A1 Manure processing plants

These regulations were included in the NeR in May 1992. Unless specific requirements for emissions are explicitly mentioned in the following, the general provisions of the NeR will apply.

Manure processing plants must comply with the following emission standards:

Ammonia
The concentration of ammonia in emissions may not exceed 5 mg/m_o^3.

Oxides of sulphur
The concentration of sulphur dioxide in emissions may not exceed 35 mg/m_o^3 if the installation is fired by natural gas.

Carbon monoxide
The concentration of carbon monoxide in emissions may not exceed 50 mg/m_o^3.

Particulates
The emission of particulates must be controlled by using a fabric or metal-type filter, or another technique capable of achieving an emission concentration lower than 10 mg/m_o^3.

If the manure or fractions thereof are incinerated in a suitable installation, the emission requirements apply stated in the Decree on air emissions from waste incineration (*Besluit luchtemissies afvalverbranding*, BLA) (refer to explanatory note).

Emission standards in the Decree on air emissions from waste incineration (BLA 1993)

Substance	Emission standard[1] (mg/m_0^3)
Particulates	5
Hydrogenchloride	10
Hydrogenfluoride	1
Carbonmonoxide	50
Total hydrocarbons	10
Nitric oxides (expressed as NO_2)	70
Sulfurdioxide	40
Heavy metals: total heavy metals: Sb+Pb+Cr+Cu+Mn+V+ Sn+As+Co+Ni+Se+Te	1,0
Cadmium Cd	0,05
Mercury Hg	0,05
	(ng TEQ[2] /m_0^3)
Polychlorodibenzodioxins and polychlorodibenzofurans (PCDDs and PCDFs)	0,1

1) These levels refer to dry gas under standard conditions and to a reference oxygen level of 11 % (v-v).
2) PCDDs and PCDF are expressed as total toxicity equivalents compared to 2,3,7,8-TCDD.

A2 Fodder drying facilities

These regulations were included in the NeR in January 1996. Unless specific requirements for emissions are explicitly mentioned in the following, the general provisions of the NeR will apply.

The emission values are based on dry waste gas.

Scope of the regulation
This regulation is applicable to installations for drying fresh products of vegetable origin to be used as livestock feed, and does not apply to drying other products.

Scope
The regulation appertains to drying facilities for mainly grass and alfalfa where occasionally other vegetable matter may be dried also in limited quantities, such as green maize fodder and sugar beet pulp. These drying facilities utilise a drum or conveyor-type drier involving immediate contact between the material to be dried and the flue gases. In the research performed measurements were only done for drum type dryers. Regulations for conveyor-type dryers can be based on these.
Other materials may cause odour emissions of such a different nature and on such a different scale that the regulation cannot be used for these without adaptation.

Oxides of sulphur
In existing installations where coal is used as a fuel the average sulphur content of the coal over a single drying season may not exceed 0.5% by weight, assuming a caloric value of 27 MJ per kg. The use of coal as a fuel in newly erected installations is not permitted.

Particulates
The emission concentration of particulates in the emission of the main dehydrating installation where multistage cyclones are used may not exceed 75 mg/m_o^3, calculated on the basis of dry waste gas. When using fabric filters an emission requirement of 10 mg/m_o^3 must be met. New installations for drying fodder must comply with the general emission standards laid down in the NeR.

Process
Fodder is dried in a direct fired drum-type drier in which gas, coal or oil is used as a fuel. The dried product is separated from the air used for drying with a cyclone. The dust content of the air used for drying is further reduced by, for example, a multistage cyclone and subsequently emitted at a temperature of 100–120°C through a stack of 40 to 60 metre average height. After drying, the product is ground into a flour-like consistency with the aid of a hammer mill. The product is then pressed into cakes which are cooled down further before they are packaged or stored. An increasingly popular alternative to grinding and pressing into cakes is cooling down and pressing into bales.

Odour

Sources of odour emissions

The table below lists the key sources of odours within the production process. Emission factors for calculating emissions have been determined; however, emission factors of different operators differ widely.

Table 1 Odour emission factors for fodder drying facilities

Installation		Odour emission factor 10^6 ou_E/tonne dry matter		Emission point
		Grass	*Alfalfa*	
Main source	Drum-type drier	1750	350	Stack
Remaining sources	Hammer mill	15	30	Cyclone/filter at roof level
	Air in hall/ presses	25	160	Roof level
	Cooling down conveyor	40	125	Free output

Emission factors

The emission factors for drying alfalfa have been determined at one operator. The measurements were performed under 3 different process conditions. With a view to the substantial difference as compared to grass, the calculations for determining the odour nuisance were based on $350*10^6$ ou_E/tonne dry matter.

The emissions from the remaining sources for drying alfalfa were also determined at one (not the same) operator. The emission factors for the remaining sources when drying grass were derived from measurements at two operators. The emission factor used is the average of both operators.

For the drum-type dryer, measurements were taken while processing grass at four operators, during which substantial differences were found. On the basis of these findings a realistic emission factor has been established.

For green maize fodder and sugar beet pulp, emission factors were not measured. As long as the percentage of the production involved is limited to approximately 10% of the annual production, correction of the emission factor is not considered necessary.

Nuisance

An immission concentration of 2.5 ou_E/m^3 as 98th percentile into the built-up areas or other objects sensitive to odours involved may not be exceeded. The immission concentration is calculated on the basis of the odour emission factors given in Table 1 and according to the dispersion calculations in the current National model.

The air used for drying is discharged from a stack of sufficient height. The odour immission concentration resulting from that emission is limited. Because of this, for a range of several kilometres the contribution of the other sources to the emissions from the stack largely determine the odour immission concentration.

Nuisance

In the past, the odour related aspects of fodder drying facilities were commonly reviewed exclusively on the basis of the odour emissions resulting from the waste gases from the dryer. By making the stack higher the odour immission into the area around the drying plant could be reduced. Through research performed by the industry in 1994 it was established that, certainly in the direct vicinity of drying facilities, other sources of odours also contribute significantly to the odour nuisance. In this context sources such as the airflow used to transport material to the hammer mill, the presses and the stream of air emitted from the coolers/cooling down conveyors come to mind. For, the emission from these remaining sources is released at relatively low altitudes and therefore contributes substantially to the odour immission into the immediate vicinity.

However, no clear relationship has been demonstrated between the odour concentration in the vicinity of fodder drying facilities and the subjectively perceived nuisance.

On the basis of emissions measured and complaints lodged with the licensing authority over the years it has been concluded that an immission concentration of 2.5 ou_E/m^3 as 98th percentile into built-up areas or other objects sensitive to odour, calculated on the basis of the above odour emission factors and according to the dispersion calculations in the pertinent National model, may not be exceeded.

This level is believed to be feasible using the indicated measures.

The approach mainly targets the remaining sources which are found in addition to the emissions from the dryer.

Measures

In the case of levels in excess of a calculated odour immission concentration of 2.5 ou_E/m^3 as 98th percentile, measures to limit odour immissions are required.

The following measures are appropriate to achieve this:

- The venting of air used as a transport medium to and from the hammer mill through an elevated emission point, possibly via the main stack. By re-circulating the air used as a transport medium, the mass flow to be discharged can be reduced.
- Local extraction of air at the presses and venting the extracted air via an elevated emission point, possibly via the main stack.
- Venting the stream of air from the coolers through a (separate) elevated emission point. Because of the huge mass flow from the coolers this airflow generally cannot be discharged through the existing stack.

It is expected that the nuisance will be reduced sufficiently if the waste gases from the remaining sources are emitted at the same height as the main stack.

Measures
The options for limiting the contribution of the air flows containing odours originating from the remaining sources consist mainly of adaptations to the process involved (re-circulation, extraction at the source) and dispersion. For a subset of the remaining sources with a relatively small mass flow, one may opt for discharging these through the main stack. In the case of air used for cooling purposes this is not always possible because of the volumes involved. In this case the air used for cooling purposes can be vented through a separate (simple) stack of sufficient height.
These measures have been established on the basis of, for instance, a business economics evaluation performed at industry level.

A3 Livestock feed compounders

The amended regulation was included into the NeR in February 1998.
Unless specific requirements for emissions are explicitly mentioned in the following, the general provisions of the NeR will apply.

Scope
This regulation only applies to existing installations for the production of compressed compound feeds of traditional composition.

Scope
'Existing installations' in this case is meant to include extensions of existing installations. In the case of new installations being erected it is usually acceptable to assume a lower immission concentration, also because in that case there is a certain freedom in the selection of a location.

Sources and dispersion
The odour emission from a feed compounding plant is caused mainly by the emission from the coolers. For the products mentioned below, odour emission factors have been established. By using the programme 'geurnorm 3.0'* it is possible, on the basis of the annual production (in tonnes/year) of each type of feed and the operating period, to calculate the extent of the odour emissions from a facility and to establish what the resulting concentration in the vicinity will be.

Emission factors have been defined for compressed compound feeds of 'traditional' composition for:
- pigs/sows for meat production;
- piglets;
- egg-laying poultry (turkeys**);
- meat poultry (ducks, dogs, fish, pheasants**);
- cattle (horses, rabbits, sheep, goats**).

The calculations take into account the odour emissions from counter flow, conveyor, cascade, shaft and transverse type coolers. The odour emissions from the hammer mill, discharge well and area ventilation are generally limited (several percent per source) as compared to the emission through the coolers.

Nuisance level
On the basis of research carried out by the Ministry of Housing, Physical Planning and the Environment (VROM) in co-operation with the livestock feed compounding industry it has been concluded that structurally levels in excess of 1 ou_E/m^3 as 98th percentile should be prevented. This level applies wherever densely populated residential areas or other objects sensitive to odour nuisance are found.

For scattered dwellings near the operator's facilities the competent authorities may set a custom level of protection on the grounds of locally applicable considerations.

Nuisance level
On the basis of the research into nuisance in the vicinity of livestock feed compounding plants it has not been possible to find a generally applicable relationship which is valid for the industry as a whole between odour concentrations and the percentage of people complaining of odour nuisance. However, it has been concluded on the basis of the information yielded by the industry wide investigation and the technical and financial options available that a level of 1 ou_E/m^3 as 98th percentile constitutes the maximum allowable level for densely populated residential areas. A certain adaptation of the permissible emission level for scattered dwellings is considered reasonable. On the basis of the local situation it must be determined which level can be considered reasonable, as long as a maximum concentration of 1 ou_E/m^3 as 95th percentile is not exceeded. For details on the criteria for deciding whether a given location constitutes scattered dwellings or a densely populated residential area please refer to the general comments. In addition, the subdivision into categories used in the Livestock Husbandry Directive (*Richtlijn Veehouderij*) and in the Nuisance Act (*Hinderwet*) also gives information.
Calculations of immission levels are carried out using the 'geurnorm 3.0' software, which incorporates the results of the industry wide investigation and the recommendations that were formulated upon completing its evaluation.

* The computer software programme 'geurnorm 3.0' and the instruction manual that belongs to it are available at InfoMil.
**These types of feed can contribute to a maximum of 10% of the total production output of the category involved without a need for the emission factor to be adapted.

Measures aimed at limiting odour nuisance due to emissions from the cooler(s)
There are multiple options available to limit odour nuisance due to emissions from coolers. Depending on the actual situation the most appropriate solution will have to be selected. For a list of measures/techniques which can be demanded without placing an unreasonable burden on the operator, please refer to the accompanying explanatory text.
Using the 'geurnorm 3.0' software it is possible to calculate the emission reductions required in a given situation.

Measures at cooler(s)
- Increasing the height of the stack (up to approx. 40% immission reduction).
- Biological waste gas treatment facilities/scrubbers (an emission and immission reduction of more than approx. 40%).
- Oxidation of certain odour components using active oxygen (emission reductions >70%).

Measures aimed at limiting nuisance caused to dwellings in the direct vicinity of the plant
Where dwellings are found at a very short distance from the facility and people report odour nuisance, several good housekeeping measures can be taken. These are indicated in the text frame below.

Good housekeeping measures
- The grounds around the facility must be cleaned up regularly.
- Raw materials and final products may not be stored outdoors, unless there are valid reasons for doing so.
- Windows and doors must be kept closed as much as possible.

Cost of measures
This regulation forms the implementation of agreements made between the Ministry of Housing, Physical Planning and the Environment (VROM) and the feed compounding industry regarding the costs of measures, as laid down in a letter from the Ministry dated 4 April 1994.*

These may be summarised as follows.
Estimates of the investment and operating costs associated with various possible measures were made. The industry has indicated that a one-time investment amount of € 0.91/tonne of compound feed produced annually would be bearable financially and reasonable, as long as the extra operating costs incurred due to the measures are reasonable in proportion to the investments made. If operators in the industry who cannot comply with the 1 ou_E/m^3 as 98th percentile standard invest a maximum of € 0.91/tonne of compound feed, they too will normally be able to comply with the 1 ou_E/m^3 as 98th percentile requirement.
The amount quoted includes the cost of increasing the height of the stack or installing biological waste gas treatment facilities/scrubbers of a design which is adequate for the intended use. For biologically active bed-type filters the costs amount to approximately € 2.72–3.63/tonne of compound feed and the cost of incineration amounts to approximately € 6.81/tonne of compound feed.
The percentages of emission reduction quoted for the technologies described here are not hard criteria to be used in prescribing measures; they are provided as an indication of the approximate maximum reduction levels achievable using the technologies mentioned.
* Reference LE/LK/ED94.09, air and energy department.

Developments in the manufacturing process
New developments in the manufacturing process which could cause a change in the odour emissions (use of extruders) will not be taken into account in the special regulation and in the 'Geurnorm' software programme. When in such cases the manufacturing process deviates too much from the premises on which the special regulations are based, then the odour nuisance situation must be assessed differently (System used for classifying nuisance caused by odours, see §3.6). In this context we wish to point out that prior compression of the flows cannot in principle affect the total odour emissions.

Justifiable deviations
In a number of situations there may be cause for deviating on duly stated grounds from these special regulations. Below two examples are given of such situations.
An example would be a situation where the principle that measures must comply with Best Available Control Technology is being compromised.
This principle states that any measures that are implemented must be typical and well dimensioned. More specifically, this means that in the case of a situation where emissions in excess of 1 ou_E/m^3 as 98th percentile are found sometimes measures are demanded that result in an immission concentration into the residential area involved which is better than 1 ou_E/m^3 (as 98th percentile), if this result is easily achievable. This non-standard concentration may then be included in the permit, in which case the reasons for it must be given in the preamble of the permit.
Another example would be a situation where locally, in the opinion of the competent authorities, a nuisance is caused which is (or could become) unacceptable, even at an odour immission concentration lower than 1 ou_E/m^3 as 98th percentile. In individual cases like this the competent authorities will determine, in consultation with the operator, the measures that must be taken to limit the nuisance caused on the basis of an individual assessment of the extent to which the nuisance can be reduced, giving due consideration to the business economics consequences for the operator. The decision must, again, be justified in the preamble of the permit.

Enforceability and implementation of the regulations
The figures quoted as standards in the permit must preferably be validated by recalculation on the basis of changed (annual) production statistics using the 'geurnorm 3.0' software. Verification of the presence of and adherence to the instructions for the use of end-of-pipe technology (where applicable) can be carried out at the same time. The standard to be met must preferably be specified in the form of the distance from the facility at which the 1 ou_E/m^3 contour can be drawn.

Interpretation of the regulation
For additional information (for example in the case of lack of clarity as regards the interpretation of the regulation) InfoMil can be consulted. Feed compounders can also contact the study group *Milieu Overlegplatform Mengvoederindustrie* (MOM) of the *Federatief OverlegOrgaan Mengvoederindustrie* (FOOM) based in Rotterdam.

B1 Sugar factories

These regulations were included in the NeR in May 1992. Unless specific requirements for emissions are explicitly mentioned in the following, the general provisions of the NeR will apply.

Particulates
The concentration of particulates in emissions from the multi-cyclones of the pulp-drying plant may not exceed 75 mg/m_o^3.
When existing pulp-drying plants are renewed, steam drying can be considered as an alternative to the present method of pulp drying, notably in the light of measures to limit odour emissions and on energy grounds.
Where steam drying is used, the general standards for particulates apply.

Ammonia
On the basis of the findings of research already underway into the removal of ammonia from the waste gases of the carbonation process, the most efficient treatment system will have to be implemented for the situation in question at the appropriate time.
It concerns the following technologies:
- use of the relevant air flows as combustion air for the pulp dryers and for the boiler house; and
- process integrated nitrification/denitrification of the relevant process flows.

B2 Production of starch and starch derivatives

These regulations were included in the NeR in May 1992 Unless specific requirements for emissions are explicitly mentioned in the following, the general provisions of the NeR will apply.

Particulates
The concentration of dust in emissions from the starch-drying plant should be between 50 and a maximum of 100 mg/m_o^3.*
The value stipulated in the licence will depend on the nature of the particulates and will need to be fixed on a case by case basis.
The aim should be to comply with the general standards.

Production of modified starch
The general standards of the NeR are applicable to emissions from the raw materials and additives used in the production of modified starch.

Production of nylgum
Ammonia emission in the production of nylgum must be reduced with an efficiency of at least 95%.**

* When potato starch is used, 50 mg/m_o^3 is feasible. For maize starch, 100 mg/m_o^3 is a realistic value.
** The feasibility of this standard is still the subject of consultations and research.

B3 Large bakeries

These regulations were included in the NeR in January 1996. Unless specific requirements for emissions are explicitly mentioned in the following, the general provisions of the NeR will apply.

Scope
This regulation only applies to bread bakeries requiring a permit that produce an average range of products. It concerns operators who are registered with the Industrial Board for the bakery trade (Bedrijfschap voor het Bakkersbedrijf) and who do not fall under a GAO in pursuance of Article 8.40 of Wm (Environmental Protection Act). This includes both operators who manufacture their products in a traditional manner and operators who produce on an industrial scale.