

# Energy-Efficient Wastewater Concentration and Recovery

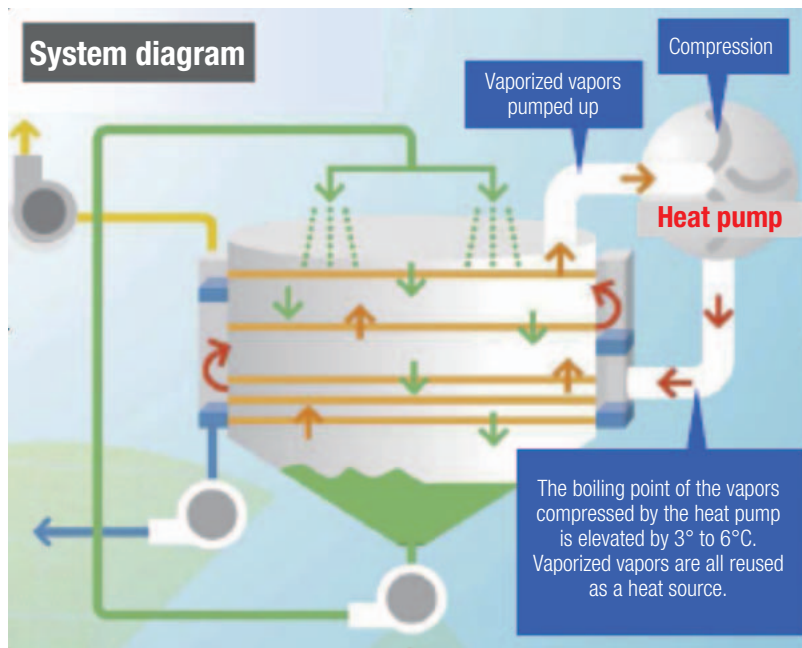
- Systems to efficiently treat wastewater and recover valuable resources

## Main Features

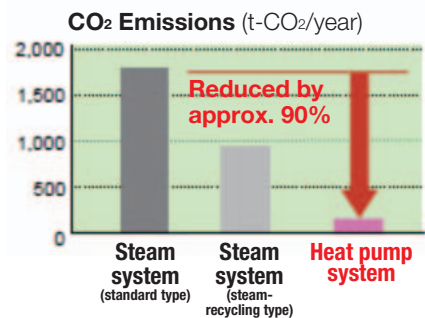
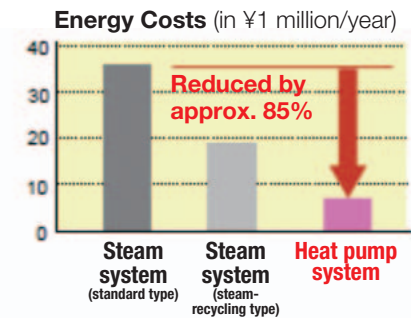
- Nearly 100% of generated vapor is recycled in heat-pump concentrators.
- Reduces industrial waste discharge fees. Recovers water and valuable resources from wastewater.
- For treating 50 m<sup>3</sup> per day, reduces energy costs by approximately 85% and reduces CO<sub>2</sub> emissions by approximately 90%.



## Special Features of Technology/Product



### Comparison: Treatment Volume of 50 m<sup>3</sup> per Day



### Heat pump reduces costs and reduces CO<sub>2</sub> emissions

- Wastewater is vaporized by a heat pump, reducing costs and CO<sub>2</sub> emissions.
- Vaporized vapor is compressed by the heat pump. By reusing this vapor as a heat source, nearly 100% of the vapor is recycled.

Estimation Conditions  
 Compared system: Manufactured by Sasakura Engineering  
 Steam heat source: Gas-fired boiler (city gas)  
 Operating hours: 24 hours/day  
 Number of days in operation: 250 days/year  
 Unit price for utility charges: Electricity: High-voltage "BL" rate (as of April 2009)  
 City gas: ¥50/m<sup>3</sup>  
 CO<sub>2</sub> emissions intensity: Electricity: 0.366 kg-CO<sub>2</sub>/kWh  
 City gas: 2.29 kg-CO<sub>2</sub>/m<sup>3</sup>

## Technology/Product Overview

**Evaporator and heat pump combined in a single unit.**  
**Ideal for high-volume concentration processing in the range of up to 4°C boiling point elevation.**  
**Compact, energy-efficient system.**

- Uses Sasakura's proprietary heat pump for easy maintenance.
- Further cost savings are possible by combining a steam ejector (thermal compressor).

### Principle of Operation

1. The liquid feed is introduced into the evaporator held under vacuum where it is mixed with circulating fluid already in the evaporator. In the top of the evaporator, the liquid is sprayed over the outside of heated tubes, where it evaporates from the surface as a thin film.
2. The vapor which has evaporated from the surface of the heated tubes is compressed in the heat pump and its boiling point is elevated by 3° to 6°C. This elevated-temperature vapor is then introduced inside the heated tubes and condenses at the same time that it vaporizes the circulating fluid sprayed on the outside surface of the heated tubes. Condensate water is formed, and this is discharged outside the system by the condensate water pump.
3. By repeating the processes in 1. and 2. above, the circulating fluid is concentrated and discharged outside the system from the circulation pump outlet port as a concentrated liquid.
4. Heat from the outside is required at machine start-up, but under normal operation, the concentration process proceeds almost entirely by the compressive power of the heat pump, and no external heat source is required.

### Product Example of Heat-Pump Concentrator

#### Sasakura WVCC Evaporator

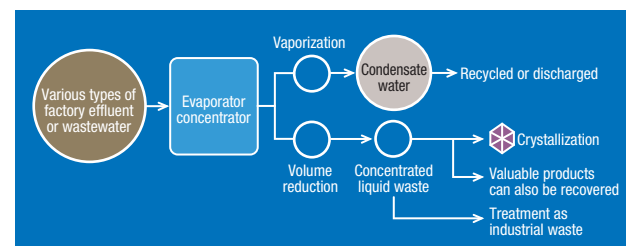


Required utilities:  
Small volume of steam, or all-electric  
Small volume of water

Capacity:  
Liquid feed volumes from 5 m<sup>3</sup>/day to  
250 m<sup>3</sup>/day

Installation size (mm):  
Approx 3,500 (W) x 4,500 (L) x 3,500 (H)  
up to approx. 6,500 (W) x 7,900 (L)  
x 8,500 (H)

### Flowchart for Wastewater Treatment



## Installation Examples

### Installations in Thailand

1. Soluble cutting oil wastewater (automotive related)
  2. Nickel sulfate (sash related)
  3. Waste soap liquid + waste degreasing liquid (tire related)  
2 units
  4. Waste plating liquid (electronic related)
  5. Waste mold lubricant fluid (rubber products related)
  6. Recycled ion exchange wastewater (electronic related)
- Total 7 installations

### Installations in Japan

1. Waste yeast culture solution (foodstuff related)
  2. Caustic soda recovery (textile related)
  3. Solvent recovery (electronic related)
  4. Water recovery (electronic related)
  5. Saline wastewater (industrial waste related)
- Total 600 installations  
Approximately 60 installations in Asia (not including Japan and Thailand)

## Benefits

Up to now, wastewater discharged from plating processes has been subjected to chemical and biological treatment, then discharged off the factory site, thus entailing costs for chemical and sludge treatments. In addition, water used in the plating process had to be replenished with clean water.

After installing the Sasakura Engineering evaporator/concentrator, water was recovered from the wastewater discharged from the plating process. In addition, the process wastewater was no longer released and discharged into rivers or streams, and we succeeded in converting the process into a closed-loop system.

Inquiries

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