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Reverse Osmosis: A Feasible Tool to Protect Salt Intrusion

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Abstract

Pi Pi, a small island with highly dense tourists in Andaman Sea, has face with shortage of fresh water supply and salt intrusion in groundwater, which is the main source of water, uses. The island is naturally formulated by limestone and classified as marine karst, which is geographically known as difficulty in water resource development. Also, the mountainous area of the island covered by a variety of plant species has been announced as national park where it seemed to be sensitive for ecological collapse caused by tourism development, especially salt intrusion problem. Such problem tended to be more concerned with regard to the increasing number of tourists particularly during peak season in each year. Thus, a feasibility study on the utilization of reverse osmosis (R/O) technology for pipe water supply project in Pi Pi was carried out in 1995. A U.S. product of R/O. from a company in Thailand was used as reference model in terms of cost and techniques.

The inlet site of seawater was selected from 3 alternatives concerning water quality and avoidance of coral disturbance. The plant site, including mainly on buildings, pre-treatment system, storage tanks, R/O. system and power generator was planned to locate at a small hill on the shoreline approximately 1 km. away from the inlet site due to geographical conditions and the agreement of land owner towards the project. The estimated capacity of 300 cu.m. /day of fresh water supply with continuous distribution system covered the whole increasing demand of the target service area throughout the project's lifetime. The brine which concentrated 47 p.p.t. of salinity with estimately 8 litre per sec. of flow rate from the production process was planned to discharge at the turbulence site with 8 distributed points in order to be naturally diluted rapidly. Also, 89% of the tourists, 98% of local people and 100% of related tourism businessmen agreed with the proposed project.

Considering financial feasibility analysis, the project would require US. $ 522,954 as investment or fixed cost together with US. $ 81,760 per year for operation cost. With regard to 5 years of the project's lifetime at discount factor (D.F.) 15% and US. $/cu.m 2-3.2 for water consumption of less than 30 to more than 90 cu.m. per month as progressive rate for service prices, payback period would be 3.7 years, benefit-cost ratio (B/C) 1.26, net present value (NPV) + 133,322 and internal rate of return (FIRR) 18.28%. The project can be finally concluded as moderately feasible. It is suggested that the practical project will not only solve shortage of water supply but also protect salt intrusion caused by existing overuse of inland water.