POLLUTION CONTROL GUIDELINES
(FOR SMALL SCALE INDUSTRIES)

NO. 7 – GRINDING MILLS

Central Environmental Authority
Parisara Piyasa
104, Robert Gunawardena Mawatha
Battaramulla
Sri Lanka

Telephone No: 01-872415, 872263, 872606
Fax No: 01-872605
POLLUTION CONTROL GUIDELINES

(For small scale industry)

No. 7 - Grinding Mills
Prepared for the
Central Environmental Authority
by the Environmental Resources Management Lanka (Pvt.) Ltd.
With financial Assistance/ from the
World Health Organization (WHO)

1997/2001
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 industrialists 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 Grinding Mills.

Thilak Hewawasam
Chairman
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1.0 Introduction

The main activity of a grinding mill is the grinding of food items such as spices and selling of products.

For convenience and efficiency People have deviated from the traditional methods of grinding these products.

Small-scale mills mainly cater to the domestic needs while large-scale mills cater to both the domestic and commercial needs such as hotels. Apart from food products some mills prepare traditional medicinal products that needs size reduction i.e. grinding and crushing.

Grinding mills are highly concentrated in urban and semi-urban areas. This is directly related to life style and to the high population in these areas.
2.0 Process description

Grinding is carried out in dry form and it is a batch wise process. Grinding time of a material will depend on; grindability of the material and the physical condition of the material. The feed material is sent through till the required size reduction is achieved.

The preparation of feed material for grinding mainly involves cleaning and drying and the process of grinding depends on the material to be ground. Consumables such as spices and food grains are ground either to reduce their particle size or to bring them into powdered form.

The process carried out in grinding mills, which lead to significant environmental impacts, is illustrated in fig.1

<table>
<thead>
<tr>
<th>UNIT</th>
<th>PROCESS</th>
<th>ENVIRONMENTAL IMPACTS.</th>
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<td>Pre-cleaning</td>
<td></td>
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<td>Primary size reduction (manual chopping)</td>
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</tr>
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<td>Grinding</td>
<td>Dust Noise</td>
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<td></td>
<td>Final Products</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1
3.0 Waste generation and environmental impacts.

Noise and dust are the two main environmental impacts due to this operation.

3.1 Noise generation

Noise is generated in the grinding process. Moving parts such as the motor, belt, grinding wheels and the feed tray are the main sources of noise. The feed tray vibrates by the tapping action of a piece of metal fixed to the machine. Noise generated due to this action contributes considerably to the noise generated in the grinding process.

Noise pollution is an adverse environmental impact and a work place occupational problem. Depending on the level of noise the damage can be acute or chronic. Acute damage may occur to eardrum, but this occurs only with very loud sudden noises. More serious is the chronic damage to the tiny hair cells in the inner ear. Prolonged exposure to noise of a certain frequency pattern may cause either temporary hearing loss, which disappears in a few hours or days, or permanent loss. Loud sounds affect the circulatory and nervous systems, although the results are difficult to assess. It interferes with speech, radio and T.V listening, disturbs sleep and relaxation, affects performance as reduced work precision and increased reaction time, causes annoyance, irritation and is a public nuisance.

3.2 Dust generation.

Dust generated during the process of grinding is mainly vegetable in origin. Fine particles will get a air borne in the process of grinding. The feed material is passed through the mill several times, usually three times in order to bring it into powder form. The fine particles are disturbed at the collection point and the feeding point of the mill and the particles get dispersed in the internal environment.

The danger from inhalation of dust or fume is best appreciated when the function of the lungs is considered in detail. The basic lung area is approximately \( 80\text{m}^2 \) and just as this provides an excellent surface area to introduce medication to body, it is also a very receptive area for foreign matter. The average lung capacity is
approximately six litres and the average factory worker breathes between 8 to 10 m$^3$ of air in an eight hour work shift. If the concentration of the pollutant therefore is one gram per cubic metre, a factory worker may inhale 10 g of dust during an eight hour of work. Much of this will be trapped in the body's defence mechanism, the nasal hair, and by deposition on the mucus-lined walls of the primary bronchi, and the airways leading to the lungs. A significant percentage however could reach the lower part of the lungs and become entrapped. Where the dust concentration is high and subsequent lung contamination is great, the sacs at the bottom of the lung, known as the alveoli, get closed after sometime by a process known as fibrosis, which is a sever lung disease.

Fine particles from grinding mills cause irritation, for example irritation or abrasion of eyes and thus will be a public nuisance.

4.0 Mitigatory measures for pollution

4.1 Mitigation of Noise Pollution

- Properly maintain all drive mechanisms - this would besides reducing pollution also reduce the energy consumption and is a waste minimisation step.
- Have enough clearance between the wall of the grinding mill and the adjacent building.
- Construct high boundary walls around the premises.
- Use noise-absorbing materials such as gypsum boards in order to absorb noise.
- Locate the motor in a soundproof housing and mount on anti vibrating mountings.
- Locate the industry away from noise sensitive areas such as schools, hospitals etc.
- Grinding and noise generating activities should be restricted to the day time preferably to the time period from 6.00 am to 6.00 p.m.
4.2 Mitigation of dust pollution

Dust is a problem of the work environment in grinding mills. Personnel protection against possible effects is suggested in order to overcome this problem. Workers should be provided with the necessary protective equipment. The list of suggested protective equipment is given below.

- Eye goggles to prevent irritation and other possible problems
- Ear plugs to prevent effects of noise.
- Dust masks to prevent inhalation of dust particles.
- Proper clothing to cover the body.

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 Organisation (WHO)

It is important that the ‘work environment’ is properly maintained. Workforce education is vital in this regard. 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,

- The health and safety requirements of the workers should conform to those prescribed in the Factories Ordinance.
- Insist that workers should wear the protective equipment.
- Educate workers on the importance of work safety.

6.0 Reference to current law

Industrial establishments cannot operate without 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 annoyance to the public or to the people in general who live in or occupy or illegal omission, which causes any common injury, danger or 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 is 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 Penal 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 by the local authority.
The public may complain about environmental protection license violations to the police, local authority, or the Central Environmental Authority.

<table>
<thead>
<tr>
<th>Region</th>
<th>Site clearance</th>
<th>EPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Western Province</td>
<td>Local Authority</td>
<td>Provincial Environmental Authority</td>
</tr>
<tr>
<td>Other Provinces</td>
<td>Local Authority</td>
<td>CEA</td>
</tr>
</tbody>
</table>
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

- Choose a machine with less noise generation when purchasing a new machine.
- Avoid premises that have attached buildings.
- Good house keeping practices should always be encouraged.
- Educate employees on the importance of pollution prevention and safe practices.
- Encourage employees who are interested in environmentally friendly work.
- The production capacity and the working hours should not exceed the values stipulated by the CEA or the relevant authority.
- Locate industries away from the residential areas.
- 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.
8.0 Sources of information and analytical facilities

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

- Industrial Development Board of Ceylon (IDB),
  615, Galle Road,
  Katubedda, 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

- University of Moratuwa,
  Dept. of chemical Engineering,
  Katubedda, Moratuwa.
  Tel. - 645301

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

- National Building Research Organisation (NBRO),
  99\1, Jawattha road,
  Colombo 05.
  Tel - 588946, 501834
9.0 Sri Lankan standards for discharge of pollutants

9.1 Maximum permissible Noise Levels at Boundaries in $L_{Aeq}$, T, for industrial activities.

<table>
<thead>
<tr>
<th>Areas</th>
<th>Day time</th>
<th>Night time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Residential Area</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Urban Residential Area</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Noise Sensitive Area</td>
<td>50</td>
<td>45</td>
</tr>
<tr>
<td>Mixed Residential</td>
<td>63</td>
<td>55</td>
</tr>
<tr>
<td>Commercial Areas</td>
<td>65</td>
<td>55</td>
</tr>
<tr>
<td>Industrial Area</td>
<td>70</td>
<td>60</td>
</tr>
</tbody>
</table>

The following noise levels will be allowed in places where the background noise levels exceed or is marginal to the given levels in schedule 1:-

a. for rural residential areas in which the background noise level exceeds or is marginal to the given level

Measured Background Noise Level +3dB(A)

b. for urban residential areas in which the background noise level exceeds or is marginal to the given level

Measured Background Noise Level +3dB(A)

c. for noise sensitive areas in which the background noise level exceeds or is marginal to the given level

Measured Background Noise Level +3dB(A)

d. for mixed residential areas in which the background noise level exceed or is marginal to the given level

I. For day - Measured Background Noise Level +5dB(A)
II. For night time - Measured Background Noise Level +3dB(A)

e. For industrial areas in which the background noise level exceeds or is marginal to the given level

I. For day time - Measured Background Noise Level +5dB(A)
II. For Night time - Measured Background Noise Level +3dB(A)