



UNEP IE - UNITED NATIONS ENVIRONMENT PROGRAMME
INDUSTRY AND ENVIRONMENT

INDUSTRY & ENVIRONMENT
EMISSION STANDARDS & GUIDELINES
INFORMATION CLEARINGHOUSE
(IE-ESGIC)

Volume I

TEXTILE INDUSTRY
EFFLUENT DISCHARGE STANDARDS

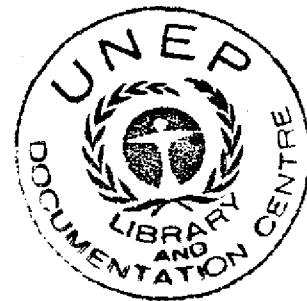
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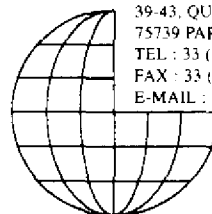
TEXTILE INDUSTRY
EFFLUENT DISCHARGE STANDARDS



UNEP

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INTRODUCTION

What is the purpose of this document?

Establishing environmental standards and guidelines for potentially polluting industrial wastes: liquid effluents, air emissions and solid wastes, is an important first step for countries concerned about regulating industrial activities as part of their environmental pollution control strategies. UNEP IE has confirmed the need for information on such guidelines from the fact that more than 10 percent of the technical/scientific inquiries handled by the UNEP IE Query-Response Service concern air emission standards, effluent standards and other regulatory requirements for industrial activities.

To help in responding to these frequent requests, UNEP IE has set up an in-house database called *Industry and Environment Emission Standards and Guidelines Information Clearinghouse (IE-ESGIC)*.

UNEP IE feels that this information, even if not exhaustive, could be useful to its partners, and has therefore decided to publish *IE-ESGIC Compendiums* covering a range of industrial sectors.

This compendium for the textile industry has been prepared to provide helpful information to governments, industry, international organizations and non-governmental organizations, trade unions, research institutes and individuals that are interested in countries' effluent discharge standards for the industry.

How was the information collected, reviewed and compiled?

The initial information set was prepared by reviewing references available at UNEP IE, for a selection of countries. These data were reviewed by relevant experts or INFOTERRA national focal points in the countries covered, who provided comments and further material for inclusion.

How is the compendium structured?

The compendium consists of three parts. The first chapter give an overview of the various approaches to the regulation of industrial releases, other regulatory mechanisms for industrial activities, and major pollutants in effluents discharged from the textile industry. The second chapter describes ways in which countries have dealt with the problem, including examples of existing standards and guidelines in a number of countries. The last part provides some standards or guidelines developed by international organizations or conferences.

How should this compendium be used?

The extracts presented here should be treated as a preliminary source of information on countries' environmental regulations. They are summaries of raw data extracted from documents available at UNEP IE or from additional reference material provided by experts or national focal point in each country, without further evaluation or interpretation.

The numerical standards need to be interpreted with care, taking into account the way in which each regulation is actually applied. Direct comparisons of national standards are not always possible. For example, some standards may be applied directly to the effluents from industrial plants, while others may be general government guidelines, on the basis of which an inspectorate decides allowable limits for industrial discharges.

Due to space constraints and complexity of data coverage, the IE-ESGIC mainly presents national regulations. However, in some countries local administrations

have considerable powers in the field of pollution control and often impose different or more stringent requirements than those established at national level.

Due to the development of environmental technologies and policies, regulations continue to evolve. Therefore each extract may not necessarily reflect the current situation of each country at the time of reading.

Bearing the above in mind, users in need of complete information are recommended to contact the authoritative organizations of each country. For reference, the list of national focal points used for this compendium is presented in Appendix 1.

Finally, this report should be regarded as a working paper, reproduced without official editing. If articles are quoted from this document, the data source should be based on the document or publisher provided in the citation part of each article rather than this compendium, or UNEP IE.

How can we improve this document?

The IE-ESGIC is updated periodically to reflect changes in legislation. UNEP IE welcomes any information for such updates, as well as comments on contents (please see Appendix 2: Input sheet for additional inclusion). The exchange of data on industrial discharge standards between UNEP IE and its partners will provide fresh and useful information to those who require it, while enabling UNEP IE to keep its database up-to-date.

**Overview of environmental discharge standards
for the textile industry**

OVERVIEW OF ENVIRONMENTAL DISCHARGE STANDARDS FOR THE TEXTILE INDUSTRY

i. Approaches to the regulation of industrial releases

Control mechanisms for industrial releases vary greatly between countries, reflecting the specific historical, administrative and legal traditions of each. No international environmental standards can apply around the world, though there are some guidelines set up by international organizations and some international conventions dealing with transboundary environmental issues. Each region and country has its own needs and must set its own standards accordingly.

Industrial releases are normally regulated by media-specific standards under laws for the protection environmental quality or human health. There are two main approaches to the regulation of industrial releases.

The most common way is through the setting and enforcement of environmental discharge standards. Governments set limits to be achieved and it is left to industry to find the most effective way of achieving them. In its simplest form, a uniform standard will apply to all industries throughout the country. Occasionally separate sets of limits for specific industries/processes/sub-processes may be introduced.

The other approach is to specify the level or type of technology that must be installed to meet the legal objectives. Usually industry is required to install "best available" or "best practicable technology." This approach put more emphasis on the availability of suitable technology rather than on assessment of the assimilative capacity of the local environment. The competent authorities may publish information on a number of industries as a guide to the means by which they would determine whether adequate technological controls have been employed. Such information often includes guidelines on industrial discharges.

In a few countries, limits are defined for the quality of the receiving environment (i.e. ambient quality) rather than the discharges. In practice however, plant permits will use a combination of the two.

There may be separate sets of standards for different types of receptors. Standards for effluents may vary depending on whether they are discharged to inland or coastal waters. When wastewater is discharged into a public sewage system, the authorities usually specify the effluent standards necessary to protect the sewer and sewage treatment system.

Also, a distinction is often made between new and existing plants. Where this distinction is made, existing plants are usually granted a more lenient standard, or are allowed a period of grace before being required to comply with stricter standards. New plants are usually required to comply with the latest standard from the start.

In many countries, environmental responsibilities are divided between local or regional and central governments. While some regulations may be set at national level, local administrations often have considerable powers in the field of pollution control and can often impose different or more stringent requirements than those established at national level.

Industry, often through its trade associations, can also assist in establishing best practices for their members, and publish codes of practice. These codes may even be adopted by policy-makers to be used as legal guidance in setting standards for compliance.

Environmental legislation is only effective when it is supported by effective compliance and enforcement measures. Most countries now have environmental standards in place. But in order to ensure that all companies equally comply with them, governments also need to establish institutional procedures such as environmental permitting, inspection and enforcement. For these administrative

mechanisms to work effectively, adequate staff and resources are required.

From the technical and economic viewpoints, if standards are too ambitious or unrealistic, their implementation will be unworkable. Setting up the discharge standards is a gradual process requiring continuous evaluation and modifications, taking into account the technical or economic conditions of the region. Thus the final standards "evolve" rather than being "created".

Regarding the expression of discharge standards, most countries adopt one of the following approaches:

- in terms of the concentration of pollutants in effluents or air emission streams; or
- in terms of the allowable quantity of pollutants discharged, usually per certain period, unit of raw material input or product output.

The concentration of pollutants is theoretically determinable at a single instant but in practice is taken as the average concentration of a number of samples. On the other hand, the quantity measure, being flow dependent, must be determined by a series of analyses of concentrations and flow rates over a specified time period.

ii. Other regulatory provisions for industrial activities

Discharge standards can only a part of the wider framework of environmental regulation for industrial activities. While the regulation of environmental releases retains a vital role, other control instruments are also indispensable to minimize environmental impacts of industrial plants, including the following:

- Environmental impact assessment;

Environmental impact assessment contributes to the decision-making process by focusing on the environmental issues surrounding industrial and other projects before, during and after they are implemented. A systematic consideration of environmental impacts often leads to the identification of alternative process options, and of mitigation measures for pollution, and as a result can have a major influence on the design of a project.

- Land-use planning and zoning for industries;

Where an external impact is expected from a plant, correct siting is one of the most important environmental decisions to be made. The environmental impact assessment process provides valuable information for zoning or siting decisions. However, siting criteria or regulations may also exist under planning laws.

- Ambient environmental quality standards;

In addition to regulating actual discharges, some countries also apply ambient environmental standards. In such cases, allowed discharge limits must be consistent with these standards. Some countries do not have discharge standards, but instead specify the desired quality of the receiving environment, which may not be exceeded.

- Waste disposal;

When solid wastes are generated, it is necessary to ensure that such wastes, including contaminated sludges, are kept in special areas and containers and are disposed of in a safe manner, taking their characteristics into consideration.

- Standards for storage, transport, labelling and packaging of certain chemicals;

The Code of Practice prepared by UN Committee on the Transport of Dangerous

Goods is often used as the basic document for national legislation.

- Ban on the use of certain chemicals;

The use of certain chemicals is now banned in some countries due to their hazardous nature. The UN also publishes the Consolidated List of Products whose Consumption and/or Sale Have Been Banned, Withdrawn, Severely Restricted or Not Approved by Governments.

- Product and process standards;

In some instances, pollution control has been achieved by the use of product or process standards (e.g. the problem of sulphur oxides emissions from the burning of fuel-oil has sometimes been confronted by specifying maximum concentrations of sulphur in the fuel-oil).

- Limits for occupational health and safety;

This problem is likely to be addressed in most countries under general industrial safety regulations. International organizations such as ILO (International Labour Office) and WHO (World Health Organization) also publish guidelines, mostly for exposure to airborne pollutants, noise and radiation.

- Emergency planning;

Some operations have the possibility to generate major accidents which endanger local populations. In such cases, it is recommended to establish emergency plans complementary to general emergency planning. UNEP IE has developed the *APELL - Awareness and Preparedness for Emergencies at Local Level - Programme*, including the publication of handbooks and other documents.

- Site remediation and liability;

Many governments are now requiring by law that companies clean up sites that have been contaminated by leakage of chemicals.

- Environmental auditing;

Auditing is a periodic review of environmental performance and is not confined to verifying compliance to regulations. Full environmental auditing is still not required under law, and is regarded as an internal tool.

- International conventions;

Through signature and ratification, members of a convention signify their commitment to the convention's goals, which are implemented through national legislation. Important conventions for industry include:

- * UN Framework Convention on Climate Change
- * Montreal Protocol on Substances that Deplete the Ozone Layer
- * London Convention on the Dumping of Waste at Sea
- * Basel Convention on the Transboundary Movement of Hazardous Wastes
- * London Guidelines on International Trade in Chemicals

iii. Main pollutants in effluents from the textile industry

In typical textile operations, both chemical and mechanical treatments are used on the raw materials to produce a finished product. Unwanted by-products arise from many points in the cycle, either as discarded natural material, or unused chemical agents. Wastewaters from textile dyeing and finishing products are generally coloured, highly alkaline, high in BOD and SS, and high in temperature.

Unwanted raw material components, such as grease and dirt, can constitute a major part of the pollution load arising from many textile operations. Waste chemicals

(dyes, oils, surfactants, etc.), from the process or washed from finished textiles, are also a source of potential pollutants. The sources of major metal pollutants (zinc, copper, chromium, etc.) are likely to be the dyes used in wet processing. Many dyes and colorants are difficult to treat but their high visibility in effluents attracts particular attention.

Ancillary operations such as machine cleaning, boilers, water treatment plants and effluent treatment facilities may also cause further releases that cause environmental impacts if they are not properly controlled.

The principal parameters used to regulate textile waste water are usually pH, BOD, COD, TSS, oil & grease, chromium, phenol and sulphides.

National environmental standards for the textile industry

Headline: Emission limits for waste discharges to water

1. Descriptors

- 1.1. Country: Australia, local (Victoria)
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, SS, turbidity, floatable matter, settleable solids, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, zinc, residual chlorine, hazardous substances

2. Legal reference

- 2.1. Title of the law/regulations: Environment Protection Act (1970), State Environment Protection Policy (Waters of Victoria), 23 February 1988
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| category | parameter | limit | unit |
|----------------------|---------------------------------------|---|--------------------------------------|
| All waste discharges | pH | 6.0 - 9.0 | - |
| | SS (*1) | 60 (maximum) 30 (annual median) | g/m ³ g/m ³ |
| | turbidity (*1) | 50 (maximum) 25 (annual median) | NTU NTU |
| | floatable matter | Waste discharges shall not contain any visible floating oil, foam, grease, scum, litter or any other objectionable floating matter. | |
| | settleable solids (*1) | Waste discharges shall be treated to reduce settleable solids to the lowest practical level. | |
| | settleable solids (*2) | 0.1 (annual median) | % by volume |
| | BOD (*1) | 40 (maximum) 20 (annual median) | g/m ³ g/m ³ |
| | arsenic | 0.50 | g/m ³ |
| | cadmium | 0.10 | g/m ³ |
| | chromium | 0.30 | g/m ³ |
| | copper | 0.20 | g/m ³ |
| | iron (maximum) | 5.0 | g/m ³ |
| | iron (continuous discharges (*1, *3)) | 2.0 | g/m ³ |
| | lead | 0.10 | g/m ³ |
| | manganese | 0.5 | g/m ³ |
| | mercury | 0.005 | g/m ³ |
| | nickel | 0.50 | g/m ³ |
| | silver | 0.10 | g/m ³ |
| | zinc | 0.50 | g/m ³ |

residual chlorine 1.0 g/m³
hazardous substances (*4)

- *1) Discharges to any segment other than the coastal segment.
- *2) Discharges to the coastal segment.
- *3) Not to be exceeded more than twice per year.
- *4) Waste containing substances which are highly toxic, persistent and/or may accumulate to toxic levels in the food chain, including, but not limited to:
 - organophosphorus compounds
 - organohalogens
 - organotin compounds
 - persistent petroleum hydrocarbons
 - substances possessing carcinogenic properties in or via the aquatic environment
 - mercury and its compounds
 - lead and its compounds
 - cadmium and its compounds
 - arsenic and its compounds
 - copper and its compounds
 - radioactive substancesshall be treated, recycled or otherwise controlled at source to reduce the amount of these substances present in the discharge to the lowest practical levels.

4. Citation

- 4.1. Title of document: "Victoria Government Gazette - Special"
- 4.2. Publisher: Victoria Government, Australia
- 4.3. Date published: Friday 26 February 1988
- 4.4. Publisher Reference Code: No. S 13
- 4.5. IEO Library Code: -

Headline: Federal effluent standards in Brazil

1. Descriptors

- 1.1. Country: Brazil
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, temperature, settleable matter, mineral oil, vegetable oil, floating matter, ammonium, total arsenic, barium, boron, cadmium, cyanide, lead, copper, chromium (VI), chromium (III), stannum, phenol index, soluble iron, fluorine, soluble manganese, mercury, nickel, silver, selenium, sulphate, sulphite, zinc, organo-phosphoric and total carbonates, carbon sulphate, trichloroethane, chloroform, tetrachlorocarbon, dichloroethane, organo-chloric compounds not listed above

2. Legal reference

- 2.1. Title of the law/regulations: Conselho Nacional do Meio Ambiente
 Resolução No. 20, 18 June 1986,
 Article 21
- 2.2. Date issued: 18 June 1986
- 2.3. Date amended: -

3. Summary

| parameter | limit | unit |
|-------------------|--------|------|
| pH | 5-9 | - |
| temperature | 40 | °C |
| settleable matter | 1 | ml/l |
| mineral oil | 20 | mg/l |
| vegetable oil | 50 | mg/l |
| floating matter | absent | - |
| ammonium | 5.0 | mg/l |
| total arsenic | 0.5 | mg/l |
| barium | 5.0 | mg/l |
| boron | 5.0 | mg/l |
| cadmium | 0.2 | mg/l |
| cyanide | 0.2 | mg/l |
| lead | 0.5 | mg/l |
| copper | 1.0 | mg/l |
| chromium (VI) | 0.5 | mg/l |
| chromium (III) | 2.0 | mg/l |
| stannum | 4.0 | mg/l |
| phenol index | 0.5 | mg/l |
| soluble iron | 15.0 | mg/l |
| fluorine | 10.0 | mg/l |
| soluble manganese | 1.0 | mg/l |
| mercury | 0.01 | mg/l |
| nickel | 2.0 | mg/l |
| silver | 0.1 | mg/l |
| selenium | 0.05 | mg/l |
| sulphate | 1.0 | mg/l |
| sulphite | 1.0 | mg/l |
| zinc | 5.0 | mg/l |

| | | |
|---|------|------|
| organo-phosphoric compounds and total carbonates | 1.0 | mg/l |
| carbon sulphate | 1.0 | mg/l |
| trichloroethane | 1.0 | mg/l |
| chloroform | 1.0 | mg/l |
| tetrachlorocarbon | 1.0 | mg/l |
| dichloroethane | 1.0 | mg/l |
| organo-chloric compounds | 0.05 | mg/l |
| not listed above | | |

4. Citation

- 4.1. Title of document: "Legislação Federal Controle da poluição ambiental"
- 4.2. Publisher: CETESB - Companhia de Tecnologia de Saneamento Ambiental
- 4.3. Date published: 1993
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Effluent standards in São Paulo State in Brazil

1. Descriptors

- 1.1. Country: Brazil, local (São Paulo)
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, temperature, settleable matter, soluble matter, BOD, arsenic, barium, boron, cadmium, cyanide, lead, copper, chromium (VI), total chromium, stannum, phenol, iron, soluble iron, fluorine, soluble manganese, mercury, nickel, silver, selenium, zinc

2. Legal reference

- 2.1. Title of the law/regulations: Conselho Nacional do Meio Ambiente
 Resolução No. 20, 18 June 1986,
 Article 21; Estado São Paulo Decreto
 No. 8468, 8 September 1976, Article 18
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| parameter | limit | unit |
|-------------------|---------|------|
| pH | 5.0-9.0 | - |
| temperature | 40 | °C |
| settleable matter | 1 | ml/l |
| soluble matter | 100 | mg/l |
| BOD | 60 | mg/l |
| arsenic | 0.2 | mg/l |
| barium | 5.0 | mg/l |
| boron | 5.0 | mg/l |
| cadmium | 0.2 | mg/l |
| cyanide | 0.2 | mg/l |
| lead | 0.5 | mg/l |
| copper | 1.0 | mg/l |
| chromium (VI) | 0.1 | mg/l |
| total chromium | 5.0 | mg/l |
| stannum | 4.0 | mg/l |
| phenol | 0.5 | mg/l |
| iron | 0.5 | mg/l |
| soluble iron | 15.0 | mg/l |
| fluorine | 10.0 | mg/l |
| soluble manganese | 1.0 | mg/l |
| mercury | 0.01 | mg/l |
| nickel | 2.0 | mg/l |
| silver | 0.02 | mg/l |
| selenium | 0.02 | mg/l |
| zinc | 5.0 | mg/l |

4. Citation

| | |
|---------------------------------------|---|
| <u>4.1. Title of document:</u> | "Legislação Estadual Controle da poluição ambiental, Estado de São Paulo" |
| <u>4.2. Publisher:</u> | CETESB - Companhia de Tecnologia de Saneamento Ambiental |
| <u>4.3. Date published:</u> | 1994 |
| <u>4.4. Publisher Reference Code:</u> | - |
| <u>4.5. IEO Library Code:</u> | - |

Headline: The 1978 proposed effluent guidelines for textile mills in Canada

1. Descriptors

- 1.1. Country: Canada
1.2. Industry: Textile industry
1.3. Mode: Discharge standards
1.4. Medium: Water/Effluent
1.5. Parameters: pH, TSS, BOD, acute lethality

2. Legal reference

- 2.1. Title of the law/regulations: The 1978 Proposed Effluent Guidelines for Textile Mills
2.2. Date issued: 1978
2.3. Date amended: -

3. Summary

The proposed guidelines:

- apply to all existing textile mills;
- limit the discharge of BOD and TSS and specify the pH of the effluent discharged as well as the acute lethality;
- the allowable BOD discharge is expressed in kilograms of pollutants per 1000 kilograms of fibre processed in a given component process (see the following table);
- the arithmetic mean of the actual daily deposit of TSS on any four operating days within a normal mill accounting period does not exceed 8kg/1000kg of average daily mill production, plus 4.5 kg/1000kg of raw wool degreased during those four days;
- the pH of each grab sample or combined grab sample of effluent determined in accordance with subsection 3 (3) is between 6.0 and 9.0; and
- the acute lethality requirements is 50% survival in the bioassay sample when tested according to the procedure specified.

Maximum deposits of BOD

| process | wool fibre or fabric allowance | cotton fibre or fabric allowance | man-made fibre or fabric allowance |
|--------------------------------------|--------------------------------------|--|--|
| 1. raw wool degreasing | 35.0 | - | - |
| 2. sizing and/or jet loom weaving | 0.2 (*2) | 0.2 (*2) | 0.2 (*2) |
| 3. pretreatment | - | - | 5.0 (*3) |
| 4. desizing | 10.0 | 10.0 | - |
| 5. scouring | 7.5 | 7.5 | - |
| 6. bleaching | 0.4 | 1.0 | - |
| 7. mercerizing | - | 1.0 | - |
| 8. fulling | 5.0 | - | - |
| 9. dyeing | 4.0 | 4.0 | 4.0 |
| 10. dyeing with dyecarrier | - | - | 8.0 |
| 11. printing | 4.0 | 4.0 | 4.0 |
| 12. printing of carpets | - | - | 15.0 |
| 13. finishing | 0.3 | 0.3 | 0.3 |

- *1) All values are expressed in kilograms of BOD per thousand kilograms of commercial dry fibre processed.
- *2) This allowance does not apply to fibre that is sized and desized at the same mill.
- *3) For man-made fibres an allowance for pretreatment is permitted for all fibre that is dyed or printed even if the pretreatment step does not exist as a discrete process stage.

4. Citation

- 4.1. Title of document: "Environmental Assessment of the Canadian Textile Industry"
- 4.2. Publisher: Environment Canada
- 4.3. Date published: June 1989
- 4.4. Publisher Reference Code: Report EPS 5/TX/1
- 4.5. IEO Library Code: 60.5/CEEA

Headline: Wastewater emission limits in Germany

1. Descriptors

- 1.1. Country: Germany
1.2. Industry: Textile industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: BOD, COD, settleable solids, filtered solids, toxicity to fish, chromium, copper, zinc, NH₄-N, sulphide, sulphite, active chlorine

2. Legal reference

- 2.1. Title of the law/regulations: 38. Allgemeine Verwaltungsvorschrift über Mindestanforderungen an das Einleiten von Abwasser in Gewässer (Textilherstellung);
38. General administrative provision for minimum requirements for direct discharge of effluent in waters (textile processing)
2.2. Date issued: -
2.3. Date amended: -

3. Summary

| parameter | limit | unit |
|--------------------|-------|-----------------|
| filtered solids | 40 | mg/l |
| settleable solids | 0.3 | mg/l |
| COD | 280 | mg/l |
| BOD | 40 | mg/l |
| toxicity to fish | 4 | dilution factor |
| zinc | 3 | mg/l |
| copper | 1 | mg/l |
| chromium | 2 | mg/l |
| NH ₄ -N | 5 | mg/l |
| active chlorine | 0.3 | mg/l |
| sulphide | 0.1 | mg/l |
| sulphite | 1 | mg/l |

4. Citation

- 4.1. Title of document: 38. Allgemeine Verwaltungsvorschrift über Mindestanforderungen an das Einleiten von Abwasser in Gewässer (Textilherstellung)
4.2. Publisher: Minister of the Interior: Gemeinsames Ministerialblatt 1984, S.348 (Joined ministerial journal 1984, p.348)
4.3. Date published: 5 Sep. 1984
4.4. Publisher Reference Code: -

4.5. IEO Library Code:

Headline: Standards for effluents discharged into inland waters in Hong Kong

1. Descriptors

- 1.1. Country: Hong Kong
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent to inland waters, groundwater.
- 1.5. Parameters: pH, temperature, colour, conductivity, suspended solids, dissolved oxygen, BOD, COD, oil & grease, boron, barium, iron, arsenic, total chromium, mercury, cadmium, silver, selenium, copper, lead, manganese, zinc, nickel, other toxic metals individually, total toxic metals, cyanide, phenols, hydrogen sulphide, sulphide, fluoride, sulphate, chloride, total (reactive) phosphorus, ammonia nitrogen, nitrate + nitrite nitrogen, surfactants (total), E. coli, PCB, PAH, fumigant, pesticide or toxicant, radioactive substances, chlorinated hydrocarbons, flammable or toxic solvents, petroleum oil or tar, calcium carbide

2. Legal reference

- 2.1. Title of the law/regulations: Technical Memorandum - Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (Water Pollution Control Ordinance 1990, Cap.358, S.21)
- 2.2. Date issued: January 1991
- 2.3. Date amended: -

3. Summary

Different discharge standards are set for four categories of inland waters. The standards also vary according to daily flow rate (F) of the discharge concerned. The standards apply to groundwater as to other inland waters. Indicated below are representative values only.

The tables 1-4 list the standards for effluents to Group A, B C and D inland water respectively. Generally, Group A includes all waters in water gathering grounds and within the boundaries of country parks. Group B waters are mainly those draining agricultural areas. Group C waters are those running through areas with fish ponds. Group D waters are those large enough to permit secondary contact recreation and those draining urban and semi-urban areas.

There are some substances that are not permitted to be discharged into inland waters. They are listed in table 5.

Table 1. (F = flow rate in m³/day)

| category | parameter | limit for | | unit |
|----------------|-------------|-----------|---------|---------------|
| | | F=50 | F=500 | |
| all industries | pH | 6.5-8.5 | 6.5-8.5 | - |
| | temperature | 35 | 30 | °C |
| | colour | 1 | 1 | lovibond unit |

| | | | (25mm cell length) µs/cm at 20 °C |
|--------------------------------------|-------|-------|---|
| conductivity | 1000 | 1000 | |
| SS | 10 | 5 | mg/l |
| DO | ≥4 | ≥4 | mg/l |
| BOD | 10 | 5 | mg/l |
| COD | 50 | 20 | mg/l |
| oil & grease | 1 | 1 | mg/l |
| iron | 2 | 1 | mg/l |
| arsenic | 0.05 | 0.05 | mg/l |
| boron | 2 | 1 | mg/l |
| barium | 2 | 1 | mg/l |
| mercury | 0.001 | 0.001 | mg/l |
| cadmium | 0.001 | 0.001 | mg/l |
| copper | 0.2 | 0.2 | mg/l |
| selenium | 0.01 | 0.01 | mg/l |
| lead | 0.1 | 0.1 | mg/l |
| manganese | 0.5 | 0.5 | mg/l |
| total chromium | 0.05 | 0.05 | mg/l |
| zinc | 1 | 1 | mg/l |
| other toxic metals (individually) | 0.1 | 0.1 | mg/l |
| total toxic metals | 0.3 | 0.2 | mg/l |
| cyanide | 0.05 | 0.05 | mg/l |
| phenols | 0.1 | 0.1 | mg/l |
| sulphide | 0.2 | 0.1 | mg/l |
| hydrogen sulphide | 0.05 | 0.05 | mg/l |
| sulphate | 600 | 500 | mg/l |
| fluoride | 1 | 1 | mg/l |
| total reactive phosphorus | 0.7 | 0.7 | mg/l |
| ammonia nitrogen | 1 | 1 | mg/l |
| nitrate+nitrite nitrogen | 15 | 15 | mg/l |
| <u>E. coli</u> | < 1 | < 1 | count/100 ml |
| chloride | 500 | 500 | mg/l |

Table 2. (F = flow rate in m³/day)

| category | parameter | limit for | | unit |
|----------------|--------------------------------------|-----------|---------|--|
| | | F=50 | F=500 | |
| all industries | pH | 6.5-8.5 | 6.5-8.5 | - |
| | temperature | 35 | 30 | °C |
| | colour | 1 | 1 | lovibond unit (25mm cell length) |
| | SS | 30 | 30 | mg/l |
| | BOD | 20 | 20 | mg/l |
| | COD | 80 | 80 | mg/l |
| | oil & grease | 10 | 10 | mg/l |
| | iron | 10 | 7 | mg/l |
| | boron | 5 | 3 | mg/l |
| | barium | 5 | 3 | mg/l |
| | mercury | 0.001 | 0.001 | mg/l |
| | cadmium | 0.001 | 0.001 | mg/l |
| | selenium | 0.2 | 0.2 | mg/l |
| | other toxic metals (individually) | 0.5 | 0.2 | mg/l |
| | total toxic metals | 2 | 1 | mg/l |
| | cyanide | 0.1 | 0.1 | mg/l |
| | phenols | 0.1 | 0.1 | mg/l |
| | sulphide | 0.2 | 0.2 | mg/l |
| | sulphate | 800 | 600 | mg/l |
| | fluoride | 10 | 8 | mg/l |
| | chloride | 1000 | 800 | mg/l |
| | total phosphorus | 10 | 10 | mg/l |
| | ammonia nitrogen | 5 | 5 | mg/l |
| | nitrate+nitrite nitrogen | 30 | 30 | mg/l |
| | surfactants (total) | 5 | 5 | mg/l |
| | E. coli. | 100 | 100 | count/100ml |

Table 3. (F = flow rate in m³/day)

| category | parameter | limit for | | unit |
|--------------------------|--------------------------------------|-----------|-------------|--|
| | | F=50 | F=500 | |
| all industries | pH | 6-9 | 6-9 | - |
| | temperature | 30 | 30 | °C |
| | colour | 1 | 1 | lovibond unit (25mm cell length) |
| | SS | 20 | 10 | mg/l |
| | BOD | 20 | 15 | mg/l |
| | COD | 80 | 60 | mg/l |
| | oil & grease | 1 | 1 | mg/l |
| | iron | 0.5 | 0.4 | mg/l |
| | boron | 10 | 5 | mg/l |
| | barium | 1 | 1 | mg/l |
| | mercury | 0.001 | 0.001 | mg/l |
| | cadmium | 0.001 | 0.001 | mg/l |
| | selenium | 0.1 | 0.1 | mg/l |
| | silver | 0.1 | 0.1 | mg/l |
| | lead | 0.2 | 0.2 | mg/l |
| | nickel | 0.2 | 0.2 | mg/l |
| | copper | 0.1 | 0.1 | mg/l |
| | other toxic metals (individually) | 0.5 | 0.4 | mg/l |
| | total toxic metals | 0.5 | 0.4 | mg/l |
| | cyanide | 0.05 | 0.05 | mg/l |
| | phenols | 0.1 | 0.1 | mg/l |
| | sulphide | 0.2 | 0.2 | mg/l |
| | sulphate | 800 | 600 | mg/l |
| | fluoride | 10 | 7 | mg/l |
| | chloride | 1000 | 1000 | mg/l |
| | total phosphorus | 10 | 10 | mg/l |
| | ammonia nitrogen | 2 | 2 | mg/l |
| nitrate+nitrite nitrogen | 30 | 30 | mg/l | |
| surfactants (total) | 2 | 2 | mg/l | |
| E. coli. | 1000 | 1000 | count/100ml | |

Table 4. (F = flow rate in m³/day)

| category | parameter | limit for | | unit |
|----------------|--------------------------------------|-----------|-------|--|
| | | F=50 | F=500 | |
| all industries | pH | 6-10 | 6-10 | - |
| | temperature | 30 | 30 | °C |
| | colour | 1 | 1 | lovibond unit (25mm cell length) |
| | SS | 30 | 30 | mg/l |
| | BOD | 20 | 20 | mg/l |
| | COD | 80 | 80 | mg/l |
| | oil & grease | 10 | 10 | mg/l |
| | iron | 10 | 7 | mg/l |
| | boron | 5 | 3.5 | mg/l |
| | barium | 5 | 3.5 | mg/l |
| | mercury | 0.1 | 0.001 | mg/l |
| | cadmium | 0.1 | 0.001 | mg/l |
| | other toxic metals (individually) | 1 | 0.8 | mg/l |
| | total toxic metals | 2 | 1.6 | mg/l |
| | cyanide | 0.4 | 0.3 | mg/l |
| | phenols | 0.4 | 0.2 | mg/l |
| | sulphide | 1 | 1 | mg/l |
| | sulphate | 800 | 600 | mg/l |
| | fluoride | 10 | 8 | mg/l |
| | chloride | 1000 | 800 | mg/l |
| | total phosphorus | 10 | 10 | mg/l |

| | | | |
|--------------------------|------|------|-------------|
| ammonia nitrogen | 20 | 20 | mg/l |
| nitrate+nitrite nitrogen | 50 | 50 | mg/l |
| surfactants (total) | 15 | 15 | mg/l |
| E. coli. | 1000 | 1000 | count/100ml |

Table 5. Prohibited Substances - inland waters

- PCB (polychlorinated biphenyls)
- PAH (polyaromatic hydrocarbon)
- fumigant, pesticide or toxicant
- radioactive substances
- chlorinated hydrocarbons
- flammable or toxic solvents
- petroleum oil or tar
- calcium carbide
- waste liable to form scum, deposits or discolouration
- sludge or solid refuse of any kind
- detergents in Group A inland waters only

4. Citation

- 4.1. Title of document: "Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters"
- 4.2. Publisher: Environmental Protection Department, Hong Kong
- 4.3. Date published: 1991
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Standards for effluents discharged into coastal waters

1. Descriptors

- 1.1. Country: Hong Kong
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, temperature, colour, suspended solids, BOD, COD, oil & grease, iron, boron, barium, mercury, cadmium, other toxic metals individually, total toxic metals, cyanide, phenols, sulphide, total residual chlorine, total nitrogen, total phosphorus, surfactants (total), E. coli, PCB, PAH, fumigant, pesticide or toxicant, radioactive substances, chlorinated hydrocarbons, flammable or toxic solvents, petroleum oil or tar, calcium carbide

2. Legal reference

- 2.1. Title of the law/regulations: Technical Memorandum - Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (Water Pollution Control Ordinance 1990, Cap.358, S.21)
- 2.2. Date issued: January 1991
- 2.3. Date amended: -

3. Summary

Different discharge standards are set for six categories of coastal waters. The standards also vary according to daily flow rate (F) of the discharge concerned.

Indicated in the table 1 are representative values, i.e. the standards for effluents into coastal waters of Tolo and Port Shelter Water Control Zones.

There are some substances that are not permitted to be discharged into inland waters. They are listed in table 2.

Table 1. Standards for effluents discharged into coastal waters of Tolo and Port Shelter Water Control Zones (F = flow rate in m³/day)

| category | parameter | limit for | | | unit |
|--------------|--------------|-----------|-------|--------|----------------------------------|
| | | F=50 | F=500 | F=5000 | |
| all industry | PH | 6-9 | 6-9 | 6-9 | - |
| | temperature | 45 | 45 | 45 | °C |
| | colour | 1 | 1 | 1 | lovibond unit (25mm cell length) |
| | SS | 30 | 30 | 15 | mg/l |
| | BOD | 20 | 20 | 10 | mg/l |
| | COD | 80 | 80 | 50 | mg/l |
| | oil & grease | 20 | 20 | 10 | mg/l |
| | iron | 10 | 7 | 0.8 | mg/l |
| | boron | 4 | 2.5 | 0.3 | mg/l |

| | | | | |
|--------------------------------------|-------|-------|-------|--------------|
| barium | 4 | 2.5 | 0.3 | mg/l |
| mercury | 0.001 | 0.001 | 0.001 | mg/l |
| cadmium | 0.001 | 0.001 | 0.001 | mg/l |
| other toxic metals (individually) | 1 | 0.5 | 0.1 | mg/l |
| total toxic metals | 2 | 1 | 0.14 | mg/l |
| cyanide | 0.1 | 0.1 | 0.02 | mg/l |
| phenols | 0.5 | 0.25 | 0.1 | mg/l |
| sulphide | 5 | 5 | 1.0 | mg/l |
| total residual nitrogen | 1 | 1 | 1 | mg/l |
| total nitrogen | 20 | 15 | 10 | mg/l |
| total phosphorus | 8 | 5 | 5 | mg/l |
| surfactants (total) | 15 | 15 | 10 | mg/l |
| E. coli. | 1000 | 1000 | 1000 | count/100 ml |

Table 2. Prohibited Substances - coastal waters

-
- PCB (polychlorinated biphenyls)
 - PAH (polyaromatic hydrocarbon)
 - fumigant, pesticide or toxicant
 - radioactive substances
 - chlorinated hydrocarbons
 - flammable or toxic solvents
 - petroleum oil or tar
 - calcium carbide
 - waste liable to form scum, deposits or discolouration
 - sludge, floatable substances or solid larger than 10 mm
-

4. Citation

- 4.1. Title of document: "Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters"
- 4.2. Publisher: Environmental Protection Department, Hong Kong
- 4.3. Date published: 1991
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Industrial effluent standards in India

1. Descriptors

- 1.1. Country: India
- 1.2. Industry: Textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, SS, BOD, oil & grease, bio-assay test, sulphide, phenolic compounds, total chromium

2. Legal reference

- 2.1. Title of the law/regulations: The Environmental (Protection) Act, 1986; the Environmental (Protection) Rules, 1986
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| category | parameter | limit | Unit |
|--|--------------------|---------|-----------------------------------|
| cotton textile industries (composite and processing) | (common) | | |
| | pH | 5.5-9.0 | - |
| | SS | 100 | mg/l |
| | BOD | 150 | mg/l |
| | oil & grease | 10 | mg/l |
| | bio-assay test | 90 | % survival of fish after 96 hours |
| | (Special) | | |
| | total chromium | 2 | mg/l (as Cr) |
| | sulphide | 2 | mg/l (as S) |
| | phenolic compounds | 5 | mg/l (as phenol) |
| composite woolen mills | (common) | | |
| | pH | 5.5-9.0 | - |
| | SS | 100 | mg/l |
| | BOD | 100 | mg/l |
| | oil & grease | 10 | mg/l |
| | bio-assay test | 90 | % survival of fish after 96 hours |
| | (Special) | | |
| | total chromium | 2 | mg/l (as Cr) |
| | sulphide | 2 | mg/l (as S) |
| | phenolic compounds | 5 | mg/l (as phenol) |

- *1) The special parameters are to be stipulated by the Central Board in case of Union territories and State Boards in case of States depending upon the dye used in the industry. Where the industry uses chrome dyes, sulphur dyes and/or phenolic compounds in the dyeing/printing process, the limits on chromium of 2 mg/l, sulphide of 2 mg/l and phenolic compounds of 5 mg/l respectively shall be imposed.
- *2) Where the quality requirement of the recipient system so warrant, the limit of BOD should be lowered up to 30 according to the

requirement by the States Boards for the States and the Central Board for the Union territories.

- *3) A limit on sodium absorption ratio of 26 should be imposed by the States Boards for the States and the Central Board for the Union territories if the disposal of effluent is to be made on land.

4. Citation

| | |
|---------------------------------------|------------------------------------|
| <u>4.1. Title of document:</u> | "Pollution Control Legislation" |
| <u>4.2. Publisher:</u> | Tamil Nadu Pollution Control Board |
| <u>4.3. Date published:</u> | 1989 |
| <u>4.4. Publisher Reference Code:</u> | - |
| <u>4.5. IEO Library Code:</u> | - |

Headline: Effluent quality standards for textile industry in Indonesia

1. Descriptors

- 1.1. Country: Indonesia
1.2. Industry: Textile industry
1.3. Mode: Discharge standards
1.4. Medium: Water/Effluent
1.5. Parameters: pH, TSS, COD, BOD, total phenol, oil & grease, total chromium

2. Legal reference

- 2.1. Title of the law/regulations: Decree of the State Minister for Population and Environment, Number:KEP-03/MENKLH/II/1991, RE:Effluent Quality Standards for Existing Operations
2.2. Date issued: February 1991
2.3. Date amended: -

3. Summary

Maximum effluent flow of 150 m³ per ton of textile.

| parameter | maximum concentration (mg/l) | maximum pollution load (kg/ton) |
|----------------|------------------------------|---------------------------------|
| BOD | 85 | 12.75 |
| COD | 250 | 37.5 |
| TSS | 60 | 9.0 |
| total phenol | 1.0 | 0.15 |
| total chromium | 2.0 | 0.30 |
| oil & grease | 5.0 | 0.75 |
| pH | 6-9 | - |

- *1) Except pH, maximum concentration of each parameter in the aforementioned table shall be stated in milligram parameter per liter of waste water.
*2) Maximum pollution load of each parameter in the aforementioned table is stated in kg parameter per ton of textile product.

4. Citation

- 4.1. Title of document: "Decree of the State Minister for Population and Environment, number:KEP-03/MENKLH/II/1991, RE:Effluent Quality Standards for Existing Operations
4.2. Publisher: BAPEDAL: Environmental Impact Management Agency with EMDI: Environmental Management Development in Indonesia
4.3. Date published: 1991

4.4. Publisher Reference Code: -

4.5. IEO Library Code: -

Headline: National effluent standards for substances related to the protection of human health

1. Descriptors

- 1.1. Country: Japan
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Cadmium and its compounds, cyanide compounds, organic phosphorus compounds, lead and its compounds, chromium (VI) compounds, arsenic and its compounds, total mercury, alkyl mercury compounds, PCB, dichloromethane, carbontetrachloride, 12-dichloroethane, 11-dichloroethylene, cis12-dichloroethylene, 111-trichloroethane, 112-trichloroethane, trichloroethylene, tetrachloroethylene, 13-dichloropropylene, thiram (TMTD), simazine (CAT), thiobencarb, benzene, selenium

2. Legal reference

- 2.1. Title of the law/regulations: Water Pollution Control Law, Cabinet Order for Establishment of the Effluent Standard (No.54-1993)
- 2.2. Date issued: 21 June 1971
- 2.3. Date amended: 1974, 1975, 1976, 1977, 1981, 1985, 1986, 1993

3. Summary

| category | parameter | limit | unit |
|----------|--------------------------------|---------------------|------|
| - | cadmium and its compounds | 0.1 | mg/l |
| - | cyanide compounds | 1 | mg/l |
| - | org. phosphorus compounds (*1) | 1 | mg/l |
| - | lead and its compounds | 0.1 | mg/l |
| - | chromium (VI) compounds | 0.5 | mg/l |
| - | arsenic and its compounds | 0.1 | mg/l |
| - | total mercury | 0.005 | mg/l |
| - | alkyl mercury compounds | Not detectable (*2) | |
| - | PCB | 0.003 | mg/l |
| - | dichloromethane | 0.2 | mg/l |
| - | carbontetrachloride | 0.02 | mg/l |
| - | 12-dichloroethane | 0.04 | mg/l |
| - | 11-dichloroethylene | 0.2 | mg/l |
| - | cis12-dichloroethylene | 0.4 | mg/l |
| - | 111-trichloroethane | 3 | mg/l |
| - | 112-trichloroethane | 0.06 | mg/l |
| - | trichloroethylene | 0.3 | mg/l |
| - | tetrachloroethylene | 0.1 | mg/l |
| - | 13-dichloropropylene | 0.02 | mg/l |
| - | thiram (TMTD) | 0.06 | mg/l |
| - | simazine (CAT) | 0.03 | mg/l |
| - | thiobencarb | 0.2 | mg/l |
| - | benzene | 0.1 | mg/l |
| - | selenium | 0.1 | mg/l |

*1) Organic phosphorus compounds; parathion, methyl parathion,

methyldimethon and EPN only.

- *2) Not detectable; the substance must be below the level detectable by the method designed by the Director General of the Environment Agency.
- *3) Prefectures may set more stringent standards.

4. Citation

- 4.1. Title of document: Cabinet Order for Establishment of the Effluent Standard (No.54-1993)
- 4.2. Publisher: Environment Agency, Government of Japan
- 4.3. Date published: 27 Dec. 1993
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: National effluent standards for substances related to the protection of living environment

1. Descriptors

- 1.1. Country: Japan
- 1.2. Industry: Textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, BOD, COD, SS, oil and fat, phenols, copper, zinc, iron, manganese, chromium, fluorine, coliform, nitrogen, phosphorus

2. Legal reference

- 2.1. Title of the law/regulations: Water Pollution Control Law
- 2.2. Date issued: 21 June 1971
- 2.3. Date amended: 1974, 1975, 1976, 1977, 1981, 1985, 1986

3. Summary

| category | parameter | limit | unit | |
|------------------|---------------------|----------------|-----------------------------------|----------------------|
| all industries | pH | 5.8 - 8.6 (*3) | - | |
| | pH | 5.0 - 9.0 (*4) | - | |
| | BOD (*5) | | 160 | mg/l |
| | | | 120 | mg/l (daily average) |
| | COD | | 160 (*6) | mg/l |
| | | | 120 (*6) | mg/l (daily average) |
| | SS | | 200 | mg/l |
| | | | 150 | mg/l (daily average) |
| | N-hexan extracts | 5 | mg/l (mineral oil) | |
| | N-hexan extracts | 30 | mg/l (animal fat and vegetal oil) | |
| | phenols | 5 | mg/l | |
| | copper | 3 | mg/l | |
| | zinc | 5 | mg/l | |
| | dissolved iron | 10 | mg/l | |
| | dissolved manganese | 10 | mg/l | |
| | chromium | 2 | mg/l | |
| | fluorine | 15 | mg/l | |
| | coliform | 3000 | /ml (daily average) | |
| | nitrogen (*8) | | 120 | mg/l |
| | | | 60 | mg/l (daily average) |
| phosphorus (*8) | | 16 | mg/l | |
| | | 8 | mg/l (daily average) | |
| textile industry | COD | 30-120 (*7) | mg/l (daily average) | |

- *1) The above standards are applied to the effluents from industrial plants whose volume of effluents is not less than 50 m³ per day.
- *2) Prefectures may set more stringent standards.
- *3) For effluents discharged into public water bodies other than coastal seas.

- *4) For effluents discharged into coastal seas.
- *5) The BOD value is applied effluents discharged to public waters other than coastal seas and lakes.
- *6) The COD(Mn) value is applied only to effluents discharged into coastal waters and lakes.
- *7) This COD value is applied only to effluents which can affect the water qualities in Tokyo Bay, Ise Bay or Seto Inland Sea areas currently under 'areawide total pollutant load control'.
- *8) The phosphorus and nitrogen standards are applicable to lakes and reservoirs in which problems due to eutrophication may occur. Also covered are rivers flowing into the lakes and reservoirs.

4. Citation

| | |
|---------------------------------------|--|
| <u>4.1. Title of document:</u> | "Quality of the Environment in Japan 1989" |
| <u>4.2. Publisher:</u> | Environment Agency, Government of Japan |
| <u>4.3. Date published:</u> | 1991 |
| <u>4.4. Publisher Reference Code:</u> | - |
| <u>4.5. IEO Library Code:</u> | - |

Headline: Recommendations on effluent standards for Nitrogen and Phosphorus in Japan

1. Descriptors

- 1.1. Country: Japan
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Nitrogen, Phosphorus

2. Legal reference

- 2.1. Title of the law/regulations: Water Pollution Control Law (1971), The Recommendations on the Environmental Quality Standards and So Forth Regarding Nitrogen and Phosphorus in the Coastal Seas Returned by the Central Council on Environmental Pollution Control (1993.5.6.)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| category | parameter | standard | | unit |
|----------------|------------|----------|------------|------|
| | | maximum | daily ave. | |
| all industries | nitrogen | 120 | 60 | mg/l |
| | phosphorus | 16 | 8 | mg/l |

*1) The above effluent standards are applicable to the bays or inland seas in danger of eutrophication problems, including Public Water Areas flowing into them. The bay or inland sea is in principal considered as in danger of eutrophication problems when its 'Closeness Index' is more than 1. The 'Closeness Index' is defined as below:

$$\text{Closeness Index} = rS \cdot Db / We \cdot De$$

where rS : square root of the area
 Db : maximum depth of the bay
 We : width of the bay entrance
 De : maximum depth of the bay entrance

*2) Interim standards for specific industries, at most for 5 years.

4. Citation

- 4.1. Title of document: The Recommendations on the Environmental Quality Standards and So Forth Regarding Nitrogen and Phosphorus in the Coastal Seas

4.2. Publisher: The Central Council on Environmental
Pollution Control, Government of Japan

4.3. Date published: May 6, 1993

4.4. Publisher Reference Code: -

4.5. IEO Library Code: -

Headline: Industrial effluent standards in Korea

1. Descriptors

- 1.1. Country: Korea
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, temperature, colour, BOD, COD, SS, oil & grease, phenols, cyanide, arsenic, cadmium, copper, organic phosphorus compounds, lead, chromium, chromium (VI), mercury, dissolved manganese, zinc, fluoride, PCB, E. coli., dissolved iron, trichloroethylene, tetrachloroethylene, total nitrogen, total phosphorus, anionic surfactant

2. Legal reference

- 2.1. Title of the law/regulations: Environmental Protection Act
- 2.2. Date issued: -
- 2.3. Date amended: 1986

3. Summary

The industrial effluent regulations in Korea are classified mainly by the area to which industrial facilities discharge their effluents. Moreover, the important control parameters such as BOD, COD and SS are further sub-classified by the daily maximum discharge rate as can be seen in the footnote.

1) Effluent standard for all industries in Korea till the end of 1995.

| parameter | limit | | | | unit |
|------------------------------------|---------|---------|---------|---------|------|
| | (*1) | (*2) | (*3) | (*4) | |
| pH | 5.8-8.6 | 5.8-8.6 | 5.8-8.6 | 5.8-8.6 | - |
| temperature | 40 | 40 | 40 | 40 | °C |
| colour (*9) | 200 | 300 | 400 | 400 | unit |
| BOD (*5) | 50 | 80 | 100 | 30 | mg/l |
| BOD (*6) | 50 | 100 | 150 | 30 | mg/l |
| COD (*5) | 50 | 80 | 100 | 50 | mg/l |
| COD (*6) | 50 | 100 | 150 | 50 | mg/l |
| SS (*5) | 50 | 80 | 100 | 70 | mg/l |
| SS (*6) | 50 | 100 | 150 | 70 | mg/l |
| oil & grease (N-hexan extracts) | | | | | |
| - mineral oil | 1 | 5 | 5 | 5 | mg/l |
| - animal fat/ vegetal oil | 5 | 30 | 30 | 30 | mg/l |
| phenols | 1 | 3 | 3 | 3 | mg/l |
| arsenic | 0.1 | 0.5 | 0.5 | 0.5 | mg/l |
| cyanide | 0.2 | 1 | 1 | 1 | mg/l |
| cadmium | 0.02 | 0.1 | 0.1 | 0.1 | mg/l |
| chromium(total) | 0.5 | 2 | 2 | 2 | mg/l |
| chromium (VI) | 0.1 | 0.5 | 0.5 | 0.5 | mg/l |
| copper | 0.5 | 3 | 3 | 3 | mg/l |
| lead | 0.2 | 1 | 1 | 1 | mg/l |

| | | | | | |
|------------------------------|--------|-------|-------|-------|------|
| dissolved manganese | 2 | 10 | 10 | 10 | mg/l |
| mercury | ND(*7) | 0.005 | 0.005 | 0.005 | mg/l |
| zinc | 1 | 5 | 5 | 5 | mg/l |
| fluoride | 3 | 15 | 15 | 15 | mg/l |
| organic phosphorus compounds | 0.2 | 1 | 1 | 1 | mg/l |
| PCB | ND | 0.003 | 0.003 | 0.003 | mg/l |
| E. coli. | 100 | 3000 | 3000 | 3000 | (*8) |
| dissolved iron | 2 | 10 | 10 | 10 | mg/l |
| trichloroethylene | 0.06 | 0.3 | 0.3 | 0.3 | mg/l |
| tetrachloroethylene | 0.02 | 0.1 | 0.1 | 0.1 | mg/l |

2) Announced to be revised from the first January of 1996.

| parameter | limit | | | | unit |
|--------------------|-------|------|------|------|------|
| | (*1) | (*2) | (*3) | (*4) | |
| BOD (*5) | 30 | 60 | 80 | 30 | mg/l |
| BOD (*6) | 40 | 80 | 120 | 30 | mg/l |
| COD (*5) | 40 | 70 | 90 | 40 | mg/l |
| COD (*6) | 50 | 90 | 130 | 40 | mg/l |
| SS (*5) | 30 | 60 | 80 | 30 | mg/l |
| SS (*6) | 40 | 80 | 120 | 30 | mg/l |
| total nitrogen | 30 | 60 | 60 | 60 | mg/l |
| total phosphorus | 4 | 8 | 8 | 8 | mg/l |
| anionic surfactant | 3 | 5 | 5 | 5 | mg/l |

- *1) For Clean Area (protected area).
- *2) For Area I (for potable use after filtration).
- *3) For Area II (for potable use after advanced treatment).
- *4) For Special Area (the final treatment facilities of industrial combinat).
- *5) For facilities with total waste water discharge rates higher than 3000 m³/day.
- *6) For facilities with total waste water discharge rates lower than 3000 m³/day.
- *7) Not detectable; the substance must be below the level detectable.
- *8) MPH/100ml.
- *9) Only for textile industry.

4. Citation

- 4.1. Title of document: Direct communication with Korea Research Institute of Chemical Technology on the environmental effluent standard for industrial facilities in Korea.
- 4.2. Publisher: -
- 4.3. Date published: June 1994
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Sewage and industrial effluent regulations in Malaysia

1. Descriptors

- 1.1. Country: Malaysia
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, temperature, BOD, COD, SS, oil & grease, phenols, cyanide, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, boron, chloride, sulphide.

2. Legal reference

- 2.1. Title of the law/regulations: Environmental Quality Act 1974,
Environmental Quality (Sewage and
Industrial Effluents) Regulations 1978
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| category | parameter | limit | | | unit |
|----------------|---------------|---------|---------|---------|------|
| | | (*1) | (*2) | (*3) | |
| all industries | pH | 6.0-9.0 | 5.5-9.0 | 5.0-9.0 | - |
| | temperature | 40 | 40 | 45 | °C |
| | BOD | 20 | 50 | 400 | mg/l |
| | COD | 50 | 100 | 1000 | mg/l |
| | SS | 50 | 100 | 400 | mg/l |
| | oil & grease | ND (*4) | 10 | 100 | mg/l |
| | phenols | 0.001 | 1 | 5 | mg/l |
| | cyanide | 0.05 | 0.1 | 2 | mg/l |
| | arsenic | 0.05 | 0.1 | 2 | mg/l |
| | cadmium | 0.01 | 0.02 | 1 | mg/l |
| | chromium(III) | 0.2 | 1 | 10 | mg/l |
| | chromium (VI) | 0.05 | 0.05 | 2 | mg/l |
| | copper | 0.2 | 1 | 10 | mg/l |
| | iron | 1 | 5 | 50 | mg/l |
| | lead | 0.1 | 0.5 | 2 | mg/l |
| | manganese | 0.2 | 1 | 10 | mg/l |
| | mercury | 0.005 | 0.05 | 0.1 | mg/l |
| | nickel | 0.2 | 1 | 10 | mg/l |
| | tin | 0.2 | 1 | 10 | mg/l |
| | zinc | 1 | 1 | 10 | mg/l |
| boron | 1 | 4 | - | mg/l | |
| free chlorine | 1 | 2 | - | mg/l | |
| sulphide | 0.50 | 0.50 | 2 | mg/l | |

*1) For discharge into any inland waters within the catchment areas.

*2) For discharge into any other inland waters.

*3) For discharge other than (*1) or (*2).

*4) Not detectable; the substance must be below the level detectable.

4. Citation

4.1. Title of document: Direct Communication with Malaysian
Director-General of Environment on
Environmental Quality Standards in
Malaysia

4.2. Publisher: Ministry of Science, Technology and
Environment, Malaysia

4.3. Date published: April 1990

4.4. Publisher Reference Code: -

4.5. IEO Library Code: -

Headline: National environmental quality standards for municipal and liquid industrial effluents in Pakistan

1. Descriptors

- 1.1. Country: Pakistan
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Temperature, pH, BOD, COD, TSS, TDS, oil & grease, phenol compounds, chloride, fluoride, cyanide, anionic detergents, sulphate, sulphide, ammonia, pesticides, herbicides, fungicides and insecticides, cadmium, chromium, copper, lead, mercury, selenium, nickel, total toxic metals, zinc, arsenic, barium, iron, manganese, boron, chlorine

2. Legal reference

- 2.1. Title of the law/regulations: Notification of National Environmental Quality Standards for Municipal and Liquid Industrial Effluents, 1993; Environmental Protection Ordinance, 1983
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| parameter | standard | unit |
|---|----------|------|
| temperature | 40 | °C |
| pH | 6.0-10.0 | - |
| BOD | 80 | mg/l |
| COD | 150 | mg/l |
| TSS | 150 | mg/l |
| TDS | 3500 | mg/l |
| oil & grease | 10 | mg/l |
| phenol compounds (as phenol) | 0.1 | mg/l |
| chloride (as Cl) | 1000 | mg/l |
| fluoride (as F) | 20 | mg/l |
| cyanide (as CN) | 2 | mg/l |
| anionic detergents (as MBAS) (*2) | 20 | mg/l |
| sulphate (SO ₄) | 600 | mg/l |
| sulphide (S) | 1.0 | mg/l |
| ammonia (NH ₃) | 40 | mg/l |
| pesticides, herbicides fungicides and insecticides | 0.15 | mg/l |
| cadmium (*3) | 0.1 | mg/l |
| chromium (III & VI) (*3) | 1.0 | mg/l |
| copper (*3) | 1.0 | mg/l |
| lead (*3) | 0.5 | mg/l |
| mercury (*3) | 0.01 | mg/l |
| selenium (*3) | 0.5 | mg/l |
| nickel (*3) | 1.0 | mg/l |
| silver | 1.0 | mg/l |
| total toxic metals | 2.0 | mg/l |

| | | |
|-----------|-----|------|
| zinc | 5 | mg/l |
| arsenic | 1.0 | mg/l |
| barium | 1.5 | mg/l |
| iron | 2.0 | mg/l |
| manganese | 1.5 | mg/l |
| boron | 6.0 | mg/l |
| chlorine | 1.0 | mg/l |

- *1) Assuming minimum dilution 1:10 on discharge, Lower ratio would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency.
- *2) Assuming surfactant as biodegradable. MBAS means Modified Benzene Alkyl Sulphates.
- *3) Subject to total toxic metals discharge.

4. Citation

- 4.1. Title of document: The Gazette of Pakistan, Extra, Aug. 29, 1993 Part II
- 4.2. Publisher: Environment and Urban Affair Division, Government of Pakistan
- 4.3. Date published: 1993
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Effluent standards in the Philippines

1. Descriptors

- 1.1. Country: The Philippines
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: BOD

2. Legal reference

- 2.1. Title of the law/regulations: Effluent Standards (Section 4-6 of the Effluent Regulations of 1982)
- 2.2. Date issued: 1982
- 2.3. Date amended: 1990

3. Summary

The Department of Environment and Natural Resources (DENR) revised the standards in 1988-1990 and the new standards have been issued (DENR Administrative Order Nos.34 and 35). The standards took effect thirty days after publication (March 17, 1990).

Through the revision the effluent standards were made more flexible by introducing separate limit for each of the four classifications in fresh and marine waters. New parameters like COD and settleable solids, were added.

For a period of time (not exceeding 10 years, existing industries will be required to comply with less stringent interim standards than new industries. Less stringent standards will be also applied to industries with very strong waste (> 5000 mg/l BOD) for a period of four years. Dischargers who cannot comply with the interim effluents standards will be required to obtain temporary permits to operate provided they pay a penalty fee.

Tables 1-3 summarizes the required BOD concentrations for the concerned classes of industry at certain period after the revised standards take effect.

Table 1. BOD effluent Standards for old/existing industries (unit; mg/l)

| initial BOD range | classification of receiving waters | | | | | | | |
|----------------------|------------------------------------|----|------------|-----------|----|-------------|------------|--|
| | A | B | C | D | SB | SC | SD | |
| below 1000 | 50 | 50 | 80 | 150 | 50 | 120 | 150 | |
| 1000 - 3000 | 50 | 50 | 80 | 200** | 50 | 200** | 200** | |
| 3000 - 10000 | 50 | 50 | 320-200** | 320-200* | 50 | 650- 320** | 650- 320* | |
| 10000 - 30000 | 50 | 50 | 1000-600** | 1000-600* | 50 | 2000-1000** | 2000-1000* | |
| above 30000 | 50 | 50 | 1500-900** | 1500-900* | 50 | 3000-1500** | 3000-1500* | |

*) Interim requirements for the periods 1990-1991 and 1992-1994.

**) When initial BOD is below median, percentage removal is used in accordance with table 3.

Table 2. BOD effluent Standards for new/proposed industries or all industries after 1994 (unit; mg/l)

| initial BOD range | classification of receiving waters | | | | | | |
|----------------------|------------------------------------|----|------|------|----|------|------|
| | A | B | C | D | SB | SC | SD |
| below 1000 | 30 | 30 | 50 | 50 | 30 | 100 | 120 |
| 1000 - 3000 | 30 | 30 | 50 | 50 | 30 | 200* | 200* |
| 3000 - 10000 | 30 | 30 | 130* | 130* | 30 | 200* | 200* |
| 10000 - 30000 | 30 | 30 | 200* | 200* | 30 | 600* | 600* |
| above 30000 | 30 | 30 | 300* | 300* | 30 | 900* | 900* |

*) When initial BOD is below median, percentage removal is used in assistance with table 3.

Table 3. Percent removal for old/existing and new/proposed or all industries after 1994 (unit; %)

| initial BOD range | classification of receiving waters | | | | |
|----------------------|------------------------------------|-------|-------|-------|-------|
| | C | D | SC&SD | C&D | SC&SD |
| below 1000 | - | - | - | - | - |
| 1000 - 3000 | - | 90 | 90 | 90 | 90 |
| 3000 - 10000 | 95-97 | 95-97 | 90-95 | 98-98 | 97 |
| 10000 - 30000 | 95-97 | 95-97 | 90-95 | 99-99 | 97 |
| above 30000 | 95-97 | 95-97 | 90-95 | 99-99 | 99 |

4. Citation

- 4.1. Title of document: "The Philippine Environment in the Eighties"
- 4.2. Publisher: Department of Environment and Natural Resources, Environmental Management Bureau
- 4.3. Date published: 1990
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Performance standards for direct discharge in Saudi Arabia.

1. Descriptors

- 1.1. Country: Saudi Arabia
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Floatables, pH, TSS, temperature, turbidity, BOD, COD, total organic carbon, total kjeldahl nitrogen, total chlorinated hydrocarbons, oil & grease, phenols, ammonia, arsenic, cadmium, chlorine, chromium, copper, cyanide, lead, mercury, nickel, phosphate, zinc, total coliform

2. Legal reference

- 2.1. Title of the law/regulations: Royal Decree No. 7/M/8903, Supreme Commission for administrative reform No. 86
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

A- Purpose:

Performance standards for direct discharge are intended to require waste water sources to adopt best practical controls.

B- Scope:

Performance standards for direct discharge apply to sanitary sewage, surface runoff (including fire control waters), cooling water discharges, boiler water conditioning blowdown, process wastewaters, and any other wastewater.

C- General Performance Standards:

Wastewaters of different character shall be segregated to the maximum extent possible. Uncontaminated surface runoff and once-through cooling waters may be discharged to receiving waters without treatment.

D- Specific Performance Standards:

The following performance standards apply to wastewaters at the end of the outfall and before-discharge to coastal waters or to any channel of wastewater.

| parameter | limit | unit |
|---------------------------------|-------|------|
| ----- | | |
| D-1. physio-chemical pollutants | | |
| floatables | none | - |
| pH | 6-9 | - |
| TSS | 15 | mg/l |
| temperature | (*1) | - |
| turbidity | 75 | NTU |

D-2. organic pollutants

| | | |
|--------------------------------|--------|------|
| BOD | 25 | mg/l |
| COD | 150 | mg/l |
| total organic carbon | 50 | mg/l |
| total kjeldahl nitrogen | 5 | mg/l |
| total chlorinated hydrocarbons | 0.1 | mg/l |
| oil & grease | 8 (*2) | mg/l |
| phenols | 0.1 | mg/l |

D-3. non-organic pollutants (*3)

| | | |
|------------------------|-------|------|
| ammonia (as nitrogen) | 1.0 | mg/l |
| arsenic | 0.1 | mg/l |
| cadmium | 0.02 | mg/l |
| chlorine (residual) | 0.5 | mg/l |
| chromium (total) | 0.1 | mg/l |
| copper | 0.2 | mg/l |
| cyanide | 0.05 | mg/l |
| lead | 0.1 | mg/l |
| mercury | 0.001 | mg/l |
| nickel | 0.2 | mg/l |
| phosphate (total as P) | 1.0 | mg/l |
| zinc | 1.0 | mg/l |

D-4. biological pollutants (*3)

| | | |
|----------------|------|----------------|
| total coliform | 1000 | MPN per 100 ml |
|----------------|------|----------------|

- *1) MEPA determines the thermal properties of discharged water to fit the properties of receiving water and such properties are determined on a case by case basis.
- *2) Not to exceed 15 mg/l in any individual discharge.
- *3) Allowable effluent level: 30-day average.

E- Mixing Zone:

Each direct discharge shall be adequately dispersed and mixed with the receiving waters. A mixing zone shall be designed to minimize adverse effects to designated beneficial uses. Adequacy of the mixing zone shall be determined on a case-by case basis.

4. Citation

- 4.1. Title of document: "Environmental Protection Standards in the Kingdom of Saudi Arabia, Document No. 1401-01, 1402 H"
- 4.2. Publisher: Meteorology and Environmental Protection Administration (MEPA), Saudi Arabia
- 4.3. Date published: -
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Allowable limits for trade effluent discharge to sewer, watercourse and controlled watercourse in Singapore

1. Descriptors

- 1.1. Country: Singapore
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Temperature, colour, pH, BOD, COD, TSS, TDS, chloride, sulphate, sulphide, cyanide, detergents, oil & grease, arsenic, barium, tin, iron, beryllium, boron, manganese, phenolic compounds, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, total metals, chlorine, phosphate, calcium, magnesium, nitrate

2. Legal reference

- 2.1. Title of the law/regulations: The Water Pollution Control and Drainage Act; Trade Effluent Regulations (TER), 1976
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| parameter | limits (*1) | | | unit |
|--------------------------------|-------------|------|-------|------|
| | I | II | III | |
| temperature | 45 | 45 | 45 | °C |
| colour | - | 7 | 7 | (*2) |
| pH | 6-9 | 6-9 | 6-9 | - |
| BOD | 400 | 50 | 20 | mg/l |
| COD | 600 | 100 | 60 | mg/l |
| TSS | 400 | 50 | 30 | mg/l |
| TDS | 3000 | 2000 | 1000 | mg/l |
| chloride (as chloride ion) | 1000 | 600 | 400 | mg/l |
| sulphate (as SO ₄) | 1000 | 500 | 200 | mg/l |
| sulphide (as sulphur) | 1 | 0.2 | 0.2 | mg/l |
| cyanide (as CN) | 2 | 0.1 | 0.1 | mg/l |
| detergents (*3) | 30 | 15 | 5 | mg/l |
| oil & grease | 60 | 10 | 5 | mg/l |
| arsenic | 5 | 1 | 0.05 | mg/l |
| barium | 10 | 5 | 5 | mg/l |
| tin | 10 | 10 | 5 | mg/l |
| iron (as Fe) | 50 | 20 | 1 | mg/l |
| beryllium | 5 | 0.5 | 0.5 | mg/l |
| boron | 5 | 5 | 0.5 | mg/l |
| manganese | 10 | 5 | 0.5 | mg/l |
| phenolic compounds (as phenol) | 0.5 | 0.2 | nil | mg/l |
| toxic metals | | | | |
| cadmium | 1 | 0.1 | 0.01 | mg/l |
| chromium (III and VI) | 5 | 1 | 0.05 | mg/l |
| copper | 5 | 0.1 | 0.1 | mg/l |
| lead | 5 | 0.1 | 0.1 | mg/l |
| mercury | 0.5 | 0.05 | 0.001 | mg/l |

| | | | | |
|---------------------------------|----|-----|------|------|
| nickel | 10 | 1 | 0.1 | mg/l |
| selenium | 10 | 0.5 | 0.01 | mg/l |
| silver | 5 | 0.1 | 0.1 | mg/l |
| zinc | 10 | 1 | 0.5 | mg/l |
| metals in total (*4) | 10 | 1 | 0.5 | mg/l |
| chlorine (free) | - | 1 | 1 | mg/l |
| phosphate (as PO ₄) | - | 5 | 2 | mg/l |
| calcium (as Ca) | - | 200 | 150 | mg/l |
| magnesium (as Mg) | - | 200 | 150 | mg/l |
| nitrate (as NO ₃) | - | - | 20 | mg/l |

- *1) I : Sewer.
 II : Watercourse.
 III: Controlled Watercourse; it means a water course from which potable water supplied by PUB under the Public Utilities Act is obtained but does not include a water course from which water is pumped into a main of the PUB.
- *2) Lovibond units.
- *3) Linear alkylate sulphonate as methylene blue active substances.
- *4) The concentration of toxic metal shall not exceed the limits as shown, individually or in total.

4. Citation

- 4.1. Title of document: "Annual Report 1993"
- 4.2. Publisher: Pollution Control Department, Ministry of Environment, Singapore
- 4.3. Date published: 1994
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Standards for industrial waste water in Sri Lanka

1. Descriptors

- 1.1. Country: Sri Lanka
1.2. Industry: All industries including textile industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: pH, SS, TSS, temperature, BOD, COD, phenolic compounds, cyanides, sulphides, fluorides, residual chlorine, ammoniacal nitrogen, arsenic, cadmium, chromium copper, lead, mercury, nickel, selenium, zinc, pesticides, oil & grease, radioactive materials, colour, odour, sulphate, chloride, sodium, boron, residual sodium, floatables

2. Legal reference

- 2.1. Title of the law/regulations: The National Environmental Act
2.2. Date issued: -
2.3. Date amended: -

3. Summary

Board of Investment of Sri Lanka has established three Export Processing Zones, Katunayake, Biyagama and Koggala. As part of the infrastructure facilities provided in these zones, potable water conforming to WHO Standards and a common waste water treatment plant where the effluents from individual factories set up by the developers are treated to meet the specified standards are available. Provision has also been made for the removal of solid wastes arising from the operations at the factories.

In terms of the National Environmental Act, an "Environmental Licensing" procedure is in force. The following is a guideline on the environmental standards to be adhered to by the BOI enterprises for setting up of projects and operations both within and outside the Export Processing Zones. All enterprises should ensure that the operations carried out conform to the National Environmental Act and Regulations gazetted thereunder.

General standards for industrial waste water (effluents) discharged into inland surface waters (after treatment)

| parameter | limit | unit |
|--|---------|------|
| pH | 6.0-8.5 | - |
| SS | 50 | mg/l |
| temperature | 40 | °C |
| BOD | 30 | mg/l |
| COD | 250 | mg/l |
| phenolic compounds (as C ₆ H ₅ OH) | 1.0 | mg/l |
| cyanides | 0.2 | mg/l |
| sulphides | 2.0 | mg/l |
| fluorides | 2.0 | mg/l |
| total residual chlorine | 1.0 | mg/l |
| ammoniacal nitrogen (as N) | 50 | mg/l |
| arsenic (as As) | 0.2 | mg/l |
| cadmium (as Cd) | 0.1 | mg/l |
| chromium (as Cr) | 0.1 | mg/l |

| | | |
|-----------------------|-----------|------------------|
| copper (as Cu) | 3.0 | mg/l |
| lead (as Pb) | 0.1 | mg/l |
| mercury (as Hg) | 0.0005 | mg/l |
| nickel (as Ni) | 3.0 | mg/l |
| selenium (as Se) | 0.05 | mg/l |
| zinc (as Zn) | 5.0 | mg/l |
| pesticides | nil | - |
| oil & grease | 10.0 | mg/l |
| radioactive materials | | |
| alpha emitters | 10^{-7} | $\mu\text{c/ml}$ |
| beta emitters | 10^{-6} | $\mu\text{c/ml}$ |

- *1) These values are based on a dilution of the effluents by at least 8 volumes of clean receiving water. If the dilution is below 8 times, the maximum tolerance limits shall be worked out on a proportionate basis taking into consideration the dilution factor. However no increase in the limits will be allowed as a result of increased dilution beyond 1:8.
- *2) All efforts should be made to remove colour and unpleasant odour from the effluents.

Tolerance limits for industrial waste water (effluents) discharged into marine coastal waters

| parameter | limit | unit |
|--|-----------|---------------------|
| BOD | 100 | mg/l |
| TSS | | |
| process waste waters | 150 | mg/l |
| cooling water effluent | (*1) | |
| particle size of: | | |
| floatable solids | 3 | mm |
| settleable solids | 840 | microns |
| temperature at point of discharge | 45 | $^{\circ}\text{C}$ |
| pH | 6.0-8.5 | - |
| oil & grease | 20 | mg/l |
| ammoniacal nitrogen (as N) | 50 | mg/l |
| residual chlorine | 1 | mg/l |
| fluoride (as F) | 15 | mg/l |
| cyanides (as CN) | 0.20 | mg/l |
| phenolic compounds (as $\text{C}_6\text{H}_5\text{OH}$) | 5 | mg/l |
| sulphides (as S) | 5 | mg/l |
| arsenic (as As) | 0.2 | mg/l |
| selenium (as Se) | 0.05 | mg/l |
| pesticides | | |
| organo-phosphorous compounds (as P) | 1.0 | mg/l |
| chlorinated hydrocarbons (as Cl) | 0.02 | mg/l |
| copper (as Cu) | 3.0 | mg/l |
| lead (as Pb) | 1.0 | mg/l |
| chromium (as Cr) | 1.0 | mg/l |
| cadmium (as Cd) | 2.0 | mg/l |
| mercury (as Hg) | 0.01 | mg/l |
| nickel (as Ni) | 5.0 | mg/l |
| zinc (as Zn) | 5.0 | mg/l |
| radioactive materials | | |
| alpha emitters | 10^{-8} | $\mu\text{c/ml}$ |
| beta emitters | 10^{-7} | $\mu\text{c/ml}$ |
| colour | | no visible colour |
| odour | | no unpleasant odour |
| COD | 250 | mg/l |
| free residual chlorine | 1 | mg/l |

- *1) Total suspended matter content of effluent cooling water plus 10 %.
- *2) All efforts should be made to remove colour and unpleasant odour from the effluents.

Tolerance limits for industrial effluents discharged on land for irrigation purposes

| | | |
|--------------------------------|------------------------------|-------|
| pH | 5.5-9.0 | - |
| TSS | 2100 | mg/l |
| BOD (*1) | 250 | mg/l |
| sulphate (as SO ₄) | 1000 | mg/l |
| chloride (as Cl) | 600 | mg/l |
| sodium absorption ratio | 10-15 | SAR |
| arsenic (as As) | 0.2 | mg/l |
| boron (as B) | 2.0 | mg/l |
| cadmium (as Cd) | 2.0 | mg/l |
| chromium (as Cr) | 1.0 | mg/l |
| lead (as Pb) | 1.0 | mg/l |
| mercury (as Hg) | 0.01 | mg/l |
| residual sodium carbonate | 25 | mg/l |
| oil & grease | 10 | mg/l |
| radioactive material | | |
| alpha emitters | 10 ⁻⁹ | µc/ml |
| beta emitters | 10 ⁻⁸ | µc/ml |
| odour | no obnoxious odour | |
| floatables | no visible large size solids | |

*1) Can be relaxed or tightened depending on soil conditions and application rate.

4. Citation

- 4.1. Title of document: "Environmental Norms"
- 4.2. Publisher: Board of Investment of Sri Lanka
- 4.3. Date published: 1993
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Effluent standards in Taiwan

1. Descriptors

- 1.1. Country: Taiwan
- 1.2. Industry: Textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Temperature, pH, BOD, COD, TSS, transparency, nitrate-N, oil & grease, anion active agent, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, zinc, boron, sulphide, fluoride, formaldehyde, phenols, cyanide, PCB, organic phosphorus compounds, amino-formate compounds, aldrin, dieldrin, endrin, lindane, DDT isomers, herbicides, endosulfan, toxaphene, pentachlorophenol and its compounds, pentachloronitrobenzene

2. Legal reference

- 2.1. Title of the law/regulations: Effluent Standards (1987) under the Water Pollution Control Law (1974)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| category | parameter | standard | unit |
|----------------|---------------------|----------------|-----------------------------------|
| all industries | temperature | 35 (*3) | °C |
| | pH | 5.0-9.0 | - |
| | nitrate-N | 100 | mg/l |
| | oil & grease | | |
| | (N-hexan extracts) | 10 | mg/l (mineral oil) |
| | | 30 | mg/l (animal fat and vegetal oil) |
| | fluoride | 15.0 | mg/l |
| | phenols | 5.0 | mg/l |
| | anion active agent | 10.0 | mg/l |
| | cyanide | 1.0 | mg/l |
| | arsenic | 0.5 | mg/l |
| | cadmium | 0.1 | mg/l |
| | total chromium | 2.0 | mg/l |
| | chromium (VI) | 0.5 | mg/l |
| | copper | 3.0 | mg/l |
| | dissolved iron | 10.0 | mg/l |
| | dissolved manganese | 10.0 | mg/l |
| | lead | 1.0 | mg/l |
| | mercury (total) | 0.005 | mg/l |
| | mercury (organic) | not detectable | - |
| | nickel | 1.0 | mg/l |
| | selenium | 0.5 | mg/l |
| | silver | 0.5 | mg/l |
| | zinc | 5.0 | mg/l |
| | boron | 1.0 | mg/l |
| | sulphide | 1.0 | mg/l |
| | formaldehyde | 3.0 | mg/l |
| | PCB | not detectable | - |
| | total organic | | |

| | | | |
|--|-------------------------------------|----------------|------|
| | phosphorus compounds | 0.5 | mg/l |
| | total amino-formate compounds | 0.5 | mg/l |
| | aldrin, dieldrin | not detectable | - |
| | endrin | not detectable | - |
| | lindane | not detectable | - |
| | heptachlor isomers | not detectable | - |
| | DDT isomers | not detectable | - |
| | herbicides | 1.0 | mg/l |
| | endosulfan | 0.03 | mg/l |
| | toxaphene | 0.005 | mg/l |
| | pentachlorophenol and its compounds | not detectable | - |
| | pentachloro-nitrobenzene | 0.05 | mg/l |
| textile industry (rinsing wool process) | BOD | 150 | mg/l |
| | COD | 500 | mg/l |
| | SS | 400 | mg/l |
| | transparency | 15< | cm |
| textile industry (dyeing process) | BOD | 80 | mg/l |
| | COD | 250 | mg/l |
| | SS | 200 | mg/l |
| | transparency | 15< | cm |
| textile industry (weaving synthetic process) | BOD | 80 | mg/l |
| | COD | 300 | mg/l |
| | SS | 200 | mg/l |

-
- *1) Regional authorities may set more stringent standards depending on local conditions.
- *2) Not detectable; the substance must be below the level detectable by the method designed by the government.
- *3) When effluent is discharged directly into coastal water, the surface temperature difference between the effluent and the receiving water should not exceed 4 °C in the area within 500 m from the outlet.

4. Citation

- 4.1. Title of document: Environmental Protection Laws in Taiwan
- 4.2. Publisher: Japan Environmental Management Association for Industry (JEMAI)
- 4.3. Date published: 1991
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Industrial effluent standards in Thailand

1. Descriptors

- 1.1. Country: Thailand
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: BOD, SS, dissolved solids, temperature, colour & odour, pH, permaganate value, sulphide, cyanide, tar, oil & grease, formaldehyde, phenol and cresols, free chlorine, insecticides, radioactivity, zinc, chromium, arsenic, copper, mercury, cadmium, barium, selenium, lead, nickel, manganese, silver

2. Legal reference

- 2.1. Title of the law/regulations: Notification of the Ministry of Industry No. 12, B.E. 2525 (1982) issued under the Factory Act B.E. 2521 (1978), published in the Royal Government Gazette, Vol. 99, Part 33, dated March 5, B.E. 2525 (1982); Notification of the Ministry of Industry No. 10, B.E. 2521 (1978) issued under the Factory Act B.E. 2521, published in the Royal Government Gazette, Vol. 95, Part 132, dated November 28, B.E. 2521 (1978).
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| parameter | standard | unit | remark |
|------------------------------|---|------|---|
| BOD | 20-60 | mg/l | |
| SS | depend on dilution ratios of wastewater ratio and receiving water | | |
| | 30 | mg/l | ratio 1/8 to 1/150 |
| | 60 | mg/l | 1/151 to 1/300 |
| | 150 | mg/l | 1/301 to 1/500 |
| dissolved solids | max. 2000 or under office's consideration but not more than 5000 | mg/l | not higher than receiving water dissolved solids. 5000 mg/l if salinity of receiving water is higher than 2000 mg/l |
| temperature | 40.0 | °C | |
| colour & odour | not objectionable | - | |
| pH | 5-9 | - | |
| permaganate value | 60 | mg/l | |
| sulphide as H ₂ S | 1.0 | mg/l | |
| cyanide as HCN | 0.2 | mg/l | |
| tar | none | mg/l | |
| oil & grease | 5.0 | mg/l | |

| | | |
|--------------------|-------|------------|
| formaldehyde | 1.0 | mg/l |
| phenol and cresols | 1.0 | mg/l |
| free chlorine | 1.0 | mg/l |
| insecticides | none | mg/l |
| radioactivity | none | Becqurel/l |
| heavy metals | | |
| zinc | 5.0 | mg/l |
| chromium | 0.5 | mg/l |
| arsenic | 0.25 | mg/l |
| copper | 1.0 | mg/l |
| mercury | 0.005 | mg/l |
| cadmium | 0.03 | mg/l |
| barium | 1.0 | mg/l |
| selenium | 0.2 | mg/l |
| lead | 0.2 | mg/l |
| nickel | 0.2 | mg/l |
| manganese | 5.0 | mg/l |
| silver | - | mg/l |

*1) A licensee for operation of a factory who does not comply with this notification shall be punished by fine not exceeding ten thousand baht.

4. Citation

- 4.1. Title of document: Direct communication with Asian Institute of Technology on the Effluent Standards in Thailand
- 4.2. Publisher: -
- 4.3. Date published: July 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: The draft guidance for effluent from textile industry in the UK issued by Her Majesty's Inspectorate of Pollution (HMIP)

1. Descriptors

- 1.1. Country: UK
- 1.2. Industry: Textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent to sewer
- 1.5. Parameters: Pentachlorophenol, hexachlorocyclohexane, cadmium, mercury, chromium, COD, colour, pH, trichlorobenzene, 12-dichloroethane

2. Legal reference

- 2.1. Title of the law/regulations: The Environmental Protection Act 1990 (EPA 1990); the Water Industry Act, 1991; the Water Resources Act, 1991
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Under the Environmental Protection Act, an IPC system (Integrated Pollution Control) is being introduced at present. By January 31 1996 operators of prescribed processes must have applied for an authorisation to Her Majesty's Inspectorate of Pollution (HMIP). This will require e.g. the use of "Best Available Techniques Not Entailing Excessive Costs" (BATNEEC).

No particular emission standards are in force for the textile industry (nor for any other industry). Emission limit values are set in consents issued by the National River Authorities (NRA) in England and Wales, and by the River Purification Boards in Scotland. The basis for the consent is e.g. the Water Quality Objectives for receiving water, and EU directives. Regulated parameters are normally waste water flow, TSS, BOD, COD and pH. Consents are given for the discharge of effluents both to receiving waters and to municipal sewage systems.

For textile treatment processes, the draft guidance is given on release concentrations or mass release rates achievable for key substances using the best combination of techniques for new processes.

| parameter | standard | unit |
|--|----------|------|
| Pentachlorophenol (and its compounds) | 1 | µg/l |
| hexachlorocyclohexane (all isomers) | 1 | µg/l |
| cadmium | 10 | µg/l |
| mercury | 5 | µg/l |

- *1) If dye carriers, trichlorobenzene or 12-dichloroethane, are present in the process then their release should be prevented by substitution with non-prescribed alternatives.
- *2) Depending upon the final effluent disposal options available it may be appropriate to set additional limits for other substances which

may be present, such as:

- chromium (used in dyeing) hexavalent chromium compounds should not be discharged to water;
- COD;
- colour (certain dyes can be very resistant to biological treatment);
- pH (for discharges to sewer - usually limited by water companies to a range of 6-9).

4. Citation

4.1. Title of document:

"Chief Inspector's Guidance to Inspectors - Environmental Protection Act 1990, Process Guidance Note IPR 6/6 Draft Version 2.0, Textile Treatment Processes", Her Majesty's Inspectorate of Pollution (HMIP), 1994; "Techno-Economic Study on the Reduction Measures, Based on Best Available Techniques on Emissions (Water, Wastes, Air) from the Paper and Board Manufacturing Industry", DG XI of the Commission of EU, 1994

4.2. Publisher:

-

4.3. Date published:

1994

4.4. Publisher Reference Code:

-

4.5. IEO Library Code:

-

Headline: BPT effluent limitations for textile mill effluent in USA

1. Descriptors

- 1.1. Country: USA
- 1.2. Industry: Textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, TSS, BOD, COD, sulphide, phenol, oil & grease, chromium(total)

2. Legal reference

- 2.1. Title of the law/regulations: The Clean Water Act (1977)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Limitation with BPT (Best Practical Technology Currently Available)

| category | parameter | limit | | unit (kg/1000kg fibre processed) | |
|----------------------------------|----------------|-------|------|--|--|
| | | (*1) | (*2) | | |
| wool scouring | pH | 6-9 | 6-9 | | |
| | BOD | 10.6 | 5.3 | | |
| | COD | 138.0 | 69.0 | | |
| | TSS | 32.2 | 16.1 | | |
| | oil & grease | 7.2 | 3.6 | | |
| | sulphide | 0.20 | 0.10 | | |
| | phenol | 0.10 | 0.05 | | |
| | total chromium | 0.10 | 0.05 | | |
| wool finishing | pH | 6-9 | 6-9 | | |
| | BOD | 22.4 | 11.2 | | |
| | COD | 163.0 | 81.5 | | |
| | TSS | 35.2 | 17.6 | | |
| | sulphide | 0.28 | 0.14 | | |
| | phenol | 0.14 | 0.07 | | |
| | total chromium | 0.14 | 0.07 | | |
| low water use processing (*3) | pH | 6-9 | 6-9 | | |
| | BOD | 1.4 | 0.7 | | |
| | - general | COD | 2.8 | 1.4 | |
| | processing | TSS | 1.4 | 0.7 | |
| low water use processing (*3) | pH | 6-9 | 6-9 | | |
| | BOD | 8.9 | 4.6 | | |
| | - water jet | COD | 21.3 | 13.7 | |
| | weaving | TSS | 5.5 | 2.5 | |
| woven fabric finishing | pH | 6-9 | 6-9 | | |
| | BOD | 6.6 | 3.3 | | |
| | COD | 60.0 | 30.0 | | |
| | COD (*4) | 20.0 | 10.0 | | |
| | COD (*5) | 40.0 | 20.0 | | |
| | TSS | 17.8 | 8.9 | | |

| | | | |
|--------------------------|------------------------|-------|-------|
| | sulphide | 0.20 | 0.10 |
| | phenol | 0.10 | 0.05 |
| | total chromium | 0.10 | 0.05 |
| knit fabric finishing | pH | 6-9 | 6-9 |
| | BOD | 5.0 | 2.5 |
| | COD | 60.0 | 30.0 |
| | COD (*6) | 20.0 | 10.0 |
| | COD (*7) | 40.0 | 20.0 |
| | TSS | 21.8 | 10.9 |
| | sulphide | 0.20 | 0.10 |
| | phenol | 0.10 | 0.05 |
| | total chromium | 0.10 | 0.05 |
| carpet finishing | pH | 6-9 | 6-9 |
| | BOD | 7.8 | 3.9 |
| | COD | 70.2 | 35.1 |
| | COD (*8) | 20.0 | 10.0 |
| | TSS | 11.0 | 5.5 |
| | sulphide | 0.08 | 0.04 |
| | phenol | 0.04 | 0.02 |
| | total chromium | 0.04 | 0.02 |
| stock and yarn finishing | pH | 6-9 | 6-9 |
| | BOD | 6.8 | 3.4 |
| | COD | 84.6 | 42.3 |
| | TSS | 17.4 | 8.7 |
| | sulphide | 0.24 | 0.12 |
| | phenol | 0.12 | 0.06 |
| | total chromium | 0.12 | 0.06 |
| | nonwoven manufacturing | pH | 6-9 |
| BOD | | 4.4 | 2.2 |
| COD | | 40.0 | 20.0 |
| TSS | | 6.2 | 3.1 |
| sulphide | | 0.046 | 0.023 |
| phenol | | 0.023 | 0.011 |
| total chromium | | 0.023 | 0.011 |
| felted fabric processing | | pH | 6-9 |
| | BOD | 35.2 | 17.6 |
| | COD | 256.8 | 128.4 |
| | TSS | 55.4 | 27.7 |
| | sulphide | 0.44 | 0.22 |
| | phenol | 0.22 | 0.11 |
| | total chromium | 0.22 | 0.11 |

-
- *1) Daily maximum.
- *2) Monthly average.
- *3) Including yarn manufacture, yarn texturizing, unfinished fabric manufacture, fabric coating, fabric laminating, tire cord and fabric dipping, and carpet tufting and carpet backing.
- *4) Woven fabric finishing through simple manufacturing operations employing a synthetic fibre or through complex manufacturing operations employing a natural fibre.
- *5) Woven fabric finishing through simple manufacturing operations employing a natural and synthetic fibre blend or through complex manufacturing operations employing a synthetic fibre.
- *6) Knit fabric finishing through simple manufacturing operations employing a natural and synthetic fibre or through complex manufacturing operations employing a synthetic fibre.
- *7) Knit fabric finishing through complex manufacturing operations employing a natural and synthetic fibre blend.
- *8) Carpet manufacturing through complex manufacturing operations.

4. Citation

- 4.1. Title of document: "Code of Federal Regulations, Parts 400 to 424, Revised as of July 1, 1992"
- 4.2. Publisher: The Office of the Federal Register
National Archives and Records
Administration, USA
- 4.3. Date published: 1992
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: BAT effluent limitations for textile mill effluent in USA

1. Descriptors

- 1.1. Country: USA
- 1.2. Industry: Textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: COD, sulphur, phenol, total chromium

2. Legal reference

- 2.1. Title of the law/regulations: The Clean Water Act (1977)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Limitation with BAT (Best Available Technology Economically Achievable)

| category | parameter | limit | | unit (kg/1000kg fibre processed) |
|--|----------------|-------|------|--|
| | | (*1) | (*2) | |
| wool scouring | COD | 138.0 | 69.0 | |
| | sulphide | 0.20 | 0.10 | |
| | phenol | 0.10 | 0.05 | |
| | total chromium | 0.10 | 0.05 | |
| wool finishing | COD | 163 | 81.5 | |
| | sulphide | 0.28 | 0.14 | |
| | phenol | 0.14 | 0.07 | |
| | total chromium | 0.14 | 0.07 | |
| low water use processing (*3) - general processing | COD | 2.8 | 1.4 | |
| low water use processing (*3) - water jet weaving | COD | 21.3 | 13.7 | |
| woven fabric finishing | COD | 60 | 30 | |
| | COD (*4) | 20.0 | 10.0 | |
| | COD (*5) | 40.0 | 20.0 | |
| | sulphide | 0.20 | 0.10 | |
| | phenol | 0.10 | 0.05 | |
| | total chromium | 0.10 | 0.05 | |
| knit fabric finishing | COD | 60 | 30 | |
| | COD (*6) | 20.0 | 10.0 | |
| | COD (*7) | 40.0 | 20.0 | |
| | sulphide | 0.20 | 0.10 | |
| | phenol | 0.10 | 0.05 | |
| | total chromium | 0.10 | 0.05 | |
| carpet finishing | COD | 70.2 | 35.1 | |
| | COD (*8) | 20.0 | 10.0 | |

| | | | |
|--------------------------|----------------|-------|-------|
| | sulphide | 0.08 | 0.04 |
| | phenol | 0.04 | 0.02 |
| | total chromium | 0.04 | 0.02 |
| stock and yarn finishing | COD | 84.6 | 42.3 |
| | sulphide | 0.24 | 0.12 |
| | phenol | 0.12 | 0.06 |
| | total chromium | 0.12 | 0.06 |
| nonwoven manufacturing | pH | 6-9 | 6-9 |
| | COD | 40.0 | 20.0 |
| | sulphide | 0.046 | 0.023 |
| | phenol | 0.023 | 0.011 |
| | total chromium | 0.023 | 0.011 |
| felted fabric processing | pH | 6-9 | 6-9 |
| | COD | 256.8 | 128.4 |
| | sulphide | 0.44 | 0.22 |
| | phenol | 0.22 | 0.11 |
| | total chromium | 0.22 | 0.11 |

-
- *1) Daily maximum.
 - *2) Monthly average.
 - *3) Including yarn manufacture, yarn texturizing, unfinished fabric manufacture, fabric coating, fabric laminating, tire cord and fabric dipping, and carpet tufting and carpet backing.
 - *4) Woven fabric finishing through simple manufacturing operations employing a synthetic fibre or through complex manufacturing operations employing a natural fibre.
 - *5) Woven fabric finishing through simple manufacturing operations employing a natural and synthetic fibre blend or through complex manufacturing operations employing a synthetic fibre.
 - *6) Knit fabric finishing through simple manufacturing operations employing a natural and synthetic fibre or through complex manufacturing operations employing a synthetic fibre.
 - *7) Knit fabric finishing through complex manufacturing operations employing a natural and synthetic fibre blend.
 - *8) Carpet manufacturing through complex manufacturing operations.

4. Citation

- 4.1. Title of document: "Code of Federal Regulations, Parts 400 to 424, Revised as of July 1, 1992"
- 4.2. Publisher: The Office of the Federal Register
National Archives and Records
Administration, USA
- 4.3. Date published: 1992
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: NSPS effluent limitations for textile mill effluent in USA

1. Descriptors

- 1.1. Country: USA
- 1.2. Industry: Textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, TSS, BOD, COD, sulphur, phenol, total chromium

2. Legal reference

- 2.1. Title of the law/regulations: The Clean Water Act (1977)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Limitation by NSPS (New Source Performance Standards)

| category | parameter | limit | | unit (kg/1000kg fibre processed) |
|--|--------------------|-------|------|--|
| | | (*1) | (*2) | |
| wool scouring | pH | 6-9 | 6-9 | |
| | BOD | 3.6 | 1.9 | |
| | COD | 52.4 | 33.7 | |
| | TSS | 30.3 | 13.5 | |
| | sulphide | 0.20 | 0.10 | |
| | phenol | 0.10 | 0.05 | |
| | total chromium | 0.10 | 0.05 | |
| wool finishing | pH | 6-9 | 6-9 | |
| | BOD | 10.7 | 5.5 | |
| | COD | 113.8 | 73.3 | |
| | TSS | 32.3 | 14.4 | |
| | sulphide | 0.28 | 0.14 | |
| | phenol | 0.14 | 0.07 | |
| | total chromium | 0.14 | 0.07 | |
| low water use processing (*3) | pH | 6-9 | 6-9 | |
| | BOD | 1.4 | 0.7 | |
| | - general COD | 2.8 | 1.4 | |
| | processing TSS | 1.4 | 0.7 | |
| low water use processing (*3) | pH | 6-9 | 6-9 | |
| | BOD | 8.9 | 4.6 | |
| | - water jet COD | 21.3 | 13.7 | |
| | weaving TSS | 5.5 | 2.5 | |
| woven fabric finishing - simple manufacturing operations | pH | 6-9 | 6-9 | |
| | BOD | 3.3 | 1.7 | |
| | COD | 41.7 | 26.9 | |
| | TSS | 8.8 | 3.9 | |
| | sulphide | 0.20 | 0.10 | |
| | phenol | 0.10 | 0.05 | |
| | total chromium | 0.10 | 0.05 | |

| | | | |
|------------------|----------------|-------|-------|
| woven fabric | pH | 6-9 | 6-9 |
| finishing | BOD | 3.7 | 1.9 |
| - complex | COD | 68.7 | 44.2 |
| manufacturing | TSS | 14.4 | 6.4 |
| operations | sulphide | 0.20 | 0.10 |
| | phenol | 0.10 | 0.05 |
| | total chromium | 0.10 | 0.05 |
| woven fabric | pH | 6-9 | 6-9 |
| finishing | BOD | 5.5 | 2.8 |
| - desizing | COD | 59.5 | 38.3 |
| | TSS | 15.6 | 6.9 |
| | sulphide | 0.20 | 0.10 |
| | phenol | 0.10 | 0.05 |
| | total chromium | 0.10 | 0.05 |
| knit fabric | pH | 6-9 | 6-9 |
| finishing | BOD | 3.6 | 1.9 |
| - simple | COD | 48.1 | 31.0 |
| manufacturing | TSS | 13.2 | 5.9 |
| operations | sulphide | 0.20 | 0.10 |
| | phenol | 0.10 | 0.05 |
| | total chromium | 0.10 | 0.05 |
| knit fabric | pH | 6-9 | 6-9 |
| finishing | BOD | 4.8 | 2.5 |
| - complex | COD | 51.0 | 32.9 |
| manufacturing | TSS | 12.2 | 5.4 |
| operations | sulphide | 0.20 | 0.10 |
| | phenol | 0.10 | 0.05 |
| | total chromium | 0.10 | 0.05 |
| knit fabric | pH | 6-9 | 6-9 |
| finishing | BOD | 2.3 | 1.2 |
| - hosiery | COD | 30.7 | 19.8 |
| products | TSS | 8.4 | 3.7 |
| | sulphide | 0.20 | 0.10 |
| | phenol | 0.10 | 0.05 |
| | total chromium | 0.10 | 0.05 |
| carpet finishing | pH | 6-9 | 6-9 |
| | BOD | 4.6 | 2.4 |
| | COD | 26.6 | 17.1 |
| | TSS | 8.6 | 3.8 |
| | sulphide | 0.08 | 0.04 |
| | phenol | 0.04 | 0.02 |
| | total chromium | 0.04 | 0.02 |
| stock and yarn | pH | 6-9 | 6-9 |
| finishing | BOD | 3.6 | 1.9 |
| | COD | 33.9 | 21.9 |
| | TSS | 9.8 | 4.4 |
| | sulphide | 0.24 | 0.12 |
| | phenol | 0.12 | 0.06 |
| | total chromium | 0.12 | 0.06 |
| nonwoven | pH | 6-9 | 6-9 |
| manufacturing | BOD | 2.6 | 1.4 |
| | COD | 15.2 | 9.8 |
| | TSS | 4.9 | 2.2 |
| | sulphide | 0.046 | 0.023 |
| | phenol | 0.023 | 0.011 |
| | total chromium | 0.023 | 0.011 |
| felted fabric | pH | 6-9 | 6-9 |
| processing | BOD | 16.9 | 8.7 |
| | COD | 179.3 | 115.5 |
| | TSS | 50.9 | 22.7 |
| | sulphide | 0.44 | 0.22 |
| | phenol | 0.22 | 0.11 |
| | total chromium | 0.22 | 0.11 |

*1) Daily maximum.

*2) Monthly average.

*3) Including yarn manufacture, yarn texturizing, unfinished fabric manufacture, fabric coating, fabric laminating, tire cord and fabric dipping, and carpet tufting and carpet backing.

4. Citation

4.1. Title of document: "Code of Federal Regulations, Parts 400 to 424, Revised as of July 1, 1992"

4.2. Publisher: The Office of the Federal Register
National Archives and Records
Administration, USA

4.3. Date published: 1992

4.4. Publisher Reference Code: -

4.5. IEO Library Code: -

Headline: Industrial emissions and discharge Standards in Venezuela

1. Descriptors

- 1.1. Country: Venezuela (all the country except Lake of Maracaibo Basin and Lake of Valencia Basin)
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/effluent
- 1.5. Parameters: Mineral oil and hydrocarbons, vegetal oil & greases, alkyl mercury, total aluminum, total arsenic, total barium, total cadmium, total cyanide, total cobalt, total copper, real colour, chromium (VI), total chromium, BOD, COD, detergents and dispersants, foam, phenols, fluorine, total phosphorus, total iron, total manganese, total mercury, total nickel, total nitrogen, pH, total silver, total lead, total selenium, floating solids, SS, total solids, sulphurs, sulphates, zinc, biocides carbamate, biocides organ-chlorinated, vanadium, isotopes

2. Legal reference

- 2.1. Title of the law/regulations: Ley Penal del Ambiente; Decreto 2.224 (Normas para Regular la Descarga de Vertidos Líquidos a Cuerpos de Agua)
- 2.2. Date issued: April 1992
- 2.3. Date amended: -

3. Summary

All the country except Lake of Maracaibo Basin and Lake of Valencia Basin

| parameter | standards (*1) | | | unit (*2) |
|------------------------------|----------------|-------|-------|-----------|
| | (1) | (2) | (3) | |
| mineral oil and hydrocarbons | 20.0 | 20.0 | 20.0 | |
| vegetal oil & greases | 20.0 | 20.0 | 150.0 | |
| alkyl mercury | none | none | none | |
| total aluminum | 5.0 | 5.0 | 10.0 | |
| total arsenic | 0.5 | 0.5 | 0.5 | |
| total barium | 5.0 | 5.0 | 10.0 | |
| total cadmium | 0.2 | 0.2 | 0.2 | |
| total cyanide | 0.2 | 0.2 | 0.2 | |
| total cobalt | 0.5 | 0.5 | 0.5 | |
| total copper | 1.0 | 1.0 | 1.5 | |
| real colour | 500 | 500 | - | |
| chromium (VI) | 0.5 | 0.5 | 0.5 | |
| total chromium | 2.0 | 2.0 | 3.0 | |
| BOD | 60.0 | 60.0 | 350.0 | |
| COD | 350.0 | 600.0 | 900.0 | |
| detergents and dispersants | 2.0 | 2.0 | 8.0 | |
| foam | none | none | - | |
| phenols | 0.5 | 0.5 | 0.5 | |
| fluorine | 10.0 | 10.0 | 10.0 | |
| total phosphorus | 1.0 | 3.0 | 20.0 | |
| total iron | 10.0 | - | 25.0 | |
| total manganese | 2.0 | - | 10.0 | |

| | | | |
|-----------------------------|--------|------|--------|
| total mercury | 0.01 | 0.01 | 0.01 |
| total nickel | 2.0 | 2.0 | 2.0 |
| total nitrogen | 10.0 | 10.0 | 80.0 |
| pH | 6-9 | 6-9 | 6-9 |
| total silver | 0.1 | 0.5 | 0.1 |
| total lead | 0.5 | 0.5 | 0.5 |
| total selenium | 0.05 | 0.2 | 0.2 |
| floating solids | none | none | none |
| SS | 60.0 | 60.0 | 400.0 |
| total solids | 1500.0 | - | 1500.0 |
| sulphurs | 0.5 | 2.0 | 2.0 |
| sulphates | - | - | 400.0 |
| zinc | 5.0 | 10.0 | 10.0 |
| biocides carbonate | 0.25 | 0.25 | 0.05 |
| biocides organo-chlorinated | 0.05 | 0.05 | 0.05 |
| vanadium | - | - | 5.0 |
| isotopes | none | none | none |

*1) standard (1): general waters.
standard (2): coastal-sea medium.
standard (3): sewage system.

*2) mg/l except for pH and real colour (un Pt-Co).

4. Citation

4.1. Title of document: Direct communication with INTEVEP.S.A. on Effluent Standards in Venezuela.

4.2. Publisher: -

4.3. Date published: April 1994

4.4. Publisher reference code: -

4.5. IEO library code: -

Headline: Maximum limit of wastewater's constituents discharging into water sources (criteria 6) in Vietnam.

1. Descriptors

- 1.1. Country: Vietnam
- 1.2. Industry: All industries including textile industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/effluent
- 1.5. Parameters: pH, SS, colour, BOD, COD, hydrocarbon (oil and grease), phenol, cyanide, chromium, zinc, copper, cadmium, mercury, lead, manganese, sulfide, chloride, hydrocarbon chlorinated, total pesticides, total coliforms

2. Legal reference

- 2.1. Title of the law/regulations: -
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

| parameter | limits (*1) (*2) | | note |
|-----------------------------|------------------|-------|--------------------------------|
| | I | II | |
| pH | 5-8 | 4-9 | - |
| SS | 50 | 100 | - |
| colour after filtering | 200 | 500 | Pt-Co scale |
| BOD | 80 | 100 | - |
| COD | 160 | 200 | - |
| hydrocarbon | 1 | 10 | oil and grease |
| phenol | 1 | 5 | - |
| cyanide | 0.2 | 1 | - |
| chromium | 0.5 | 2 | - |
| zinc | 1 | 5 | - |
| copper | 0.5 | 3 | - |
| cadmium | 0.02 | 0.1 | - |
| mercury | 0.01 | 0.05 | - |
| arsenic | 0.1 | 0.5 | - |
| lead | 0.2 | 1 | - |
| manganese | 2 | 10 | - |
| sulfide | 0.5 | 1.0 | calculated as H ₂ S |
| chloride (Cl ⁻) | 500 | 1000 | - |
| hydrocarbon chlorinated | 0.01 | 0.02 | - |
| total pesticides | 0.005 | 0.01 | - |
| total coliforms | 5000 | 10000 | - |

*1) class I : water sources using for water supply, tourism, fishing. Distance from effluent discharge should be more than 500 m.
 class II: water sources not using for above purposes.

*2) Unit: mg/l except for pH, colour after filtering (un Pt-Co) and total coliforms (number of cultures in 100 ml Petri dish at 37°C).

4. Citation

| | |
|---------------------------------------|--|
| <u>4.1. Title of document:</u> | "Provisional Environmental Criteria" |
| <u>4.2. Publisher:</u> | Ministry for Science, Technology and Environment |
| <u>4.3. Date published:</u> | 1993 |
| <u>4.4. Publisher reference code:</u> | - |
| <u>4.5. IEO library code:</u> | - |

**International agreements and guidelines
for the textile industry**

Headline: World Bank Environmental Guidelines for textile and synthetic fiber Industry

1. Descriptors

- 1.1. Country: International (World Bank)
- 1.2. Industry: Textile and synthetic fiber industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, TSS, BOD, COD, phenol, sulphide, oil & grease, total chromium, fecal coliform MPN, pesticides

2. Legal reference

- 2.1. Title of the law/regulations: Environmental Guidelines - Textile and Synthetic Fibre Industry
- 2.2. Date issued: 1983
- 2.3. Date amended: -

3. Summary

Daily maximum effluent limitations for various textile process operations, based on the best available technology currently available, are presented below:

| category | parameter | limit | unit |
|------------------------|----------------|---------|---------------------|
| - | pH | 6.0-9.0 | - |
| wool scouring | TSS | 32 | kg/Mg raw wool |
| | COD | 138 | kg/Mg raw wool |
| | BOD | 10 | kg/Mg raw wool |
| | phenol | 0.10 | kg/Mg raw wool |
| | sulphide | 0.20 | kg/Mg raw wool |
| | oil & grease | 7.2 | kg/Mg raw wool |
| wool finishing | TSS | 35 | kg/Mg final product |
| | COD | 163 | kg/Mg final product |
| | BOD | 22 | kg/Mg final product |
| | phenol | 0.14 | kg/Mg final product |
| | sulphide | 0.28 | kg/Mg final product |
| | total chromium | 0.14 | kg/Mg final product |
| dry processing | TSS | 1.4 | kg/Mg final product |
| | COD | 2.8 | kg/Mg final product |
| | BOD | 1.4 | kg/Mg final product |
| | fecal coliform | 400 | per 100 ml MPN |
| woven fabric finishing | TSS | 18 | kg/Mg final product |
| | COD | 60 | kg/Mg final product |
| | BOD | 6.6 | kg/Mg final product |
| | phenol | 0.10 | kg/Mg final product |
| | sulphide | 0.20 | kg/Mg final product |
| | total chromium | 0.10 | kg/Mg final product |
| knit fabric finishing | TSS | 22 | kg/Mg final product |
| | COD | 60 | kg/Mg final product |
| | BOD | 5.02 | kg/Mg final product |
| | phenol | 0.10 | kg/Mg final product |

| | | | |
|--------------|----------------|------|-----------------------------|
| | sulphide | 0.20 | kg/Mg final product |
| | total chromium | 0.10 | kg/Mg final product |
| carpet mills | TSS | 11 | kg/Mg primary backed carpet |
| | COD | 70 | kg/Mg primary backed carpet |
| | BOD | 7.8 | kg/Mg primary backed carpet |
| | phenol | 0.04 | kg/Mg primary backed carpet |
| | sulphide | 0.08 | kg/Mg primary backed carpet |
| | total chromium | 0.04 | kg/Mg primary backed carpet |
| stock & yarn | TSS | 17 | kg/Mg final product |
| dyeing- | COD | 85 | kg/Mg final product |
| finishing | BOD | 6.8 | kg/Mg final product |
| | phenol | 0.12 | kg/Mg final product |
| | sulphide | 0.24 | kg/Mg final product |
| | total chromium | 0.12 | kg/Mg final product |

*1) Mg = Megagram = metric ton

*2) For plants carrying out commission finishing the limitations are double those shown.

4. Citation

| | |
|---------------------------------------|---|
| <u>4.1. Title of document:</u> | Environmental Guidelines |
| <u>4.2. Publisher:</u> | Office of Environmental Affairs, the World Bank |
| <u>4.3. Date published:</u> | 1984 |
| <u>4.4. Publisher Reference Code:</u> | - |
| <u>4.5. IEO Library Code:</u> | 250.1/EGWC |

Appendix

APPENDIX 1: LIST OF INFOTERRA NATIONAL FOCAL POINTS

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ISBN 92 807 1342 X, 62 p., 1992. Price: FF 200/US\$ 40

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n° 5. ISBN 92 807 1295 X, 1992. Price: FF 250/US\$ 50

Tanneries and the Environment - Technical Report n°4. ISBN 92 807 1276 4, 119 p., 1991.
Price: FF 200/US\$ 40

Environmental Aspects of the Metal Finishing Industry - Technical Report n°1. ISBN
92 807 1216 0, 91 p., 1989. Price: FF 200/US\$ 40



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