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Tuas South Incineration Plant (TSIP) is Singapore's fourth and largest refuse incineration plant. With new state-of-the art features to boost efficiency and throughput, TSIP, together with the other three incineration plants and the offshore Semakau Landfill will meet the refuse disposal needs of Singapore.

Built at a cost of \$900 million, the Ministry of the Environment's (ENV) fourth waste-to-energy plant can incinerate 3,000 tonnes of refuse every day through its six incinerators, nearly twice the amount of refuse currently being incinerated at Tuas Incineration Plant. Together the four plants - Ulu Pandan Refuse Incineration Plant, Tuas Incineration Plant, Senoko Incineration Plant and TSIP will have the capacity to incinerate 8,200 tonnes of refuse daily.

TSIP is the first incineration plant in Southeast Asia to use SiC tiles as refractory materials in the furnace. Refractory materials are required to protect the surfaces of the boiler wall tubes and furnace castings from the high temperature flame, highly abrasive flyash and highly corrosive flue gases which are generated as a result of the intense combustion in the furnace. It is critical to operational efficiency for these refractory materials to be able to withstand the harsh operating environment for long periods without excessive wear and corrosion. Otherwise, there will be a need to have frequent shutdowns for maintenance. The high-quality SiC tiles are expected to have a longer life span and can easily be replaced owing to an easy-to-install hooking system.

Operational efficiency of the plant will also be increased and manpower reduced with the use of an advance Digital Control System which allows more pieces of equipment in the incineration process to be operated, monitored and controlled simultaneously. Instead of deploying one operator to operate an incinerator, TSIP requires only one operator to operate up to three incinerators. The automation also frees operators from routine tasks to concentrate on optimizing the plant's throughput.

The plant's four high capacity rotary bulky waste crushers will help improve efficiency as well. Refuse comes to the plant in various shapes and sizes. As the incinerators are designed for mass combustion of municipal waste, there are size limitations to the type of refuse that can be fed into the furnace. These crushers will help overcome these constraints. They are integrated in the refuse reception hall, allowing refuse trucks to discharge their loads directly into the crushers.

TSIP is a "green" plant, helping to conserve our portable water resources by using industrial water pre-treated by its own water reclamation plant for use in the boilers. The reverse osmosis water reclamation plant, which makes use of the latest membrane technology, will save the plant approximately 194,000m³ of potable water annually. The plant will also not consume any of Singapore's present electricity resources. Rather it will generate 80 MW of electricity, 80% of which will be made available for the public to use. Together the four plants supply about 2 % of Singapore's overall electricity consumption. Like all the other incineration plants, ferrous metals are recovered for recycling. The

amount of wastewater discharged from TSIP is also minimized by way of a design which allows wastewater drainage from the refuse bunker to be collected and pumped back into the bunker for dust suppression and eventual destruction in the furnace.

Incineration reduces the volume of waste substantially, by as much as 90%. As land is limited in Singapore, ENV has adopted the policy of incinerating all incinerable waste in order to conserve land. Incineration infrastructure however does not come cheap. ENV has spent \$1.83 billion building these four incineration plants and \$610 million for the offshore Semakau Landfill.

Our severe land constraints and the high cost of building and maintaining refuse disposal facilities means that we cannot afford to continue subsidising waste disposal. By subsidising refuse generation, we are, in effect discouraging recycling and waste minimisation. This is because companies will find it much cheaper to simply send their waste for disposal instead of making the necessary efforts to minimise waste. Artificially low waste disposal charges will also make recycling plants non-viable, thereby discouraging investors from setting up such operations.

Thus, as announced earlier in Jan 99 and in April 2000, refuse disposal fees will be increased progressively to encourage waste minimisation and to partially offset the high costs of building refuse disposal infrastructure. Disposal fees will therefore continue to be increased according to the schedule announced: \$10 a year till it reaches \$87 per tonne in 2002. So far two increases have been implemented. The next increase will be effected early next year.

As the cost of infrastructure increases, the cost of waste disposal in Singapore can only escalate over time. The increases in refuse disposal fees and waste minimisation is thus necessary to ensure that our waste disposal capacity is used at a more sustainable rate. Privatisation of the waste disposal industry will allow competition to keep such increases down.

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