

The FANTASTIC Virtual guide -- she knew all the answers!



SLP visitors all excited about what they are about to discover.

NEWater from old



now be produced from “used” water at an economic rate. The tyranny of the weather/rain cycle has now been broken. Water from this process will, of course, never be as cheap as natural water from rain. But this is missing the point. For Singapore, with its abundant rain, NEWater will never be the only source of potable water. It will be a supplement for what will come from our reservoirs. (A related process is sea-water desalination but we are not considering it here.)

Singaporeans are aware, from a very young age, that we have a water problem. But what exactly is the problem? First we have to say that we are referring to fresh or potable water – the type that we can drink and use in our homes for cooking and washing.

But why do we have a problem. Singapore is not a desert. It has heavy rainfall. If we go by the rainfall, we are more than adequately supplied. Many nations would die to have as much rain as we have. We are also surrounded by the sea! (To be fair, sea water is salty and it should not enter the equation at this stage.)

If water use is restricted to domestic purposes only, our problem is very small indeed. However, the demand for fresh water is very much bigger than what is consumed in our homes. Why? The reason is because the same water that we drink is used in large quantities in factories, hotels, shopping centres, offices, educational establishments, military camps and other places. Of course, water in these places is used for drinking too but this use is very small compared to other uses. We could, of course, use non-potable water for industrial and commercial purposes. Some of this is already done. For example, sea water is used for cooling in oil refineries and petrochemical plants. Some factories in the Jurong area use industrial water. When two grades of water, say potable water and industrial water, are distributed, two sets of pipelines need to be laid to move the water around. This obviously is a costly proposition. There are other problems too eg. cross contamination which could lead to a serious health problem. In addition, some industries need fresh water in their manufacturing processes eg. food and drink factories and wafer fabrication plants.

The problem for Singapore is not lack of raw water supply per se. It is a problem of balancing supply with demand -- it doesn't rain evenly throughout the year and from year to year. We don't have a large river that flows constantly. Thus we need to store water in reservoirs – the reservoir level will rise during the rainy season and fall during the dry season. (The challenge, of course, is not to let the reservoir run dry.) This is where we run into a limitation. We just do not have enough land to set aside for reservoirs. The government has built many reservoirs in the last 20 or 30 years and has also started collecting rain water from non-traditional sources eg. run-off from roads and built up areas. These initiatives have helped to some degree but does not solve the problem completely. The critical question remains, can Singapore have enough fresh water on a sustained basis – year in, year out, rain or no rain.

There is also the ever present issue of the water agreements with Johore. By 2061, the second agreement will run out. What happens then?

Fortunately for Singapore, the technology for water re-use and re-cycling has reached such a stage that it is feasible to consider the wide spread re-use and re-cycling of fresh water resources. It makes economic sense to now re-use and re-cycle fresh water. Ultra filtration and reverse osmosis (RO) can now be used to produce water from what is essentially effluent from sewage treatment plants. The wonder is that the water produced from these water factories is purer than any filtered and purified water from a natural source ie. a river or a conventional reservoir. In fact, salts have to be added back to the product so that this NEWater will have some taste. Fresh water can

The future face of potable water can now be seen at the NEWater Plant in Bedok, not far from Changi Airport. The plant produces 9 million gallons per day(mgd). Currently, the product, called NEWater, is used directly by wafer fabrication plants which require ultra- pure water in their manufacturing process and by a small number of commercial/public buildings eg. Changi General Hospital for their air conditioning cooling towers. A small amount of NEWater, 2 mgd, is pumped into our reservoirs. This represents less than 1% of our potable water consumption. The NEWater is mixed with water in the conventional reservoir and undergoes a process of naturalisation. The reservoir water is treated and purified one more time in a conventional waterworks before it reaches our homes and other places to be consumed or used in other ways. This indirect use of NEWater is being done more for psychological rather than scientific reasons. It is not difficult to imagine that, in the not too distant future, that Singaporeans will be regularly drinking NEWater directly. Many Singaporeans have already done so. All visitors to the NEWater Visitor Centre receive bottles of this water and happily drink it.

The plant produces NEWater by a 3-stage process. First the feed, received from a neighboring water re-cycle plant, undergoes ultra-filtration. The output from this step then goes through reverse osmosis (RO). This is the core technology for the NEWater Process. Water molecules are forced through the pores of the RO membrane while larger matter/molecules are kept back ie. prevented from passing through the pores. Thus bacteria, viruses and chemicals eg. salt and drugs are separated from water. The product is now an ultra-pure water. Most RO plants in the world would only apply these two steps. In Singapore, there is a third step ie. radiation by ultra violet light (UV). This is an extra precaution to provide more psychological comfort to Singaporeans. The product is stored in large tanks before it is distributed to customers eg. wafer fabrication plants or is sent away for bottling. As mentioned above, 2 mgd are returned to our reservoirs.

The NEWater Visitor Centre is a modern educational establishment set up by the Public Utilities Board (PUB) to educate Singaporeans on all aspects of water as a resource and its importance to the survival of any country. Visitors will find out that large numbers of people on this planet Earth have no or inadequate access to good potable water. Singapore is one of the fortunate countries to have reliable potable water on tap. While we do have a water problem, we should put the problem in perspective – we have abundant rainfall and we now have the technology to make the best use of the water resources we have.

Nine SLP members were fortunate to have had the opportunity to visit the Centre on August 26. They were hosted by Mr. Lim Keng Hwa and Ms Julie Tan who were the guides. After the tour, SLP members had a very interesting and detailed question and answer session with Ms Chong Mien Ling, a civil engineer with PUB. Members were also treated to some refreshments and of course the best thirst quencher of all, NEWater. Richard Gillis presented a memento to Ms. Ling to round off the day.

Members who want more information on NEWater may consult the website www.pub.gov.sg/newater.

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