

Air quality guidance note

Meat chicken production

This guideline deals with air pollution issues. It does not deal with water pollution or noise.

1 Industry description

Meat chicken establishments that are intended to accommodate more than 250,000 birds are scheduled under the POEO Act. They need to hold an Environment Protection Licence and DECC is the Appropriate Regulatory Authority. Local government is responsible for environment protection for meat chicken farms with capacity smaller than 250,000 birds.

Councils can influence the initial siting of all intensive agricultural industries through the development approval process. This is usually the most important decision on air quality management for these premises.

There are many similarities between egg production and poultry production, both being based on managing large numbers of chickens, but this series includes a separate guidance note for egg production.

1.1 Industry structure

The size of the NSW meat chicken industry has increased dramatically in the last thirty years. The industry is dominated by a number of quite large, vertically integrated companies (processors). Each of these companies contributes significant resources to in-house research and development, particularly in regard to product development, processing technologies, quality control procedures, packaging, distribution and market research.

Growers have contracts with these large, vertically integrated meat chicken processors:

- The grower provides labour, management, shedding, equipment and bedding material.
- The processor provides the day-old chicks, feed, medication, technical advice, chicken pick-up crews and transport.

The industry also includes a small percentage of extensively run meat chicken farms. This guidance note applies to intensive meat chicken farms only.

Breeding farms

Breeding farms produce the fertile eggs that become the chickens for commercial meat production. Day-old progeny from grandparent stock are reared to laying age and then mated to produce hatching eggs for commercial meat chicken production.

The birds that produce the meat chickens are known as parent or secondary stock. They are housed in large, deep litter sheds. The fertile eggs produced by the parent stock are collected daily and stored for transport to the hatchery. The grandparent and parent stock are productive for about 12 months. At the end of their productive life, these birds are removed for meat processing. The litter is cleaned from the sheds at the end of each cycle and the process repeated.

Hatcheries

Eggs from parent stock are incubated at hatcheries until they hatch. The chickens produced are graded for quality and sex, vaccinated then consigned to meat chicken farms within hours of hatching.

Meat chicken farms

Batches of day-old chicks are delivered to farms. Here they are raised within large sheds, naturally or mechanically ventilated, with some climate control. Usually the day-old chicks are placed in an insulated, hot-air brooding section, which occupies about a third to half of the shed. The floor space is increased over the next 10–14 days until the chicks occupy the entire shed. The chickens feed on demand from automatic feeders filled from bulk bins or silos. Drinking water is continuously available.

1.2 Meat chicken housing

The meat chickens are housed on litter, which may consist of sawdust, wood shavings, paper, rice hulls or chopped straw, depending on availability, price and absorbency. The litter layer is generally 50 to 100 mm thick.

Litter cleaning

Litter may be cleaned out and replaced at the end of each batch of chickens reared (single batch), partially cleaned out after each batch (partial reuse), or cleaned out after several batches (multi-batch). The processor will generally determine the litter clean-out interval, but the aim should be to maintain conditions where the litter is dry and friable.

Size of sheds

Sheds are mostly 100–150 m long and 12–20 m wide and house approximately 20,000 to 50,000 meat chickens. Most farms have three to four sheds.

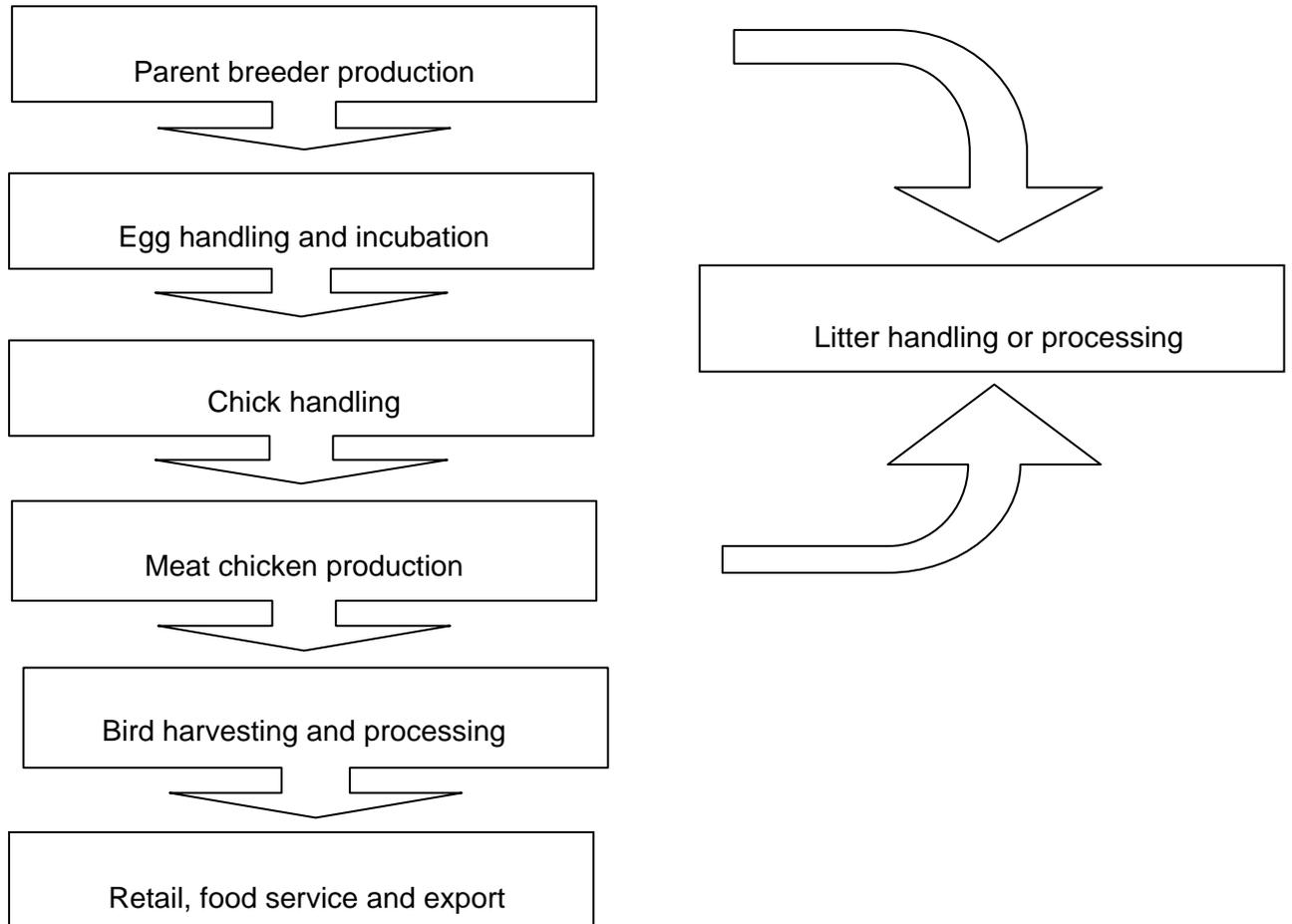
Meat chickens are generally raised in batches and when they reach market age they are caught (generally at night), placed in crates and transported to processing plants. Generally, part of the flock is processed after about five weeks (thin-out), with the majority of the flock harvested between six to eight weeks of age.

Sheds are empty for one to two weeks after bird harvest for shed clean-out and disinfection between batches. Farms generally raise five to six batches of meat chickens per year.

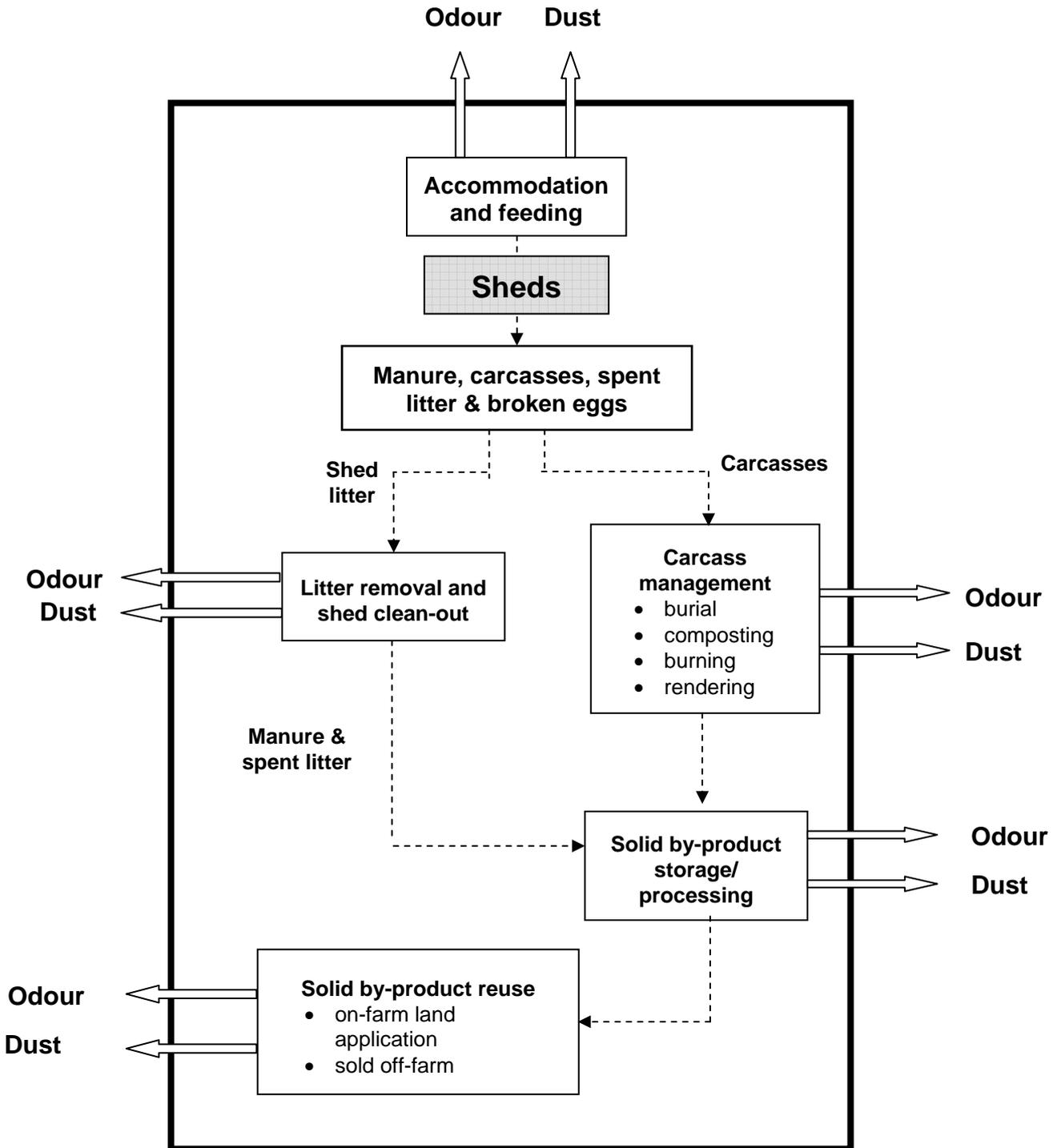


1.3 Production cycles

The following flow chart summarises the production cycle for meat chickens.



The following more detailed diagram of the production cycle shows the potential points of impact on air quality.



2 Potential emissions to air

Before going on site for an inspection or assessment the following should be checked:

- the consent conditions for the premises or the activity, and
- any previous reports on file including diagrams, photographs, maps, etc.

The intensive meat chicken industry has traditionally been located close to markets and processing plants. Most of the feed mills and processing plants are located in metropolitan areas, with the chicken grower sector of the industry concentrated in the rural outskirts of these areas.

With increasing urban expansion into these traditionally rural areas there has been a rise in complaints by neighbouring residents, mainly pertaining to odour, dust, noise and flies from the farms.



In the photograph here the urban area of a rural town sits down a gentle slope from a poultry establishment.

Complaints are registered when litter clearing occurs during stable atmospheric conditions due to the drainage flow (cool air flowing downhill).

The main air pollutants from meat chicken products are odours and dust.

2.1 Odours

In meat chicken production odours arise from:

- manure, and storing or moving it
- cleaning out shed litter between cycles
- composting litter materials
- applying stored or treated bird waste to land
- disposing of carcasses
- transporting treated or untreated wastes off site.

2.2 Dust

While not strictly air quality issues, increases in flies, vermin or noise can also cause problems for intensive chicken farming.

Dust in meat chicken production arises from:

- cleaning out shed litter between cycles
- applying stored or treated bird waste to land
- handling feed materials
- transporting treated or untreated wastes off site.

Windblown feathers are also a problem around some meat chicken farms.

3 Managing air pollution

Air pollution control techniques available to meat chicken producers are limited because:

- anaerobic processes are necessarily involved
- large odorous surface areas are exposed, and
- large ventilation air flows through sheds and cages are required to maintain suitable production conditions.



3.1 Location of establishments

Initial location of establishments and their relationships to sensitive neighbours is critical because **dispersion** is the main method of amelioration of both odours and dust. This is discussed in Module 3 Part 1, 'Air pollution control techniques' sections 3 and 5.3.

Stacks are not feasible for the large air volumes or large areas involved, so distance separation is the only practical means of dispersion. Correct assessment at the development approval stage is paramount.

Many existing meat chicken facilities in Australia are found in outer-fringe urban areas which are often associated with slaughtering and rendering activities. These areas were usually semi-rural when the industries were first established, but have since been overtaken by urban or semi-urban encroachment.

3.2 Odour

Measures that can be adopted to manage odours from meat chicken production include:

- **preventing excessive moisture build-up** in the manure in the floor litter; this has to be balanced against maintaining suitable temperature and humidity for the birds

Excessive moisture can be caused by:

- unsuitable bedding material (litter)
- leaking waterers in the sheds due to lack of maintenance
- rainfall entering the shed
- condensate from evaporative coolers entering the shed
- insufficient replacement of wet bedding at the end of a batch.

The following table is a guide to moisture content according to the condition of the litter.

Litter description according to moisture content

Litter description	Moisture content (% wet basis)
Dusty	< 15
Dry to friable	15–20
Friable to moist	20–30
Sticky—beginning to cake	30–40
Wet and sticky—heavy caking	40–50
Very wet and sticky	> 50

When moisture content exceeds 50% (wet basis) significant odour generation begins.

- **keeping collected manure and bedding litter dry** before spreading it on land, composting it or transferring it off site

There have been concerns about spreading spent un-composted litter onto land around sheds because of the risk of cross-infection between chicken batches. Spreading is generally only possible on larger meat chicken establishments.

- **storing manure in trapezoidal piles** (wider at the base than the top) to maximise pile drainage; storage should be covered wherever possible and located away from sensitive receptors
- moving manure and litter piles, or recovering solids from them, **during conditions that favour dispersion**, that is, during sunny periods with moderate winds blowing, and in a location away from sensitive receptors; anaerobic conditions in the piles mean that odorous gases are likely to be released when they are moved

- **using manure and waste litter soon after it has been collected**, i.e. spreading it on land or composting it as soon as possible rather than leaving it in stockpiles
- **observing the following measures** when spreading dried or treated waste solids (litter and manure) on land:
 - apply only when soil surface is dry
 - whenever possible, apply during weather conditions when dispersion is good and the wind is blowing away from sensitive receptors
 - use treated (composted) material rather than material straight from production
 - apply at a rate and in a manner such that minimal material remains on the soil surface after application
 - incorporate applied material into the soil immediately after application
 - keep neighbours informed about when short-term application will occur
- **covering the load** when manure or waste litter are transported off site
- making sure that **composting systems are designed and operated according to recognised principles** to minimise odours, especially during windrow turning (see Module 3 Part 1, ‘Air pollution control techniques’ section 5.6)
- **burying carcasses in deep trenches** that are well-removed from ground water and protected from surface water infiltration; carcasses need to be covered with a substantial layer of soil or clay (2 m minimum)
- taking extra care when **changing the rations fed to birds** because in some circumstances this can result in significant changes in their excretion pattern, with the litter becoming very moist and more odorous; avoiding certain feeds or sudden changes can sometimes alleviate the intensity of odour (see Module 3 Part 1, ‘Air pollution control techniques’ section 5.4)
- **clearing litter from sheds during the day when the wind is blowing away from close receptors** and dispersion conditions are favourable; clearing during early morning, evening or night should be avoided



Carcass burial trench



Carcass burial trench partially covered

- where natural ventilation is to be replaced by fully enclosed forced ventilation, the **exhaust end of the shed** should, wherever possible, be the end **furthest from sensitive neighbours** so as to maximise the separation distance.



The ventilation system on the shed at bottom left should be sited away from neighbouring houses

3.3 Dust

The main method for managing dust emissions is to separate the source of the dust as far as possible from sensitive receptors. The same management principles apply for both odours and dust.

Wherever possible, activities such as cleaning sheds, moving waste materials (manure, litter, etc.) or spreading wastes on land should not be carried out during strong wind conditions because this would enhance dust generation and transport.

Some additional measures for dust control are:

- **erecting wind breaks, wind barriers or screens** in locations where dusty materials are stored; key locations are around manure, compost and waste litter storage; low porosity wind barriers can be effective in trapping windborne feathers
- locating storage areas for dusty materials **as far away as possible from sensitive neighbours**
- scheduling activities which involve moving dusty materials **during the day** whenever possible
- **applying water sprays to unsealed road and other dusty surfaces** to reduce dust raised by vehicle movement—but water sprays should not be used extensively on stockpiles of stored manure because of the risk of generating odours
- if dust emissions are a problem when cleaning out shed litter, **applying water to the litter** beforehand could help—but extra moisture could also lead to an increase in odour levels.

4 Considerations for consent conditions

Other conditions may be necessary to control environmental impacts other than air pollution.

4.1 Standards to be met

- In cases where odour modelling and testing is to be undertaken, odours from the premises to comply with the requirements of DEC draft policy *Assessment and management of odour from stationary sources in NSW* (2001).
- Solid particle emissions to comply with POEO (Clean Air) Regulation 2002 for any stack discharges on the site:
 - 400 mg/m³ for plant installed before 1 Aug 1997 (not for a new development consent)
 - 250 mg/m³ for plant installed between 1 Aug 1997 and 1 Sept 2005 (not for a new development consent)
 - 100 mg/m³ for plant installed after 1 Sept 2005.
- Smoke emissions to comply with Ringelmann 1 or 20% opacity.
- Plant to be operated and maintained in a proper and efficient manner which does not cause air pollution, in accordance with s. 124 and 125 of the POEO Act.
- Materials to be handled in a proper and efficient manner which does not cause air pollution, in accordance with s. 126 of the POEO Act.

4.2 Operational and control requirements

- Odours from the premises not to be detectable at the nearest sensitive land use.
- All sheds to be constructed to prevent entry of water from external sources.
- Mechanical ventilation systems to be designed to exhaust shed air as far as possible from nearby receptors.
- Bedding within sheds to be maintained within the optimum moisture range to minimise odour and dust emissions.
- Removal of bedding from sheds to be carried out in weather conditions which minimise impact on sensitive receptors.
- All operations and activities conducted at the premises to be carried out in a manner that will minimise dust at the boundary of the premises.
- All solid by-products (e.g. bedding litter) to be stored in an impervious, free-draining, bunded area.
- Solids to be stored as far away from sensitive receptors as practicable.
- Wherever possible, movement of solids to be carried out in weather conditions which minimise odour emissions.
- Application of solids to land to be carried out in weather conditions which minimise odour and dust emissions and impact on sensitive receptors. Solids to be incorporated into soil immediately after application.
- Carcasses to be disposed of in a manner which minimises odour and dust emissions.
- Carcasses which are buried to be covered with sufficient soil to prevent odour emissions.

Meat chickens: air quality management checklist

This checklist has been designed for:

- local government officers—to help identify potential air emission problems and provide advice to operators.
- operators—to help identify and manage potential air emission problems.

Company

Address

Site location

Contact	Permit assessment
	Complaint response
Phone	Compliance inspection
Fax	Time & date of inspection
Email	Inspector's name

A Site location and context

What are nearby sensitive land uses? (e.g. schools, hospitals, car detailers, etc.)

	Land use	Distance	Comments
North			
South			
East			
West			

What are the prevailing winds at the site? (morning/afternoon/night)

Summer		Autumn	
Winter		Spring	

How will the surrounding topography and nearby buildings affect dispersion of any air pollution that is emitted from the site?

B Sketch plan of the site

Draw a sketch plan of the site showing the surrounding land uses, nearby buildings and local topography.



Note particularly:

- nearby sensitive land uses (schools, homes, other affected premises)
- locations of any complainants
- locations and heights of nearby buildings or trees
- locations and heights of stacks on premises
- wind directions during times of complaint (night and day)
- any other relevant features.

Comments:

D Core business and activities

Tick if yes and add comments as appropriate.

Types of operation

Operation	Number	Size (birds)	Comments
Sheds			
Other			

Treatment of wastes

Wastes treated	Method	Comments
Shed litter	Land application	
	Composting	
	Storage	
Carcasses	Burial	
	Composting	
	Rendering	
Other		

Location and numbers of ventilation discharge points

Location	Forced or natural	No.	Comments

Operational conditions

Aspect	Condition/activity	Yes/no/NA
Accommodation—sheds	Is the bedding relatively dry but not dusty?	
	No wet patches under waterers?	
	Not dusty inside?	
	Floor well covered with litter?	
	Comfortable to breath inside?	
	Run-off excluded from shed?	
	Evaporative coolers drain away from shed?	
Mechanically ventilated	Exhaust located at furthest end of shed from sensitive receptors?	
Solids management	Operations carried out during day time?	
	Screens around storage areas?	
	Transport vehicles well covered?	
	Solids movement areas tidy?	
	Solids stored in well-defined piles?	
	Area dry and well drained?	
	Carcasses well covered?	
	Stormwater excluded?	
Land application	No by-products visible on soil surface?	
	Vegetation on soil surface?	
	Spreading operations done during day?	

Comments and recommendations on operations:

E Management of odorous materials

How are odorous materials stored?

	Open storage	Covered storage	Bin or hopper storage	Comments
Manure				
Shed litter				
Compost				

How are odorous materials moved?

Operation	Weather considered?	Comment
Litter clearing from sheds		
Movement from storage		
Land application		

Comments on the general standard of housekeeping:

F Complaints from nearby premises

Odours

Date	Complainant	Distance and direction from chicken farm	Time of day	Comments

Dust

Date	Complainant	Distance and direction from chicken farm	Time of day	Comments

