



# ORGANIC DUST IN AGRICULTURE

**General Recommendations of the Swedish National Board of  
Occupational Safety and Health on Organic Dust in Agriculture**

**Adopted 15th June 1994**

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## **General Recommendations of the Swedish National Board of Occupational Safety and Health on Organic Dust in Agriculture**



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The following General Recommendations are issued by the National Board of Occupational Safety and Health on the implementation of the Work Environment Act (SFS 1977:1160).

### **Background**

#### **Health hazards**

Inhalation of organic dust occurring in agriculture can give rise to diseases of the airways and lungs. Dust of this kind comes, for example, from hay, grain, fuel chips and straw or other types of bedding and from livestock. Many tasks in agriculture give rise to large quantities of dust. Lung diseases are more prevalent among farmers and agricultural employees than in the rest of the population. Roughly one out of every ten persons working in agriculture has at one time or another suffered from acute toxic alveolitis. Repeated exposure to the kind of organic dust capable of causing acute toxic alveolitis can lead to allergic alveolitis. Asthma due to hypersensitivity, e.g. to storage mites is hard to prevent and, once it has occurred, difficult to cure.

Health problems affecting the respiratory organs of persons employed in agriculture are to a great extent work-related; that is, the causes of illness are to be found at the workplace. Persons employed in agriculture have a higher lung disease mortality rate than the population generally, despite fewer of them being smokers. Exposure to organic dust can also give rise to chronic bronchial catarrh, coughs, nasal catarrh and nasal congestion.

### **Acute toxic alveolitis**

Acute toxic alveolitis, otherwise known as "organic dust toxic syndrome" (ODTS), can accompany brief, occasional exposures to heavy concentrations of organic dust in agricultural environment. The contents of the dust inhaled can include fungal spores, bacteria, bacteria spores and endotoxins.<sup>1</sup> Symptoms of illness often become apparent between 4 and 8 hours after inhalation of heavily concentrated organic dust.

Acute toxic alveolitis is an inflammatory state of the alveoli<sup>2</sup> with symptoms resembling those of influenza. The onset of illness can be sudden, with high temperature, trembling, shivering, nasal congestion, irritation of the throat, headache, aching of muscles and joints and coughing. The symptoms are of brief duration. The illness lasts for between 1 and 3 days and passes off without treatment if further exposure is avoided.

### **Allergic alveolitis**

Allergic alveolitis is the "chronic" lung disease which can occur following repeated exposure over a long period to organic dust containing high concentrations of microorganisms. Allergic alveolitis is a serious illness of long duration (capable of persisting for several months). It can impair the efficiency of the lungs and permanently injure them. This illness can be hard to distinguish from pneumonia.

Allergic alveolitis means that the alveoli become inflamed and the efficiency of the lungs gradually deteriorates, which in turn leads to increasing shortness of breath, fatigue and impaired fitness. The symptoms are painful dyspnoea, high temperature, hacking cough, nausea and muscular pain. The onset of the illness can be insidious, beginning with a hacking cough and shortness of breath, in which case the connection with exposure to organic dust may be hard to perceive.

<sup>1</sup> **Endotoxin:** A toxic component in the cell wall of certain bacteria.

<sup>2</sup> **Alveolus:** A lung bladder.

The main sporiferous microorganisms capable of causing allergic alveolitis are mould and actinomycetes.<sup>1</sup>

### Organic dust

Heavy concentrations of organic dust are common in different agricultural working operations, which means a high risk of exposure to dust. High concentrations of dust can occur, for example, during work in swine confinement buildings and grain dryers, in the combustion of chips and in the preparation of livestock feed.

The contents of organic dust in the agricultural environment can include particles from grain and hay as well as pollen, fungal spores, fungal hyphae, mycotoxins,<sup>2</sup> bacteria and endotoxins. Dust from livestock pens also includes, for example, particles from skin, hair, feathers and excrement. The contents depend on where, when and how the dust is produced (season, geographical location and moisture content). Dust can also contain inorganic material, such as particles of sand.

The Provisions of the National Board of Occupational Safety and Health on Occupational Exposure Limit Values (AFS 1993:9) give a level limit value<sup>3</sup> for total organic dust content (5 mg/m<sup>3</sup> air). This limit value refers to the maximum acceptable concentration of dust from organic substances, and it does not allow for specially hazardous components of biological origin. Components of the latter kind include, for example, endotoxins, bacteria, mite excrement and fungal spores, as well as severely allergenic substances like particles from down, animal hair, epithelium and bacterial spores. Input data on which to base special limit values for hazardous components of this kind are still lacking.

<sup>1</sup> **Actinomycetes:** Bacteria growing in a similar way to fungi. They reproduce partly by forming spores.

<sup>2</sup> **Mycotoxin:** Toxic substance formed by certain moulds.

<sup>3</sup> **Level limit value:** An occupational exposure limit value for exposure during one working day.

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Depending on biological component content, disorders resulting from organic dust in agriculture have been demonstrated at concentrations far below the 5 mg/m<sup>3</sup> limit value. Thus exposures to concentrations this heavy of organic dust containing particularly hazardous components is not acceptable.

In certain agricultural environments, these problems can be compounded by manure gases, e.g. ammonia and hydrogen sulphide. Ammonia has an irritant effect and can also paralyse the cilia of the mucous membranes. Simultaneous exposure to ammonia and dust can increase the quantity of dust reaching the lower airways.

Dust particles vary a great deal in size. Particles 5 µm<sup>1</sup> or less in diameter are so small that they accompany the inhaled air into the alveoli and may cause inflammatory changes in the lungs.

### *Microorganisms*

Microorganisms are almost everywhere and are a prerequisite of all higher forms of life. Microorganisms are small organisms which are not normally visible to the naked eye. They differ from plants and animals through their comparatively simple structure. They need nutrition and moisture in order to grow, and they have various requirements as regards temperature and oxygen availability. Microfungi (mostly mould fungi) and bacteria are commonly present in organic dust in agricultural environment.

The majority of microorganisms do not normally cause infections. Certain of them are "opportunists", which means that they can cause infection in persons whose immunological defence is impaired.

Microorganisms multiply very rapidly under certain conditions. When pulverised, moist material such as grain, chips, straw or hay is piled up, large quantities of mould can form in only a few days, simultaneously with heat generation.

<sup>1</sup> µm: Micrometre (millionth of a metre).

Mould fungi commonly occurring in agricultural environment include, for example, *Alternaria*, *Cladosporium* and *Fusarium*, which occur on grass and grain and *Aspergillus* and *Penicillium*, which predominate in storage-damaged livestock feed. Mould fungi usually grow as mycelium<sup>1</sup> and form spores. Fungal spores are ubiquitous in our environment and the amount of spores in the outdoor air varies according to the season of the year. Dust formed in the handling of material subjected to microbial growth contains large quantities of fungal spores and bacteria. In certain agricultural environments, atmospheric concentrations have been recorded which are more than a million times those normally occurring in the outdoor air.

In agricultural work where disorders have occurred, total concentrations of up to 10 billion fungal spores/m<sup>3</sup> air have been recorded in the inhalation zone. On farms where there are no illness, the level is generally 1 million fungal spores/m<sup>3</sup> air or less. Outdoor atmospheric concentrations vary according to the season, from 10 fungal spores/m<sup>3</sup> air in the winter to 10,000 fungal spores/m<sup>3</sup> air in summer and autumn.

Organic dust from mouldy material may contain mycotoxins. These have been demonstrated in the milling of grain and in the handling of livestock feed. Mycotoxins are capable among other things of causing cancer, kidney damage and reproductive disturbances.

Bacteria commonly occurring in the agricultural environment are *Coryneform*, *Micrococcus* and actinomycetes. Heavy concentrations of airborne bacteria have been recorded in livestock farming. The spores of actinomycetes are widely prevalent and, being 0.5-1.5 µm in diameter they are smaller than fungal spores.

Large quantities of bacteria are present in environments frequented by livestock. These bacteria come, for example, from the animals' dung. Prolonged retention of mature inside the livestock pens can cause heavy indoor atmospheric concentrations of bacteria.

Observations in poultry houses and swine confinement buildings, for example, have revealed heavy concentrations of endotoxins. It has been

<sup>1</sup> **Mycelium:** A very small ramified network of microscopic filaments of fungal cells (hyphae).

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shown that organic dust containing relatively low quantities of endotoxin ( $0.1 \mu\text{g}/\text{m}^3$  air) can produce an acute feverish reaction and inflammation of the airways. Observations in poultry houses have revealed concentrations of up to  $1.5 \mu\text{g}$  endotoxin/ $\text{m}^3$  air.

Organic dust containing microorganisms comes under the Board's Biological Agents Ordinance (AFS 1992:8), which among other things requires employers, as far as possible, to acquire knowledge of the biological agents occurring in the activity, to assess the risks these may entail to health of the workers and whether the agents entails a risk to workers' health, as far as possible, to take necessary steps to prevent exposure to the agents.

### *Mites*

Mites are termed according to occurrence in different places, e.g. poultry mites in poultry houses, storage mites in stored hay, grain or straw, and domestic dust mites in people's homes. The excrement of mites contains allergenic substances.

A survey of the agricultural population of Gotland showed 6 per cent to be allergic to storage mites. This is by far the commonest form of allergy, despite daily exposure to other allergens such as pollen, animal epithelium and domestic dust mites. 15 per cent of hypersensitive farmers and agricultural workers were allergic to mites. Of farmers and agricultural workers with allergic asthma or hay fever, 38 per cent were allergic to mites.

## **Protective measures**

### **General**

In all work where air contaminants, e.g. in the form of dust and gases, can be presumed to occur, the Provisions of the National Board of Occupational Safety and Health on Measures Against Air Contaminants (AFS

<sup>1</sup>  $\mu\text{g}$ : Microgram (millionth of a gram).

1980:11) are applicable.

Materials should be selected and work, process or technical device designed so as to minimize the amount of dust occurring. By reducing the growth of microorganisms on the material worked with (bedding, chips, livestock feed and grain), one reduces the risk of illness. The handling of mouldy material should be avoided wherever possible. If disorders occur in connection with exposure to dust, the work should be discontinued as soon as possible.

Hay, straw, grain etc. should be kept dry while in storage, to prevent microorganism attacks. When working with such material, on the other hand, slight humidity can be an advantage, because the moisture binds the dust. The material should then be used within a short time, because the moisture in it can facilitate the growth of microorganisms.

When ensiling, it is important to exclude the air as efficiently as possible, because air seepage can give rise to microbial growth. Compaction is important in a silo since close compaction effectively excludes the air. Air seepage can also be caused by poor coverage, leaks in silo walls or unsuitable techniques of insertion and removal.

It is important that organic dust should be prevented from spreading. The closer to its source the dust is trapped, the better the separation effect and, accordingly, the air quality will be. Dust could be trapped, for example, by encapsulating equipment and receptacles where there are dust-generating materials present.

Good maintenance and cleaning routines limit the occurrence and dispersion of dust and simplify cleaning.

Good working organization helps to reduce exposure to dust. Job rotation can reduce exposure time for the individual. Work intensity has a bearing on the amount of dust inhaled. More dust is inhaled during heavy, strenuous and intensive operations. When there are specially dust-generating activities in progress (e.g. feeding, bedding work, weighing of pigs etc.), the number of persons in the vicinity should be kept to a minimum.

The great majority of persons employed in agriculture are self-employed or work on family farms. Undertakings with employees are also common, especially in plainland regions. The Ordinance of the National Board of

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Occupational Safety and Health on Internal Control of the Working Environment (AFS 1992:6) requires employers to plan, direct and follow up their activities.

### Technical preventive measures

Often the working environment can be improved by technical means. Appropriate technology for the drying, storage, conservation and handling of grain and feed prevents mould formation among other things. Operations where exposure to organic dust is liable to occur should be mechanized as far as possible (e.g. automatic feeding devices instead of manual feeding). Automatic control of temperature and air humidity can improve the hygienic quality of the air.

*Vacuum cleaning* reduces the dust content of livestock pens. The interval at which vacuum cleaning should take place depends on the head of livestock, how the pens are designed and so on. A central dust extraction system removing the dust from the building is to be preferred. Mobile vacuum cleaners should be fitted with fine filters, so that the return air is effectively cleaned. It is important to comply with the instruction given for the use of the vacuum cleaner so as to derive maximum benefit from it.

*Water sprinkling* reduces the amount of dust in the air. Small water particles encapsulate the dust particles, causing them to fall to the floor. Sprinkling from one or more low-pressure nozzles also causes dust accumulating on the fittings to adhere to them. This method is based on a combination of binding sedimented dust and causing the dust to aggregate.

The occurrence of small dust particles can be reduced by *mist sprinkling*. Water mist sprinkling is based on high-pressure nozzles dividing the water into very small particles which form a mist. This binds the smallest dust particles, with the result that they fall to the floor or adhere to fittings and walls. Air quality improves for a limited time. Mist sprinkling should be carried out just before work begins.

In water and mist sprinkling, it is important to use small quantities of water, so as to avoid subsequent microorganism growth. In some swine confinement buildings, floor heating has been installed, which helps the box floor to dry quickly.

Dust can be bound, and atmospheric dust content reduced, by adding *dust-binding components* to feed and bedding. The addition of vegetable oil (1%) to flour feed has been found to have a good effect. This is particularly important in manual feeding, because the stockman is then heavily exposed.

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*The design and ventilation of the premises* have a bearing on the working environment. Dust extraction at tipping pits, elevators, conveyors and grain dryers reduces dust content. One effective means of reducing dust dispersion in the handling of concentrated feed is to seal the connections between different stages of handling, e.g. between mill and conveyor and in the tube connection using sheet metal or galloon. The effect of encapsulation and sealing measures will be greatly increased if the different parts of the feed preparation equipment are given negative pressure. Provisions on ventilation are contained in the Provisions of the National Board of Occupational Safety and Health on Ventilation and Air Quality (AFS 1993:5).

When introducing new methods and techniques, it is important to find out whether they can entail new work environment problems. Techniques used wrongly or not working satisfactorily can lead to favourable conditions for microbial growth. Mould problems have occurred, for example, in the handling of fuel chips and large bales.

Technical devices, such as machinery, feeding installations and ventilation systems, should be designed with the aim of minimizing the formation or dispersion of dust and gases. It is important to have maintenance routines for technical devices, so that the intended effect is actually achieved.

### **Respiratory protective equipment**

If the prevention of exposure to high concentrations of organic dust is not possible or sufficient by other means, suitable personal protective equipment, e.g. respiratory protective equipment, must be used, in compliance with the Provisions of the National Board of Occupational Safety and Health on Measures Against Air Contaminants (AFS 1980:11). In occupational environments where there is a risk of excessive dust concentrations or if health disorders are caused by the dust, respiratory protective equipment with a P2 dust filter should be used. The Board's manual on personal protective equipment contains advice on the selection, testing and care of respiratory protective equipment. In specially hazardous operations where large quantities of dust are released, powered filtering devices incorporating helmets or hoods should be used. Jobs of this kind include the manual weighing of swine for slaughter, the transfer of poultry to and from battery cages and the cleansing of grain hoppers from mouldy grain, and also, in certain conditions, threshing with a cableless threshing machine.

The respiratory protective equipment should always be intended for personal use and should fit the wearer after necessary adjustment. Section 11 of the Provisions of the National Board of Occupational Safety and Health on Personal Protective Equipment (AFS 1993:40) stipulates that personal protective equipment must be maintained, repaired and stored in such a way that its protective effects and hygienic standard are preserved. It is important that users of respiratory protective equipment should know how and how often to change filters, and that the right type of filter should be available.

## **Information**

It is important for all concerned to keep themselves informed of new technical solutions, protective equipment, symptoms of illness and current work environment regulations.

Chap. 3, Section 8 of the Work Environment Act requires suppliers and manufacturers of technical devices to furnish information material to the prevention of illness and accidents. Information of special importance for the working environment must be supplied when the device is marketed.

Sections 9 and 10 of the Provisions of the National Board of Occupational Safety and Health on Internal Control of the Working Environment (AFS 1992:6) contain rules concerning the employer's duty of providing employees with an introduction, instructions and other information on the work environment aspects of the activity.

Information material concerning the working environment and health hazards in agriculture is compiled, for example, by the Swedish Institute of Agricultural Engineering, the Swedish University of Agricultural Sciences and the Swedish Farmers' Safety and Preventive Health Association. The series of publications entitled "Skogs- och Lantbrukshälsan informerar" (The Swedish Farmers' Safety and Preventive Health Association informs) contains practical solutions, for example, to problems of handling and clearance connected with mould attacks in grain, hay, bedding and chips etc. Journals published by agricultural trade organizations and associations often describe new techniques, health hazards, protective equipment, current work environment regulations and problems of the working environment.

## Advice on special situations

### Swine breeding

The dust in swine confinement buildings usually contains bacteria and endotoxins, as well as epithelium from the swine. The concentration of dust in the swine buildings increases with the animals' activity and density. Work which has to be done among the animals presents a particular hazard, because the animals' own activities give rise to a large part of the dust in the swine building air. Tasks in which particularly high concentrations of dust occur include, for example, the transfer of swine for slaughter between pens, selection for slaughter, weighing, bedding work and manual feeding.

Large quantities of organic dust occur during feeding, due to the swine activity increasing and the feed generating dust. Automation or remote control of the feeding installation make it unnecessary for stockmen to be indoors with the swine while feeding is in progress. Inspection windows can reduce the risk of exposure to dust. In a Danish study, the addition of fat to the feed has been found to reduce the dust content of the swine building air. Wet feeding reduces dust content in the swine building. Feed with a high moisture content should be consumed within a few days, to avoid mould formation.

*Vacuum cleaning* of the passages between the pens and of fittings reduces the amount of dust. This is a suitable method for smaller swine buildings with feeding and inspection passages at floor level. Vacuum cleaning should be carried out at least once weekly.

*Sprinkling of fine oil aerosol* over the animals is another method of reducing dust content. Oil sprinkling once a day in connection with feeding has reduced the concentration of dust in the building. Oil sprinkling is more effective than water sprinkling. Oil mixtures which have been successfully tested contain rapeseed and linseed oil mixed with water, sometimes with emulsifier added. Due to the risk of oil aerosol inhalation, work in the swine building should as far as possible be avoided while sprinkling is in progress.

*Mist sprinkling* with water at intervals of a few seconds, just before work begins, has produced positive results. The best effect is obtained if the swine building is quickly filled with mist. The dust-reducing effect is shortlived, and the best result is obtained by repeating the mist sprinkling on several different occasions.

Sectioning off of swine buildings can help to reduce the concentration of dust. Job rotation can reduce the exposure time of each individual stockman.

### **Poultry farming**

The dust in poultry houses contains, among other things, epithelium, feather fragments, particles of manure and microorganisms. The birds' own activity generate most of the dust, and so it is important to minimize the amount of time spent among them. Putting birds in battery cages and removing them for slaughter are tasks involving very high concentrations of dust (up to 36 mg organic dust/m<sup>3</sup> air have been observed). For operations like this, it is important that respiratory protective equipment should be used.

For egg production in battery systems, new, improved types of cage, overhaul and improvement of ventilation devices, mechanical egg handling and feed handling and automatic manure disposal are some of the measures serving to reduce dust exposure. Transfer of egg sorting to separate premises reduces the risk of exposure. Dust content can also be reduced by mist sprinkling the houses.

When laying hens are kept in a loose housing system, the birds are more active than in battery cages. The litter in the floor system helps to increase the amount of organic dust. A great deal of the manure is deposited in the litter, the particles of manure emit dust and, moreover, gases are formed. Loose housing systems mean a greater risk of exposure to dust, partly due to stray eggs being picked up manually between 3 and 6 times a day.

In the course of daily control the stockman is exposed to dust. There are facilities in which regulation of feed, water, lighting, temperature etc. is mechanized and automated, with the result that stockmen have to spend less time in the poultry houses. This is an advantage in work environment terms.

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Cleaning and maintenance between different poultry stocks are strenuous because a great deal of dust is formed, and it is often difficult to penetrate every nook and cranny. Cleaning work is made more difficult by weak lighting. The job can be simplified by some fittings being detachable and by using material where dirt accumulates less easily. Cleaning to specially designed routines reduces the risk of illness to the stockman and prevents disease among the livestock. Careful decontamination after the occurrence of mites or after outbreaks of infectious diseases (such as coccidiosis or salmonella) should be undertaken both inside the poultry house and in storage facilities for grain and straw.

When manure is handled, both dust and gases can cause major health problems. Manure disposal systems should be used in which the manure is retained as briefly as possible inside the poultry house, so as to reduce both dust production and ammonia concentration.

### **Cattle farming**

People working with cattle are exposed to organic dust, for example, when handling hay, straw, silage and concentrated feed. The livestock too are a source of dust. Concentrations of up to 35 mg organic dust/m<sup>3</sup> air have been measured in the breathing zone.

Manual feeding augments the risk of dust exposure, as do manual bedding work and the moving of livestock. Dust exposure can be reduced by using a technique which does not involve blowing of litter.

The hygienic quality of feed, straw and litter has a very important bearing on the work environment. Handling of mouldy feed, straw and litter should be avoided as far as possible.

### **Handling of hay and straw**

Dust is released into the air when hay and straw are handled in the course of harvesting, storage, bedding-down and feeding etc. When straw is chopped for litter, large quantities of organic dust are formed, so use of respiratory protective equipment is advisable. Certain straw choppers have dust separators which effectively reduce the dust content. It is important not to use mouldy hay. The same hygienic standards should be applied to bedding straw as to feed.

When ensiling in bales, it is important not to damage the plastic wrapping, otherwise air may penetrate the bale, causing mould to form. Hay which is not dried in a hay-loft dryer must be sufficiently dry when pressed, especially into large bales. Low moisture content (12-13%) is important in hard pressing so as to avoid mould formation. Self-loading trailers and hay-loft drying are an alternative to hard pressing.

Loft drying of hay needs to be rapid, so as to eliminate the risk of mould. The drying fans must have a capacity matching the input. Storage with low moisture content is also important, because otherwise the hay will be damaged by microorganisms. Early cut hay is more susceptible to mould attacks than hay cut later.

### **Grain handling**

Extremely high concentrations of dust are liable to occur in the threshing, harvesting and storage of grain. The contents of grain dust include particles from grain, fungi and bacteria, as well as inorganic material. Jobs which can entail a risk of exposure to dust include, for example the cleaning of silos, dryers and grain hoppers, as well as the threshing and milling of feed grain. A lot of dust forms round tipping pits, elevators, open conveyors, hoppers, silos, dryers and scales. Dust content can in many cases be reduced with the aid of local extraction devices, e.g. at tipping pits, elevators, conveyors and grain dryers.

When crushing or grinding grain, moistening can be used to bind the dust, thereby reducing the risk of dust exposure. Moistening can occur in transit to the buffer bin over the mill or crusher. Water can be added batchwise in an ordinary batch mixer or continuously with augers.

It is important to keep the seed of the grain undamaged by using a properly adjusted thresher and with gentle transport arrangements. Damaged seed is very liable to be attacked by microorganisms. In adverse conditions, heavy microorganism growth can already start in the field, in which case respiratory protective equipment should be used. Dust exposure is reduced by having a cab and ventilator on the threshing machine.

For storage purposes, the temperature and moisture content of the grain should not be too high. Temperature should be measured continuously at several points during the storage period. A rise in temperature indicates

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microbial growth, in which case further drying is needed. A consignment of grain with consistent, low moisture content has a good storage life expectancy. Grain with uneven or high moisture content is improved by mixing. High moisture content in a small part can entail heat generation and mould formation, which are then liable to spread. If heat generation is suspected in the grain, it should be ventilated with cold air.

### **Chip fuelling**

Chip fuelling has increased the risk of exposure to microorganisms. Organic dust containing microorganisms can be released when the chips are transferred from the storage space to the boiler, e.g. by shovelling.

Chips which are to be stored should be dried, because the fragmented fresh timber can soon be attacked by mould. Storage conditions are improved by the possibility of aerating the chip pile. If the storage space has no aeration facility, chips should only be produced as and when they are needed. The timber to be chipped should be as dry as possible.

Chip store, chip dryer and combustion plant should be positioned in such a way that dust will not spread to other spaces. The chip store should be completely emptied and cleaned, preferably with a vacuum cleaner, before new chips are put into it, because microorganisms are liable to grow in old residues and may infect new consignments.

If mould is found in chips, careful consideration should be given to dealing with it. Respiratory protective equipment with a class P2 dust filter is recommended when handling mouldy chips.

The Provisions and General Recommendations of the National Board of Occupational Safety and Health on Wood Mould (AFS 1988:6) include regulations on the handling of fragmented wood fuel.

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### **Other relevant rules etc.**

The following are examples of rules etc. relevant to work entailing a risk of exposure to organic dust in agriculture.

#### **Statute Book of the Swedish National Board of Occupational Safety and Health**

Measures against Air Contaminants (AFS 1980:11)  
Wood Mould (AFS 1988:6)  
Internal Control of the Working Environment (AFS 1992:6) \*  
Biological Agents (1992:8) \*  
Ventilation and Air Quality (AFS 1993:5) \*  
Occupational Exposure Limit Values (AFS 1993:9) \*  
Use of Personal Protective Equipment (AFS 1993:40) \*

#### **Publication series from:**

##### **The Swedish Institute of Agricultural Engineering (JTI):**

- Teknik för lantbruket (Agricultural Technology)
- JTI-Meddelanden (JTI Notices)
- JTI-Rapporter (JTI Reports) \*\*

##### **The Swedish Farmers' Safety and Preventive Health Association.**

- Undersökningsrapporter (Investigation Reports)
- Skogs- och Lantbrukshälsan informerar (The Swedish Farmers' Safety and Preventive Health Association informs)
- Skyddsmeddelanden (Protection notices)

##### **Swedish National Board of Agriculture:**

- Lantbruksinformation (Agricultural information)
- Praktiska råd (Practical advice)

\* Available in English

\*\*Series, a few issues available in English

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**Swedish University of Agricultural Sciences (SLU):**

- JBT-Specialmeddelanden (JBT - Special notices) \*\*
- JBT-Rapporter (JBT Reports) \*\*

**The Work Environment Committee of the Agricultural Sector:**

- LAMKs rekommendationer (LAMKs recommendations)

**The National Institute for Working Life:**

- Arbete och Hälsa (Work and Health) \*\*

**Trade journals:**

e.g.

- Fjäderfä (Poultry)
- Husdjur (Livestock)
- Svinskötsel (Swine breeding)

\* Available in English

\*\* Series, a few issues available in English