

Opportunity and money lies in **Malaysia's** hospital waste management market

馬來西亞醫療垃圾管理市場：淘金之地，財富之門

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One man's thrash is another man's treasure!

垃圾堆裏能淘金！

HOSPITAL WASTE MANAGEMENT HAS been a topic long discussed and regulated within most countries with an advanced healthcare system. In 1997, Malaysia introduced a new business model for public healthcare support services in a bid to contain rising medical costs and maintain affordability. The new concept was to corporatize the services by outsourcing to the private sector with the hope that for-profit governance will help in managing resources more economically and efficiently. As part of the exercise, 3 companies were selected to provide 7 types of support services, among them medical waste management.

在醫療系統發達的國家中，醫療垃圾管理一直是一個備受關注的話題，監管十分嚴格。為控制醫療費用，讓民眾看得起病，1997年馬來西亞推行了一種全新的公共醫療輔助服務運營模式。新模式的理念是對輔助服務進行私有制改革，將其外判給私營企業，希望這種以盈利為前提的管治模式能夠讓資源配置更加經濟，高效。作為試點單位，有三間公司獲得七類輔助服務的經營權，其中之一便是醫療垃圾管理。

- Faber Medi-Serve Sdn Bhd serves 79 government-owned hospitals and 500 smaller clinics in the states of Perlis, Kedah, Penang, Perak, Sarawak and Sabah

Faber Medi-Serve Sdn Bhd, 為玻璃市，吉打，檳城，霹靂，沙撈越和沙巴的 79 間國有醫院及 500 間小型診所服務

- Radicare Sdn Bhd serves 47 other hospitals in Kuala Lumpur, Putrajaya, Kelantan, Pahang and Terengganu.

Radicare Sdn Bhd, 為吉隆坡，布城，吉蘭丹，彭亨和丁加奴的 47 間醫院服務





剩下的柔佛，森美蘭和馬六甲三州 22 間醫院的醫療垃圾

In 2009, the three concessionaires generated nearly RM200 million in revenue by managing 15,952 tones of discarded needles and syringes, scalpels, discarded surgical instruments, contaminated bandages, human tissues and body parts, and many other potentially infectious wastes turning them into inert and less harmful 'ash', as stipulated by the Ministry of Health and the Department of Environment. This often overlooked sector within the healthcare industry is expected to grow at an average 12.8 percent annually, to reach RM672 million by 2015.

2009 年三大特許經營商合共實現收入 2 億馬幣，按衛生部及環境署要求處理醫療垃圾 15,952 噸，包括廢棄針頭，注射器，手術刀，外科器具，受污繃帶，人體組織器官及其他多種潛在感染性廢棄物，處理方式為將其焚燒成危害較小的惰性「灰燼」。作為醫療行業中常常被忽視的一塊領域，預計將以每年 12.8% 的平均速度增長，2015 年整體市場蛋糕將達 6.72 億馬幣。

Clinical waste management in Malaysia

馬來西亞醫療垃圾管理現狀

Management of clinical waste in Malaysia is based on the 'cradle-to-grave' concept, where the concessionaires bear most of the responsibilities for every step in the life cycle of medical waste, which includes supply of the consumables, collection of waste at the generators' sites, storage, transportation to treatment sites, and disposal in treatment plants. However, the initial stage of waste disposal, which is waste segregation, is performed by healthcare providers.

馬來西亞的醫療垃圾管理推行「從搖籃到墳墓」的制度，特許經營商幾乎是一肩擔當醫療垃圾整個生命週期的每一個環節，包括消耗品的供應，垃圾的收集，貯存，運輸及處置，僅垃圾處置的第一步——垃圾分類是由醫療服務提供商負責。

The generation of clinical waste is closely related to the size and growth of healthcare services. In Malaysia, the number of healthcare institutions is changing at a rapid rate as hospitals add new services and change procedures on an

- Pantai Medivest Sdn Bhd, a subsidiary of Pantai Holdings Berhad manages the clinical waste from 22 hospitals in the remaining 3 states of Johor, Negeri Sembilan and Melaka.

Pantai Medivest Sdn Bhd, Pantai Holdings Berhad 的附屬公司，負責管理

Annual Clinical Waste Generation by Source (1997 to 2015)
不同來源醫療垃圾年產量（1997-2015 年）

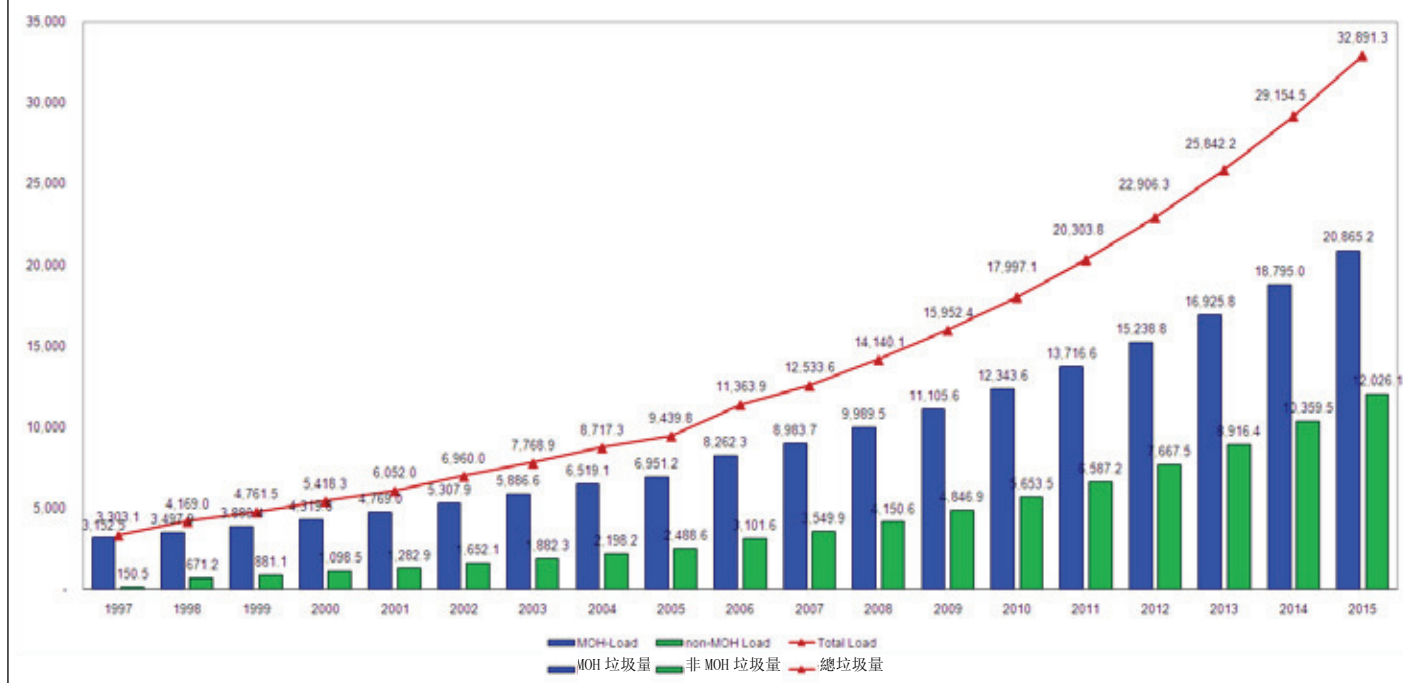


Chart : Historical and Projected Growth in Domestic Clinical Waste in Metric Tonnes (1997 to 2015). Source : Department of Environment and Ministry of Health, Malaysia

圖表：國內醫療垃圾過往及預計增速（1997-2015 年，單位公噸）。資料來源：馬來西亞衛生部及環境署

annual basis as they refocus and upgrade operating activities.

醫療垃圾的產生量與醫療服務的規模和發展密切相關。馬來西亞醫療機構的數量急速上升，醫院在調整和升級經營業務的同時每年都在增加新服務，改變舊程序。

Between 2006 to 2008, a total of 3 new government hospitals and 10 new private hospitals opened to the public and several others underwent expansions, increasing the number of treatment beds in the country by 2,525. In 2009, the Malaysian healthcare system comprised of 352 hospitals; 9,386 clinics; 3,635 dental clinics; hundreds of diagnostic, research, transfusion, and haemodialysis centres, as well as several maternity & nursing homes.

2006 至 2008 年間，共有三間新政府醫院和十間新私家醫院向公眾開放，還有若干醫院完成了擴建，國內新增床位 2,525 張。2009 年，馬來西亞醫療系統共有醫院 352 間，診所 9,386 間，牙科診所 3,635 間，診療，研究，輸血，血液透析中心幾百間，以及產科醫院和療養院若干。

Future outlook of clinical waste generation in Malaysia

馬來西亞醫療垃圾產量前景展望

In 2009, hospitals and health centers across the country produced 15,953 tons of clinical waste, almost three times the total load generated in 2000. The threefold increase in clinical waste production has been attributed to increase number of healthcare institutions, rise in number of hospital admissions and clinic visits, and higher usage of disposable clinical instruments. In the next 5 years, the growth of this industry is expected to remain strong with a CAGR of about 13%. The

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double-digit growth is the result of 3 main market drivers described below.

2009 年全國醫院及醫療中心產生醫療垃圾 15,953 噸，較 2000 年增長近三倍。增長如此之快的原因在於醫療機構數量增加，住院及就診人數提升，一次性醫療器具用量上升。未來五年該行業預計將以 13% 的複合年增長率飛速向前，而這主要得益於以下三大市場助力。

1. Growth in the Private Healthcare sector 私營醫療行業的發展

In 1980, there were only 1,171 private hospital beds in the country. By 2008, to meet demand, the number of treatment beds available at private healthcare providers grew to 11,689.

回望 1980 年，整個大馬私家醫院僅有 1,171 張床位。為滿足市場需求，2008 年私人醫療服務供應商的床位數達到了 11,689 張。

Medical Tourism further drives growth in with more than 400,000 foreign medical tourists having sought care in 2009. The most popular medical procedures include cosmetic surgeries, dental surgery, total hip replacement, cardiovascular, oncological treatments as well as organ transplants. In 2010, an estimated 519,000 medical tourists are expected to visit Malaysia.

2009 年有 400,000 餘名外國醫療遊客來馬，這更是起到推波助瀾的作用。熱門醫療項目包括整容，口腔整容，全髖關節置換，心血管疾病治療，腫瘤治療及器官移植。預計 2010 年馬來西亞將吸引 519,000 名醫療遊客入境。

A study conducted on a hospital waste incineration plant in the Northern part of Peninsula Malaysia found a positive correlation in hospital occupancy rate and the generation of waste. In 2002, the estimated rate of clinical waste generation varied between 0.3 and 0.8 kg per occupied bed per day. In 2006, the clinical waste originating from these facilities gathered from private hospitals accounted for 27 percent of the total clinical waste load, up from 20.3% in 2000.

一項針對北馬來西亞半島醫療垃圾焚燒廠的研究顯示，醫院入住率與垃圾產量成正比增長。2002 年，每張入住床位每天估計產生 0.3-0.8 千克的醫療垃圾。2006 年，這些企業收集自私家醫院的醫療垃圾在醫療垃圾總量中的佔比由 2000 年的 20.3% 升至 27%。

2. Pandemic of New Strains of Infectious Diseases 流行病新變種的大蔓延

The pandemic like the A (H1N1) influenza, the Bird flu and the Severe Acute



Respiratory Syndrome (SARS) outbreak have in the past intensified infection control activities in Malaysia. During such times, several changes are often made to clinical waste policies. For example, in the recent strategy to combat the spread of pandemic influenza, the Ministry of Health had outlined that any material that comes into contact with 'isolated patients' are to be handled as potentially infectious. At the same time, all disposable items and personal protective equipments like facial masks are to be regarded as clinical waste and to be disposed accordingly; resulting in an increase in the clinical waste volume generated.

之前甲流 (H1N1), 禽流感, 非典 (SARS) 等流行病的爆發迫使馬來西亞加強了感染控制。在此期間, 醫療垃圾制度也作出了不少改進。例如, 為防止流感肆虐, 衛生部出台新政規定, 凡「被隔離病人」接觸過的物品均應視作已被感染。此外, 所有一次性用品及口罩等個人防護裝備均應視作醫療垃圾, 須予銷毀。如此以來, 醫療垃圾怎能不增加。

3. Aging Malaysian Population

人口老齡化

It is estimated that by the year 2035 Malaysia will become an "old" nation with 10% of the total population being over 65 years of age. The growth of medical care facilities and retirement homes catering to both local and expatriates under the "Malaysia My Second Home (MM2H)" participants may also help to increase the load of clinical waste generated in the country. (Source: United Nations).

估計馬來西亞將在 2035 年邁入老齡化社會, 65 歲及以上人口將佔到總人口的 10%。為滿足本國民眾及「馬來西亞我的第二家園」計劃下移民的需求, 醫療機構及養老院數量必會上升, 進而推高國內醫療垃圾的產量。(資料來源: 聯合國)。



The elderly typically consume more healthcare services, and the care required by older people is more resource intense, and needs to be delivered in institutionalized settings. Hospitalisation is more common for the age range of 60 and above, and the tendency is that it is longer in duration, thus generating higher quantities of clinical waste.

一般而言, 長者需要更多的醫療服務, 而且所需醫療服務基本屬於資源緊張領域, 需要專門機構。花甲之年或者年逾花甲的長者住院頻率更高, 住院時間更長, 因此將產生更多醫療垃圾。

From ashes to 「焚燒成灰」之外

In 2009, several waste treatment facilities were already receiving clinical waste loads exceeding their design capacity. Frost & Sullivan estimates that the total load of clinical waste may reach 32,891 tonnes by 2020, registering an annual growth rate of 12.8 percent. Assuming zero-breakdown, and each incinerator is running with maximum load at 100% efficiency, 24 hours per day and 365 days per year, the country may only incinerate a total of 18,571 tonnes of clinical waste annually – significantly less than the total amount of waste projected for 2011!

2009 年, 不少垃圾處理廠接收的醫療垃圾已經超出了其設計處理量。Frost & Sullivan 預計 2020 年醫療垃圾總量將達 32,891 噸, 年增長率將達 12.8%。假設每座焚燒爐均以零故障, 最大效率的狀態滿

負荷運轉, 一天二十四小時全年無休, 全國每年僅可焚燒 18,571 噸醫療垃圾——遠低於 2011 年的預計垃圾總產量。

It is very likely that in coping with the immediate and the long-term need of the industry, concession companies may invest in building new incinerators or increase the capacity of their existing facilities in the near future. Although the burning of clinical waste in incinerators is a relatively easy method of disposal, it has major drawbacks that make it unattractive and uncommon.

考慮到該行業的眼前及長遠需求, 特許經營企業可能會在不久的將來投資新建焚燒爐或提高現有設施的處理量。焚燒當然是處理醫療垃圾的一個相對簡單的途徑, 不過它有不少缺點使其吸引力大打折扣, 或者不能大範圍推廣。

Incinerators also cause significant environmental damage. As one of the countries who signed the Stockholm Convention treaty on Persistent Organic Pollutants (POPs), Malaysia agreed to reduce the unintentional release of selected organic pollutants, the growing concern over the environmental toxicity of incinerators gave rise to greater use of greener non-incineration technologies. The new technologies that are being adopted around the world include autoclaving, hydroclaving, microwave sanitization, chemical disinfection and plasma pyrolysis.

焚燒還會造成嚴重的環境污染。作為《關於持久性有機污染物的斯德哥爾摩公約



(POPs)》的簽署國之一，馬來西亞同意減少某些有機污染物的非惡意排放。有關焚燒爐環境毒性的擔憂與日俱增，非焚燒綠色技術應運而生。目前世界上已被採用的替代技術有高壓消毒，hydroclaving 系統，微波消毒，化學消毒及等離子熱解。

The World Health Organization (WHO) suggests that incineration may be the interim solution for developing countries where alternative technologies are limited. In the long run, each country should scale-up their adoption of non-incineration technologies as the main method of clinical waste treatment.

世界衛生組織建議焚燒可作為替代技術條件受限的發展中國家的過渡性方案。但長期而言，各國應提高非焚燒技術的使用率，將其作為醫療垃圾的主要處理方式。

The availability of incineration plants in Malaysia may hamper the adoption of alternative technology as a means of waste disposal unless the authorities impose much more stringent policies. Additional challenges such as rising costs of supplies and decreasing efficiency make any new inventions and technologies very attractive to the industry. Examples include:

由於馬來西亞焚燒廠眾多，這可能會妨礙垃圾處理替代技術的推廣，除非當局出台更為嚴格的政策。供應成本上升，效率降低等問題亦讓該行業對新發明及新技術的需求顯得尤為迫切。新技術現列舉一二：

- SmartBins solutions (www.smartbin.com), where the clinical waste bins 'communicate' their fill level with the

waste management company via mobile phone and automatically have the host server to schedule pick-ups, SmartBins 解決方案 (www.smartbin.com), 醫療垃圾箱透過電話與垃圾處理公司「溝通」垃圾堆積水平，主伺服器將自動安排上門收集。

- MediVac (www.medivac.com.au) solutions, where traditional waste treatment process is cut in half with the sterilizing and shredding done on site in healthcare facilities using Envac Stationary Vacuum System, which reduces infection and injury rates among healthcare personnel by cutting down the needs of manual waste handling. MediVac 解決方案 ([www.medivac.com](http://www.medivac.com.au)), 從傳統垃圾處理程序的中間環節入手，直接在醫療機構以 Envac 固定真空系統完成消毒粉碎，免去了人工處理垃圾之役，降低了醫護人員感染受傷的機會。

- Sharps Disposal by Mail System (www.sharpsinc.com), a sealed, leak



and puncture resistant container that allows sharps and small quantity of clinical waste to be mailed to a disposal center via the postal service, may help companies to expand their client base to smaller clinical practice. Sharps 郵遞處理系統 (www.sharpsinc.com), 是將少量的尖銳醫療垃圾裝進一個防穿透的密封鉛製容器中，利用郵政服務寄給處理中心，這有助於公司將業務觸角延伸至規模較小的醫療機構。

- Additionally, companies could adopt waste-to-energy or waste-to-other useful materials technology where residues from incineration or other waste treatment methods are converted into either a electricity, or other materials like high performance concrete and helped them to gain extra revenue.

此外，還有一些公司採用垃圾發電，垃圾轉換其他材料的技術，對焚燒或其他垃圾處理法的殘留加以利用，或用來發電，或用來轉變為高性能水泥等其他材料，從而打開了一條創收之路。

Other clinical waste-related businesses like supplies, equipment, replacement parts vendors and equipment service specialists, together with technology and environment consulting companies, healthcare facilities architects and designers and many other indirectly related businesses are expected to grow in tandem with the annual clinical waste generation in the country.

供應，裝備，備件供應商及設備維護專家，連同技術和環保諮詢公司，醫療機構建築師和設計師等其他醫療垃圾相關業務，以及其他間接相關業務，均將隨國內醫療垃圾年產量的上升而獲得發展。**[AT]**

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