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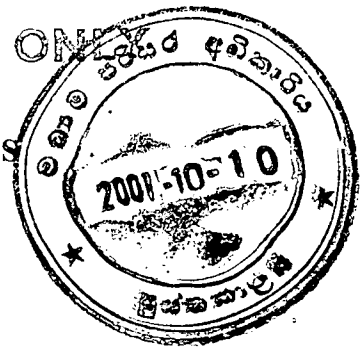
# POLLUTION CONTROL GUIDELINES
## (FOR SMALL SCALE INDUSTRIES)

## NO. 1 – PADDY MILLS

Central Environmental Authority
Ministry of Forestry & Environment
2001




# POLLUTION CONTROL GUIDELINES

*(For small scale industry)*

**No. 1 - Paddy Mills**

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Prepared for the
Central Environmental Authority
by the Environmental Resources Management Lanka (Pvt.) Ltd.
With financial Assistance/ from the
World Health Organization (WHO)

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## Preface

During the last two decades, rapid industrial development and population growth have contributed to the deterioration of the environmental quality in Sri Lanka.

In recent past, the Central Environmental Authority has initiated a number of important measures towards sustainable development by protecting, managing and improving our environment. Most notable legislative measures were the amendments to the National Environmental Act No 47 of 1980 which was subsequently amended by Act No 56 of 1988 and Act No 53 of 2000 reaching the basic goals of industrial pollution control in Sri Lanka.

The Central Environmental Authority has been entrusted with the task of preparing industrial pollution control guidelines for the industrial sectors. With an objective of fulfilling this tasks, industrial pollution control guidelines were prepared in 1992 for the eight high polluting major industrial sectors i.e. Natural Rubber Industry, Concentrated Latex Industry, Desiccated Coconut Industry, Leather Industry, Dairy Industry, Textile Processing Industry, Pesticide Formulating Industry, Metal Finishing Industry.

The following nine guidelines have now been prepared to cover the small scale industrial sectors in Sri Lanka.

| | |
|---|---|
| No. 1 | Paddy Mills |
| No. 2 | Saw Mills |
| No. 3 | Metal Crushers |
| No. 4 | Garages and Service Stations |
| No. 5 | Lime Kilns |
| No. 6 | Coconut Shell Burning Industries |
| No. 7 | Grinding Mills |
| No. 8 | Coir Mills |
| No. 9 | Bakeries |

The main purpose of the preparation of these guidelines was to assist Local Governmental Authorities and ndustrialists in industrial pollution control to meet the requirements of the Environmental Protection Licensing scheme.

These nine guidelines have been prepared by the Environmental Resources Management Lanka (Pvt) Limited for the Central Environmental Authority with financial assistance of the World Health Organisation (WHO).

This document contains pollution control guidelines for **Paddy Mills**.

Thilak Hewawasam
Chairman

# CONTENTS

# 1.0 INTRODUCTION

Sri-Lanka is an agricultural country and paddy is the main food crop in Sri- Lanka. Therefore paddy milling is an important industry.

Sri Lanka in early days was known as the granary of the east because of its paddy cultivation and production capacity. To the world paddy is the global gram and is the world's number one food crop. Being the staple diet of Sri Lanka paddy cultivation holds a vital position in the Sri Lanakan society.

Paddy milling may be defined as an activity by which the husk is removed through a milling machine. Numerous paddy mills operate in the country. Paddy is cultivated in two seasons, Yala and Maha, where by production is increased. Paddy mills normally keep stocks that are milled during non-production periods.

The Rice Processing Research and Development Center at Anuradhapura provides the know-how for the modernization of rice mills. Following table gives the production of paddy and the rice imports in the past few years.

| ITEM | UNITS | 1994(A) | | | 1995(B) | | |
|---|---|---|---|---|---|---|---|
| | | MAHA | YALA | TOTAL | MAHA | YALA | TOTAL |
| Gross extent sown | Hectares | 581 | 349 | 930 | 566 | 348 | 915 |
| Gross extent harvested | Hectares | 561 | 336 | 897 | 549 | 340 | 890 |
| Net extent harvested | Hectares | 499 | 299 | 798 | 489 | 306 | 795 |
| Production | MX 000 | 1670 | 1014 | 2684 | 1761 | 1049 | 2810 |
| Yield | Kg/ hectares | 3345 | 3393 | 3363 | 3603 | 3427 | 3535 |

Table -1

## 2.0 PROCESS DISCRIPTION

The general processes carried out in paddy milling which creates considerable environmental impacts are shown in figure 2.1 and 2.2. There are two main methods of rice milling operated in the industry, i.e. raw rice milling and parboiled rice milling. Raw rice milling concern the removal of impurities, drying and dehusking. However different acts of production could be seen in parboiled rice milling industry. Mainly there are four methods for parboiling of paddy.

- Cold soaking
- Hot soaking
- Semi modern method
- Modern method.

A milling machine is used to produce milled rice. In Sri Lanka four types of milling activity are carried out.

1. Mill in one huller
2. Mill in more than one huller
3. Semi modern mill
4. Modern mill

In modern mills, pre-cleaning is done in mechaanical cleaners, drying in mechanical dryers, de-husking in rubber roller shellers, paddy separation in compartment type separators and polishing in vertical cone polishers. Elevators provide a conveyor system for the paddy.

In semi modern mills, the polishing of the rice is still done using steel hullers, thus reducing costs of conversion. De-husking is done in rubber roller shellers.

In traditional huller mills, both operation are done with a battery of steel hullers, leading to a low outturn of head rice, high percentage of brokens and poor quality by- products due to mixture of husk with bran. Parboiled rice is sometimes under polished or even not polished prior to sale.

More than one fifth of the rice crop in the world is subjected to the process of parboiling. In Sri Lanka nearly 60% of the rice is consumed in parboiled form. The main advantage of parboiling is that the parboiled grain resist breakage during milling resisting in a higher milled return. Parboiling is done by consists of soaking paddy in water to hydrate the grain to about 30% moisture,

steaming the hydraed grain to gelatinize the starch within, followed by drying toabout 14% moisture before milling.

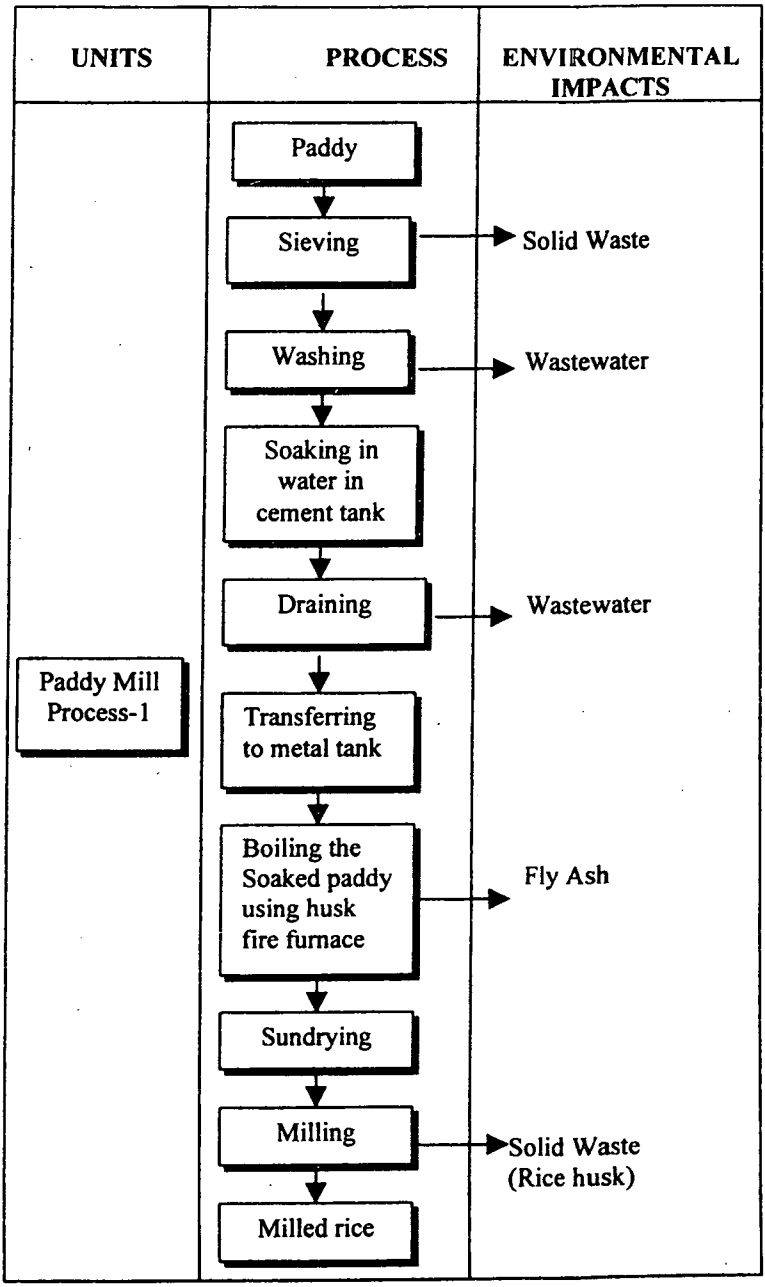

UNITS
PROCESS
ENVIRONMENTAL IMPACTS
Paddy
Sieving
Solid Waste
Washing
Wastewater
Soaking in water in cement tank
Draining
Wastewater
Paddy Mill Process-1
Transferring to metal tank
Boiling the Soaked paddy using husk fire furnace
Fly Ash
Sundrying
Milling
Solid Waste (Rice husk)
Milled rice

Figure-2.1

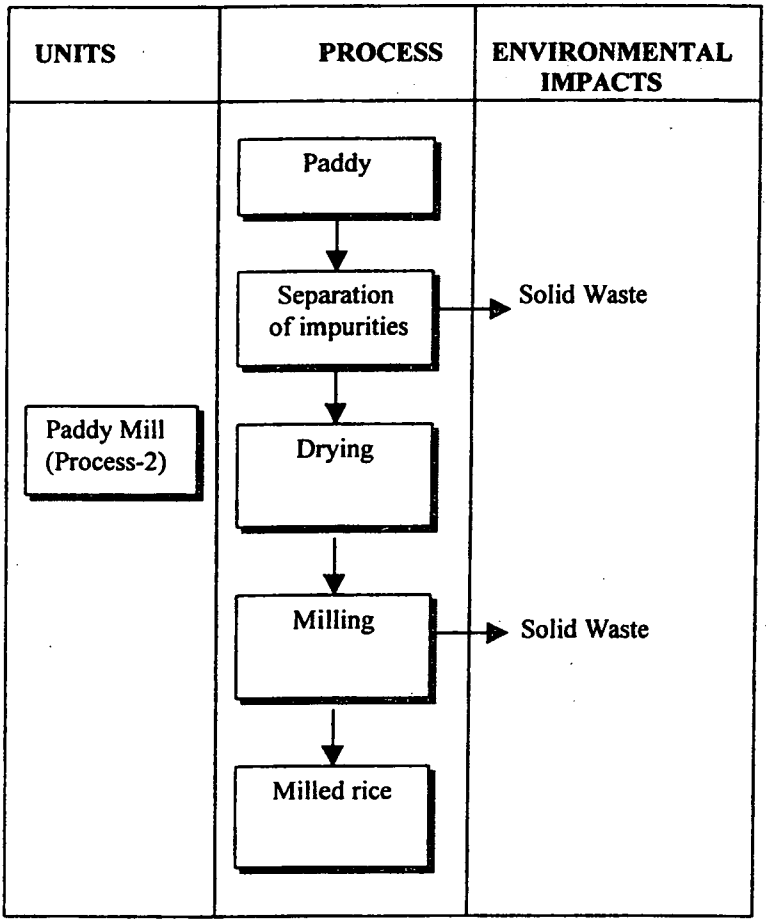

UNITS
PROCESS
ENVIRONMENTAL IMPACTS
Paddy
Separation of impurities
Solid Waste
Paddy Mill (Process-2)
Drying
Milling
Solid Waste
Milled rice

Figure 2.2

## 3.0 Waste generation and environmental impacts.

### *3.1 Waste water*

Wastewater is generated in the soaking process. Fresh water is used to soak paddy and at the end of soaking period the water used for soaking is discharged.

Wastewater from paddy mills is generally discharged without treatment into a nearby stream, paddy fields or lands. These discharges result in low dissolved oxygen concentration in streams or rivers and emission of bad odours caused by anaerobic degradation of organic substances. Solid particles may cause build-up of bottom deposits and also could give rise to anaerobic conditions at low levels of the water bodies. In addition nutrients present will promote the growth of algae in such waterways. Too much of growth of algae will result in eutrophication of tanks and result in deficit of dissolved oxygen affecting other higher order aquatic life. Photosynthesis will be affected as a result of loss of sunlight penetration due to colour and turbidity, then the natural ecosystem will be affected in water bodies. In addition to this, the recreational uses by people will also be affected.

Disposal of wastewater on lands will cause ground water pollution especially in areas where the ground water level is closer to the surface.

Typical analysis of wastewater sample is given in table 3.1.

| Parameter | Mill (A) | Mill (B) |
|---|---|---|
| BOD ( mg/l ) | 2200 | 1038 |
| COD (mg/l ) | 3800 | 1848 |
| pH | 5.2 | 4.7 |

Table 3.1

### *3.2 Paddy Husk (Solid waste)*

Every one ton of paddy yields about 200 kg of husk. Most of the parboiling millers use the husk as a fuel in their furnaces. Paddy husk is used in small quantities in poultry farming, cooking and brick making etc.

Excess paddy husk is considered useless and is disposed by means of heap burning in the direct surroundings of the mills, and burned or dumped in the nearest forest or uncultivated lands. Degradation time for husk is relatively high and land filling of paddy husk will render valuable land unsuitable for construction and cultivation purposes. Improper dumping (especially near natural waterways) might lead to wash off of paddy husk in rainy water and getting mixed with the surface water bodies. This will lead to the formation of bottom layers in the natural waterways and generate anaerobic conditions at the bottom layers of the water body. Aquatic life cannot survive under anaerobic conditions and bad odours will be emitted as a result of anaerobic digestion.

Smoke emission from heap burning of paddy husk in open air is a nuisance to the public and a source of aesthetic pollution. As the combustion is incomplete lots of particulate emission, which is a health hazard, take place.

## 4.0 Waste minimization, treatment and disposal

### *4.1 Wastewater*

Wastewater generated during the process should be treated (to reach CEA stipulated standards) prior to disposal. This aspect is depicted in fig.4 and suitable treatment systems have been recommended.


Influent
(Waste water)

Treated effluent
(meeting CEA standards)

Fig. 4.1

### *4.1.1 Chemical Treatment.*

Chemical treatment employs coagulation/precipitation and settling to remove the settlable solids from the effluent. Figure 4.2 gives diagrammatic information of the plant.

### *4.1.2 Description of construction of the treatment plant*

- Coagulant mixing/Dosing tank
  Volume – 250 litres.
  Material – metal/ plastic
- Fix a suitable sized stirrer in the tank
- Settling tank
  Dimensions – Refer Figure 4.2
  Material – mild steel
- Suitable supports to be provided for all tanks made out of mild steel frames.

### *4.1.3 Operation of the Plant*

The plant is designed to operate 8 hours a day. The treatment involves use of alum, lime and a suitable polyelectrolyte. Alum, lime and polyelectrolyte solutions will be added to the effluent and mixed using flash mixers. The operational procedure is given below.

Chemical solution preparation.

- Prepare a 2.5% (by weight) solution of Alum by adding 5 kg of Alum and 200 litres of water into the first chemical mixing tank. Mix the content thoroughly with the stirrer provided.

- Prepare a 5% (by weight) solution of Lime by adding 10 kg of Lime and 200 litres of water into the second chemical mixing tank. Mix the contents thoroughly .

- Prepare a 0.1 % (by weight) solution of a suitable Polly-electrolyte by adding 200 g of Polly-electrolyte and 200 litres of water into the third mixing tank. Mix the contents.

- Start pumping the effluent from the collection pit by switching on the pump. Adjust the flow rate by manipulating the valves V2 and V3. The rate of pumping should be equal to one eight of the volume collected in the collection sump per hour assuming eight hours operation a day. The purpose of recycling is to introduce mixing into the collection tank since a uniform effluent will ensure easy operation of the plant.

- Introduce chemicals into the tanks by opening the valves of the chemical dozing tanks. Adjust the rates of flow until the treated effluent is clear and colourless. The minimum rate of addition of chemicals should be determined by trial and error. (Alum Solution is added to coagulate the suspended solids and this would result in lowering of pH. For effective settling, the pH which is controlled by lime should be above 7).
- The sludge will settle in the settling tank and needs separation. This can be done hourly or as it is necessary by opening the valve V4 for a small period of time. The sludge will be in a form of a thick slurry and this could be used as a land fill.

- The treated effluent which overflows from the settling tank could be discharged into;

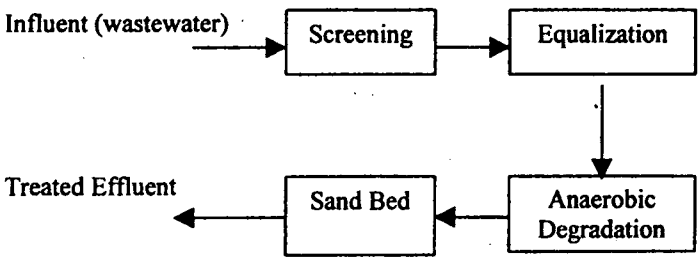
    - A nearby surface water body
    - Sewerage system
    - Lands

*Biological treatment method.*

*Description of the method*

The method employs anaerobic digestion to remove the biodegradable matter in the effluent. Anaerobic digestion can remove more than 90% of the organic content in the effluent. Figure 4.3 gives diagrammatic information on the plant.

*Process flow diagram of the Treatment Plant*




*Screening*

The effluent from the mill should be screened to remove solid matter in the effluent. The meshes can be fixed in the drain which carries the effluent to the equalization tank.

- Proposed mesh sizes are 10mm, 5mm and 3mm.
- Meshes should be fixed to the steel frames and installed in the drain so that they can be removed for cleaning needs.
- All meshes should be cleaned regularly.

*Equalization and neutralization*

Equalization tank ensures a uniform feed into the plant and prevents shock loads. The effluent from this tank is pumped in to the next stage from the pump sump. Pump sump is dozed with a base (Sodium Carbonate) before the effluent is pumped to the next stage to keep the pH of the effluent in the range of 6.5- 7 .5

*Anaerobic Digestion*

The anaerobic bacteria degrade the biodegradable matter in the effluent in this stage. The reactor is a vertically constructed

cylindrical tank. The tank is filled with filter media that retains anaerobic bacteria on its surface and prevents the bacteria from getting sloughed off. The filter media increases the reaction area in the tank. The anaerobic condition is maintained by making the tank airtight. Biogas is generated during in anaerobic digestion which has value as a fuel gas.

Sand Bed

A sand bed is used as the final stage of treatment. The main purpose of the sand bed is to remove suspended particles remaining in the effluent. This will act as a final filter clearing solids from the effluent.

Start up of the plant

- Half fill the anaerobic reactor with water and the other half with effluent
- Introduce anaerobic bacterial culture from another plant (e.g. effluent from a biogas tank or septic sludge). The transporting of and the transferring of the bacteria from and to the anaerobic reactors should be carried out in airtight conditions as anaerobic bacteria will die if exposed to air.
- Adjust the pH of the effluent to the range of 6.5-7.5 using Sodium Carbonate. The pH could be checked using pH papers. Pump effluent into the tank intermittently for few weeks while monitoring the BOD reduction efficiency of the plant.
- Start pumping effluent continuously once the reactor performance is established.
- The pH adjustment will not be required once the bacterial growth is established.

*Disposal of the effluent*

- The effluent could be used for irrigation purposes.

### *4.2 Paddy husk*

Paddy husk in excess should be burned in a properly constructed burning device as illustrated here and shown in figure 4.4 and figure 4.5.

Burning of paddy husk is an unsatisfactory act. There are many options available although they need to be developed. Some examples are given in the following table 2.

| Option | Applicability | Assistance/Information |
|---|---|---|
| Electricity generation | Group of paddy husk generators can get together and efficiently generate energy | Energy Conservation Fund |
| Industrial combustion | As solid fuel in steam generation boilers in the paddy mills and paddy dryers | |
| Brick manufacture | In the brick kilns paddy husk can be used as a fuel in place of wood | Ministry of energy conservation |
| Manufacture of hydraulic setting cement | Superior to Portland cement in strength. All purpose cement for civil construction | |
| Rice husk char | Rubber compounding, Filter media, Insulation material | |
| Gasification plant | Automatic gasification plant: developed in Japan for electricity generation and drying operations | |
| Paddy husk stove | Fuel saving paddy husk stove is more economical and easy to operate. For domestic use. | Rice processing research and development center for Anuradhapura (RPRDC) |

Table 2

*Construction of the burning device*

- Assess the volume of paddy generation per day.
- Construct a burning device with a capacity equal to the volume of husk generated per day.
- Build a tapering chimney 30 feet high out of 225mm (9inch) brickwork. The top width of the chimney should be around 0.6m.
- The stack also could be constructed with metal. (using metal sheets or empty tar barrels, but it will have a short life span if it is not properly maintained)
- The stack height depends on the site conditions and is intended for the proper dispersion of smoke emitted during burning of paddy husk. The minimum height can be 30 feet or 2.5 times the height of nearby building (if there is any) which could be affected from the smoke from the incinerator.
- Resulting ash can be used as a soil conditioner or should be disposed after mixing with sand.

## 5.0 Occupational health and safety

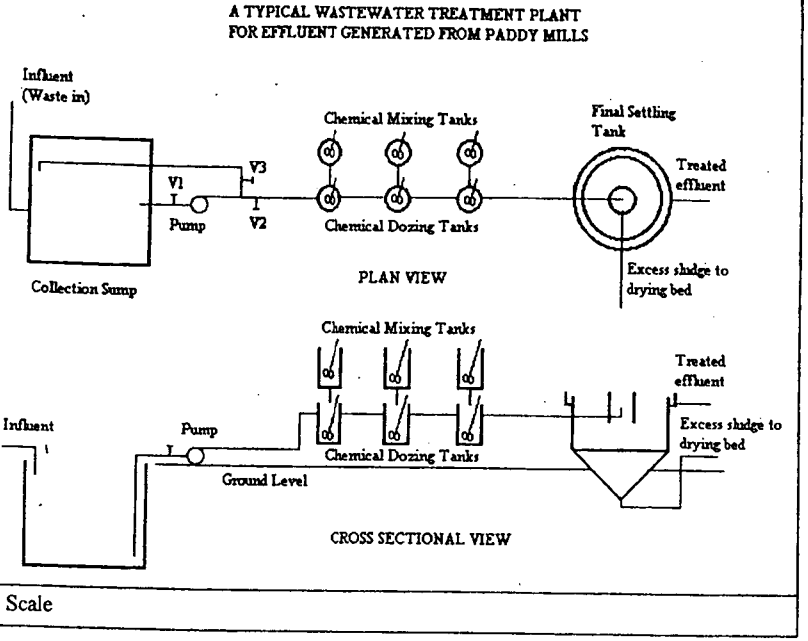
***"Health is a state of complete, physical, mental and social well-being and not merely the absence of disease or infirmity"***

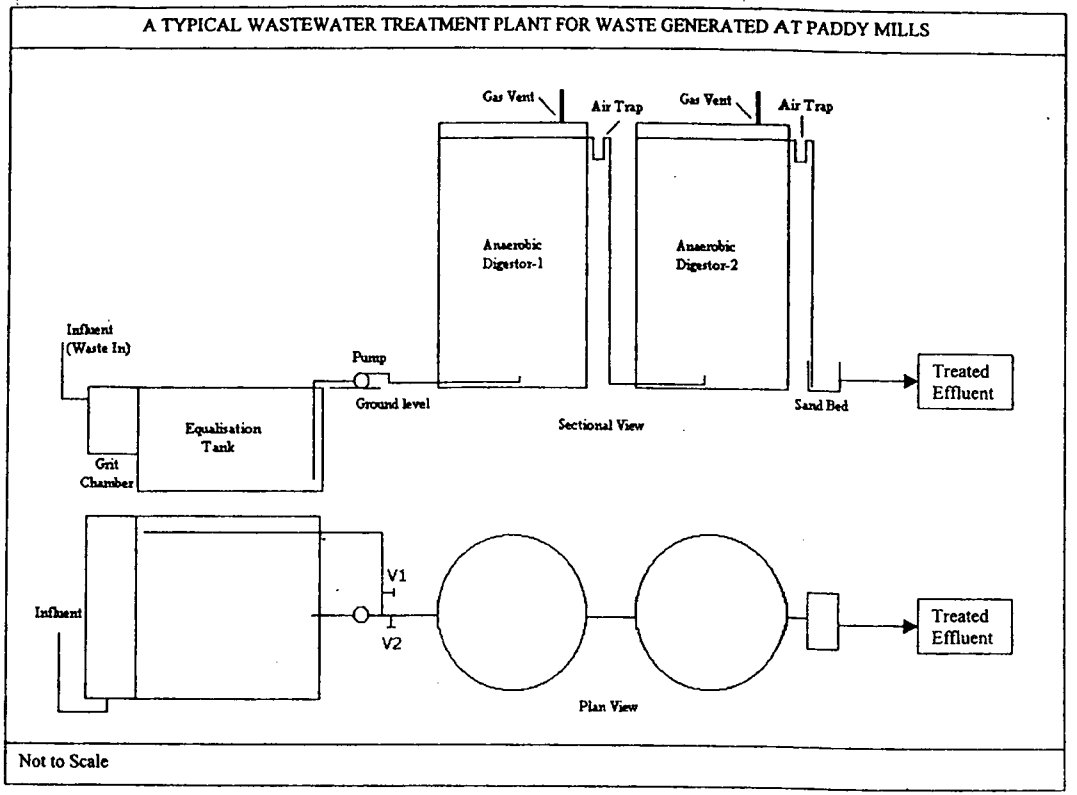
**World Health Organization (WHO)**

It is important that the 'work environment' be properly maintained. Workforce education is vital for this purpose. The benefits of this type of an approach would result in overall positive environment management by the system concerned.

Steps to be followed are given below.

- Provide workers with dust masks.
- Insist that workers should wear the protective equipments
- Milling machine and the factory environment should be as per requirement setout by the factories ordinance.




**Design Data**

Effluent Flow - 20,000 l/d

**Tank Dimensions**

| Description | No. of units | Internal dimensions in meters |
|---|---|---|
| Collection Tank | 01 | 3 * 3 * 2.5 (L * W * Depth) |
| Final Settling Tank | 01 | 2.6 * 3.3 * (Diameter * Wetted Height) |

Figure 4.2

**Design Data**

Effluent Flow - 20,000 l/d
BOD - 2,400 mg/l
COD - 4,000 mg/l

**Design Parameters**

Hydraulic retention time in anaerobic digester - 5 days

**Tank Dimensions**

| Description | No. of units | Internal dimensions in meters |
|---|---|---|
| Primary settling Tank | 01 | 3.5 * 1 * 1.3 (L * W * Depth) |
| Collection Tank | 01 | 3.5 * 3.5 * 2 (L * W * Depth) |
| Anaerobic digester | 02 | 3.6 * 5 * (Diameter * Height) |

Figure 4.3

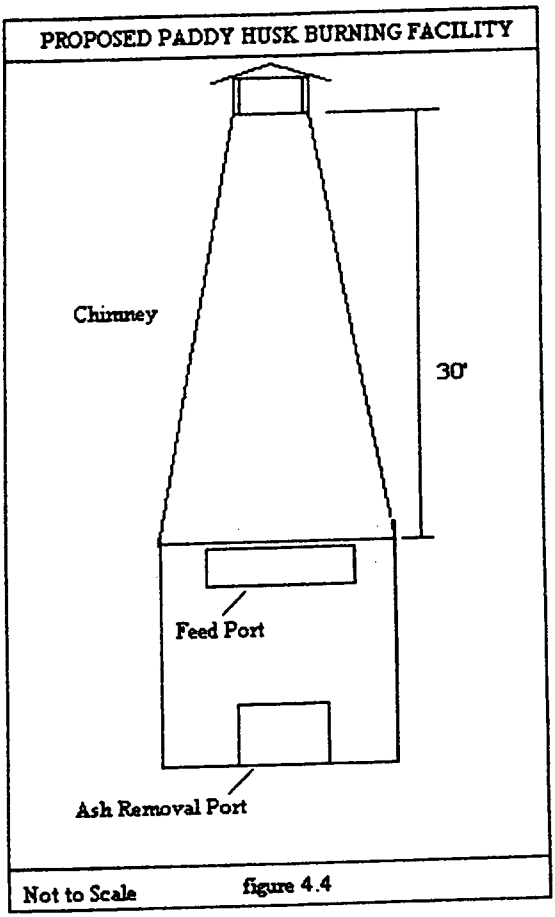
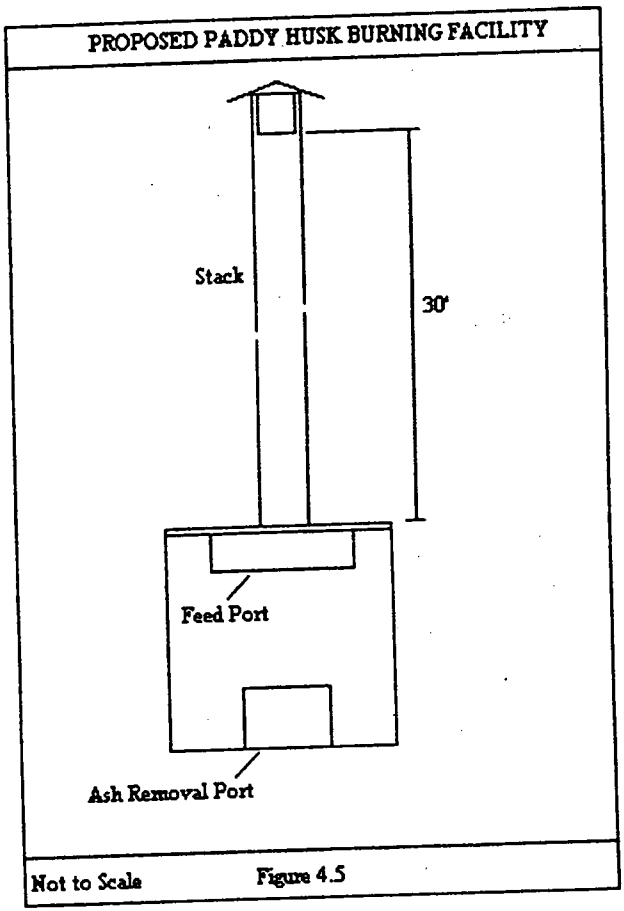

PROPOSED PADDY HUSK BURNING FACILITY
Chimney
30'
Feed Port
Ash Removal Port
Not to Scale

figure 4.4


PROPOSED PADDY HUSK BURNING FACILITY
Stack
30'
Feed Port
Ash Removal Port
Not to Scale
Figure 4.5

## 6.0 Reference to current law

Industrial establishments cannot operate without having appropriate permission from relevant local authority. It is necessary initially to obtain siting and planning permission and then relevant approval from the local authorities. The functions if improperly executed, can be subjected to prosecution under the public nuisance ordinance. It is important that owners plan and run industrial institutions accordingly.

PUBLIC NUISANCE

" Public nuisance is an act or illegal omission, which causes any common injury, danger or annoyance to the public or to the people in general who live in or occupy property in the vicinity"
e.g. Noise, Air or water pollution etc.
Discharging effluent into a natural waterway endangering public health or
Quarrying activities using explosives etc. in a manner that endangers neighbours or the public.
Public can complain to the local police for necessary action.
Thus proper adherence to guidelines are important.

In respect of public nuisance, whether it is caused by air pollution, water pollution, sound pollution or other means the police will act as follows

- Prosecute the offenders under Section 261 of the Panel Code for causing a public nuisance.
- File a motion in the Magistrate's Court under Section 98 of the Criminal Procedure Code to abate the public nuisance.

ENVIRONMENTAL PROTECTION LICENSE (EPL)

It is an offence for any industry to discharge, deposit or emit waste into the environment without an environmental protection license issued by the Central Environmental Authority or in some cases by the local authority.
The public may complain about Environmental Protection License violations to the police, local authority or directly to the Central Environmental Authority.

| Region | Site Clearance | EPL |
|---|---|---|
| North Western Province | Local Authority | Provincial Environmental Authority |
| Other Provinces | Local Authority | CEA |

Thus the industry should be established away from any primary residential zones and all relevant constructions should conform to the zoning plan and the existing rules and regulations of the relevant local authority

The owners should comply with the rules and instructions or conditions laid down by the CEA and the respective local authority.

## 7.0 Conclusions and Recommendations

- All factory owners should apply for the Environmental Protection License using the questionnaire that has been prepared by the CEA. The questionnaires could be obtained from the Local Authority of the area or the CEA.
- Depending on the degree of pollution, only those applications coming under Low Polluting Industries/ Processes should be received by the local authority.
- A license is valid only for a period of 3 years from its date of issue. The owner of the industry should apply for renewal of license to the relevant local authority, one month before the expiry date.
- The EPL issued should not be considered as an approval for the industry to be operated at a particular location. It is only a permit to discharge of effluent/emissions or emitting of noise levels according to stipulated standards.
- Written approval (i.e. trading or operating license) of the relevant local authority should be obtained for operational purposes.
- Try to use the waste recycling methods.
- Encourage the employers who are interested to the environmentally friendly works.
- Always try to use the modern technology and waste minimization methods.

- Educate the employees on the importance of pollution control and safe practices.
- Good house keeping practices should always be encouraged.

## 8.0 Sources of information and analytical facilities

- Central Environmental Authority(CEA),
  Parisara Piyasa,
  104, Robert Gunawardena Mawatha,
  Battaramulla.
  Tel - 872415, 872263, 872606

- Rice Processing Research and Development Centre (RPRDC),
  Jayanthi Mawatha,.
  Anuradhapura.
  Tel-025-22344

- Energy Conservation Fund,
  Room No: 2-203,
  BMICH,
  Colombo-07.
  Tel-682534

- Industrial Development Board of Ceylon (IDB),
  615, Galle Road,
  Katuubedda,
  Moratuwa.
  Tel - 612603

- Relevant Local Authority

- Local Environmental Development Officers

- National Engineering Research and Development Centre (NERD),
  2P/17B, IDB,
  Industrial Estate,
  Ekala,
  Jaela.
  Tel - 236384, 236307

- Industrial Technology Institute (ITI) - (former CISIR),
  363, Bauddhaloka Mawatha,
  Colombo - 07.
  Tel-693807-9, 698621

- National Building Research Organization (NBRO),
  99/1, Jawatta Road,
  Colombo-05.
  Tel-588946, 501834

- University Of Moratuwa,
  Department Of Chemical /Civil Engineering,
  Katubedda Moratuwa,.
  Tel - 645301.

- Industrial Services Bureau (ISB),
  North Western Province,
  No: 141, Kandy Road,
  Kurunegala.
  Tel - 037-23721/2

# 9.0 Sri Lankan standards for discharge of pollutants

## *9.1 General Standards For Discharge Of Effluents Into Inland Surface Waters*

| No. | Determinant | Tolerance limit |
|---|---|---|
| 1. | Total Suspended Solids mg/l, max | 50 |
| 2. | Particle size of total suspended solids | shall pass Sieve of aperture size 850 micro m |
| 3. | pH value at ambient temperature | 6.0 to 8.5 |
| 4 | Biochemical Oxygen Demand-BOD in 5 days at 20 $^{0}$C mg/l, max | 30 |
| 1. | Temperature of discharge | shall not exceed 40 c in any Section of the stream within 15 m down stream from the effluent outlet |
| 6. | Oil and greases mg/l, max | 10.0 |
| 7. | Phenolic Compounds (as phenolic OH), mg/l, max | 1.0 |
| 8. | Cyanides as (CN) mg/l, max | 0.2 |
| 9. | Sulfides, mg/l, max | 2.0 |
| 10. | Fluorides, mg/l, max | 2.0 |
| 11. | Total residual chorine mg/l, max | 1.0 |
| 12. | Arsenic, mg/l, max | 0.2 |
| 13. | Cadmium total, mg/l, max | 0.1 |
| 14. | Chromium total, mg/l, max | 0.1 |
| 15. | Copper total, mg/l, max | 3.0 |
| 16. | Lead total, mg/l, max | 0.1 |
| 17. | Mercury total, mg/l, max | 0.0005 |
| 18. | Nickel total, mg/l, max | 3.0 |
| 19. | Selenium total, mg/l, max | 0.05 |
| 20. | Zinc total, mg/l, max | 5.0 |
| 21. | Ammoniac nitrogen, mg/l, max | 50.0 |
| 22. | Pesticides | undectable |
| 23. | Radio active material | |
| | • Alpha emitters micro curie /ml | $10^{-7}$ |
| | • Beta- emitters micro curie/ml | $10^{-8}$ |
| 24. | Chemical Oxygen Demand (COD), mg /l, max | 250 |

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### 9.2 *Tolerance Limits For Industrial Effluents Discharged On Land For Irrigation Purpose*

| No | Determinant | Tolerance limit |
|---|---|---|
| 1. | Total dissolved solid , mg/l, max | 2100 |
| 2. | pH value at ambient temperature | 5.5 to 9.0 |
| 3. | Biochemical Oxygen Demand $(BOD)_5$ in 5days at 20 c, mg/l, max | 250 |
| 4. | Oil and grease , mg /l, max | 10.0 |
| 5. | Chloride (as Cl), mg/l, max | 600 |
| 6. | Sulfate (as $SO_4$) , mg/l, max | 1000 |
| 7. | Boron (as B), mg/l, max | 2.0 |
| 8. | Arsenic (as As) mg/l, max | 0.2 |
| 9. | Cadmium (as Cd) mg/l, max | 2.0 |
| 10. | Chromium (as Cr), mg/l, max | 1.0 |
| 11. | Lead (as Pb), mg/l, max | 1.0 |
| 12. | Mercury (as Hg), mg/l, max | 0.01 |
| 13. | Sodium adsorption ratio : (SAR) | 10 to 15 |
| 14. | Residual Sodium Carbonate, mol/l, max | 2.5 |
| 15. | Radio active material: | |
| | • Alpha emitters, micro curie /ml | $10^{-9}$ |
| | • Beta emitters micro curie /ml | $10^{-8}$ |

### 9.3 *Maximum permissible Noise Levels at Boundaries*

| Areas | Equivalent Continuous Sound pressure level (dB) | |
|---|---|---|
| | Day time | Night time |
| Rural residential Areas | 55 | 45 |
| Urban residential Areas | 60 | 50 |
| Noise sensitive Areas | 50 | 45 |
| Mixed residential Areas | 63 | 55 |
| Commercial Areas | 65 | 55 |
| Industrial Areas | 70 | 60 |

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