

MERCURY IN INDIA

# STANDARDS AND LEGISLATIONS

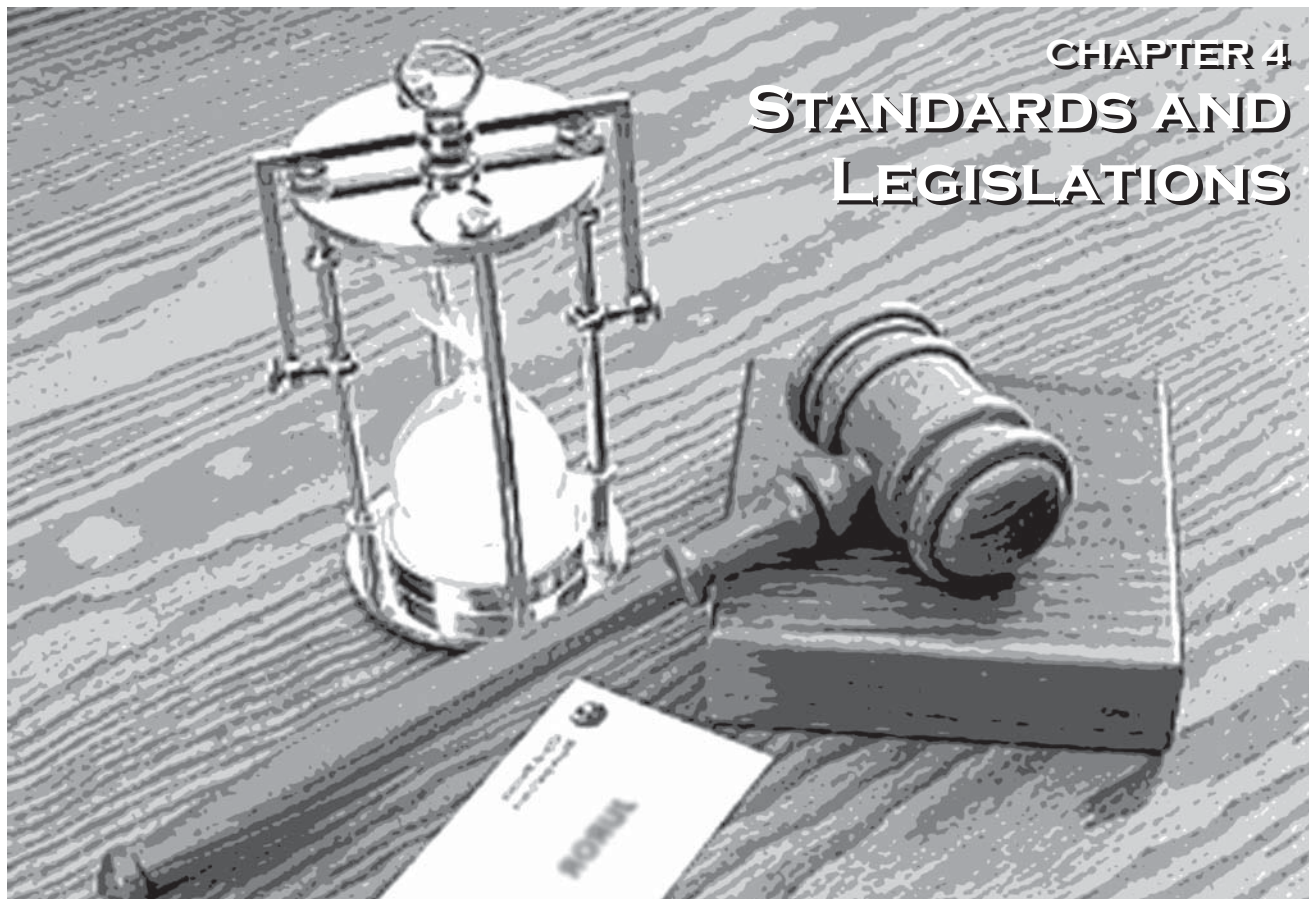


## MERCURY IN INDIA

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- ▶ In 1976, when the Parliament passed the 42<sup>nd</sup> Amendment to the Constitution, India became the first country in the world to provide protection and improvement of the environment in the Constitution itself.
- ▶ Mercury has been the focus of regulatory activity because of its documented toxic and carcinogenic effects, as well as its persistent prevalence in the environment.
- ▶ Comprehensive standards have been set for all the major industries which emit mercury, except coal-based thermal power plants. The government has not taken serious note regarding this aspect of mercury emission from thermal power plants, which emit tonnes of mercury in to the environment every year.
- ▶ India signed the Basel Convention on March 15, 1990 and ratified it on June 24, 1992. The Ministry of Environment and Forests has been designated as the competent authority in India under this Convention. As a party to the convention, it is obligatory for India to comply with the requirements of this convention for any trans-boundary movements of hazardous wastes, and it is obligatory, for all parties, to incorporate the provisions of this convention in their national legislation.
- ▶ The Central Pollution Control Board (CPCB) has developed National Standards for Effluents and Emission Standards under the statutory powers of the Water Act, 1974, and the Air Act, 1981. These standards have been approved and notified by the Government of India, Ministry of Environment and Forest, under Section 25 of the Environment Protection Act, 1986.
- ▶ The main problem of our standards and legislations lies in the poor level of implementation by the various implementing agencies.

## CHAPTER 4 STANDARDS AND LEGISLATIONS



In 1976, when the Parliament passed the 42nd Amendment to the Constitution, India became the first country in the world to provide protection and improvement of the environment in the Constitution itself. India is one of the top 20 industrialised countries in the world with 16 per cent of the world's population and 2.4 per cent of land area. Protection of the environment now forms an integral part of the nation's Constitution.<sup>32</sup>

Standards and legislation are the software for environmental pollution control. These are not a mere vision or an ideal in their intrinsic nature, but provide the administrative targets to be reached as common objectives of a diversity of measures, organised and pushed forward to prevent the contamination of environment.<sup>33</sup>

Mercury has been the focus of regulatory activity because of its documented toxic and carcinogenic effects, as well as its persistent prevalence in the environment. Since mercury is volatile and readily mobilised, and often travels great distances before being deposited, regulatory concern about the environmental impacts of mercury appear to be quite justified.

Legislative control of environmental pollution caused by toxic mercury and the protection of workers engaged in the related industries involves:

- ◆ Laying down a set of rules on the expert recommendations to control environmental pollution.
- ◆ Adopting international conventions and recommendations concerning the prevention of occupational risks.
- ◆ Observing the codes of practice and guides on prevention.

The Ministry for Environment and Forests is the focal point in the Government of India for all matters relating to the environment. As the nodal Ministry, its first and foremost responsibility is to ensure coordination with all other ministries that come into the picture.

### LEGISLATIONS

Legislation, defined as preparing a law or the exercise of making or giving of laws having the force of authority by virtue of their promulgation by an official organisation of a state or other organisation, is most necessary to meet the goal for protection of environment and human health. Many developed and developing countries have proper legislation in place to maintain environment quality.<sup>34</sup>

There are various Provisions and Acts pertaining to the prevention and control of pollution, and protection of the environment. In the 42nd Amendment to the

Constitution of India, under Article 48A, a provision that deals with the protection and improvement of our environment, reads: “The State shall endeavour to protect and improve the environment and safeguard the forest and wildlife of the country”. All the Acts have drawn immense inspiration from the proclamation adopted by the UN Conference on the Human Environment, which took place in Stockholm in 1972.

## ENVIRONMENTAL LEGISLATION

The various laws related to mercury in the environment are:

### The Water (Prevention and Control of Pollution) Act, 1974

Passed in 1974, this Act is a specialised legislative measure, meant to tackle one facet of environmental pollution. Its main objectives are to provide:

- i) The prevention, control and abatement of water pollution.
- ii) The establishment of central and state boards, to implement the above objective.
- iii) Conferring on such boards the power and assigning to such boards functions relating to that purpose.
- iv) All matters connected therewith.

The Act specifies areas affected by water pollu-

tion in the country and prohibits the use of streams or wells for disposal of polluting matter. It restricts new outlets and new discharges for discharge of sewage. The Act, however, does not provide effluent standards.

### The Water (Prevention and Control of Pollution) Rules, 1975

The Rules specify details of budget estimates on an annual basis.

#### Schedule IV

It gives rates of fees payable for reports conducted by the Central Water Laboratory.

VI. Test of Water, Sewage or Trade Effluent

(c) Heavy metals (qualitative test)

Mercury: Rs 24 (for each test)

### The Water (Prevention and Control of Pollution) Cess Act, 1978

The Act was primarily intended to levy and collect a cess for the purposes of the Water (Prevention and Control of Pollution) Act, 1974, and utilisation thereunder to make provision of adequate funds for the state boards for their efficient and effective functioning. The

(continued on page 65)

## SUMMARY OF LEGISLATION RELATED TO MERCURY

S No	Acts and Rules	Nature	Remarks
1.	The Water (Prevention and Control of Pollution) Act, 1974.	To provide for the prevention, control and abatement of water pollution; and the establishment of central and state boards to implement that objective.	It specifies areas affected by water pollution in the country and prohibits the use of streams or wells for disposal of polluting matter.
	i) The Water (Prevention and Control of Pollution) Rules, 1975.	Specifies details of budget estimates; and shows rates of fees payable for test of water, sewage or trade effluents.	Heavy metals (qualitative test). Mercury: Rs 24 (each test).
	ii) The Water (Prevention and Control of Pollution) Cess Act, 1978.	Primarily intended to levy and collect a cess for the purposes of the Water (Prevention and Control of Pollution) Act, 1974.	
	iii) The Water (Prevention and Control of Pollution) Cess Rules, 1978.	Specifies quantity of water consumed.	Specified quantity for mercury cell process of caustic soda production.

**SUMMARY OF LEGISLATION RELATED TO MERCURY (CONTINUED FROM PAGE 62)**

S No	Acts and Rules	Nature	Remarks
2.	The Environment Protection Act, 1986.	Provides for the protection and improvement of environment.	
	i) The Environment (Protection) Rules, 1986.	Formed to regulate environmental pollution, with power given to central and state boards.	Standards for emission, effluents given in the schedules. Limits to the pollutants given according to the industries. Mercury was included in the standards of all the major emitting industries, but there were no regulations or standards for thermal power plants emitting mercury in the air.
	ii) The Environment (Protection) 3rd Amendment Rules, 1993.	Structures of the Rules were the same.	Some more industries and standards were added to the rules. The amendments again missed out on mercury emissions from thermal power plants.
	iii) The Hazardous Wastes (Management and Handling) Rules, 1989.	Formed to regulate hazardous waste in the country.	Mercury included in the waste category.
	iv) The Hazardous Wastes (Management and Handling) Amendment Rules, 2000.	The amendments were made to specify the waste categories in detail.	Hazardous waste generating processes were taken into consideration.
	v) The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989.	Formed to regulate hazardous chemicals in the country.	Chemicals included according to the degree of toxicity. Several mercury compounds were included in the Rules.
	vi) The Manufacture, Storage and Import of Hazardous Chemicals (Amendment) Rules, 2000.	Specifies the degree of toxicity in greater detail.	Some more mercury compounds were included.
3.	The Basel Convention.	International convention to regulate the trans-boundary movement of hazardous waste.	Mercury was included in some categories of hazardous waste.

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**SUMMARY OF LEGISLATION RELATED TO MERCURY (CONTINUED FROM PAGE 63)**

S No	Acts and Rules	Nature	Remarks
4.	The Workmen's Compensation Act, 1923.	Provides for compensation payment by certain classes of employers to their workmen for compensation for personal injury by accident.	Diseases caused by mercury or its toxic compounds are included. However, all this becomes useless because generally mercury poisoning occurs after the retirement of the worker.
5.	The Factories Act [Act No. 63 of 1948] as amended by the Factories (Amendment) Act, 1987.	Covers all the aspects of health and safety of workers.	Permissible limits of exposure to mercury in the work environment.
6.	The Public Liability Insurance Act, 1991.	Provides for public liability insurance for the purpose of providing immediate relief to the person affected by accident.	The schedule provides reimbursement of medical expenses incurred.
	i) The Public Liability Insurance Rules, 1991.	Provides the list of chemicals with quantities for application of the Act.	Only one mercury compound is on the list.
7.	The Bureau of Indian Standards.	The BIS provides standards to maintain products' quality.	Mercury-related standards are present in the Indian Standards.
8.	The Prevention of Food Adulteration Act, 1955.	'Consumer legislation' to regulate and protect consumers from adulterated food.	The Act has limits to all categories.
9.	The Prevention of Food Adulteration Rules, 1955.	Lays down the standards of quality of various food articles.	Mercury and methyl mercury are included as poisonous metals.
10.	The Foreign Trade (Development and Regulation) Act, 1992, No 22 of 1992 (7th Aug 1992).	Regulates trade in the country.	Mercury and its compounds are included as 'free' to import and export.
11.	The Municipal Solid Wastes (Management and Handling) Rules, 2000.	Regulates municipal solid waste.	Standards set for mercury in ground water, composts and leachate.

(continued from page 62)

cess, as contemplated under the Act, is categorised into two groups: industrialists and local authorities.

**The Water (Prevention and Control of Pollution) Cess Rules, 1978**

The Rules specify the quantity of water consumed by industries.

WATER CONSUMED BY INDUSTRIES		
Name of Industry	Category	Maximum Quantity of Water
Chemical	a) Caustic soda i) Mercury cell process	5 cubic metres per tonne of caustic soda produced (excluding cooling water) and 5 cubic metres per tonne of caustic soda produced for cooling water.

**The Environment Protection Act, 1986**

The Bhopal Gas Tragedy in 1984 was an eye-opener for the Government of India; it made the government realise that the Water Act and the Air Act were not sufficient. Thus, an Act to provide for the protection and improvement of the environment and for related connected matters was deemed a priority.

This need was fulfilled by the decisions taken at the United Nations Conference on the Human Environment held in Stockholm in June 1972 (in which India participated) which laid down appropriate steps for the protection and improvement of the human environment.

It is considered necessary further to implement the decisions aforesaid as far as they relate to the protection and improvement of the environment and the prevention of the hazards to human beings, other living creatures, plants and property.

In this Act, powers were given to the central government to take measures to protect and improve the environment and rules were formed to regulate environmental pollution.

**The Environment (Protection) Rules, 1986**

The Rules were formed under the Environment Protection Act, 1986, to regulate environmental pollution. The central and state boards under the Water Act and the Air Act were given powers to regulate and lay down guidelines to implement the Rules. In Article 3 of the Rules, various Standards for emission, effluents or discharge of environmental pollutants are given in the schedules. Pollutants' limits are given according to the industries.

**The Environment (Protection) 3rd Amendment Rules, 1993**

In the Amendment, more standards were added to the Rules. More pollutants and more industries were also added to the Rules.

**HAZARDOUS WASTE**

**The Basel Convention**

The Basel Convention on the trans-boundary movement of hazardous wastes and their disposal came into force in May 1992. The Government of India is a party to the Basel Convention; it signed the convention on March 15, 1990, and ratified it on June 24, 1992. The Ministry for Environment and Forests has been designated as the competent authority in India under this Convention.

As a party to the convention, it is obligatory for India to comply with the requirements of this convention for any trans-boundary movement of hazardous wastes, and it is obligatory, for all parties, to incorporate the provisions of this convention in their national legislation.

The categories of waste to be controlled are specified. Mercury and mercury compounds are included in the category 'waste having as constituents'. (see table below.)

**The Hazardous Wastes (Management and Handling) Rules, 1989**

The Rules were designed under the Environment Protection Act, 1986, to regulate hazardous waste in the country. The central and state boards, under the Water Act and the Air Act, were given powers to regulate and guidelines to implement the rules. (see table on next page)

Y 29 MERCURY; MERCURY COMPOUNDS					
Basel no	OECD no	Desc of metal	Annex I	Annex III	Customs code
A 1		Metal and metal bearing wastes			
A 1010	AA 100	Mercury (see A 1030)	Y 29	6.1, 11, 12	Ex 2620.9

CATEGORIES OF HAZARDOUS WASTES		
Waste categories	Types of waste	Regulatory quantities
Waste category no 4	Mercury, arsenic, thallium and cadmium bearing wastes	5 kilograms per year the sum of the specified substance calculated as pure metal

### The Hazardous Wastes (Management and Handling) Amendment Rules, 2000

The Amendments were made in the Rules to specify the waste categories in detail. The processes generating hazardous wastes were also taken into consideration.

#### Schedule 1

Processes Generating Hazardous Wastes

2. Natural gas production.

2.1 Mercury-containing sludge.

2.2 Mercury-containing filter material.

13. Production of chlorine.

13.1 Asbestos containing discards by means of mercury.

13.2 Mercury bearing sludge diaphragm-electrolysis process.

#### Schedule 2

Limits have been prescribed for toxic constituents in the wastes, which will lead to their being classified as hazardous in the 2000 Amendments to the Hazardous Wastes Rules. Following are the prescribed limits, which could not be considered as acceptable limits:

*Class A: Concentration limit: 50 mg/kg*

#### A 6 Mercury and mercury compounds

Under the Environment (Protection) Rules, 1986, Rule 13 notifies the procedure for prohibition/restriction of hazardous substances. Following the procedures, prescribed notifications have been issued after expert consultations to prohibit/restrict hazardous chemicals/hazardous wastes. Following are the details of hazardous wastes banned for imports so far:

Based on the recommendation of the Mashelkar Committee, the Ministry for Environment and Forests has prohibited/restricted the import of the following wastes:

A. (i) Cyanide wastes.

(ii) Mercury and arsenic bearing wastes.

### The Hazardous Wastes (Management and Handling) Amendment Rules, 2003

Recently, there were amendments made to the existing rules. However, mercury related Rules remained unchanged.

### The Municipal Solid Waste (Management and Handling) Rules, 2000

The Rules were formed under the Environment Protection Act, 1986, to regulate the municipal solid waste in the country and every municipal authority shall, within the territorial area of the municipality, be responsible for the implementation of the provisions of these Rules. The Rules provide standards for mercury in the ground water, composts and the leachates, while the disposal of municipal solid waste as per the provisions of these Rules.

### The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989

The Rules were formed under the Environment Protection Act, 1986, to regulate hazardous chemicals in the country; The central and the state boards under the Water Act and the Air Act were given powers to regulate and guidelines to implement the Rules.

#### Schedule 1: Indicative Criteria and List of Chemicals

##### Part 1: Toxic Chemicals

Chemicals, which have the following values of acute toxicity and which, owing to their physical and chemical properties, are capable of producing major accident hazards: (see table below)

HAZARDOUS TOXICITY – I			
Degree of toxicity	Oral toxicity LD (50 mg/kg)	Dermal toxicity LD (50 mg/kg)	Inhalation toxicity LD (50 mg/kg)
Extremely toxic	1-50	1-200	0.1-0.5
Highly toxic	51-500	201-2000	0.5-2.0

##### Part 2: List of Hazardous and Toxic Chemicals (Mercury)

- ◆ Mercury alkyl
- ◆ Mercury fulminate
- ◆ Mercury methyl
- ◆ Methoxy ethyl mercuric acetate
- ◆ Phenyl mercury acetate



**The Manufacture, Storage and Import of Hazardous Chemicals (Amendment) Rules, 2000**

In the amended Rules the degree of toxicity was more specific. There was an increase in the number of hazardous chemicals.

*Schedule 1: Indicative Criteria and List of Chemicals*

*Part 1: Toxic Chemical*

Chemicals, which have the following values of acute toxicity and which, owing to their physical and chemical properties, are capable of producing major accident hazards (See table on next page, top left)

*Part 2: List of Hazardous and Toxic Chemicals (Mercury)*

- ◆ Mercuric chloride
- ◆ Mercuric oxide
- ◆ Mercury acetate

HAZARDOUS TOXICITY – II			
Degree of toxicity	Oral toxicity LD 50 (mg/kg)	Dermal toxicity LD 50 (mg/kg)	Inhalation toxicity LD 50 (mg/kg)
Extremely toxic	1-5	1-40	0.1-0.5
Highly toxic	5-50	40-200	0.5-2.0
Toxic	50-200	200-1,000	2-10

- ◆ Mercury fulminate
- ◆ Mercury methyl chloride
- ◆ Methoxy ethyl mercuric acetate
- ◆ Methyl mercuric di-cyanamide
- ◆ Phenyl mercury acetate

**OCCUPATIONAL HEALTH LEGISLATION**

**The Workmen’s Compensation Act, 1923**

This is an important social legislation, which provides for payment by certain classes of employers to their workmen for compensation for personal injury by accident. Out of 22 occupational diseases described in A-C of Schedule III of the Act, five pertain to metals and/or their compounds. They include poisoning by mercury and its compounds.

*Schedule III: List of Occupational Diseases*

*Part B*

LIST OF OCCUPATIONAL DISEASES		
S no	Occupational disease	Employment
2	Diseases caused by mercury or its toxic compounds	All work involving exposure to the risk concerned

The above Act sometimes becomes useless because mercury poisoning, as included in the Schedule, generally happens when a worker has already retired from the job and not during the production process.

**The Factories Act [Act No 63 of 1948] as Amended by the Factories (Amendment) Act, 1987**

This is a comprehensive piece of legislation and covers all aspects of health and safety of workers. It is mandatory on the part of the factories to ensure the effective disposal of the wastes and effluents and controlling the levels of dust and fumes injurious or offensive to the workers.

The Act was set up to protect factory workers from the dangers to their health from machines and from bad working conditions in the factory. It has detailed provisions relating to the health, safety and welfare of workers. It also concerns their working conditions, safety measures and other facilities to enhance their welfare.

It applies to every factory established in India, including the ones owned by the government.

*Schedule I: List of Industries Involving Hazardous Processes*

This includes mercury specific industries, where mercury is involved in the production process or is emitted as a result of the industrial process.

1. Power generating industries (for example, thermal power plants, etc)
2. Pulp and paper (including paper products) industries

3. Fertiliser industries
  - ◆ Nitrogenous
  - ◆ Phosphoric
  - ◆ Mixed
4. Cement industries
5. Petroleum industries
  - ◆ Oil refining
  - ◆ Lubricating oils and greases
6. Petrochemical industries
7. Drugs and pharmaceutical industries
  - ◆ Narcotics, drugs and pharmaceuticals
8. Paints and pigment industries
9. Chemical industries
  - ◆ Alkalis and acids
  - ◆ Halogens and halogenated compounds (chlorine, fluorine, bromine and iodine)
  - ◆ Explosives (including industrial explosives and detonators and fuses)
10. Insecticides, fungicides, herbicides and other pesticides industries
11. Synthetic resin and plastics
12. Man-made fibre (cellulosic and non-cellulosic) industry
13. Manufacture and repair of electrical accumulators
14. Dyes and dyestuff including their intermediates
15. Highly flammable liquids and gases

**Schedule 2: Permissible Levels of Certain Chemical Substances in Work Environment**

PERMISSIBLE LIMITS OF EXPOSURE				
Substance	Time average weighted concentration (8 hrs)		Short-term exposure limits (15 min)	
	ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>
Mercury (as Hg) - skin alkyl compounds	-	0.01	-	0.03

**Schedule 3: List of Notifiable Diseases**

4. Mercury poisoning or its sequelae.

The inclusion of mercury poisoning does not specify poisoning noticeable after retirement from the factory. Besides, there are chapters on health, safety and exposure to hazardous processes in the Act.

**The Public Liability Insurance Act, 1991**

An Act was created to provide public liability insurance, which means providing immediate relief to a person affected by an accident occurring while handling any hazardous substance. It also provides for liability to provide relief in certain cases on the principle of no fault. It will be the duty of the owner to take out insurance policies.

The Schedule provides a reimbursement of medical expenses incurred up to a maximum of Rs 12,500.

**The Public Liability Insurance Rules, 1991**

In application of the Public Liability Insurance Act, the Rules provide a list of chemicals, organised in four groups, with authorised quantities:

- ◆ Toxic substances
- ◆ Highly reactive substances
- ◆ Explosive substances

Surprisingly, only one category of mercury compound, which is used as an explosive, is found on this list. (See table below)

MERCURY AS AN EXPLOSIVE			
S no	Name of hazardous substance	Quantity	Chemical abstract service number
GROUP 4 - EXPLOSIVE SUBSTANCES			
1	Mercury fulminate	10 tonne	20820-45-5 628-86-4

**CONSUMER-RELATED LEGISLATION**

**Bureau of Indian Standards**

The Bureau of Indian Standards provides specific and strict standards to maintain the quality of the products, thus providing safety to the consumers. Mercury-related standards are given in the annexure.

The Bureau of Indian Standards provides thousands of standards for every aspect related to quality control, which covers manufacturing, etc. The standards mentioned above are all related to mercury and its compounds. The standards are good but should be updated to match with international standards. An example is the Indian Standards No. 7812, passed in 1975, which deals with 'Code of Safety of Mercury'. It provides all the basic information about mercury to the consumers, giving details about its properties, health hazards and toxicity, storage and handling, packing and labelling and some other preventive measures.

However, safety measures during storage and handling should be made more stringent and their implementation should be overseen.

**The Prevention of Food Adulteration Act, 1955**

The Prevention of Food Adulteration Act is a 'consumer legislation' directed to regulate consumer-supplier relationships. The aim is to protect consumers from adulterated food and to ensure safe foodstuffs. The Act has limits for all categories that could be present in the food and harmful to the consumer.

**The Prevention of Food Adulteration Rules, 1955**

The quality standards of the various specified food articles are present in the Rules. The Rules give authority and power to the implementing agencies to implement the rules. The limits for all poisonous metals are expressed in Part XI.

*Part XI: Poisonous Metals*

◆ Chemicals described in the Indian monographs of the Indian pharmacopoeia, when used in foods, shall

MERCURY LEVELS IN FOOD		
Name of poisonous metal	Article of food	ppm by weight
Mercury	i) Fish	0.5
	ii) Other food	1.0
Methyl mercury	All foods (calculated as the element)	0.25

not contain poisonous metals beyond the limits specified in the appropriate monographs of the Indian pharmacopoeia for the time being in force.

◆ Notwithstanding the provisions of the sub-rule (1), no article of food specified in column 2 of the table below shall contain any metal specified in excess of the quantity specified in column 3 of the said table:

**TRADE-RELATED LEGISLATION**

**The Foreign Trade (Development and Regulation) Act, 1992, No 22 of 1992 (7th Aug 1992)**

**Mercury**

"Items which do not require any license under the export and import policy have been denoted as 'free' subject to licensing notes."

TRADE REGULATIONS			
Exim code	Item/goods	Policy	Duty
280540 00	Mercury	Free	67.086
282739 01	Mercuric chloride	Free	67.086
282739 05	Mercurous chloride	Free	67.086
282590 04	Mercury oxide (mercuric oxide)	Free	67.086
283329 02	Mercuric sulphates	Free	67.086

◆ "Exim code 280540 00 includes quicksilver (as mercury) vide policy circular No.49 (RE-99)/97-02 dated 20.1.2000.

◆ Import of hazardous waste is permitted against a license and only for the purpose of processing and reuse.

TRADE REGULATIONS FOR MERCURY-RELATED PRODUCTS			
Exim code	Item/goods	Policy	Duty
902511 00	Thermometers (all types)	Free	53.816
853932 00	Mercury or sodium vapour lamps; metal halide lamps	Free	67.086
853939 01	Mercury vapour lamps	Free	67.086
300640 00	Dental fillings	Free	67.086

It is really surprising that a toxic metal like mercury and its various forms are still under the free licensing policy of the government.

### OTHER MERCURY-RELATED LEGISLATION

This includes Acts, which, in one way or the other, are related to mercury.

#### The Insecticides Act, 1968

The Insecticides Act regulates the import, manufacture, sale, transport, distribution and use of insecticides to prevent risk to people, animals and for other matters connected to it. Under the Act, there is a Central Insecticides Board to advise governments on matters under the Act. The Registration Committee under the Act registers insecticides after scrutinising the formula and verifying claims made by the importer or manufacturer about the safety and efficacy of the pesticides vis-a-vis people and animals. There is little scope for third parties to intervene at this stage.

A major flaw in the Act is that once a substance is specified in the Schedule of the Act, there is no power to cancel the Registration Certificate issued in respect of that particular substance even if, in a scientific study, it appears that the substance in question is grossly detrimental to health.

Mercury-based compounds registered on a regular basis under Section 9(3) of the Act are:

#### The Schedule

##### List of mercury-based insecticides

- ◆ Ethyl mercury phosphate
- ◆ Ethyl mercury chloride
- ◆ Ethoxy ethyl mercury chloride
- ◆ Mercuric chloride
- ◆ Methoxy ethyl mercury chloride — agallol, aretan
- ◆ Methyl mercury chloride
- ◆ Phenyl mercury acetate (PMA) — ceresan
- ◆ Phenyl mercury chloride
- ◆ Phenyl mercury urea
- ◆ Toly mercury acetate

Out of the above mercury-based insecticides registered in the Act, phenyl mercury, acetate and ethyl mercury chloride are banned in India. Methoxy ethyl mercury chloride is banned for seed dressing except for potato and sugarcane.

## STANDARDS

The Standards are available as countermeasures to environmental pollution by toxic pollutants like the heavy metals. Many developed and developing countries and international agencies have formulated such standards. Standards for trace metals like mercury should be stringent since they are highly toxic to human beings, and human health should always be given preference over anything else.<sup>35</sup>

The Central Pollution Control Board (CPCB) has developed National Standards for Effluents and Emission Standards under the statutory powers of the Water Act, 1974, and the Air Act, 1981. These Standards have been approved and notified by the Government of India, Ministry for Environment and Forests, under Section 25 of the Environment Protection Act, 1986. Till now, effluent standards for 37 categories and emission standards for 31 categories of industries have evolved and been notified, besides standards for ambient air quality, ambient noise, automobile and fuels quality specification for petrol and diesel.

This report provides emission and effluent standards only with regard to mercury. These standards are present in both Schedules of the Environment Protection Rules, 1986, and 1993.

PARAMETER STANDARDS		
Industry	Parameters	Standards
i) Battery manufacturing industry	Pollutants	Concentration (not to exceed mg/l)
ii) Dry cell manufacturing industry		
Effluent standards	Mercury	0.02 mg/l
Caustic soda industry	Total concentration of Hg in final effluent*	0.01 mg/l
	Mercury bearing waste water generation (flow)	10 kilolitres/tonnes of caustic soda produced

\* Final effluent is the combined effluent from: a) cell house; b) brine plant; c) chlorine handling; d) hydrogen handling; and e) hydrochloric acid plant.

## MERCURY IN INDIA

### General Standards for Discharge of Environmental Pollutants

#### Part A: Effluents

EMISSION STANDARDS		
Chlor-alkali (caustic soda)	Emissions	Standard (concentration in mg/m <sup>2</sup> {normal})
a) Mercury cell	Mercury (from hydrogen gas holder stack)	0.2 mg/m <sup>2</sup>

EFFLUENTS				
Parameter	Standards			
	Inland surface water	Public sewers	Land for irrigation	Marine coastal area
Mercury (mg/l) max	0.01	0.01	–	0.01

EFFLUENT STANDARDS		
Industry	Effluents	Standard (concentration not to exceed mg/l)
Dye and dye intermediate industries	Mercury	0.1 mg/l
Pharmaceutical industry (bulk drugs)	Mercury	0.1 mg/l
Pesticide manufacturing and formulation industry	b) Heavy metals Mercury	0.1 mg/l
Inorganic chemicals industry (waste water discharge)	Mercury	0.1 mg/l
Organic chemicals manufacturing industry	b) Additional parameters Mercury	0.1 mg/l

#### Part B: Wastewater Generation Standards

WASTEWATER GENERATION STANDARDS	
Industry	Quantum
Caustic soda b) Mercury cell process	4 <sup>1</sup> [m <sup>3</sup> /tonne] of caustic soda produced (mercury bearing), 10% blow down permitted for cooling tower

#### Part D: Concentration Based Standards

GENERAL EMISSION STANDARDS	
Parameter	Standard (concentration not to exceed {in mg/Nm <sup>3</sup> })
Mercury	0.2

#### Oil Drilling and Gas Extraction Industry

STANDARDS FOR LIQUID EFFLUENTS	
Parameter	Toxicity limit (mg/l)
Mercury	0.01

i) Oil and gas drilling and processing facilities, situated on land and away from saline water sink, may opt either for disposal of treated water by on-shore disposal or by re-injection in abandoned wells; effluent has to comply only with respect to suspended solids and oil and grease at, respectively, 100 mg/l and 10 mg/l. For on-shore disposal, the permissible limits are outlined in the tables on the following page.

ON-SHORE DISPOSAL		
S No	Parameter	On-shore discharge standards (not to exceed)
20	Mercury	0.01 mg/l

COMMON EFFLUENT TREATMENT PLANTS			
a) Primary treatment	Mercury		0.01 mg/l*
b) Treated effluent quality of common effluent treatment plant	Into inland surface waters	On land for irrigation	Into marine coastal areas
Concentration in mg/l			
Mercury	0.01	-	0.01

\*Notes: 1) These standards apply to small scale industries, and total discharge up to 25 kl/day.

2) For each CETP and its constituent units, the state board will prescribe standards as per the local needs and conditions; these can be more stringent than those prescribed above. However, in case of clusters of units, the state boards with the concurrence of CPCB in writing, may prescribe suitable limits.

### Water Quality Standards for Coastal Waters Marine Outfalls

COASTAL WATER STANDARDS	
Class	Designated best use
SW-1 salt pans, shell fishing, mariculture and ecologically sensitive zone	Salt pans, shell fishing, mariculture and ecologically sensitive zone

### Primary Water Quality Criteria for Class SW-1 Waters

WATER QUALITY CRITERIA		
Parameters	Standards	Rationale/ remarks
Heavy metals: Mercury	0.01mg/l	Value depends on: Concentration in salt, fish and shell fish

The Municipal Solid Wastes (Management and Handling) Rules, 2000, have also developed standards for groundwater, composting and leachates while disposing of waste.

### Water Quality Monitoring

Usage of groundwater in and around landfill sites for any purpose (including drinking and irrigation) is to be considered after ensuring its quality. The following specifications for drinking water quality shall apply for monitoring purpose for mercury:

WATER QUALITY MONITORING		
S No	Parameters	IS 10500: 1991 Desirable limit (mg/l except for pH)
7.	Mercury	0.001

### Compost

In order to ensure safe application of compost, the following specifications for compost quality shall be met:

SPECIFICATIONS FOR COMPOST QUALITY	
Parameters	Concentration not to exceed* (mg/kg dry basis, except pH value and C/N ratio)
Mercury	0.15

\* Compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilised for purposes other than growing food crops.

### Leachates

LEACHATES			
Parameter	Standards (mode of disposal)		
	Inland surface waters	Public sewers	Land disposal
Mercury (as Hg), mg/l, max	0.01	0.01	-

### SUMMARY

Standards have been set for all the major industries which emit mercury, except coal-based thermal power plants. The government has not taken serious note regarding this aspect of mercury emission from thermal power plants, which emit tonnes of mercury in the environment annually.

The main problem of our standards and legislations lies in the poor level of implementation by the various implementing agencies. If the legislation and standards were properly implemented, half of India's environmental problems would be solved.

### REFERENCES

32. Sharma, H.C., 'Pollution Regulations in India,' *Indian Journal of Environmental Protection*, Vol. 13, No 9, 1993.
33. Tiwari, R.S. and D.S. Bhargava, 'Trace Metals (Cd, Pb and Hg) in the Environment,' *Indian Journal of Environmental Protection*, Vol. 12, No 4, 1992.
34. Ibid.
35. Sharma, H.C., Op cit, page 1.





MERCURY IN INDIA  
**ANNEXURES**

<b>CAUSTIC SODA MANUFACTURING UNITS USING MERCURY CELL PROCESS</b>		
S. No.	Name and address of the industry	Process type
1.	M/s Bihar Caustic and Chemicals Ltd, Ghanshyam Kunj, Garhwa Road, P.O. Rehla 822 124, Distt Palamau, Bihar.	Mercury cell
2.	M/s Chemplast Sanmar Ltd (Caustic-chlor Divn) Plant- I, II and III, Mettur Dam 636 402 Distt Salem, Tamil Nadu.	Mercury cell
3.	M/s DCW Ltd, Caustic soda unit, P.O Arumuganeri, Sahupuram 628 229, Tamil Nadu.	Mercury cell
4.	M/s DCW Shriram Consolodated Ltd, Shriram Fertilisers and Chemicals (SFC), Shriram Nagar, Kota 324 004, Rajasthan.	Mercury cell
5.	M/s Durgapur Chemicals Ltd, Dr Hanemann Sarani, Durgapur 713 214, West Bengal.	Mercury cell
6.	M/s Hindustan Heavy Chemicals Ltd, 19 Barrackpur Trunk Road, Khardah P.O. Balaram Dharma, Sopan 743 121, Distt. 24 Parganas (N), West Bengal.	Mercury cell
7.	M/s Hindustan Paper Corporation Ltd, Nagaon Paper Mill, P.O. Kagaz Nagar, Distt Maligaon 782 413, Assam.	Mercury cell
8.	M/s Hindustan Paper Corporation Ltd, Cachar Paper Mill, P.O. Panchgram, Distt Hailakandi 788 802, Assam.	Mercury cell
9.	M/s Jayashree Chemicals Ltd, P.O. Jayashree, Distt Ganjam 761 025, Orissa.	Mercury cell
10.	M/s Kanoria Chemicals and Industries Ltd, P.O. Renukoot 231 217, Distt Sonbhadra, UP.	Mercury cell
11.	M/s Orient Paper Mill, P.O. Brajraj Nagar 768 216, Distt Jharsuguda, Orissa.	Mercury cell
12.	M/s Andhra Sugars Ltd, P.O. Kovvur 534 350, Distt West Godavari, Andhra Pradesh.	Mercury cell Membrane cell
13.	M/s Atul Ltd, P.O. Atul 396020, Distt Valsad, Gujarat.	Mercury cell Membrane cell
14.	M/s BILT Chemicals Ltd, P.O. Binaga, Uttar Kanara, Distt Karwar 581 361, Karnataka.	Mercury cell Membrane cell
15.	M/s BILT Chemicals Ltd, Khavda Marine Chemical Complex, Himmat Nagar, Revenue Colony, Near Jubilee Ground, Bhuj 370 001, Gujarat.	Mercury cell Membrane cell
16.	M/s BILT Chemicals Ltd, Unit: Singach, Vill and P.O. Singach, Distt Jamnagar 381 010, Gujarat.	Mercury cell Membrane cell
17.	M/s Grasim Industries Ltd (Chemical Division), P.O. Birlagram, Nagda 456 331, Madhya Pradesh.	Mercury cell Membrane cell

### CAUSTIC SODA MANUFACTURING UNITS USING MERCURY CELL PROCESS

S. No.	Name and address of the industry	Process type
18.	M/s Hukumchand Jute and Industries Ltd, P.O. Amlai Paper Mill, Distt Shahdol 484 117, Madhya Pradesh.	Mercury cell Membrane cell
19.	M/s Modi Alkalies & Chemicals Ltd, SP-460, M.I.A., Alwar 301 030, Rajasthan.	Mercury cell Membrane cell
20.	M/s Punjab Alkalies & Chemicals Ltd, Nangal-Una Road, Nayanangal 140 126, Punjab.	Mercury cell Membrane cell
21.	M/s Southern Petrochemicals Industries Corporation (SPIC) Ltd, Express Highway, Manali, Chennai 600 068.	Mercury cell Membrane cell
22.	M/s Standard Industries Ltd, P.O. Ghansoli, Thane-Belapur Road, Thane 400 601, Maharashtra.	Mercury cell Membrane cell
23.	M/s Travancore Cochin Chemicals Ltd, Udyogmandal, P.O. Kochi 683 501, Kerala.	Mercury cell Membrane cell

#### ABSTRACTS OF REFERENCES

◆ **B.M. Tejam and B.C. Haldar**, 'A Preliminary Survey of Mercury in Fish from Bombay and Thane Environment', *Indian Journal of Environmental Health*, Vol 17 (1), 1975, 9-16.

The results of a survey for mercury in 30 species of fish from seven sources in Mumbai and Thane environment are reported in this paper. Neutron activation techniques have been used in the present investigation to estimate mercury in muscle, bone and brain in fish samples. The upper limit of natural mercury concentration in fish has been estimated at 100-200 µg/g. The results reveal that bones and brain of *Tilapia Mozambique*, *Mugil Dussumieri* and other varieties of fish from Thane and Mumbra creek have mercury concentration greater than 500 µg/g on fresh weight basis.

◆ **R.R. Khan**, 'Environment and Health Effects of Toxic Metals', *Indian Journal of Toxicology*, Vol 6 (2), 1999, 1-2.

An overview of the problem of toxic metals in the environment in India is given. Studies and surveys done on the status of pollution due to toxic metals in air, water, soil and food in India have been reviewed. The paper also covers metal concentrations in human blood, tissue and urine. Salient findings of the study done under the Integrated Environmental Programme on Heavy Metal Pollution sponsored by the Union Ministry of Environment and Forests during 1983-89 have also been given.

◆ **K. Ayyadura, N. Kamalam and C.K. Rajagopal**, 'Mercury Pollution in Water in Madras City', *Indian Journal of Environmental Health*, Vol 25 (1), 1983, 15-20.

Water samples were collected from 12 spots in

Chennai City for analysing the content of mercury and its accumulation in toxic amounts. The samples were then taken up for analysis and mercury determined by flameless atomic absorption spectrophotometer. The result of the analysis showed amounts of mercury ranging 2.43 to 32.99 µg/ml. All the spots sampled had non-toxic levels of mercury. The fact that the levels of mercury observed in these waters was low, and that none of the places where analysis of mercury was done showed any significant difference between them, point to the conclusion that these water sources have not been contaminated so far.

◆ **A.M. Komerwar, K. Asokan, S. Krishnamurthy, P. Subbaiah, B.R. Yadav and H.V.K. Udupa**, 'Mercury Pollution from Chlor-alkali in India and role of TSIA for its Abatement', *Indian Journal of Environmental Health*, Vol 20 (3), 1978, 284-289.

In India, during 1976 about 4 lakh tonnes of caustic soda was produced by the mercury cell process. About 0.23 kg of mercury is lost per tonne of caustic soda produced. As a result, the effluents and emissions from chlor-alkali industries contain around 90,800 kg of mercury contaminating the air, rivers and other waterways into which the emissions are let out and the effluents are discharged, thereby creating a serious pollution problem. This paper aims at bringing to light the area of the pollution problem that arises due to the use of mercury in chlor-alkali industries and suggests a way for its abatement by the use of Titanium Substrate Insoluble Anodes (TSIA).

◆ **Manju Agrawal and H.D. Kumar**, 'Physico-chemical and Phycological Assessment of two Mercury-polluted Effluents', *Indian Journal of Environmental Health*,

Vol 20 (2), 1978, 141-155.

Physico-chemical and biological analyses of mercury-containing effluents discharged by the Kanoria Chemicals Factory, Renukoot, and the Rohtas Paper Industry, Dalmiyana, were made. The effluents of the Rohtas Paper Industry are discharged directly without any dilution. It was highly toxic and did not harbour any algae populations.

A biological assessment of effluent toxicity using the unicellular algae *Chlorella* and *Anacystis nidulans* revealed that the main cause of absence of algae in the effluent channel was the presence of mercury. Subsidiary factors possibly responsible for the lack of algae in the effluent include the presence of some amounts of zinc, copper, chlorides and organic matter and the deficiency of nutrients such as phosphate and nitrate.

◆ **P. Kaladharan, V.K. Pillai, A. Nandkumar and P.K. Krishnakumar**, 'Mercury in Seawater along the Coast of India', *Indian Journal of Marine Science*, Vol 28, 1999, 338-340.

The present study indicated that the distribution of mercury in the Arabian Sea had a conspicuous pattern showing very low values ranging from below detection level (BDL) to 0.058 µg/l during the pre-monsoon period and remained more or less same during the SW monsoon period, with an exceptional higher value of 0.117 µg/l mercury observed in the shelf waters off Veraval. During the post monsoon season the Hg levels attained were higher than the levels during the earlier seasons, ranging from BDL to 0.117 µg/l, with some pockets showing stray high values.

Stray occurrences of higher levels of Hg were observed both in the southern and northern latitudes during the post monsoon period of 1996 ranging from 0.117 µg/l in the south adjacent to the Cape and Laccadive Sea, to a concentration of 0.352 µg/l in the north adjoining the Veraval coast, where a similar higher trend prevailed during the SW monsoon season also. The seasonal average of Hg levels showed a 100 per cent increase during the post monsoon period over the preceding monsoon as well as pre-monsoon seasons. The present study was limited to surface only.

◆ **Sujata Sanzgiri, R. Sengupta and S.Y.S. Singbal**, 'Total Mercury Concentrations in Waters of the Laccadive Sea', *Indian Journal of Marine Science*, Vol 8, Dec 1979, 252-254.

Concentrations of mercury, measured at surface and at different depths in the Laccadive Sea, ranged from 50-204 µg/l, which agreed with the earlier reported values (11-221 µg/l) for the Arabian Sea. A few isolated values were higher than the average but these were low enough to show that the Laccadive Sea waters are at present free from mercury pollution. Average surface mercury concentration in the Laccadive Sea was 91 µg/l (range 60-120 µg/l). In the coastal waters of the Arabian Sea the average surface value was 136 µg/l and

for the entire Arabian Sea the average value at the surface was 120 µg/l. Pooling the observations of all the cruises the average concentration at the surface for the northern Indian Ocean would be 106 µg/l.

◆ **S.Y.S. Singbal, Sujata Sanzgiri and R. Sengupta**, 'Total Mercury Concentrations in the Arabian Sea Waters off the Indian Sea Coast', *Indian Journal of Marine Science*, Vol 7, Dec 1978, 124-126.

There is continuous addition of heavy metal ions into the marine environment mostly due to industrial and domestic releases. Dissolved inorganic mercury probably occurs mostly as HgCl<sub>2</sub>. Its concentration in open ocean water usually lies in the range 10-50 µg/l, but considerably higher concentrations may occur in inshore waters, especially in polluted estuaries. The lowest and highest concentrations observed are 13 and 407 µg/l, respectively, among all the samples analysed from different depths. The rest of the values from the surface give an average concentration of 77 µg/l.

◆ **P.R. Kamath, Y.K. Agrawal, B.M. Sankhesara and N.G. Laghate**, 'Control of Mercury Pollution from Discharge of Industrial Effluents to the Environment', *Chemical Engineering World*, Vol XI (9), Sept 1976, 59-63.

The largest industrial use of mercury is in the chlor-alkali industry employing mercury cells. The study was carried out in the laboratory to remove mercury present in waste waters as sulphide by passing the effluents at pH 3.5 through a bed of iron sulphide (FeS). H<sub>2</sub>S is produced when the effluent comes in contact with FeS. It reacts with Hg to precipitate HgS. The techniques are further discussed in the report.

◆ **Shams Pervez and G.S. Pandey**, 'Contamination of River Water and Sediments by Thermal Power Ash Pond Discharge', *Indian Journal of Environmental Health*, Vol 36 (1), 1994, 8-12.

Contamination of Hasdeo river water, due to effluents from a thermal power plant ash pond, is discussed. The data presented here are related to Hasdeo River, which receives the ash pond discharge of a thermal power plant located in Korba. The discharge from the ash pond reaches Hasdeo River after flowing about 1 km. Data show that toxic elements (Pb, Cu, Cd, Zn, Cr, Mn, Ni, As and Hg) which were not detected earlier in river water and sediments were found introduced to it as a result of the merging of the ash pond effluents.

◆ **Rathin N. Sharma, Anil K. Baruah, Gobin C. Borah and Parash K. Chowdhary**, 'Assessment of Heavy Metals in Surface Water Around Oil Installations', *Indian Journal of Environmental Health*, Vol 37 (4), 1995, 243-250.

Levels of 13 heavy metals in pond/stagnated water bodies around few well sites and two group gathering stations of Rudrasagar field in Sibsagar districts of Assam have been assessed and their seasonal variations as well as extent of lateral spread out have been investigated. Heavy metals (Fe, Mn, Ni, Pb, Cr, Cu, Zn, Hg,

As and V) have been found marginally above background levels in close proximity to the group gathering stations and new/ongoing well sites, whereas metal levels around production sites and abandoned wells lie within background levels. Results show marked seasonal variation; the extent of lateral spread out was insignificant.

◆ **R.S. Lokhande and Nilima Kelkar**, 'Studies on Heavy Metals in Water of Vasai Creek, Maharashtra', *Indian Journal of Environmental Protection*, Vol 20 (6), 1999, 441-446.

Vasai creek is an important source of fish farming and is used for many other purposes such as salt pans, agriculture, etc. Due to the recently developed chemical industries, oil and grease spillage from ships and public sewage, the shores as well as water of Vasai creek is polluted and all these pollutants are carried by water. Hence intertidal collection of water samples was carried out to understand physico-chemical and microbiological quality of water, along with what heavy metals were present in it. Heavy metals are the most harmful and insidious pollutants because of their non-biodegradable nature. The study was conducted to determine the levels of heavy metals (such as Cd, Cu, Fe, Ni, Mn, Zn, Pb and Hg). The water of Vasai creek, carrying toxic heavy metals, like Fe, Pb and Hg, seriously reduces soil fertility and agricultural output. It is estimated that the major 18 industries release 7 tonnes of mercury along with other heavy metals yearly into the Ulhas river system.

## INTERNATIONAL OCCUPATIONAL EXPOSURE LIMITS

Comparison of the limits regarding mercury and its compounds prescribed by some international organisations such as ILO, OSHA, NIOSH, etc.

### Mercury and its compounds

#### Mercury: Occupational exposure limits

TLV: 0.025 mg/m<sup>3</sup> (as TWA) (skin, A4) (ACGIH 2000).

MAK: 0.01 ppm; 0.1 mg/m<sup>3</sup>; (1992).

#### Mercuric acetate: Occupational exposure limits

TLV (as Hg): 0.025 mg/m<sup>3</sup> (skin) A4 (ACGIH 1999).

MAK as Hg: 0.01 mg/m<sup>3</sup>; BAT 25 mg/l in blood, 100 µg/l in urine (1999)

MAK as Hg STEL: 1 mg/m<sup>3</sup>; (1999)

MAK: class Sh (1999)

#### Mercuric chloride: Occupational exposure limits

TLV (as Hg): 0.025 mg/m<sup>3</sup> (skin, A4) (ACGIH 1999).

#### Mercuric nitrate: Occupational exposure limits

TLV (as Hg): 0.025 mg/m<sup>3</sup> (skin) A4 (ACGIH 1999).

MAK as Hg: 0.1 mg/m<sup>3</sup>; BAT 25 µg/l in blood; 100 µg/l in urine (1999)

MAK as Hg STEL: 1 mg/m<sup>3</sup>; (1999)

MAK: class Sh (1999)

### EXPOSURE LIMITS AND GUIDELINES FOR MERCURY

Agency	Form of mercury	Exposure limits/ guidelines	Reference
HSE	Mercury and mercury compounds except alkyls	0.025 mg/m <sup>3</sup> (OES; 8-hr TWA RP)	HSE, 1996
	Mercury alkyls	0.01 mg/m <sup>3</sup> (OES; 8-hr TWA RP) 0.03 mg/m <sup>3</sup> (OES; 15-min RP)	
OSHA	Mercury vapour	0.05 mg/m <sup>3</sup>	IRIS, 1996
NIOSH	Mercury vapour	0.05 mg/m <sup>3</sup>	IRIS, 1996
WHO	Mercury in indoor air	1 µg/m <sup>3</sup>	WHO, 1987

### Mercuric oxide: Occupational exposure limits

TLV (as Hg): 0.025 mg/m<sup>3</sup> A4 (skin) (ACGIH 2000).

### Mercuric sulphate: Occupational exposure limits

TLV (as Hg): 0.025 mg/m<sup>3</sup> (skin, A4) (ACGIH 1999).

### Mercurous chloride: Occupational exposure limits

TLV (as Hg): 0.025 mg/m<sup>3</sup> (skin) A4 (ACGIH 1999).

MAK as Hg: 0.1 mg/m<sup>3</sup>; BAT 25 µg/l in blood; 100 µg/l in urine (1999)

MAK as Hg STEL: 1 mg/m<sup>3</sup>; (1999)

MAK: class Sh (1999)

### Notes:

**MAK** (*Maximum Arbeits Konzentration = maximum working concentration*) is the German OEL.

**TWA** means *time-weighted average*; most OELs are expressed as average exposures over the whole working day (for example, 1 part per million of chlorine gas all morning and 3 ppm all afternoon adds up to a 2 ppm TWA).

**ACGIH** is the American Conference of Governmental Industrial Hygienists, a professional non-governmental group that has authored recommended OELs that were called TLVs (*Threshold Limit Values*).

**BAT** (*Biological Tolerance Value*).

### Sources:

- ◆ HSE (1996) *Occupational exposure limits 1996* (Health and Safety Executive EH40/96), Sudbury, UK, HSE Books.
- ◆ IRIS (1996) *Integrated risk assessment system, mercury*, US Environmental Protection Agency, Online search conducted January 1996.
- ◆ WHO (1990) *Methyl mercury* (International Programme on Chemical Safety, Environmental Health Criteria, 101), Geneva, Switzerland, World Health Organisation.

- ◆ WHO (1991) *Inorganic mercury* (International Programme on Chemical Safety, Environmental Health Criteria, 101), Geneva, Switzerland, World Health Organisation.

### Mercury Related Standards by Bureau of Indian Standards (BIS)

- ◆ IS: 71 (1950): Mercuric oxide for paints (Status: withdrawn)
- ◆ IS: 2183 (1973): Schedule for high pressure mercury vapour lamps (1<sup>st</sup> revision) with amendment 1, (Status: superseded by IS: 9900 (part 1 to part 4), 1981)
- ◆ IS: 2305 (1988): Method for Mercurous nitrate test for copper and copper alloys (1<sup>st</sup> revision)
- ◆ IS: 2353 (1963): Phenyl mercury chloride (PMC), technical (amendment 1.) (Status: reaffirmed 1993)
- ◆ IS: 2354 (1963): Ethyl mercury chloride (EMC), technical (amendment 1.) (Status: reaffirmed 1993)
- ◆ IS: 2355 (1963): Stabilised ethoxy ethyl mercury chloride concentrate. (Status: withdrawn)
- ◆ IS: 2356 (1963): Formulation based on phenyl mercury salicylate. (Status: withdrawn)
- ◆ IS: 2357 (1963): Formulation based on phenyl mercury acetate. (Status: withdrawn)
- ◆ IS: 2358 (1984): Formulation based on stabilised methoxy ethyl mercury chloride, concentrate (1<sup>st</sup> revision) (Status: reaffirmed 1989)
- ◆ IS: 2359 (1963): Formulation based on stabilised ethoxy ethyl mercury chloride (Status: withdrawn)
- ◆ IS: 3025 (1994): Methods of sampling and test (physical and chemical) for water and waste water, Part 48, mercury (1<sup>st</sup> revision)
- ◆ IS: 4705 (1985): Dental mercury (1<sup>st</sup> revision) (Status: reaffirmed 1990)

### IMPORT OF MERCURY

Article code	Articles	Countries	1990-91		1991-92		1992-93	
			Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
28054000	Mercury	Algeria	152,189	16,688,157	62,500	5,695,272	63,577	5,311,930
		Belgium	-	-	6,900	743,492	-	-
		Canada	-	-	3,000	257,067	6,900	815,708
		Chile	-	-	-	-	-	-
		Chinese Taipei	39,389	4,059,643	6,450	677,506	14,092	1,380,850
		China	5,963	678,348	-	-	14,000	1,656,806
		Denmark	200	30,876	-	-	-	-
		Finland	-	-	12,350	807,070	15,313	1,503,691

- ◆ IS: 6616 (1982): Ballast from high pressure mercury vapour lamps (1<sup>st</sup> revision) (*Status: reaffirmed 1990*)
- ◆ IS: 7023 (1973): Methods of test for high pressure mercury vapour lamps. (*Status: superseded by IS: 9900 Part 1 to 4*)
- ◆ IS: 7244 (1974): Thermometer for mercury barometer (*Status: reaffirmed 1996*)
- ◆ IS: 7812 (1975): Code of safety for mercury (*Status: reaffirmed 1996*)
- ◆ IS: 9900 (1981) Part 1 to 4: High pressure mercury vapour lamps (amendment 4). (*Status: reaffirmed 1992*)
- ◆ IS: 9931 (1981): Mercurimetric method for determination of chloride in inorganic chemicals (*Status: reaffirmed 1988*)
- ◆ IS: 12398 (1988): Mercury barometer (for educational use) (*Status: reaffirmed 1998*)
- ◆ IS: 2490 and 3306 (1974): for drinking water, Mercury concentration: 0.01 mg/l

## MERCURY IN INDIA

IMPORT OF MERCURY								
Article code	Articles	Countries	1990-91		1991-92		1992-93	
			Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
28054000	Mercury	France	-	-	-	-	7,900	608,810
		Germany	6,000	699,555	13,925	1,030,471	12,075	1,102,184
		Hong Kong	1,725	212,907	-	-	-	-
		Indonesia	-	-	-	-	-	-
		Italy	-	-	4,350	348,012	28,800	2,350,254
		Japan	27,200	2,540,016	6,900	440,928	4,313	241,139
		Kyrgyzstan	-	-	-	-	-	-
		Morocco	-	-	-	-	-	-
		Netherlands	5,225	674,296	33,200	2,711,165	10,200	1,744,548
		Norway	3,000	404,156	6,900	420,285	-	-
		Poland	-	-	-	-	-	-
		Russia	-	-	-	-	-	-
		Singapore	-	-	126,990	816,446	-	-
		Slovak Republic	-	-	-	-	-	-
		Spain	27,251	2,806,961	-	-	40,550	5,169,057
		South Africa	-	-	-	-	-	-
		Sweden	-	-	-	-	-	-
		Switzerland	-	-	-	-	-	-
		Turkey	5,175	571,223	4,905	424,291	-	-
		UAE	-	-	-	-	-	-
UK	24,519	3,024,445	13,625	951,683	1,898	185,448		
Ukraine	-	-	-	-	-	-		
USA	128,679	13,058,351	170,901	13,148,627	119,329	8,612,125		
Venezuela	-	-	-	-	-	-		
	<b>Total</b>		<b>426,515</b>	<b>45,448,934</b>	<b>482,901</b>	<b>39,780,816</b>	<b>338,947</b>	<b>30,682,572</b>

### IMPORT OF MERCURY

Countries	1993-94		1994-95		1995-96		1996-97	
	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
Algeria	-	-	-	-	-	-	4,000	62,429
Belgium	-	-	-	-	-	-	-	-
Canada	-	-	-	-	-	-	-	-
Chile	305,039	24,966,572	-	-	-	-	-	-
Chinese Taipei	-	-	10,350	837,157	-	-	-	-
China	-	-	-	-	-	-	-	-
Denmark	-	-	-	-	-	-	-	-
Finland	32,974	2,655,959	3,450	383,283	-	-	17,250	2,357,979
France	-	-	-	-	-	-	-	-
Germany	690	80,147	-	-	150	19,213	828	137,526
Hong Kong	13,835	1,751,751	-	-	-	-	-	-
Indonesia	-	-	-	-	-	-	-	-
Italy	130,660	8,924,895	-	-	5,000	654,837	-	-
Japan	-	-	23	4,500	-	-	-	-
Kyrgyzstan	-	-	-	-	-	-	-	-
Morocco	-	-	-	-	39,130	4,471,756	-	-
Netherlands	8,121	941,743	32,775	3,462,092	21,250	2,040,145	7,000	1,237,972
Norway	-	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	207	28,856
Russia	-	-	6,450	774,331	235,285	2,6438,906	171,674	19,470,039
Singapore	-	-	-	-	-	-	-	-
Slovak Republic	-	-	-	-	-	-	-	-
Spain	30,383	3,112,899	23,390	2,381,314	42,705	6,485,719	18,993	3,826,894
South Africa	-	-	-	-	-	-	-	-
Sweden	-	-	-	-	-	-	1,000	118,495
Switzerland	-	-	-	-	130	16,176	10	1,500



## MERCURY IN INDIA

IMPORT OF MERCURY								
	1993-94		1994-95		1995-96		1996-97	
Countries	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
Turkey	-	-	-	-	1,725	282,965	-	-
UAE	-	-	20,000	1,016,593	-	-	-	-
UK	6,210	701,998	27,563	2,183,744	27,600	3,919,476	1,898	352,158
Ukraine	-	-	41,400	3,604,071	-	-	-	-
USA	75,666	6,128,387	126,894	10,875,466	55,360	4,868,228	-	-
Venezuela	-	-	-	-	-	-	30,878	3,382,792
<b>Total</b>	<b>603,578</b>	<b>49,933,144</b>	<b>292,295</b>	<b>25,522,551</b>	<b>428,473</b>	<b>49,225,076</b>	<b>253,738</b>	<b>31,526,640</b>

IMPORT OF MERCURY								
	1997-98		1998-99		1999-2000		2000-01	
Countries	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
Algeria	14,635	2,593,201	-	-	3,450	637,532	-	-
Australia	-	-	-	-	-	-	18,040	7,262,833
Belgium	36,363	5,048,851	-	-	-	-	230	53,003
Canada	-	-	-	-	-	-	-	-
Chile	-	-	-	-	-	-	-	-
Chinese Taipei	-	-	-	-	-	-	3,000	605,701
China	-	-	-	-	5,175	829,462	-	-
Denmark	-	-	-	-	-	-	-	-
Finland	23,287	3,412,525	10,316	2,010,329	-	-	-	-
France	-	-	-	-	-	-	4	36,105
Germany	1,725	306,951	-	-	600	135,385	3,003	539,822
Hong Kong	-	-	-	-	-	-	-	-
Indonesia	11,750	1,573,912	-	-	-	-	-	-
Italy	24,002	2,740,034	13,217	1,964,488	-	-	-	-
Japan	-	-	-	-	-	-	-	-
Kyrgyzstan	1,725	292,334	-	-	-	-	-	-

### IMPORT OF MERCURY

Countries	1997-98		1998-99		1999-2000		2000-01	
	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
Mauritius	-	-	-	-	-	-	10,000	1,647,310
Morocco	8,500	1,320,262	9,000	1,300,779	-	-	-	-
Netherlands	20,311	4,176,564	5,484	1,035,497	6,827	1,248,859	13,181	2,367,870
Norway	-	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-
Russia	6,959	1,234,006	22,890	3,099,390	38,127	6,352,673	12,900	2,005,986
Singapore	-	-	36	27,899	-	-	850	238,082
Slovak Republic	-	-	-	-	4,000	574,439	-	-
Spain	54,480	10,015,474	29,120	6,155,878	19,699	3,071,364	80,786	15,835,136
South Africa	24,150	3,592,450	-	-	-	-	7,000	1,148,208
Sweden	-	-	-	-	-	-	-	-
Switzerland	-	-	-	-	-	-	-	-
Turkey	-	-	-	-	-	-	-	-
UAE	-	-	-	-	-	-	-	-
UK	17,250	2,748,324	34,500	4,752,068	11,212	1,466,254	79,145	12,497,310
Ukraine	-	-	-	-	-	-	-	-
USA	22,660	5,190,610	260	271,618	118,294	14,917,170	23,661	4,099,005
Venezuela	-	-	-	-	-	-	-	-
<b>Total</b>	<b>267,797</b>	<b>43,945,502</b>	<b>124,823</b>	<b>20,617,946</b>	<b>207,384</b>	<b>29,233,141</b>	<b>251,800</b>	<b>48,336,371</b>

## MERCURY IN INDIA

IMPORT OF MERCURIC CHLORIDE								
			1990-91		1991-92		1992-93	
Article code	Articles	Countries	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
28273901	Mercuric chloride	Belgium	-	-	-	-	-	-
		China	-	-	-	-	-	-
		Germany	-	-	-	-	-	-
		Hong Kong	-	-	-	-	-	-
		Indonesia	-	-	-	-	-	-
		Japan	-	-	-	-	-	-
		Netherlands	863	73,059	-	-	-	-
		South Africa	-	-	-	-	-	-
		UK	-	-	-	-	-	-
		USA	-	-	-	-	-	-
		<b>Total</b>			<b>863</b>	<b>73,059</b>		

IMPORT OF MERCURIC CHLORIDE										
			1993-94		1994-95		1995-96		1996-97	
Countries	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)		
Belgium	-	-	-	-	-	-	-	-		
China	-	-	-	-	-	-	-	-		
Germany	-	-	-	-	-	-	-	-		
Hong Kong	-	-	-	-	-	-	-	-		
Indonesia	-	-	-	-	-	-	-	-		
Japan	-	-	-	-	-	-	600	1,011,020		
Netherlands	-	-	-	-	-	-	-	-		
South Africa	-	-	-	-	-	-	-	-		
UK	-	-	-	-	-	-	-	-		
USA	-	-	-	-	251	38,289	-	-		
<b>Total</b>					<b>251</b>	<b>38,289</b>	<b>600</b>	<b>1,011,020</b>		

<b>IMPORT OF MERCURIC CHLORIDE</b>						
	1997-98		1998-99		1999-2000	
<b>Countries</b>	<b>Qty (kg)</b>	<b>Value (Rs)</b>	<b>Qty (kg)</b>	<b>Value (Rs)</b>	<b>Qty (kg)</b>	<b>Value (Rs)</b>
Belgium	-	-	-	-	900	273,129
China	-	-	-	-	10,000	530,250
Germany	-	-	-	-	4,310	1,340,510
Hong Kong	-	-	-	-	150	14,762
Indonesia	60	64,204	160	176,563	-	-
Japan	-	-	-	-	600	143,712
Netherlands	-	-	-	-	-	-
South Africa	-	-	-	-	500	54,288
UK	-	-	-	-	16	7,301
USA	-	-	22,065	3,140,895	400	197,985
<b>Total</b>	<b>60</b>	<b>64204</b>	<b>22,225</b>	<b>3,317,458</b>	<b>16,876</b>	<b>2,563,937</b>

<b>IMPORT OF MERCURIC OXIDE</b>								
		1990-91			1991-92		1992-93	
<b>Article code</b>	<b>Articles</b>	<b>Countries</b>	<b>Qty (kg)</b>	<b>Value (Rs)</b>	<b>Qty (kg)</b>	<b>Value (Rs)</b>	<b>Qty (kg)</b>	<b>Value (Rs)</b>
28259004	Mercury oxide	-	-	-	-	-	-	-

<b>IMPORT OF MERCURIC OXIDE</b>									
		1993-94		1994-95		1995-96		1996-97	
<b>Countries</b>		<b>Qty (kg)</b>	<b>Value (Rs)</b>	<b>Qty (kg)</b>	<b>Value (Rs)</b>	<b>Qty (kg)</b>	<b>Value (Rs)</b>	<b>Qty (kg)</b>	<b>Value (Rs)</b>
Indonesia		-	-	-	-	-	-	20,897	2,497,184
Netherlands		-	-	-	-	-	-	500	37,735
USA		-	-	-	-	-	-	38	99,437
<b>Total</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>21,435</b>	<b>2,634,356</b>

## MERCURY IN INDIA

IMPORT OF MERCURIC OXIDE								
	1997-98		1998-99		1999-2000		2000-01	
Countries	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
Germany	-	-	2,600	1,158,145	2,016	182,382	-	-
Spain	-	-	100	56,207	25	86,068	-	-
USA	-	-	25	85,667	-	-	-	-
<b>Total</b>	-	-	<b>2,725</b>	<b>1,300,019</b>	<b>2,041</b>	<b>268,900</b>	-	-

EXPORT OF MERCURY								
			1993-94		1999-2000		2000-01	
Article code	Articles	Countries	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)	Qty (kg)	Value (Rs)
28054000	Mercury	Ethiopia	-	-	-	-	1,126	45,315
		France	-	-	-	-	44,400	4,113,283
		Israel	-	-	-	-	85,026	4,215,909
		Malaysia	-	-	7,200	734,262	-	-
		Spain	-	-	-	-	38,273	4,190,556
		Singapore	21,000	868,836	9,600	1,018,725	-	-
		Sri Lanka	200	61,400	19,037	749,267	2,000	461,154
		Sweden	-	-	-	-	6,708	1,017,741
		Thailand	-	-	-	-	10,001	1,169,368
		UK	-	-	-	-	1,000	124,749
		USA	-	-	-	-	171,000	31,179,773
		Yemen Republic	2,500	437,780	-	-	-	-
		<b>Total</b>			<b>23,900</b>	<b>1,368,016</b>	<b>35,837</b>	<b>2,502,254</b>

**IMPORTERS OF MERCURY (2000-2001)**

Date	Product	Importers	Country	Port	Qty	Value (Rs)	CIF rate
4.5.2000	Prime virgin mercury	Indian Dyestuff Industries	Spain	Mumbai	50 kg	3,69,387	7,387.74
17.7.2000	Supply of mercury purity 99.99%	Shriram Alkalies & Chemicals	Spain	Mumbai	7,590 kg	13,45,683.6	177.80
17.7.2000	Mercury purity 99.99 %	Shriram Alkalies & Chemicals	Spain	Mumbai	903.25 kg	1,81,774.75	201.25
21.7.2000	Flakes prime virgin mercury metal 99.9% min	Champa Purie-Chem Ind	Spain	Mumbai	4,246.87 kg	8,70,847	205.06
21.7.2000	Prime virgin mercury metal 99.9% min	Champa Purie-Chem Ind	Spain	Mumbai	265.3 kg	5,44,042	205.07
27.7.2000	Prime virgin mercury 99% 25 flasks	GE Lighting India Ltd	S. Africa	Mumbai	25 pcs	1,97,091	7,883.64
28.7.2000	Prime virgin mercury 99.99%	Indian Dyestuff Ind	Spain	Mumbai	50 pcs	3,64,964	7,299.28
29.8.2000	Mercury	Major Metals Ltd	UK	Mumbai	13,800 kg	18,54,758	134.40
25.9.2000	Merc. Min 99.99% Hg adr 8/IMCO 8/UN 2809	Enkay Associates	The Netherlands	Mumbai	1,621.5 kg	2,51,935	155.37
28.9.2000	Mercury	Major Metals Ltd	UK	Mumbai	462 kg	21,02,123	4,550.05
28.9.2000	Mercury	Major Metals Ltd	UK	Mumbai	492 kg	22,38,625	4,550.05
10.1.2001	Mercury metal	Dow Ltd	Germany	Chennai	48 nos	3,22,867	6,726.40
10.1.2001	Mercury metal	Dow Lt.	Germany	Chennai	12 nos	80,717	6,726.42
6.2.2001	Flakes prime virgin mercury Min 99.99% Hg	Surya Roshni Ltd	Algeria	Mumbai	1,725 kg	3,60,004	208.70
16.3.2001	Mercury	Major Metals Ltd	UK	Mumbai	16,974 kg	23,78,010	140.10
21.3.2001	Mercury	Major Metals Ltd	UK	Mumbai	16,560 kg	23,21,374	140.18

## MERCURY IN INDIA

### IMPORTERS OF MERCURY (1999-2000)

Date	Products	Importers	Country	Port	Qty (units)	Value (Rs)	CIF rate
24.8.1999	Mercury 99.99%	Shriram Vinyl and Chemical	USSR	Mumbai	1,725 kg	333,522	198.35
25.8.1999	Misc metal trem 99% Min	HBR Sales (P) Ltd	China	Kolkata	1,000 kg	175,538	175.54
8.4.1999	Misc metal	Mehta Flint	China	Mumbai	2,000 kg	301,182	150.59
15.4.1999	Misc metal	Lalwani Ind Ltd	Chile	Kolkata	2,000 kg	335,997	168.00
23.8.1999	Flakes prime virgin mercury metal 99.9%	Champa Purie-chem Industries	Russia	Mumbai	1,300 kg	238,468	188.44
2.3.2000	Mercury	Beri Mercurio Ltd	USA	Mumbai	16,380 kg	2,093,194	127.79
12.11.1999	50 flasks each of 34.5 kg	Indian Dyestuff Ind Ltd	Spain	Mumbai	1,725 kg	368,966	213.89
15.1.2000	90 flasks prime virgin mercury	Excel India Ltd	Spain	Mumbai	3,174 kg	585,887	184.59
23.8.1999	Flasks prime virgin mercury metal 99.99%	Champa Purie-Chem Industries	Russia	Mumbai	2,150 kg	389,080	180.97
19.4.1999	Under duty	Surya Roshni Ltd	Algeria	Mumbai	344 kg	63,545	184.79
6.4.1999	Flasks, mercury	Surya Roshni Ltd	Algeria	Mumbai	1,725 kg	318,766	184.79
19.4.1999	Flasks, mercury	Surya Roshni Ltd	Algeria	Mumbai	1,381 kg	255,221	184.79
25.8.1999	Mercury	L.S. Chem & Pharma Ltd	USA	Mumbai	300 nos.	1,514,015	5046.72
16.4.1999	25 flasks prime virgin mercury	GE Lighting India Ltd	Russia	Mumbai	25 nos	181,785	7271.40
9.4.1999	Mercury of purity 99.999%	Goa Instruments Industries	Spain	Mumbai	6 nos	60,235	10039.17

**IMPORTERS OF MERCURY (1999-2000)**

Date	Products	Importers	Country of origin	Port	Qty (units)	Value (Rs)	CIF rate
25.8.1999	Mercury	L.S. Chem & Pharma	USA	Mumbai	200 nos	1,009,344	5,046.72
20.9.1999	Flasks prime virgin	GE Lighting India Ltd	Germany	Mumbai	25 nos	182,121	7,284.84

**DISTRIBUTION OF IMPORTS BY COMPANY (MERCURY) 2000-2001**

Importers name	Quantity	Value (Rs)	CIF rate
Champa Purie-Chem Industries	6,900 kg	1,414,889	205.0602
DCW Industries	60 nos	403,584	6,726.4
Enkay Associates	1,622 kg	251,935	155.3716
GE Lighting India Ltd	25 pcs	197,091	7,883.64
Indian Dyestuff Industries Ltd	50 kg	369,387	7,387.74
Indian Dyestuff Industries Ltd	50 nos	364,964	7,299.24
Major Metals Ltd	47,334 kg	6,554,142	138.4658
Major Metals Ltd	954 nos	4,340,748	4,550.05
Shriram Alkalies & Chemicals	8,493 kg	1,527,458	179.8438
Surya Roshni Ltd	1,725 kg	360,004	208.698



**DISTRIBUTION OF IMPORTS BY COMPANY (MERCURY) 1999-2000**

Importers name	Quantity	Value (Rs)	CIF rate
Beri Mercurio Ltd	16,380 kg	2,093,194	127.79
Champa Purie-Chem Industries	3,450 kg	627,548	181.90
Excel Industries Ltd	3,174 kg	585,887	184.59
GE Lighting India Ltd	50 nos	363,906	7,278.12
Goa Instruments Industries	6 nos	60,235	10,039.17
HBR Sales P Ltd	1,000 kg	175,538	175.54
Indian Dyestuff Industries Ltd	1,725 kg	368,966	213.89
Lalwani Industries Ltd	2,000 kg	335,997	168.00
L S Chemicals & Pharmaceuticals	500 nos	2,523,359	5,046.72
Mehta Flint	2,000 kg	301,182	150.59
Shriram Vinyl & Chemical Industries	1,725 kg	333,522	193.35
Surya Roshni Ltd	3,450 kg	637,532	184.79

**DISTRIBUTION OF IMPORTS 1999-2000**

Port	Quantity	Value (Rs)	CIF rate
Kolkata	3,000 kg	511,534.7	170.51
Mumbai	31,904 kg	4,947,831	155.08
Mumbai	556 nos	2,947,500	5,301.26

**DISTRIBUTION OF IMPORTS 2000-2001**

Port	Quantity	Value (Rs)	CIF rate
Chennai	60 nos	403,584	6,726.40
Mumbai	66,123.62	10,477,815.35	158.46
Mumbai	1,004	4,705,712	4,686.96
Mumbai	25 pcs	197,091	7,883.64

**DISTRIBUTION OF IMPORT BY COUNTRY 2000-2001**

Country	Quantity	Value (Rs)	CIF rate
Algeria	1,725 kg	360,004	208.70
Germany	60 nos	403,584	6,726.40
Netherlands	1,622 kg	251,935	155.37
Spain	15,443 kg	3,311,734	214.45
Spain	50 nos	364,964	7,299.28
South Africa	25 pcs	197,091	7,883.64
UK	47,334 kg	6,554,142	138.47
UK	954 nos	4,340,748	4,550.05

**DISTRIBUTION OF IMPORT BY COUNTRY 1999-2000**

Country	Quantity	Value (Rs)	CIF rate
Algeria	3,450 kg	637,532	184.79
Chile	2,000 kg	335,996.7	168.00
China	3,000 kg	476,720	158.91
Germany	25 nos	182,121	7,284.84
Russia	3,450 kg	627,548	181.90
Russia	25 nos	181,785	7,271.40
Spain	4,899 kg	954,853	194.91
Spain	6 nos	60,235	10,039.17
USA	16,380 kg	2,093,194	127.79
USA	500 nos	2,523,359	5,046.72
USSR	1,725 kg	333,522	193.35

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