CHAPTER FIVE: GENERAL DISCUSSION AND SUMMARY

Prior to 1997, clinical wastes were managed by the individual hospitals and they used their own systems to treat and/or dispose. The unsatisfactory situation prompted the Government to reorganize the waste management in the interest of safeguarding the society and environment. In October 1996, the Government signed agreements with 3 private concessionaires to manage five support services namely Cleaning services, Clinical waste management, Linen and laundry services, Facilities maintenance and Biomedical equipment maintenance of all MOH hospitals in the country. Accordingly the services were entrusted to three major consortiums namely Faber Mediserve Sdn. Bhd. for Northern Zone consisting Perlis, Kedah, Pulau Pinang, Perak and Sabah & Sarawak; Redicare (M) Sdn. Bhd. for Central and Eastern Zone consisting Kuala Lumpur, Selangor, Pahang, Kelantan and Terengganu, and Tongkah Medivest Sdn. Bhd. for Southern Zone consisting Negeri Sembilan, Melaka and Johor. Subsequently, the total take over of waste management came into effect from 1st January 1997. This privatization scheme regulated the clinical waste management system in the country at the cost of roughly RM19 million/year for the Government. Ever since privatization, clinical wastes are disposed of safely for the maximum protection of environment and society.

Malaysia, being a rapid developing country, has altogether 133 Government hospitals and 142 licensed private hospitals spread all over the country including Sabah and Sarawak and these hospitals are under the control of Ministry of Health. The total bed capacity in the Government hospitals in the year 1997 was 36073. Assuming an average of 55% occupancy, 19840 beds ware occupied on a daily basis. It includes all facilities like specialist care, ophthalmic, dental, mental care etc. The total capacity does not include expansion or extension on a makeshift basis of beds in times of emergency on epidemic breakout. The total number of beds available in private hospitals was 2840 in the same year.

Prior to mid 1997, clinical wastes were not adequately segregated. However, since July 1997, adequate segregation processes were introduced due to more awareness instilled by both the waste management consortiums and the relevant Government Departments.

Out of the total volume of 3.49 million kg of waste generated in the MOH hospitals in Malaysia in 1998, the Northern States (Perlis, Kedah, P.Pinang and Perak) alone generated about 849,816 kg which was 24.35%. Sabah and Sarawak jointly generated a volume of 623,956 kg, which was about 17.87%. The proportion of wastes generated in 1998 by each individual states are Perlis: 1.14%, Kedah: 7.36%, Pulau Pinang: 7.54%, Perak: 8.29%, Selangor: 7.80%, Kuala Lumpur: 12.95%, Negeri Sembilan: 5.20%. Malacca: 3.59%, Johor: 12.07%, Pahang: 6.00%, Kelantan: 4.15%, Terengganu: 4.96%, Sabah: 9.76% and Sarawak: 8.11%.

Perak has the highest number of beds (7050) followed by Johor (5030) and Sabah (3660). However the bed occupancy rate in Perak is only 42.10% whereas Kuala Lumpur with a bed capacity of 2880 has an occupancy rate at 64.43%. Kuala Lumpur generates 0.830 kg per occupied bed per day whereas Johor generates only 0.480 kg per occupied bed per day, which is almost half of Kuala Lumpur's waste volume. Terengganu, the second largest waste generator generates a waste volume of 0.820 per occupied bed per day and has an occupancy rate of 49.01%. Perak, with a bed capacity of 7050 and bed occupancy rate of 50.10%, produces only 0.220 kg per bed per day, which is the least and well managed in terms of clinical waste management compared to other states of Malaysia. The lesser amount of waste generation in hospitals with a higher bed capacity is a positive sign of an efficient clinical waste management system.

The waste management in the Northern States of Malaysia (Perlis, Kedah, Pulau Pinang and Perak), Sabah and Sarawak is managed by some 157 consortium staff members excluding administrative staff. The storage area used for all sites total up to 1000 m^2 and is maintained at temperature and other conditions stipulated by DOE.

Wastes are transported from this storage area to incineration points as early as possible to avoid health hazards. The wastes generated are transported at less than 6°C in cold storage trucks. Faber Mediserve has a fleet of 24 cold storage vehicles. The internal (within the hospitals) transport of clinical waste is carried out with the use of 958 wheeled and closed bins of 660-liter capacity.

Teluk Intan District hospital caters to the medical needs of approximately 44 thousand people spread over a surrounding viscinity of 25 miles radius from the heart of town. The waste management of the hospital comes under one of the consortiums namely Faber Medi Serve Sdn. Bhd. assigned by the MOH in the year 1997. Being a prototype hospital operating since colonial years, it has a well-established system that controls and keeps all medical and paramedical activities including waste management within the desired scale. The support services system currently being practiced could be considered well within the guidelines laid by MOH and DOE.

With a bed capacity of 548, Teluk Intan District Hospital contributes 7.78% of the total bed numbers in Perak State. The bed occupancy rate of the hospital is 51.5% (as against the State rate of 42.1%). The annual Clinical waste generated in this hospital ranges from 61,000 to 70,000 kg, which is 21% to 24.1% of the total volume generated in the State (289.587.8 kg). The daily Clinical waste generation ranges from 109 to 171 kg depending on the various clinical activities carried out within the hospital.

The Kamunting incinerator plant is a product of Belgium, assembled to cope with European standards of incineration. Installed in 1997, the plant operates 24 hours a day and seven days a week with three shifts of staff controlling the incineration process. The incinerator is continuously fed by wastes arising from the four Northern states at the maximum rate of 4.4 tonnes per day. The emission characteristics of fly ash and stack emission fall well within the DOE limits. The residual ash in scavenger boxes are being transported to Kuality Alam's secure landfill at Bukit Nanas where further disposal processes are carried out. Apart from the incineration plant, the

whole premises with weigh-bridge, cold storage and programmed logic computer operating systems are designed to meet the European Standards of incineration of clinical wastes.

Analyses of stack emission and residue ash are carried out twice a year as required by DOE and the results are forwarded to DOE for approval. Usually the analyses are carried out in March to June and September to December in each year. The results for 1998 indicated that the total toxic equivalents are well within the standards set by DOE. The heavy metal pollutants like Nickel, Cadmium, Antimony, Chromium, Mercury, Selenium, Lead and Arsenic are well below the permissible limits. Emission analysis indicates the presence of total toxic equivalents in the form of Dioxin and Furan compounds at less than 0.1000 ng/Nm^3. Hence, the incineration process carried out is considered to be safe and within the parameters imposed by DOE.