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RECYCLING OF SEWAGE

Tohkemy Corporation – Japanese water treatment company with over 50 years of experience in Japan.

1. Background: increase of water stress.
 - The water on earth: 97% is seawater, only 3% is freshwater, only 0.8% of freshwater is actually usable.
 - The world's population: 7.35 billion in 2015→7.88 billion in 2021→9.73 billion in 2050=32% increase from 2015.
 - Global economic development and urbanization will continue.
 - All result increase water demand and water stress.
 - We need new water resources.
2. Where are the new water resources?
 - Seawater is one of them. 97% of the water on earth is seawater. Seawater desalination is one of the solutions. But it has high energy and environmental costs.
 - Sewage and waste water are other new resources. In addition, these will increase with economic development and urbanization. Treatment cost is also cheaper than seawater desalination.
 - Thus recycling system is very important.
3. Conventional sewage treatment process (figure 1):
 - Primary treatment: coagulation and sedimentation.
 - Secondary treatment: bacteria for biological treatment. This is called secondary treatment. In some cases, MBR (Membrane Bioreactor), which combines this with membrane treatment, is used. In this case, the electricity costs for aeration are high because the bacteria need to be supplied with oxygen 24 hours a day. Sludge disposal is also required.
 - Secondary treated sewage is often discharged into the environment.
4. Sewage recycling system (figure 2a): we propose to tertiary treat secondary treated sewage and use it as industrial water (figure 2b). Our experiences show 2 options:
 - Option 1 is a case that secondary treatment is properly made. In this case we use submerged membranes and nano filters to provide industrial water quality. The energy cost for aeration is mainly for membrane washing only and lower than option 2.
 - Option 2 is a case that secondary treatment is not properly made. In this case we have to use MBR and RO to achieve industrial water quality. The energy cost for aeration is much higher for supplying oxygen to bacteria.
5. This proposal achieves:
 - Recycling society.
 - Reallocation of conventional clean water to residents.
 - Reduction of secondary treated sewage release to environment.

Since clean water, which was conventionally supplied as industrial water, is covered by this recycled sewage, conventional clean water is provided to other users such as residents.

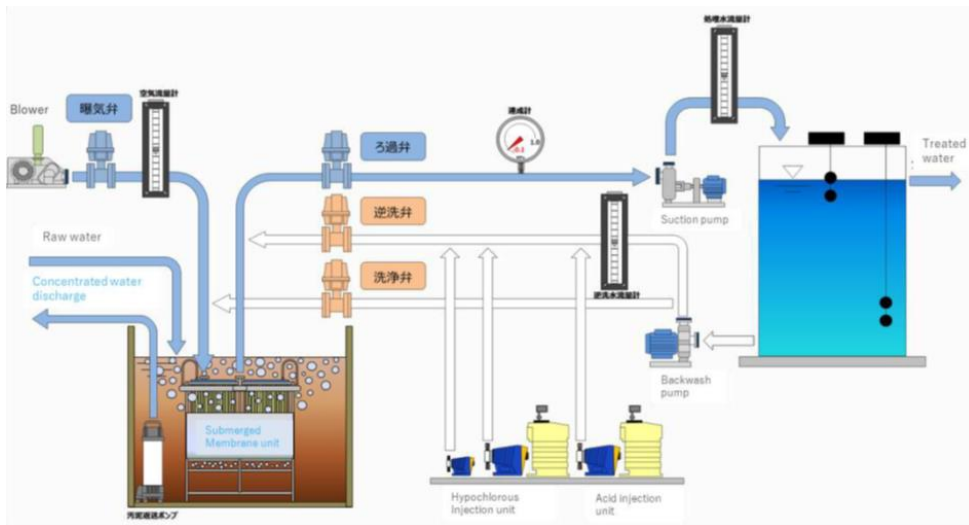


Figure 1. Sewage treatment process

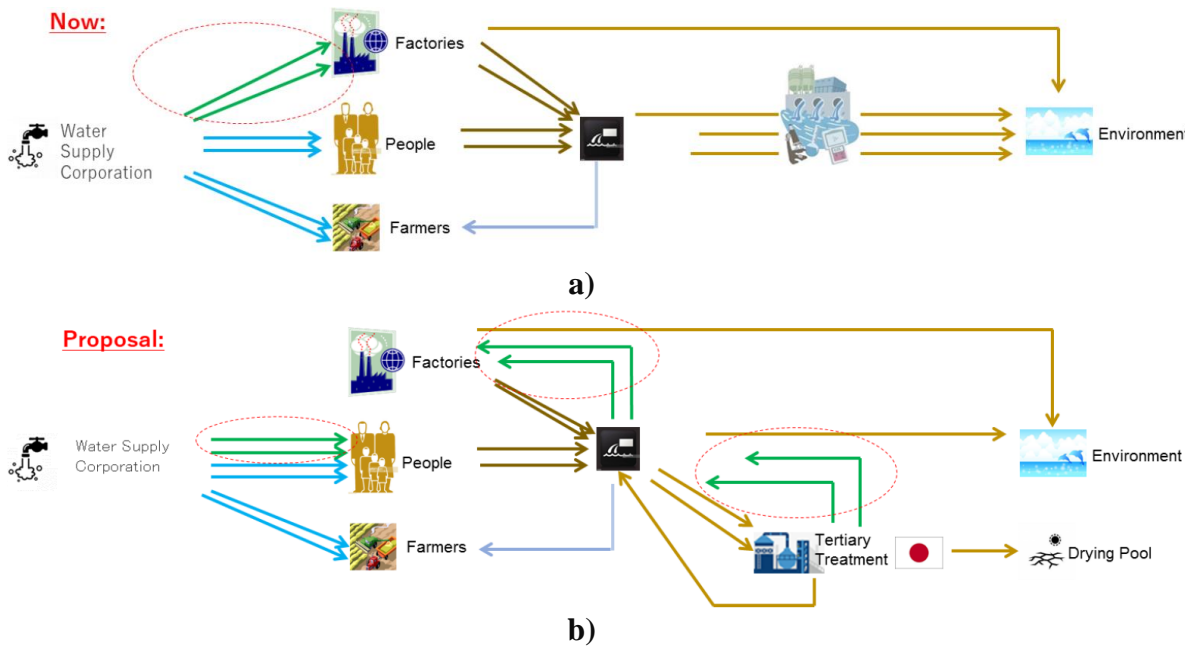


Figure 2. Sewage recycling system. a) Now available system; b) Proposed system