



## Case Study:

# Benefiting through the use of heat pumps at Royal Plaza On Scotts

### Introduction

The *Royal Plaza On Scotts*, located along Scotts Road, is one of the hotels in Singapore that had benefited from the use of heat pumps.

Back in 1997, with an average occupancy of 75 per cent, the hotel's hot water requirement was approximately 145,000 litres per day at 55 deg C, with peak load of 21,300 litres for 2 hours.

The hotel relied on 2 fuel oil boilers to provide its hot water requirements, which posed the following problems:

- Poor efficiency
- Unacceptable exhaust emission level
- High maintenance costs

Operating cost for hot water production was estimated at S\$2.33 per cubic metre of hot water delivered.

### Replacement with heat pumps

After assessing its merits, the hotel decided to replace the boilers with 30 heat pumps in 1998, which not only provided for its hot water requirement, but also produced cooled air that were supplied to the central air conditioning system.

Each of these heat pumps was capable of producing 193 litres of hot water per hour at  $\Delta T = 30^{\circ}\text{C}$  (including losses in the ring main), and were operated for about 17 hours per day.

The operating cost for hot water production with the heat pump was estimated at S\$1.13 per cubic metre of hot water delivered.





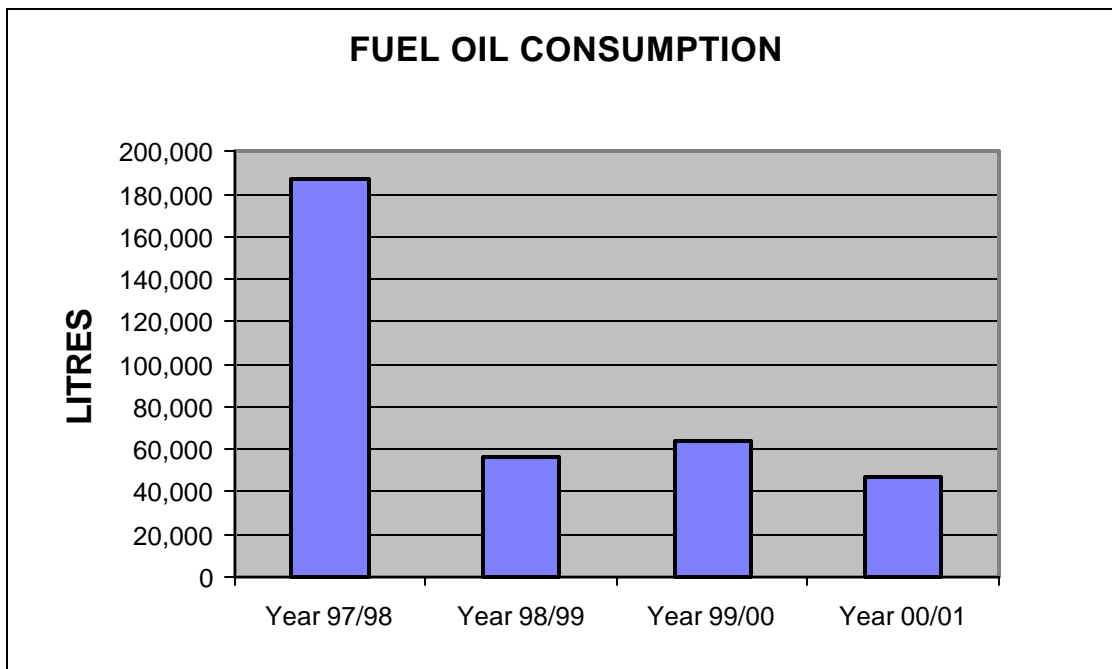
## Results

Based on a review by the hotel 1 year after installation, the heat pump system has resulted in the following benefits:

- Annual cost savings of \$41,000 through avoided fuel oil consumption (Refer to Figure. 1)
- Annual cost savings of \$78,000 through reduced electricity consumption (Refer to Figure. 2)
- Reduced maintenance costs estimated at \$11,000

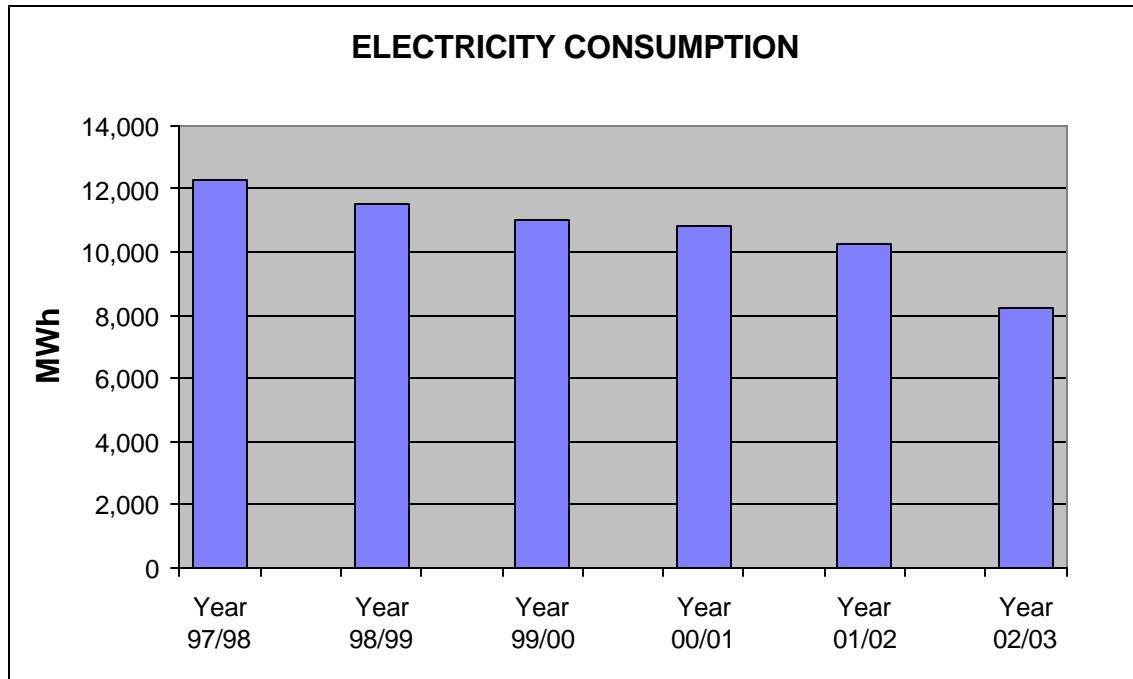
Based on the figures above, the project yielded a simple payback of 1.36 years.

In addition, it also brought about several other less-tangible benefits such as improved (cleaner and cooler) working environment and lower risks of fire hazard in the plant room. The air-conditioning system operations were also improved as the cooled air produced by the heat pumps helped to reduce the cooling demand on the system.



**Figure. 1** *Reduction in Fuel Oil Consumption* (Source: Royal Plaza on Scotts)

*Note: the remaining fuel oil consumption were for kitchen steam boilers, which were replaced by electricity operated steam booster.*



**Figure. 2** *Reduction in Electricity Consumption* (Source: Royal Plaza on Scotts)

*Note: additional reduction in electricity consumption was achieved in Year 02/03 due to air-conditioning system retrofit*

### Conclusion

Heat pump is commonly used in temperate countries and employs the same refrigeration concept that most air-conditioning systems are based on.

The application of heat pump for hot water generation in Singapore can result in:

- Lower energy costs for businesses, especially for those with consistent and high demand for hot water
- Reduced pollution due to lower energy consumption
- Cleaner and safer working conditions

Clearly, this is a win-win situation for both businesses and the environment.