

Part 2: The Demonstration Project of Large-Scale Desert Greening by PEC

This time we would like to focus on two parts of the above project which were reported in the last issue, namely (1) development of water treatment technology in Riyadh and (2) sewage treatment technology in Khafji. According to the Saudi Arabian Ministry of Planning, the annual water consumption of the entire country is estimated to be approximately 18 billion tons. Of this only 0.7 billion tons are supplied from desalination facilities which convert sea water into fresh water. Almost all the rest of water demand is met purely with ground water. However, with the increasing population and development of industries, serious problems have emerged in respect with the use of ground water, such as the depletion of water table and an increase in salinity of ground water. On the other hand, water from desalination plants costs \$3 per ton, which amounts to \$ 20 billion annually, for only 4% of the total water supply in the country. In addition to this, there are costs for transporting water from the coastal desalination facilities to inland cities. Given this situation, water recycling has come to draw attention as one efficient way of water utilization. Proper treatment and recycling of waste water in urban areas would bring about the same beneficial effect as developing new water resources. The waste water treatment process consists of two stages. The first stage, known as solid-liquid separation, consists of the removal of Suspended Solids (SS) and solid sedimentation. The second stage of treatment which removes organic substances by dissolution uses the digestive enzymes of microbes. In addition, there is a third stage of high-level treatment, which removes substances which cannot be completely removed in the first two stages treatments, such as nitrogen and phosphorus etc. They are removed by a coagulating sedimentation method, rapid filtration, and membrane separation.

In Riyadh an experimental plant is being constructed for such waste water treatment. Here at the first stage, waste water will be treated by aeration, waste removal by screening and a settling method that uses coagulation sedimentation to produce treated water (10-12 t/d). At the second treatment stage SS will be removed by activated sludge process, and Micro Filtration (MF) membranes. The third, high level stage of treatment is conducted using Nano Filtration (NF) membranes and low-pressure Reverse Osmosis (RO) membranes that are used in food processing. It is expected that with this experimental plant, appropriate filtering systems, the quality of treated water and various conditions for running such a waste water treatment plant can be studied.



Photo 1

On the other hand, at the sewage treatment plant in Khafji, waste water which has gone through the first treatment stage in a lagoon (3,000t/d, presently discharged into the sea) will be further treated at the second stage with the help of microbes, combining the technique of bio-module contact sedimentation technology with biological contact filtration technology (Photo 1). In addition, at the stage of high-level treatment, salt contained in the waste water is removed by the energy-efficient low-pressure RO filter which is used for desalination (Photo 2). The water thus treated (300t/d) is in turn supplied to the greening experiment plot as irrigation water. In Riyadh, research and development activities focus on the examination of the most appropriate operation technologies for each filtering technique, sanitation and economic evaluation of water treatment, etc. On the other hand, in Khafji, research and development activities focus on the improvement of quality of treated urban waste water by the second stage treatment using microbes, to the standard level required for irrigation water in Saudi Arabia. Also work focuses on the durability of RO filters and their cleansing method; measures against fluctuation in total dissolved salt (TDS) and load variation; development and experiments into treatment methods of water discharge from microbe treatment facilities and RO condensed waste water, etc.



Photo 2

At the PEC Gulf States Greening Seminar held at the Kuwait Institute for Scientific Research, the relationship between the issue of sewage water treatment and the particular Muslim concept of uncleanness was discussed. To sum up, the dominant view was that there would be no religious objection if the water is 'clean' from the hygienic point of view, after a thorough treatment including sterilization using chlorine. However, in UAE people dislike mist-form water sprinklers, and even with no scientific problems some psychological obstacles seem to remain.