

## JAPAN

# Current situation and future outlook

MBRs have been applied to many on-site wastewater treatment tanks and industrial wastewater treatment facilities in Japan. Recently many efforts have been made to introduce MBRs to municipal wastewater treatment. The current Japanese situation and future outlook concerning MBRs are introduced.

In Japan the application of MBRs had been at first almost limited to the wastewater reuse facilities of large buildings and the night soil treatment plants. These 'first generation' MBRs were crossflow solid-liquid separation process combined either with biological or physicochemical process.

Recently, however, since the emergence of submerged type MBRs the application of MBRs is widely diffusing. The submerged type MBRs are applied mainly to the on-site wastewater treatment tanks and to the industrial wastewater treatment facilities so far. The on-site wastewater treatment tanks are prefabricated FRP package type reactors and are used for domestic and community wastewater treatment for up to 10,000 people where they have no sewerage served. More than 300 MBR type on-site wastewater treatment tanks have already been adopted and it is expected that the number of them will increase. As for the industrial wastewater treatment, more than 150 MBR plants have been applied to various type of wastewater

such as food processing or brewery.

The MBRs are in most cases MF membrane reactors with either flat panels or hollow fiber membrane. In order to prevent pH decrease and to assure stable operation, anoxic and oxic tank are installed with internal recycling between two tanks, resulting in nitrogen removal.

On the other hand, in municipal wastewater treatment field, the application of MBRs has not moved ahead on so far in Japan. We have only few cases of MBRs application to rural area sewerage. As a example, a treatment plant receiving 465 m<sup>3</sup>/d of domestic wastewater from rural area of a small town adopted MBR. The membrane system was installed when the plant had to be modified in order to enlarge its existing treatment capacity. Such a way of MBR application to existing plants is considered to be in great request since many sewage treatment plants will have to be rebuild in the near future.

The reason that MBRs has not yet been applied in municipal wastewater treatment may be that MBR was not considered to be an appropriate technology because of the high membrane costs.

With recent membrane cost declining, efforts by many public and private sectors have been made in order to utilize the

attractive merits of MBRs to municipal wastewater treatment. Japan Sewage Works Agency (JSWA) started a research on the application of MBRs to municipal wastewater treatment in 1998 including co-researches with four Japanese private companies. They were Kubota co., Hitachi Plant Engineering & Construction co., Nishihara Environmental Sanitation Research co. and Mitsubishi Rayon Engineering co.. The co-researches were implemented using four pilot plants with treatment capacity ranged from 20 to 70 m<sup>3</sup>/d that were installed in a large-scale wastewater treatment plant. The membrane types were either flat panel or hollow fiber of MF with exception of Kubota's ceramic membrane. The flux ranged between 0.4 and 0.8 m/d. The pilot plants were operated under two different patterns of the inflow volume fluctuation.

The co-researches ended in May 2001. The results of the research showed that stable removal performances for not only organic matters but also nutrients could be obtained with HRT less than six hours even under inflow fluctuation condition. Also good dewaterability of excess sludge was confirmed. The basic design factors and operational factors were confirmed and it is considered that MBRs are ready to be applied to municipal sewage system.

However there are still some problems that should be improved. These are firstly the reduction of energy consumption by air supply and secondly the extension of the life of membrane, which is now usually estimated for years. To improve these problems many new technologies are being tested. They are for example new type of membranes such as metal membrane or chemical resistant membranes made of new materials and also new methods of air bubbling.

JSWA is going to conduct a further research in order to solve these problems. As a part of the research a new co-research project which aims to reduce energy consumption and maintenance cost of MBRs from this autumn. Several pilot-scale studies will be held in JSWA's newly opened experiment field.

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Overview Kubota installation in the Ebisu building (photo DHV Water).

