



THE ECONOMIC BUREAU

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JAPAN INTERNATIONAL  
COOPERATION AGENCY (JICA)

TOXIC CHEMICAL WASTE  
IN SAUDI ARABIA

A SECTOR PROFILE

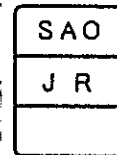
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Prepared By:

*The Economic Bureau  
Riyadh – Saudi Arabia*







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**June 1999**



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**Section 1**

**GENERAL DESCRIPTION**

**Section 1**  
**GENERAL DESCRIPTION**

**INTRODUCTION**

A hazardous material is any material that, because of its quality, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety if released into the home, workplace or the environment.

From industrial chemicals and toxic waste to household detergents and air fresheners, hazardous and toxic materials are becoming part of our everyday lives. Affecting urban, suburban, and rural areas, hazardous materials incidents can range from a major chemical spill on a highway or at a chemical plant to accidental spills, leaks, or releases of hazardous materials in our offices or homes, to groundwater contamination, etc.

These substances are hazardous because of their chemical, physical or biological nature and may pose a potential risk to life, health or property if they are improperly handled or released. Hazards exist during production, storage, transportation, use and disposal.

Chemical plants are one source of hazardous materials, but there are many others. The local service station stores gasoline and diesel fuel, and others store a wide range of hazardous toxic materials. Hazardous materials may also be found in offices, maintenance areas, storage areas and many other locations.

There are many hazardous materials other than industrial. Drain cleaners, solvents, pesticides, paints, motor oil, dyes and antifreeze are hazardous materials, which may be found at homes. In the office, furniture cleaners, paint, office cleaners, thinners such as rubber cement thinners and white-out thinners, white-out and even fluorescent bulbs may constitute hazardous materials. Thus, one



should use, store and dispose of all these materials as well as many others in a safe and proper manner.

Improper disposal of hazardous waste has caused many problems to both human health, safety and the environment. Pouring hazardous waste illegally into drains has caused damage to water treatment plants contaminating drinking water supplies. Improper storage, use and disposal of volatile materials has polluted the air with various hazardous materials, and, hence, has exposed people to many dangers.

Hazardous wastes may be liquid, solid, or gas, and are classified as toxic, corrosive, ignitable or reactive. These types are defined as follows:

- **Toxic** wastes may make human and animals sick.
- **Corrosive** wastes may eat through metal, leather, wood or cloth and do damage to the skin or eyes.
- **Ignitable** wastes may burst into flame.
- **Reactive** wastes may release heat or toxic materials or may explode under certain conditions.

One may not be able to identify a hazardous waste by sight alone as it may, in many cases, resemble harmless substances. However, the following materials or situations may constitute a potential for hazardous wastes:

- Piles of trash or containers.
- Substances leaking from tanks or barrels.
- Substances that smell bad.
- Bags or piles of powder or granulated material.
- Discolored water or other liquids.
- Substances found in boxes marked flammable, corrosive, or explosives.
- Substance found in containers marked with the traditional poison insignia – the skull and cross bones.

- Any group of unmarked containers such as plastic jugs or milk cartons empty and / or containing unknown substances.

## **HAZARDOUS WASTE IN SAUDI ARABIA**

Like many developing countries, rapid industrialization of the Kingdom has produced many hazardous wastes posing various risks to humans and the environment. However, the Kingdom is fortunate in that it recognized such environmental issues and concerns at the early stages of its industrial development. This resulted in establishment of agencies such as Meteorological and Environmental Protection Administration (MEPA), and the Royal Commission for Jubail and Yanbu. The main role of such agencies is to regulate industries in such a way which minimizes adverse environmental implications. The challenge facing the Kingdom is that industrialization has been occurring at a rapid pace, which has added to the difficulties of managing considerable amounts of hazardous wastes generated in the process.

Regulations in Saudi Arabia concerning transfer, transportation, treatment and disposal of hazardous wastes are in draft form and yet to be promulgated. There have been many instances of illegally disposing of toxic and hazardous wastes in illegal dumps in the desert. While developing the necessary regulations and mechanisms to enforce them are important, it is necessary to raise the level of public awareness of problems and dangers of hazardous wastes in general and of toxic chemical wastes in particular. This task is still at its very early stage in the Kingdom.

**Section 2**

**RESPONSIBLE AGENCIES**

## Section 2

### RESPONSIBLE AGENCIES

The “General Description” section shows that there are many economic and consumer sectors that generate toxic chemical wastes in various forms. This also implies that there are many agencies involved in and responsible for dealing with all the issues associated with hazardous wastes, including the toxic chemical ones. Following is a list of the most important agencies involved and a brief description of roles and responsibilities of each agency.

#### **THE MINISTRY OF INDUSTRY AND ELECTRICITY (MOIE)**

The **MOIE** issues some guidelines and directives, requiring all industrial establishments in all industrial cities and in other areas, particularly those chemical industries generating toxic chemical wastes, to adopt advanced and approved alternatives to dispose their wastes. However, implementation and follow-up mechanisms are not considered comprehensive or enforceable. One of the reasons for little implementation is that full enforcement of such measures may constitute a heavy burden for such industries and may make them less competitive internationally, especially that most of those industries are still in their infancy stages.

#### **THE MINISTRY OF HEALTH (MOH)**

As in the case of the **MOIE**, the **MOH** issues some guidelines and directives, requiring all hospitals, other medical institutions and agencies, having chemical laboratories, which generate toxic chemical wastes, to adopt advanced and approved alternatives to dispose of their wastes. Again, as in the case of **MOIE**, implementation and the follow-up mechanisms are not considered comprehensive or enforceable. One of the reasons for that is size of waste, which in many cases may be very small to the degree that it is undetected. This is especially true in the case of wastes which may be in a liquid form. Many of these institutions may dispose of a large part of their toxic chemical waste into sewers, with many such incidents passing unnoticed.

## **THE MINISTRY OF MUNICIPAL & RURAL AFFAIRS (MOMRA)**

While **MOMRA** does not directly oversee any activities, generating toxic chemical waste, it oversees all tasks of household waste management. This may include regular and hospital household waste. As more of the household consumer goods generate toxic chemical waste in one form or another, involvement of **MOMRA** in that matter has increased. However, there still is an absence of any form of well-developed program to regulate disposal of toxic wastes generated from households. There have been several efforts to inform people of the dangerous implications of disposing of household toxic chemical wastes in the regular household waste. However, this campaign has been very limited in scale, without any alternative mechanism, addressing separation of toxic waste from household waste and disposing it using appropriate means.

## **THE MINISTRY OF AGRICULTURE & WATER (MOAW)**

**MOAW** provides some directives and advisory brochures to farmers on issues of handling chemical pesticides in terms of types to be used and amounts used, storage of such pesticides, disposing of unwanted pesticides, and other waste, which may be considered chemically toxic.

## **OTHER AGENCIES**

Efforts of each of the agencies above is limited by a certain boundary of authority, and for a long time there was a lack of coordination between various programs of each organization. Several agencies such as **Al-Riyadh Development Authority (ADA)** in Riyadh and the **Royal Commission for Jubail and Yanbu** among others have realized such shortcomings. Realizing such shortcoming with concern about preserving a healthy environment, such agencies have developed selective programs, rules and regulations. The aim of these agencies has been to coordinate efforts of previous by-mentioned agencies in a comprehensive framework aimed at regulating all activities of collecting, dumping, and recycling a large amount of waste, especially the hazardous and toxic ones.

## **ENVIRONMENTAL AGENCIES INVOLVED**

Increasing interest in improving and preserving a healthy environment has led the government to establish the **Environmental Protection Coordination Commission (EPCC)** and the **Meteorology and Environmental Protection Administration (MEPA)** in 1981. Main tasks assigned to such agencies include conducting regular environmental surveys to identify any problems and developing necessary standards, measures and regulations to deal with such problems and other emergency situations. Their tasks also include formulation of environmental standards with specifications and pollution control measures for other authorities to enforce when issuing permits to certain ventures, specifically those where operations may have certain adverse environmental implications.

In 1989, the government established the **Ministerial Committee on the Environment (MCE)**. The **MCE** acts as the highest institutional authority establishing environmental strategies and policies at the national level. It also determines and portrays the government's views on environment at both national and international levels. However, this has not diminished the roles of the previous two agencies. **MEPA** acts as General Secretariat of **MCE** and continues to perform its tasks of managing daily operations, which may have certain environmental implications. Among its most critical tasks, **MEPA** assists **MOIE** in reviewing applications for establishing new industrial projects to insure that they conform to national environmental guidelines.

Thus, there is no special policy on handling toxic chemical waste issue at the national level, but rather, the issue is addressed implicitly through government policies on the environment. **The Royal Commission for Jubail and Yanbu** issued the first comprehensive regulation manual in the country, which is based on the U.S. Environmental Protection Agency guidelines. This manual provides all the necessary regulations for collecting, transporting, dumping and disposing of all types of wastes including hazardous ones. The section on "Administration and Regulations" of this document compiles from this manual all points on handling hazardous wastes including toxic chemical ones. While, the manual seems comprehensive, there has not been a comprehensive implementation policy at either national or local levels, and hence, there is no way, at the present time, to measure effectiveness of all existing policies, guidelines and regulations.

**Section 3**

**PRIVATE COMPANIES INVOLVED**

### Section 3

#### PRIVATE COMPANIES INVOLVED

The area of hazardous waste is not yet fully developed in the Kingdom. In the absence of strict and enforceable policies, there will no be voluntary efforts to deal with the subject. Adding political dimensions and sensitivities of the subject, this has discouraged many private companies from venturing in that area. However, the following companies are pioneers in that area and evidence shows that their operations in the field are expanding.

#### **SAUDI ENVIRONMENTAL PROJECTS COMPANY (SEPCO)**

The **Saudi Environmental Projects Company (SEPCO)** is a major company involved in handling hazardous waste in general and medical waste in particular. As a matter of fact **MEPA** certified **SEPCO** as the first, among very few companies so far, to handle medical and other toxic wastes. According to the Saudi Economic Survey (June 3, 1998), **SEPCO** has decided to raise its capital from SR 50 million to SR 115 million. The company started the operation of its Jeddah medical waste disposal facility in October of 1998. In light of the new capital expansion, **SEPCO** intends to establish nine centers to dispose of hazardous wastes at a cost of SR 100 million. The company will set three of these centers in Riyadh, Dammam and Madinah at a cost of SR 45 million. It will establish the other six centers in Qassim, Tabuk, Abha, Makkah and Taif at a cost of SR 55 million. Each of the proposed centers will handle a total of 24 tons of wastes per day.

**SEPCO** has introduced new technology to deal with hazardous wastes at the Jeddah medical waste treatment complex, which is considered the first to operate in the Middle East. The company uses advanced microwave incinerators, which does not release any gases as those released when using conventional incinerators. **SEPCO** has had a large number of contracts with various Saudi hospitals.



## **KAID AL INJAZ CO. FOR DESTRUCTION OF HAZARDOUS WASTES**

According to the Saudi Economic Survey (May 6, 1998), in 1998 two Saudi partners established **Kaid Al Injaz Co. For Destruction of Hazardous Waste** with a capital of SR 5 million, obtaining a license from MEPA to use the Enviroclean-500 system to get rid of medical waste. **Kaid Al Injaz Co.** is cooperating with a U.S. firm **IMCO**, manufacturer of the system. In May of 1998, **Kaid Al Injaz Co.** signed an agreement with the National Guard Health Directorate for disposal of medical waste at a cost of SR 300 million. The project aims at serving 250 hospitals and 2,500 medical centers and posts in private and public sectors all over the Kingdom. According to this accord, **Kaid Al Injaz Co.** will dispose of ordinary and hazardous medical wastes at health facilities via five centers in Riyadh, Jeddah, Dammam, Qassim and Hail. In the first stage of the project, which would last for one year, each facility would handle 24 tons of waste per day.

## **THE NATIONAL ENVIRONMENTAL PRESERVATION COMPANY (BEEA'H)**

**The National Environmental Preservation Company (BEEA'h)** opened its first hazardous waste management center in 1989. The site is located 27 kilometers west of the town of Jubail. The site is well suited for treatment and disposal of hazardous wastes as it is remote, has no agricultural value, supports no prime habitat, with no potential for flooding. The first stage of the plan, involved construction of six main components: Double lined secure landfill, Monofill. Environmental laboratory, Stabilization plant, Chemical treatment plant and Evaporation pond. The plant has a design capacity of 15,000 metric tons. By the end of 1992, the plant had received a total of 43,000 metric tons of hazardous wastes.

**BEEA's** hazardous waste management system involves a logical procedure of waste identification, reception and processing (**Figures 3-1 & 3-2**). In 1997, **BEEA'h** began operations at its new Hazardous Waste Incineration Facility in Madinat Al Jubail Al Sinaiyah. In this new site **BEEA'h** operates its Thermal Processing Unit for controlled destruction of selected organic hazardous wastes.

The overall incineration system employs proven state-of-the-art technology in the rotary kiln, afterburner, combustion gas cleaning and air pollution control system, with process instrumentation and control systems. Its design parameters for emissions outperforms that currently required to meet United States Environmental Protection Agency standards for hazardous waste generators fully complying with **Royal Commission** and **MEPA** environmental requirements.

**BEEA'h** facility includes a variety of unit processes and equipment needed to support efficient running of the thermal processing unit. These ancillary facilities include an Environmental Laboratory, Weighbridge, Drum and PCB Transformer & Capacitor Processing Systems, Chemical Treatment Plant, Tank Farm, Fire Protection System and Evaporation Pond. **BEEA'h** continuously monitors operation of its facility to insure that it meets or improves on standards for compliance with environmental guidelines.

#### **EL-SEIF DEVELOPMENT COMPANY**

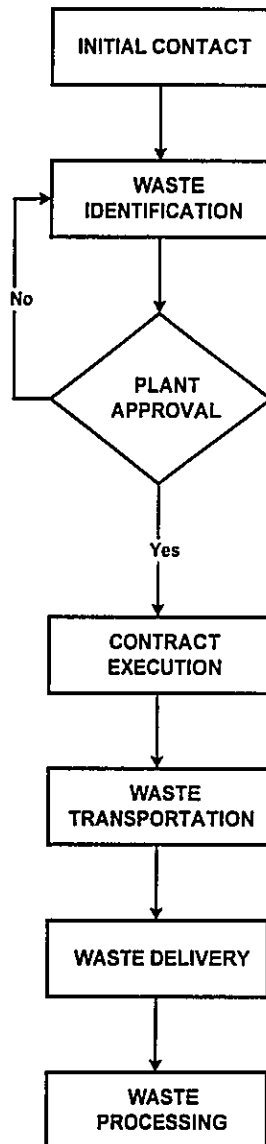
El-Seif Development Company sells equipment for treating medical and hazardous wastes. According to the Saudi Economic Survey (September 9, 1999), El-Seif Development Company had just concluded the first deal to sell to **SEPCO** a unit for treatment of medical waste using microwave technology produced by the US firm **Sanitec**. The Survey also mentioned that El-Seif Development Company was negotiating to sell 10 similar units valued at about \$10 million to Gulf and other Arab organizations.

**Figure (3-1)**  
**BEEA'h Waste Management System**

**CUSTOMER ACTIVITIES**

**BEEA'H ACTIVITIES**

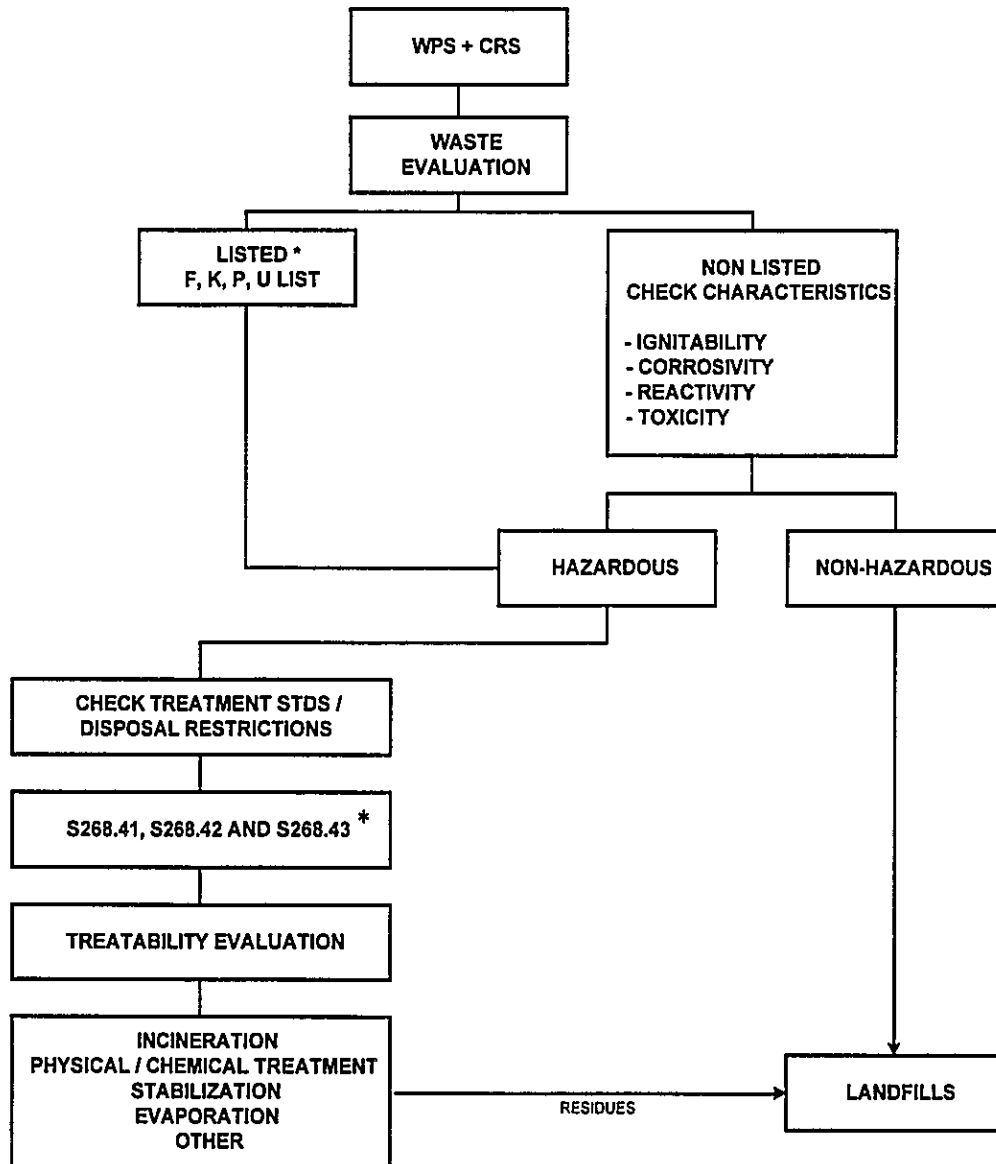
- \* Identify waste type & amount
  
- \* Complete Waste Policy Sheet (WPS) and take representative sample
- \* Submit WPS sample
  
- \* Review and approve services rates
- \* Complete Review Sheet (CRS)
  
- \* Obtain labels & manifest for transportation from BEEA'h
- \* Label containers and ensure that packaging is appropriate
- \* Send shipment notification
  
- \* Payment is made within 30 days of the invoice date



- \* Explains procedures
  
- \* Provide WPS and outline sample requirements
- \* Notify plant that waste sample has arrived for analysis
  
- \* Confirmed waste as material outlined on WPS
- \* Determine treatment methodology
  
- \* Provide Service rate quote
- \* Send contract to customer specifying price & conditions
  
- \* Schedule transportation to pick up waste
- \* Send waste pick up notification specifying price & conditions
  
- \* Weigh shipment
- \* Carry out cross check and finger print analysis
- \* Sign and return manifest
- \* Send invoice
  
- \* Issue waste destruction / disposal certificate

Source: BEEA'h Publications

**Figure (3-2)**  
**BEEA'h Waste Identification Procedure**  
**According to US EPA Regulations**



**\* Notes:**

- " F list " Hazardous wastes from non-specific sources
- " K list " Hazardous wastes from specific sources
- " P list " Acute hazardous wastes
- " U list " Toxic wastes

- S268.41 Treatment standards expressed as concentrations in waste extract
- S268.42 Treatment standards expressed as specific technologies
- S268.43 Treatment standards expressed as waste concentrations

Source: BEEA'h Publications

**Section 4**

**PRIORITY OF GOVERNMENT FOR  
PRIVATIZATION**

#### **Section 4**

#### **PRIORITY OF GOVERNMENT FOR PRIVATIZATION**

The government has encouraged the privatization of most sectors of the economy. However, the issue of the clean and healthy environment has taken a special place in the government's latest 5-year plan, which ends in the year 2000. While the plan does not detail various activities of the waste issue, it does mention issues of solid waste. The government has not provided any direct financial assistance to encourage the private sector to participate. However, the national government together with other regional and local organizations have focused on preparing some ongoing studies on the subject and on preparing a comprehensive guidelines and framework, aimed at laying the ground work for active participation of the private sector. Much evidence has shown that there is an increasing interest in the field.

**Section 5**

**DEGREE OF CURRENT ACTIVITY  
& RELATIVE GROWTH**

## Section 5

### DEGREE OF CURRENT ACTIVITY & RELATIVE GROWTH

Public statistics, available on the overall waste treatment market in Saudi Arabia, is very limited. General statistics (public or private) on size of the Saudi waste management market, the amount of users' expenditures or the industry's growth rate virtually do not exist when it comes to toxic waste management in particular. Similarly, there is neither breakdown of the amount of discharge of toxic wastes by kind nor are there statistics as to production and foreign trade of toxic waste control equipment. One of the reasons for shortage of such data may be due to the sensitive and political nature of the problem. Hence, many companies and municipalities may tend not to disclose information related to toxic waste treatment and disposal. Another important reason is that there has not been any industry association or professional society whose activities are solely involved with this relatively new market sector. Given this limitation, this section will review some of the data on size and relative growth of certain economic sectors, which are main generators of toxic chemical wastes in the Kingdom. This may help to assess the market size of toxic chemical wastes in the country.

### **VOLUME OF TOXIC WASTES**

According to the Saudi Economic Survey (Jan. 20, 1999), a Saudi generates 2.5 kilograms of waste on average per day. With an estimated current population of 20 million, total waste generated in the Kingdom is estimated at 18.25 million tons per year. This is equal to 4 percent of all waste generated in Japan, for instance. The Ministry of Municipal and Rural Affairs (MOMRA) estimated that only 1 percent of total wastes generated in the Kingdom is hazardous (Table 5-1). This puts total volume of hazardous waste in the Kingdom at about 0.2 million tons per year. The table also shows that about 45 percent of total waste is industrial, compared to about 90 percent in Japan.



Thus, hazardous waste issues in general, and toxic waste issues in particular may seem very small if compared with major industrial nations such as Japan and the USA. However, the major problem lies in absence of comprehensive policy and implementation programs to tackle such a growing problem, especially with government encouragement of expanding industrial and health care sectors, the main generators of most toxic wastes.

**Table (5-1)**  
**Wastes Types Generated in the Kingdom**

Waste Type	Percent of Total (%)	Quantity (million tons)
Industrial Waste	44.7	8.20
Household Waste	35.7	6.50
Commercial Waste	18.6	3.40
Hazardous Waste	1.0	0.18
Total Waste	100.0	18.25*

Source: The percentages are based on MOMRA figures.

\* This figure is based on an average of 2.5 kgms per person per day.

## **GROWTH OF THE INDUSTRIAL SECTOR**

**Table 5-2** shows the number of all licensed and producing factories in the Kingdom's thirteen regions over the period from 1988 to 1997. It is obvious that the industrial sector grew at an average annual rate of 6.4 percent, as the total number of factories increased from 1704 in 1988 to 2689 in 1997. Thus, one may assume that the waste that such factories generate also grew at that rate. **Table 5-3** shows the number of factories by industry type in the Kingdom in 1997, and it is obvious that number of factories in the Chemical Industries & Chemical Products group accounted for about 20 percent of total factories in the Kingdom.

## GROWTH OF THE HEALTH CARE SECTOR

The number of medical facilities in the Kingdom increased slightly during the 1992-96 period. Government hospitals, for example, increased from 174 in 1992 to 180 in 1996, with the total number of beds in such hospitals increasing from 26,974 to 27,058 over the same period (Table 5-4). Table 5-5 shows all the Kingdom's health resources in 1997. This Table shows that by 1997 there were a total of 303 hospitals with a capacity of 44,213 beds; 1,387 clinics; 3,178 pharmacies; 44 medical institutions and 13 medical colleges. The number of laboratory tests in all medical facilities in the Kingdom grew by about 18 percent over the 1992-96 period, increasing from 51 million in 1992 to 60 million in 1996. However, the number of radiology films declined slightly from 5.3 million in 1992 to almost 5 million in 1996, (Table 5-6). The General Director of Preventive Medicine at the MOH declared that all medical resources in the Kingdom generate about 107 tons of hazardous medical waste per year.

Table (5-2)

Number of Licensed and Producing Factories in the Kingdom's Regions (1988-97)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average Annual Growth Rate (%)
Riyadh	562	609	643	670	712	765	810	861	890	924	7.1
Al-Qaseem	70	75	79	80	85	91	96	101	105	113	6.8
Makkah	455	483	501	526	550	586	620	660	711	728	6.6
Al-Jouf	7	8	9	10	10	111	12	12	11	11	6.3
Gazan	18	20	20	21	21	22	22	224	224	28	6.2
Eastern	426	453	473	497	525	556	580	600	632	651	5.9
Aseer	39	39	40	41	42	46	50	50	53	58	5.4
Ha'il	15	17	18	20	20	21	21	22	22	22	5.2
Tabook	16	16	16	16	18	18	19	21	21	23	4.9
Al-Madinah	70	72	74	78	80	88	95	94	98	99	4.6
Al-Baha	9	9	10	10	11	11	11	11	11	12	3.7
Northern	4	4	4	4	4	5	5	5	5	5	2.8
Nagran	13	13	13	13	13	14	14	15	15	15	1.7
<b>Total</b>	<b>1704</b>	<b>1818</b>	<b>1900</b>	<b>1986</b>	<b>2091</b>	<b>2334</b>	<b>2355</b>	<b>2676</b>	<b>2798</b>	<b>2689</b>	<b>6.4</b>

Source: Ministry of Industry & Electricity Annual Report 1998.

**Table (5-3)**  
**Number of Licensed and Producing Factories by Industry Types**  
**in the Kingdom's Regions (1997)**

	Riyadh	Al-Qaseem Makkah	Al-Madinah Eastern	Jazan	Nagran	Aseer	Al-Baha	Ha'il	Tabook	Northern	Al-Jouf	Total		
<b>Metal Products, Machinery &amp; Equipment</b>	287	30	201	10	186	3	2	10	0	5	2	1	0	737
<b>Chemical Industries &amp; Chemical Products</b>	153	18	146	17	157	2	3	5	1	1	8	1	3	515
<b>Building Materials, China, &amp; Glass</b>	166	21	92	23	116	14	9	33	5	5	4	3	2	493
<b>Food Industries</b>	117	29	135	25	83	7	1	8	2	7	8	0	4	426
<b>Paper Industries, Printing &amp; Publishing</b>	70	3	56	1	36	1	0	1	3	2	0	0	1	174
<b>Wood, Wood Products, &amp; Furniture</b>	51	5	27	6	33	0	0	1	0	2	0	0	0	125
<b>Textiles, Clothes, &amp; Leather</b>	51	4	34	10	21	0	0	0	0	0	0	0	1	121
<b>Other Various Industries</b>	23	2	26	4	10	0	0	0	0	0	0	0	0	65
<b>Transport &amp; Storage</b>	3	1	5	3	5	1	0	0	0	0	1	0	0	19
<b>Primary Metal Industries</b>	3	0	6	0	4	0	0	0	0	0	0	0	0	13
<b>Total</b>	924	113	728	99	651	28	15	58	11	22	23	5	11	2689

Source: Ministry of Industry & Electricity Annual Report 1998.

**Table (5-4)**  
**The Number of Government Hospitals & Beds in the Kingdom (1992-96)**

	1992		1993		1994		1995		1996	
	Hospitals	Beds	Hospitals	Beds	Hospitals	Beds	Hospitals	Beds	Hospitals	Beds
Riyadh	26	5063	26	5013	27	4829	27	4835	30	4929
Jeddah	11	2864	11	3022	12	3065	11	2894	11	2708
Al-Madinah	15	2035	15	2112	15	2112	15	2117	15	2102
Makkah	7	2037	7	2027	7	2027	7	2049	7	2038
Ta'if	9	2086	9	1854	9	1854	9	1968	10	1968
Aseer	17	2010	16	1942	16	1942	16	1923	16	1954
Al-Qaseem	15	1940	15	1928	15	1928	15	1932	15	1942
Eastern	13	1776	13	1792	13	1792	13	1792	13	1808
Jizan	12	1429	12	1393	12	1393	12	1401	12	1399
Al-Baha	8	1076	8	1073	8	1073	8	1077	8	1039
Al-Ahsa	5	726	5	726	5	726	5	739	5	947
Tabook	9	745	9	754	9	754	9	760	9	773
Nagran	5	619	5	615	5	615	5	625	5	620
Northern	4	576	4	576	4	576	4	579	4	589
Ha'il	7	568	7	576	7	576	7	576	7	584
Al-Jouf	4	520	4	502	4	502	4	502	4	502
Bishah	3	385	3	455	3	455	3	458	3	435
Qurayyat	3	248	3	248	3	248	3	274	3	278
Hafr Al-Baten	1	271	1	270	1	270	1	270	1	273
Qunfudah	0	0	0	0	0	0	2	184	2	170
<b>Total</b>	<b>174</b>	<b>26974</b>	<b>157</b>	<b>26878</b>	<b>173</b>	<b>26737</b>	<b>176</b>	<b>26955</b>	<b>180</b>	<b>27058</b>

Source: Ministry of Health Annual Report 1998.

**Table (5-5)**  
**Summary of Health Resources in the Kingdom in 1997**

	Ministry of Health	Other Government Organizations	Private Sector	Total
Nurses	34739	16447	10800	61986
Beds	27058	8970	8185	44213
Others Medical Assistants	19385	9302	6540	35227
Doctors	14717	6806	8891	30414
Pharmacists	746	766	3782	5294
Pharmacies			3178	3178
Medical Centers	1737			1737
Private Clinics			776	776
Multi-Purpose Clinics			611	611
Hospitals	180	39	84	303
Medical Institutions	44			44
Medical Colleges	13			13
Bed / 1000	1.44			
Doctor / 1000	7.8			

Source: Ministry of Health Annual Report 1998.

**Table (5-6)**  
**The Number of Laboratory Tests & Radiology Films in the Kingdom (1992-96)**

	1992	1993	1994	1995	1996
Laboratory Tests	51,188,591	55,299,288	55,730,990	57,856,109	60,274,205
Number of Radiology Films	5,342,175	5,632,981	5,524,424	5,283,355	4,975,581

Source: Ministry of Health Annual Report 1998.

## RECYCLING

There has been some efforts to recycle some toxic chemical waste items such as lead and motor oil. So far, there is only one factory, the National Company for Forging Lead Ltd. in Dammam, which recycles lead obtained mainly from used car batteries. This factory recycles about 25,000 tons of lead per year.

**Table 5-7** lists all the factories, which recycle motor oil in the Kingdom.

**Table (5-7)**  
**Factories that are Licensed and Recycle Motor Oil in the Kingdom**

Factory Name	City	Industrial Production	Annual Production (tons)	Capital (million SR)	Number of Workers
The United Company for Greeting Oils BOTICO	Jeddah	Recycled Motor Oil	45,000	98.3	51
Nasco factory for Recycling Oil	Dammam	Recycled Motor Oil	30,000	18	38
Nora Factory for Recycling Motor Oil	Dammam	Recycled Motor Oil	30,000	18.4	36
The Saudi Factory for Recycling Motor Oil	Al-Jubail	Recycled Motor Oil	25,000	14.2	38
Al-Manar Factory for Motor Oil	Jeddah	Recycled Motor Oil	25,000	54	70
Tam Factory for Motor Oil	Riyadh	Recycled Motor Oil Metal Grease	20,000 2,000	17	46
Company for Treating Used Motor Oils	Jeddah	Recycled Motor Oil	15,000	29.6	43
The Saudi Factory for Purifying Motor Oil	Jeddah	Recycled Motor Oil	14,000	210	50

**Section 6**

**REGULATIONS & ADMINISTRATIVE SYSTEM**

**Section 6**  
**REGULATIONS & ADMINISTRATIVE SYSTEM**

This Section compiles regulations and guidelines pertaining to managing hazardous and toxic chemical wastes from the Royal Commission's document "Environmental Regulations Consultations Document".

**1. HAZARDOUS MATERIALS CLASSIFICATION**

A hazardous material is defined as any material in a quantity or concentration, which if improperly managed, may pose a hazard to human health or the environment. Hazardous materials may be solids, semi solids, liquids or gases and include hazardous wastes. The classification of hazardous materials include materials with the following characteristics:

**1.1 Ignitable:** A material is considered ignitable if a representative sample of the material has any of the following properties:

- It is a liquid, or other than an aqueous solution which:
  1. Contains less than 24% alcohol by volume; and
  2. Has a flash point less than 60 degrees centigrade
- It is not a liquid, and is capable under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes, and when ignited, burns so vigorously and persistently that it creates a hazard.
- It is an ignitable compressed gas.
- It is an oxidizer that;
  1. Causes or contributes to combustion of other material by yielding oxygen or other oxidizing substances, whether or not the substance is itself combustible, or
  2. Is an organic compound that contains the bivalent "O-O" structure.



- 1.2. Corrosive:** A material is considered corrosive if a representative sample of the material has either of the following properties:
- It is aqueous and / or its aqueous solution has a pH less than 2 or greater than or equal to 12.5.
  - It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm per year at a test temperature of 55 degrees centigrade.
- 1.3. Reactive:** A material is considered reactive if a representative sample of the material has either of the following properties:
- It is normally unstable and readily undergoes violent change without detonating.
  - It reacts violently with water.
  - It forms a potentially explosive mixture with water.
  - When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
  - It is a cyanide or sulfide bearing material which, when exposed to pH between 2 and 12.5 can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
  - It is capable of detonation, explosive decomposition or reaction at standard temperature or pressure.
- 1.4. Toxic:** A material is considered toxic if it contains contaminant concentrations at levels which, based on available human, animal or botanic toxicity testing data, may be harmful to human health or the environment.
- 1.5. Radioactive:** Radioactive materials are any materials, which spontaneously emit either alpha particles, beta particles, gamma or X-rays, neutrons and or other atomic particles, at or above natural background levels.

- 1.6. **Biohazard:** Biohazard materials are those materials, which contain biological materials that are capable of causing harm to human health or the environment. Included in the classification of biohazard materials are etiologic materials, which are capable of harboring or transmitting disease. Also included in the classification of biohazard materials are materials which contain plants, animals, or other organisms that would cause harmful effects if released into the environment.

## 2. HAZARDOUS MATERIALS INVENTORY REGULATIONS

- 2.1 The owner or operator of a facility shall retain on file current Material Safety Data Sheet (MSDS) information, for all hazardous materials present at the facility.
- 2.2 The owner or operator of a facility shall develop and maintain an inventory of materials or mixtures of hazardous materials stored or transferred from the facility in quantities greater than 5000 kg. The inventory shall summarize the following information for each hazardous material present at the facility.
- The chemical and trade name of the hazardous material.
  - Physical form of the material.
  - Storage quantity (annual average and maximum values).
  - Concentration of the hazardous components of the hazardous materials.
  - Associated hazard classification.
  - Annual throughput quantity of the hazardous material.
- 2.3 The owner or operator of a facility shall develop and maintain an inventory of any equipment, which contains PCBs in a concentration greater than 50 ppm, except for small electrical devices containing less than 500 grams of

PCB containing material. The inventory shall at a minimum include the following information for each piece of PCB containing equipment:

- A description including manufacturer, model number and serial number.
- Location of equipment (this may be keyed to a facility map).
- Concentration of PCBs in the equipment.
- Quantity of PCB containing material in the equipment.

2.4 The owner or operator of a facility shall provide an annual report on the hazardous materials inventory summarizing information as identified in the previous two points for the preceding calendar year.

2.5 The material is exempt from reporting requirements of the previous section if a hazardous material is present in a mixture of materials and the hazardous material is in a concentration below 1.0% of the mixture or 0.1% in the case of a carcinogen.

### **3. HAZARDOUS MATERIALS STORAGE & HANDLING REGULATIONS**

3.1 Container storage tanks, storage areas and impervious barriers used to contain or store hazardous materials shall be designed and constructed with suitable materials to permanently contain the hazardous materials.

3.2 All containers used to hold hazardous materials shall be kept closed at all times except when adding or removing materials from the containers.

3.4 An empty hazardous material container shall not be used for containing a different material unless the empty container has been properly decontaminated.

- 3.4 Covered and well-ventilated storage areas shall be used to store drums or containers containing volatile substances.
- 3.5 Access to a hazardous material shall not be placed in common containment areas or in the same containers.
- 3.6 Hazardous liquids or sludges stored in fixed storage tanks, drums, or other moveable containers shall be provided with secondary containment. The secondary containment shall be impervious to the hazardous material being stored and shall be provided by:
1. An outer shell or multiple-wall tank, where the volume of secondary containment shall be at least 100% of the volume held in the primary container, or
  2. A bund or berm where the volume of the secondary containment shall be greater of either 10% of the total volume of hazardous material storage within the containment area plus water accumulation from a 25-year, 24-hour storm event; or 110% of the volume of the largest tank within the containment area plus water accumulation from a 25-year, 24-hour storm.
- 3.7 All valves, fittings and other appurtenances associated with hazardous materials storage shall be located within secondary containment.
- 3.8 Solid hazardous materials stored in sacks, stockpiles, drum or other containers shall be stored, loaded and unloaded in impervious areas equipped with dikes, bunds, curbs and collection systems as necessary to retain spillage, leaks, leachate and precipitation. The containment system shall be of sufficient size to retain accumulation from a once in 25-year, 24-hour storm.

- 3.9 The owner or operator of a facility shall cover hazardous material stockpiles to control wind dispersion of the material.
- 3.10 Hazardous materials stored in drums or other moveable storage containers shall be stored in such a manner that all drums and containers are readily accessible for inspection and removal. Drums shall be stacked on pallets or skids, no more than (2) drums high, with rows of drums being separated by sufficient aisle spacing to allow inspection and movement of the drums or containers.
- 3.11 Stored hazardous materials shall be labeled. The labeling shall at a minimum include the following information:
- The type of material being stored; and
  - Identification of the hazard classification of the stored material in accordance with the U.S. National Fire Protection Association standard No. 704
- 3.12 Surface impoundment shall not be used to store volatile, ignitable or reactive hazardous materials.
- 3.13 The owner or operator of a facility may utilize surface impoundment to store hazardous liquid materials providing the following apply:
- Approval is obtained from the Royal Commission.
  - Impoundments are lined with a compatible impervious material.
  - The liner systems shall be provided with a leak detection system capable of detecting a release from the surface impoundment.
  - No volatile, ignitable, reactive or odorous wastewater or sludge shall be present.
  - Incompatible materials are not placed in the same impoundment.
  - Surface water is diverted away from the impoundment.
  - The impoundment is securely fenced and signs placed to prevent unauthorized access.

- Adequate freeboard capacity is present to retain a once in 25-year, 24-hour storm.
  - Sludged and residues are removed to appropriate waste disposal facilities before closure.
  - The surface impoundment shall be equipped with leakage detection systems and surrounded with groundwater monitoring boreholes spaced at a minimum of 50 meters apart.
- 3.14 Any radioactive or biohazard materials shall be managed in such a manner which shall minimize to the fullest extent possible the potential for harm to human health or the environment.
- 3.15 All owners and operators of facilities storing and handling hazardous materials shall prepare and implement a contingency plan to address emergencies involving those hazardous materials. At a minimum the contingency plan shall:
- Identify realistic and probable accident, spill or emergency scenarios.
  - Identify arrangements with local authorities for emergency services.
  - Identify safety, control and alarm equipment associated with the storage, transport or disposal of hazardous materials.
  - Identify responsible individuals and roles for the facility emergency response team, contact personnel and arrangements with security, fire and hospital officials.
  - Identify responsible individuals for coordination with external emergency services.
  - Have procedures for initial and annual update training to address plant emergencies.
  - Have procedures for inspection and maintenance of emergency and spill control equipment.
  - Have provisions for review and update for the contingency plan.

- 3.16 The owner and operator of a facility shall develop and follow a written schedule for inspecting all hazardous material storage areas and associated monitoring, safety and emergency equipment. The schedule of inspection shall address the type of potential problems, which are associated with the type of hazardous material storage and associated equipment.
- 3.17 All owners and operators of facilities storing and handling hazardous materials shall immediately notify the Royal Commission of any emergency involving the hazardous materials stored at the facility, consistent with section 8.2 of these regulations.

#### **4. HAZARDOUS MATERIAL TRANSPORTATION REGULATIONS**

- 4.1 The owner and operator of a facility transferring hazardous materials within Madinat Al-Jubail Al-Sinaiyah shall be responsible for safe transfer of hazardous materials.
- 4.2 The owner and operator of a facility receiving hazardous materials from outside Madinat Al-Jubail Al-Sinaiyah shall be responsible for safe transportation and delivery of hazardous materials within Madinat Al-Jubail Al-Sinaiyah.
- 4.3 All vehicles and containers used to transport hazardous materials shall be constructed, operated and maintained such that release of liquids, litter, dust, solids or odor are prevented while in transit.
- 4.4 The owner and operator of a facility transporting hazardous materials in Madinat Al-Jubail Al-Sinaiyah shall clearly identify, label and placard hazard classification of material being transported in accordance with the United Nations chemical hazard classification system for transport of dangerous goods.

- 4.5 Containers of hazardous materials shall be secured during transport to prevent movement or dislodgment under normal operating conditions.
- 4.6 The transporter shall notify the facility owner and operator and the Royal Commission Industrial Security Department (ISD) immediately in the event of an accident, spill or discharge involving hazardous materials. The driver of the transit vehicle shall report the following information to the Royal Commission ISD:
- Spill / accident location.
  - Estimated amount of hazardous substance released.
  - Type and class hazardous substance released.
  - Cause of the release.
  - Transporters company name.
  - Type and degree of injuries (if any).
- 4.7 In the event of an accident, spill or discharge involving hazardous material in transient Madinat Al-Jubail Al-Sinaiyah, and if integrity of containers has not been comprised, transfer of hazardous material to another qualified transport vehicle for delivery to the designated receiving facility is permitted subject to approval by the Royal Commission or Civil Defense representatives. Any transfer shall be documented on the accident report filed with the Royal Commission.
- 4.8 In the event of an accident, spill or discharge involving hazardous material in transient, and where integrity of the container(s) has been compromised, transfer of hazardous material shall be permitted if collection methods and containers compatible with the hazardous material being collected are used.
- 4.9 The transporter and generator of hazardous material shall be responsible for any costs associated with cleanup and proper disposal of hazardous



materials released following an accident, spill or discharge involving hazardous materials waste in transit.

## **5. UNDERGROUND STORAGE TANK REGULATIONS**

5.1 An underground storage tank (UST) is defined as any one tank or combination of tanks, inclusive of underground piping connected to such tanks and any associated containment system, that is used to contain hazardous materials, and volume of which, inclusive of connected underground piping volume, is 10% or more beneath surface of the ground.

5.2 The underground storage tank regulations apply to all owners and operators of UST's except as provided below:

- Any wastewater treatment tank system that is part of a wastewater treatment facility.
- Oil sumps.
- A septic tank.
- Pipeline system carrying single use feedstock for process or other use.
- Surface impoundment, pit, pond, or lagoon.
- Stormwater or wastewater collection system.
- Liquid traps or associated gathering lines directly related to oil or gas production operations.
- Flow through process tank.
- Any UST system with capacity of 2000 liters or less.
- Any emergency spill or overflow containment system that is emptied immediately after use.

5.3 No person, facility, or commercial enterprise shall install a UST system, for the purposes of storing a hazardous material after January 1, 1998, unless the UST system is provided at a minimum with the following:

- Leak detection, and/or;
  - Secondary containment provisions in accordance with section 4.3.7 of these Regulations.
  - Corrosion protection.
  - Overfill and overspill protection.
- 5.4 Owners and operators of facilities with existing UST systems shall perform tank tightness testing within one year from date of these Regulations, and a minimum of once every three years thereafter. Such tightness testing shall include the entire tank system as defined in section 5.5.1 of these Regulations, and shall be capable of detecting a leak of 12.5 ml/min. or greater, from the UST system.
- 5.5 Owners and operators of facilities with existing UST systems provide a method or combination of methods of release detection that can detect a release from any portion of the tank and connected underground piping that routinely contains product. The leak detection system shall be installed, calibrated, operated and maintained in accordance with manufacturer's instructions, including routine maintenance and service checks for operability.
- 5.6 Owners and operators of facilities with an existing UST system that cannot apply a method of release detection or containment in accordance with section 5.5 of these Regulations shall remove the tank and complete closure following procedures approved by the Royal Commission.
- 5.7 At least thirty days before permanently closing a UST or removing it from service, owners and operators shall notify the Royal Commission of their intent to permanently close the system and the methods or procedures to be used to close or remove the system from service.

Mixing of Group-A materials with those identified Group-B materials may produce the noted hazardous reactions resulting in unsafe or unhealthy conditions.

**Table (6-1)**  
**Potentially Incompatible Materials**

<b>Group I: Potential Consequences: Heat Generation, Violent Reaction</b>	
<b>Group I-A</b>	<b>Group I-B</b>
Acetylene sludge	Acid Sludge
Alkaline caustic liquids	Acid & water
Alkaline cleaner	Battery acid
Alkaline corrosive liquids	Chemical cleaners
Alkaline corrosive battery fluid	Electrolyte acid
Caustic wastewater	Etching acid or liquid or solvent
Lime sludge; other corrosive alkalis	Pickling liquor; other corrosive acids
Lime wastewater	Spent acid
Lime and water	Spent mixed Acid
Spent caustic	Spent sulphuric acid

<b>Group II: Potential Consequences: Release of Toxic Substances in Case of Fire or Explosion</b>	
<b>Group II-A</b>	<b>Group II-B</b>
Asbestos waste, other toxic waste	Cleaning solvents
Beryllium wastes	Data processing liquid
Unrinsed pesticide containers	Obsolete explosives
Waste pesticides	Refinery or petroleum waste
	Retrograde explosives
	Solvents
	Waste Oil; other flammable and explosive wastes

<b>Group III: Potential Consequences: Fire or Explosion; Generation of Flammable Hydrogen Gas</b>	
<b>Group III-A</b>	<b>Group III-B</b>
Aluminum Beryllium Calcium Lithium Magnesium Potassium Sodium Zin powder; other reactive metals and metal hydrides	Any waste in Group I-A or I-B

<b>Group IV: Potential Consequences: Fire Explosion or Heat Generation; Generation of Flammable or Toxic Gas</b>	
<b>Group IV-A</b>	<b>Group IV-B</b>
Alcohols Water	Any concentrated waste in Group I-A / I-B Calcium Lithium Metal Hydrides Sodium SO <sub>2</sub> Cl <sub>2</sub> ; SOCl <sub>2</sub> ; PCI <sub>2</sub> ; CH <sub>2</sub> SICI <sub>2</sub> and other water reactive wastes

<b>Group V: Potential Consequences: Fire, Explosion or Violent Reaction</b>	
<b>Group V-A</b>	<b>Group V-B</b>
Alcohols Aldehydes Halogenated hydrocarbons Nitrated hydrocarbons and other reactive organic compounds and solvents Unsaturated hydrocarbons	Concentrated Group I-A / I-B wastes or Group III-A wastes

<b>Group VI: Potential Consequences: Generation of Toxic Hydrogen Cyanides or Hydrogen Sulphide Gas</b>	
<b>Group VI-A</b>	<b>Group VI-B</b>
Spent cyanide and sulphide solutions	Group I-B wastes

<b>Group VII: Potential Consequences: Fire, Explosion or Violent Reaction</b>	
<b>Group VII-A</b>	<b>Group VII-B</b>
Chlorates Chlorine Chlorites Chromic acid Hydrochlorites Nitrates Perchlorates Permanganates Peroxides Other strong oxidizers	Acetic acid; other organic acids  Concentrated mineral acids Group II-B wastes Group III-A wastes Group V-A wastes and other flammable and combustible wastes

**Table (6-2)**  
**Underground Storage Tank Regulations**  
**Schedule for Existing Tank Upgrade**

Year Tank System was Installed	Year when release Detection is Required (by Dec. 31 of the Year indicated)
Before 1975	1997
1976-1980	1999
1981-1985	2001
1986-1990	2004
1991-1996	2005

**6. HAZARDOUS WASTE TREATMENT AND DISPOSAL REGULATIONS**

- 6.1 All hazardous wastes generated within Yanbu shall be disposed of at the Royal Commission approved hazardous waste disposal facilities or hazardous waste treatment facilities located in Yanbu within ninety (90) days of waste being generated, unless otherwise approved by the Royal Commission.
  
- 6.2 The generator of waste shall always be responsible for storage, treatment and safe disposal of its waste. Any waste found to be disposed of illegally should be retrieved by the generator and disposed of at the generators cost in accordance with these regulations.
  
- 6.3 Operators of hazardous waste disposal facilities shall follow standards for selection of the most appropriate hazardous waste pretreatment and disposal techniques for hazardous waste in their control in accordance with

Regulations, methodologies and techniques established by the U.S. EPA in Title 40 CFR Parts 264, 266 and 270.

6.4 The following hazardous wastes shall be pretreated before final disposal to a landfill is allowed:

- Ignitable wastes with properties as defined in section 1.1.
- Corrosive wastes with properties as defined in section 1.2.
- Toxic wastes with properties as defined in section 1.4 if after application of the test method 1311 Toxicity Characteristics Leaching Procedure (TCLP), as established in U.S. Title 40 CFR 261, Appendix II, the extract from the waste contains contaminant concentration(s) equal to or in excess of those listed 5-A.
- Radioactive wastes except low activity reagents used for medical diagnostic purposes (e.g., C14 containing culture media) or domestic products containing low activity radioactive sources (e.g. smoke detectors).
- Biohazard wastes with properties as defined in section 1.6.
- Sludge that is not dewatered to the maximum extent economically feasible.
- Containers holding free liquids, unless;
  1. All free standing non-hazardous liquid; has been removed by decanting or other method, or are mixed with absorbent, or solidified, or otherwise eliminated.
  2. The container is very small, such as an ampoule.
  3. The container is designed to hold free liquids for use other than storage such as a battery or capacitor.

6.5 The owner or operator of a hazardous waste treatment or disposal facility shall develop and follow a written schedule for inspecting all waste storage and treatment areas with associated monitoring, safety and emergency equipment. The schedule of inspection shall address the type of problems,

which are to be expected associated with elements of storage areas and associated equipment.

6.6 Small containers of hazardous waste in overpacked drums (laboratory packs) may be placed in a landfill without pretreatment if the following requirements are met:

- The waste shall be packed in non-leaking inside containers, which are of a material that will not react dangerously with, be decomposed by or ignited by the waste.
- The containers shall be tightly sealed and overpacked in a compatible drum.
- The drum shall be provided with sufficient quantity of absorbent material to completely absorb all the liquid contents of the inside containers.
- The absorbent material used shall be of a material that will not react dangerously with, be decomposed by or ignited by the waste.

6.7 When hazardous substances having different hazard classes are contained within the same packaging, or when two or more packages containing compatible substances are placed within the same container or overpack, the container label shall clearly identify each hazardous substance contained therein.

6.8 Landfill disposal of hazardous wastes shall only take place at a Class I disposal site which has, as a minimum the following characteristics:

- Hazardous waste is isolated from the ground or groundwater by means of a double liner system.
- Surface water runoff is prevented from entering the fill site.
- Leachate and runoff water from the fill sites are collected and treated before being allowed to leave the boundary limits of the fill area. The treated leachate / runoff effluent shall meet the relevant



water quality criteria provided in Section 3, dependent upon final point of discharge.

- The disposal site has impermeable and stable foundations and embankments.
- The site is fenced and designated as off limits to the public.
- Each landfill cell is equipped with leachate monitoring wells.
- The site is surrounded with groundwater monitoring wells located at no more than 50 m intervals.

6.9 All Class 1 landfill sites shall be operated such that:

- Wastes deposited in the landfill are compatible with the landfill liner.
- Only physically, chemically and biologically compatible wastes are deposited in the same landfill cell.
- Adequate equipment is to be maintained on-site to control fire, dust and odor problems.
- Operating procedures including monitoring, safety and emergency procedures approved by the Royal Commission are followed.

6.10 Upon completion of Class I landfill cells, the cells shall be covered with an impermeable liner and stone mulched to prevent erosion.

6.11 Monitoring of groundwater around the Class I landfill shall be undertaken for 30 years after site closure according to a schedule approved by the Royal Commission.

6.12 The owner or operator of a facility generating hazardous waste shall be responsible for reporting once every ninety (90) days to the Royal Commission, the following information regarding the hazardous waste generated at their facility. This information shall include:

- Name of facility generating the waste.
- Description of the waste generated.

- Waste classification.
- Volume of waste generated of for the time period in question.
- Dates of disposal.

6.13 The owner or operator of a treatment or disposal facility shall be responsible for reporting once every ninety (90) days to the Royal Commission, the following information regarding the hazardous waste disposed of at their facility. This information shall include:

- Name of facility generating the waste.
- Description of the waste generated.
- Waste classification.
- Volume of waste generated of for the time period in question.
- Dates of disposal.
- Method of treatment and disposal for the waste streams.



