... There are total four companies in Tilburg industrial park. They are Agristo and Coca Cola and Fuji, Iff. Originally, they discharged wastewater to municipal wastewater treatment plant and paid sewarage charge. They needed to expand capacity. But municipal wastewater treatment could not expand any more. So they decided to build own wastewater treatment plant inside of Tilburg industrial park invested by third party who is one of our partner, AWT. As a result, they could discharge to own wastewater treatment plant at 33% discount price of sewarage charge.

- **OEM** ......................... AWT Watertreatment B.V.
- **Capacity** ...................... 9,000m3/d (375m3/hr)
- **Product Code** ............... 5CE0025SA x 800 pcs
- **MBR driving force** .......... Request for safety treated water quality and saving space, future wastewater recycling

**Design condition**

<table>
<thead>
<tr>
<th>Item</th>
<th>MLSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeration Tank</td>
<td>10,000 mg/L</td>
</tr>
<tr>
<td>Membrane Tank</td>
<td>10,000 mg/L</td>
</tr>
<tr>
<td>Filtration/Relaxation</td>
<td>10 min. / 20sec with BW</td>
</tr>
<tr>
<td>RAS ratio</td>
<td>3-4 Q</td>
</tr>
<tr>
<td>Pretreatment</td>
<td>Screen 1 mm</td>
</tr>
<tr>
<td>Aeration volume for membrane</td>
<td>3.9 Nm3/min. for 1,000 m2/module</td>
</tr>
<tr>
<td>Chemical Cleaning</td>
<td>Maintenance cleaning</td>
</tr>
</tbody>
</table>

**Water quality**

<table>
<thead>
<tr>
<th>Item</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>BOD</td>
<td>400</td>
<td>1000</td>
</tr>
<tr>
<td>COD</td>
<td>1571</td>
<td>1700</td>
</tr>
<tr>
<td>T-N</td>
<td>605</td>
<td>1009</td>
</tr>
</tbody>
</table>

**Process flow diagram**

1. **Screen 1 mm**
2. **DAF**
3. **Anoxic**
4. **Oxic**
5. **MBR**
6. **Discharge**
Chemical Waste Water Treatment Plant

• Features

This plant manufactures various chemical products. With diversification of production varieties and increased production, it is necessary to raise capacity without increasing the area of existing wastewater treatment facilities. That is why MBR was introduced. By updating the conventional coagulation sedimentation tank, it was introduced without load such as installing a new tank. Also, during the second phase of construction, a small diameter membrane was used to secure space for future capacity enhancement.

• Information

- **Project Name** ........................................ Chemical Waste Water Treatment Plant
- **Location** ........................................... Otake-city, Hiroshima-prefecture, Japan
- **Outline** ............................................... The scale of the facility is large and the capacity is high. Some trains are working with coagulants.
- **OEM** .................................................. Nippon Rensui
- **Capacity** .............................................. Treatment by MBR : Total 6,000 m³/d
- **Product Code** ....................................... Phase-1, 25 m³/element x 60pcs x 5units
- **MBR driving force** ................................ Space saving : MBR can be introduced without enlarging the existing wastewater treatment facility, and even space for future MBR expansion can be secured.
  Energy saving : The 40-square-membrane element introduced during the 2nd phase construction has a footprint equivalent to that of the 25-square-meter membrane element, but the membrane surface area is large, so SADm can be significantly reduced.

  - **HRT** .............................................. 10h
  - **MLSS (mg/L)** ..................................... 6,000～10,000
  - **Filtration/Relaxation** ......................... 7min/1min
  - **Flow rate** ........................................ 14.6LMH
  - **Static pressure/Suction pressure** ........... Static pressure : 2～3kPa
  - **Membrane scouring air** ...................... 8Nm³/min·unit
  - **CIP** ................................................
    - Maintenance Cleaning : NaClO 500ppm once/week
    - Recovery Cleaning : NaClO 3000ppm, Citric Acid 1～2wt% Once/4～12months

- **Water quality**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Raw water</th>
<th>Treated water</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD (mg/L)</td>
<td>600</td>
<td>&lt; 25</td>
</tr>
<tr>
<td>SS (mg/L)</td>
<td>1000</td>
<td>&lt; 3</td>
</tr>
<tr>
<td>T·N</td>
<td>240</td>
<td>N/A</td>
</tr>
<tr>
<td>T·P</td>
<td>2</td>
<td>N/A</td>
</tr>
<tr>
<td>pH</td>
<td>6.6～10</td>
<td>6.6～8</td>
</tr>
</tbody>
</table>

• Process How diagram

Influent → Screen → Aeration tank → MBR → Treated water
Textile Factory Effluent Treatment Plant in Bangladesh

**Features**

This is Textile / Dyeing factory ETP (Effluent Treatment Plant) in Bangladesh. Existing ETP plant (Conventional) get shortage of production & treatment capacities as well as to improve treated water quality for the environmental contribution and MBR expansion is installed in next existing ETP in 2016. This is the first MBR ETP plant in Bangladesh and operating proper management and conditions under local EPC.

**Information**

- **Project name** .................................. Knit Concern Limited ETP expansion (from 3,000 m³/d to 6,000 m³/d)
- **Location** ........................................ Narayanganj, Bangladesh
- **Operation started** .......................... Sep. 2016
- **Furnished by** ................................. Charm Ltd.
- **Capacity** ........................................ 6,000 m³/d
- **Product type** ................................. 50M1000FFx16pcs (Membrane: Area 16,000 m²)
- **Advantage of MBR** .......................... Improve Treated Water Quality, Space Saving and Future Wastewater Recycling.

**Design and Operation Condition**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLSS (mg/L)</td>
<td>6,000 ppm</td>
<td></td>
</tr>
<tr>
<td>Filtration/Relaxation</td>
<td>7 min./1 min.</td>
<td></td>
</tr>
<tr>
<td>RAS Ratio</td>
<td>2Q</td>
<td></td>
</tr>
<tr>
<td>Pretreatment</td>
<td>1 mm Drum Screen</td>
<td></td>
</tr>
<tr>
<td>TMP</td>
<td>50 ~ 100 mbar</td>
<td></td>
</tr>
<tr>
<td>Chemical Cleaning</td>
<td>Maintenance Cleaning Every week NaClO 300-500 mg/L, Recovery Cleaning Every 3 month NaClO 3,000 mg/L</td>
<td></td>
</tr>
</tbody>
</table>

**Water quality**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Inlet</th>
<th>Outlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>8.5 ~ 9</td>
<td>6.5 ~ 7</td>
</tr>
<tr>
<td>BOD (mg/l)</td>
<td>250</td>
<td>&lt; 20</td>
</tr>
<tr>
<td>COD (mg/l)</td>
<td>800</td>
<td>&lt; 50</td>
</tr>
<tr>
<td>TSS (mg/l)</td>
<td>300</td>
<td>&lt; 10</td>
</tr>
</tbody>
</table>

**Process flow diagram**

Inlet → Screen → Equalization tank → Neutralization → Drum Screen

Aeration tank → Drum Screen → MBR tank → Discharge
Hollow-fiber membrane element and module for industrial/municipal wastewater treatment

Water recycling plant in China

Challenge
As water shortage in urban areas in China is becoming a serious problem due to growing population in such areas, effective use of treated water is needed as a countermeasure to solve this problem.

Solution
The purpose of this treatment system is reuse of the treated water, allowing the treated water to be discharged into the upstream of the dam. To this end, MBR that can cut off SS almost 100% to obtain excellent water quality has been used.

Benefits
The sewage treated water by SBR(Sequencing Batch Reactor) is treated by MBR(Membrane Bio Reactor) and then being discharged into the dam serving as a water supply resource.

Process flow diagram

Location
China

Furnished by
Beijing Origin Water Technology Ltd.

Capacity
45,000m³/d

Application
Domestic Sewage

Operation started
2006

Product
STERAPORE™ 5000

Mitsubishi Chemical Corporation
Membrane Business Section
Performance Separation Materials Unit
Aqua & Infrastructure Sector
Amenity Life Division
Advanced Solutions Domain

E-mail: membrane@m-chemical.co.jp
URL: https://www.m-chemical.co.jp/sterapore/en
Challenges

This plant is located near Seoul, a growing megacity with a population of over 10 million, and its treatment capacity needs to be increased from 150,000 to 180,000 m³/day; however, there is not enough land space.

Solution

A significant land-saving is a critical factor for this project. Membrane Bio-Reactor (MBR) can reduce about 60% land space compared with conventional activated sludge process because MBR can eliminate a secondary clarifier.

Benefits

MBR makes it possible to utilize the limited land. Also, the MBR treated water can be discharged to riverhead for improvement in the quality of river water.

Process Flow Diagram

---

Location
Korea

Furnished by
Hyundai Engineering Co., Ltd.

Capacity
30,000 m³/d

Application
Domestic Sewage

Operation started
2008

Product
STERAPORE™ 5000

Mitsubishi Chemical Corporation
Membrane Business Section
Performance Separation Materials Unit
Aqua & Infrastructure Sector
Amenity Life Division
Advanced Solutions Domain

E-mail: membrane@m-chemical.co.jp
URL: https://www.m-chemical.co.jp/sterapore/en
Hollow-fiber membrane element and module for industrial/municipal wastewater treatment

Industrial water recycling plant in Japan

**Challenge**

Need to reduce industrial water quantity as part of the client’s CSR programs.

**Solution**

Reuse a part of the treated water for CIP makeup water and beer bottle container washing using reclaimed water from production lines with Membrane Bio-Reactor (MBR) and Reverse Osmosis (RO) technologies.

**Benefits**

Lower the client’s water and wastewater bills in addition to contribution to their CSR activities.

**Process flow diagram**

- **Influent**
- **MBR**
- **Activated Carbon**
- **RO** (Recovery Ratio: Approx. 70%)
- **Plant Reuse** (for non-product use only)

**Location**

Japan

**Capacity**

720m³/d

**Application**

As a part of production facility

**Operation started**

2010

**Product**

STERAPORE™ 5000

**Mitsubishi Chemical Corporation**

Membrane Business Section

Aqua & Infrastructure Sector

Amenity Life Division

Advanced Solutions Domain

E-mail: membrane@m-chemical.co.jp

URL: https://www.m-chemical.co.jp/sterapore/en
Challenge
The initially installed MBR system equipped with a flat-sheet membrane was operated at a water flux rate higher than normal to process the influent more than originally planned. This situation brought an unstable MBR system operation such as frequent chemical cleanings and membrane replacements in a shorter period than expected. Therefore, a retrofit of this MBR system with the minimum CAPEX to realize a stable operation and minimize OPEX was highly anticipated.

Solution
Replace the flat-sheet membrane module with the STERAPORE™ hollow-fiber membrane module to increase the membrane surface area per footprint to secure a sufficient influent treatment capacity without a tank and blower expansion.

Benefits
Through the membrane replacement, the MBR system has gained more capacity under operation at an appropriate water flux rate accompanied by the following cost saving:
CAPEX: No membrane tank and blower capacity expansion
OPEX: Less membrane maintenance and replacement
Challenge
Reduce or eliminate sludge carry-over to the final effluent dealing with significant fluctuations in the inlet water composition.

Solution
Retrofit the existing conventional activated sludge process with Membrane Bioreactor (MBR) featuring the Mitsubishi Rayon hollow fiber membrane.

Benefits
Realize hassle-free STP operation and maintenance while getting the better quality final effluent especially in terms of BOD and SS.

Water analysis

<table>
<thead>
<tr>
<th></th>
<th>Influent</th>
<th>DAF treated water</th>
<th>MBR treated water</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>5-10</td>
<td>5-10</td>
<td>5-10</td>
</tr>
<tr>
<td>BOD₅</td>
<td>mg/L</td>
<td>1,500</td>
<td>500</td>
</tr>
<tr>
<td>COD₅,</td>
<td>mg/L</td>
<td>600</td>
<td>220</td>
</tr>
<tr>
<td>SS</td>
<td>mg/L</td>
<td>800</td>
<td>200</td>
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<tr>
<td>T-N</td>
<td>mg/L</td>
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<td>49</td>
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<td>T-P</td>
<td>mg/L</td>
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<td>14</td>
</tr>
<tr>
<td>n-H</td>
<td>mg/L</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

Process flow diagram

Location
Korea

Furnished by
CJ Korea Express Co.

Capacity
1,000m³/day

Application
Industrial Wastewater (Dairy Plant)

Operation started
2008

Product
STERAPORE™ 5000

Mitsubishi Chemical Corporation
Membrane Business Section
Performance Separation Materials Unit
Aqua & Infrastructure Sector
Amenity Life Division
Advanced Solutions Domain

E-mail: membrane@m-chemical.co.jp
URL: https://www.m-chemical.co.jp/sterapore/en
Hollow-fiber membrane element and module for industrial/municipal wastewater treatment

Wuxi Xincheng wastewater treatment plant

Case

Challenge
On June 5, 2008, the newly revised Taihu Lake Water Pollution Prevention Regulation was brought into effect. However, the footprint of this facility was too small to comply with the stringent regulation by increasing of the existing conventional activated sludge process capability without overloading.

Solution
Apply membrane bioreactor (MBR) to meet the effluent standard with the limited land.

Benefits
Compliance with the standard with no overload concern and less manual operation.

Water analysis

<table>
<thead>
<tr>
<th></th>
<th>Influent</th>
<th>Treated water</th>
</tr>
</thead>
<tbody>
<tr>
<td>COD$_{Cr}$ mg/L</td>
<td>360</td>
<td>33.2</td>
</tr>
<tr>
<td>SS mg/L</td>
<td>400</td>
<td>&lt;5</td>
</tr>
<tr>
<td>T-P mg/L</td>
<td>5</td>
<td>0.3</td>
</tr>
<tr>
<td>NH$_3$-N mg/L</td>
<td>38</td>
<td>1.3</td>
</tr>
<tr>
<td>T-N mg/L</td>
<td>43</td>
<td>11.1</td>
</tr>
</tbody>
</table>

Process flow diagram and water quality

Mitsubishi Chemical Corporation
Membrane Business Section
Performance Separation Materials Unit
Aqua & Infrastructure Sector
Amenity Life Division
Advanced Solutions Domain

E-mail: membrane@m-chemical.co.jp
URL: https://www.m-chemical.co.jp/sterapore/en
Hollow-fiber membrane element and module for industrial/municipal wastewater treatment

**STERAPORETM 5000 Series**

Petrochemical plant wastewater recycling

**Challenge**
- Reuse purified terephthalic acid (PTA) plant wastewater as cooling tower makeup to reduce the environmental load associated with effluent disposal and to cut the water bill
- Install all the membrane modules in the existing 10 meter depth tank without a shutdown of the WWTP

**Solution**
- Retrofit of the existing WWTP with an MBR-RO system to obtain reusable water for the purpose
- Use of the existing beam to hang membrane modules to eliminate the guide pipe foundation work which requires a WWTP shutdown

**Benefits**
- Reuse up to 70% of the wastewater (4,200m³/day) as cooling tower makeup
- No WWTP downtime

**Process flow diagram**

**Location**
Ningbo, China

**Furnished by**
Mitsubishi Chemical Engineering Co.

**capacity**
6,000m³/day

**Application**
Petrochemical Plant Wastewater

**Operation started**
2012

**Product**
STERAPORETM 5000

Mitsubishi Chemical Corporation
Membrane Business Section
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Amenity Life Division
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Electronics industry wastewater treatment plant in Vietnam

Challenge
This facility is located in an industrial park, Vietnam. Need to construct the integrated wastewater treatment facility in the industrial park due to lack of capacity. Treated water directly discharge to the river. The criteria is BOD<24mg/L, COD<41mg/L.

Solution
A treated water high quality is a critical factor for this project. Membrane Bio Reactor (MBR) can adhere the strict effluent standards of this river.

Benefits
The treated water by MBR directly discharge into the river for protecting the environment.

Process flow diagram

Location
Vietnam
Furnished by
Goshu Kohsan Co., Ltd.
Capacity
500m³/day
Application
Electronics Industry Wastewater
Operation started
2012
Product
STERAPORE™ 5000

Mitsubishi Chemical Corporation
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Performance Separation Materials Unit
Aqua & Infrastructure Sector
Amenity Life Division
Advanced Solutions Domain

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**Hollow-fiber membrane element and module for industrial/municipal wastewater treatment**

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**STERAPORE™ 5000 Series**

**High COD effluent treatment at a chemical plant**

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**Challenge**

The raw wastewater is mixed effluent from chemical and pharmaceutical plants. The wastewater treatment facility cannot stop because the plant is running all year. The existing settling tank agitator has damaged by aging facility.

**Solution**

Without stopping the existing facilities, adding a membrane tank, modifications were carried out. Membrane Bio-Reactor (MBR) was equipped.

**Benefits**

MBR does not require settling tank and it also raised load. The water quality of the MBR process is very good and stable. Our client said that ‘wastewater treatment by MBR is the best choice’.

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**Water analysis**

<table>
<thead>
<tr>
<th></th>
<th>Raw wastewater</th>
<th>Diluted wastewater</th>
<th>MBR treated water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (m³/h)</td>
<td>4.0 (2.5—8.0)</td>
<td>16</td>
<td>—</td>
</tr>
<tr>
<td>COD (mg/L)</td>
<td>8,000 (1,000—15,000)</td>
<td>2,000</td>
<td>4.9</td>
</tr>
<tr>
<td>T-N (mg/L)</td>
<td>500 (9—1,000)</td>
<td>125</td>
<td>—</td>
</tr>
<tr>
<td>pH</td>
<td>8.0 (6.5—9.0)</td>
<td>8.0</td>
<td>1.2</td>
</tr>
<tr>
<td>SS (mg/L)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

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**Process flow diagram**

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**Location**

Japan

**Furnished by**

Swing Corporation

**Maximum Capacity**

700m³/day

**Application**

Chemical Wastewater

**Operation started**

2012

**Product**

STERAPORE™ 5000

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**Mitsubishi Chemical Corporation**

Membrane Business Section

Performance Separation Materials Unit

Aqua & Infrastructure Sector

Amenity Life Division

Advanced Solutions Domain

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