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ABSTRACT

Potential Reuse of Wastewater Effluent in Macau

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Fresh water shortage is a major limiting factor for economic development around the world and is no exception to Macau. Although with the commitment and unlimited backup of its motherland, Macau is determined to do something internally to maintain a sustainable development by building up a water saving society. There are two main ways to achieve this goal : 1) to find more water resources and 2) to use fresh water more efficiently. With the proper uses of reclaimed wastewater gaining public acceptance worldwide as a means of supplementing the scarce fresh water resources, Macau is also putting resources promoting this. Currently Macau has three major existing secondary wastewater treatment plants under operation to treat wastewater generated in the city. All built in the 1990s, the treatment works are producing no effluent meeting the international standard for reuse in unrestricted areas. The aim of this study is to set up the reuse quality goals suitable for the specific reuse purposes by taking reference to other countries, then to investigate the most feasible polishing treatments to be added to one of the existing wastewater treatment plants in Macau so as to find an economic way to render its treated wastewater attaining recognized qualities for some region-specific reuse purposes, like street washing, landscape irrigation, toilet flushing, recreational waters, etc. After extensive literature reviews, several methods are identified. The two most feasible methods - sand filtration and microfiltration with membrane filters, either alone or

followed by UV disinfection downstream, were tested experimentally in the laboratory. Analytical results of the quality of the filtrate show that sand filtration is not good enough, while that of the permeate of the membrane filtration with the UV sterilizer delivers promising results which warrant further studies. With the obtained experimental data and the O&M manual of a pilot membrane filtration plant, cost and benefit analysis is also done to estimate the unit cost of permeate produced.