Poultry
SIGNALS®

LAYER SIGNALS

A PRACTICAL GUIDE TO LAYER FOCUSED MANAGEMENT

Credits

Layer Signals

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Contents

CHAPTER 2

The **hen** and her **environment**

Good management requires thinking about things from the hen's point of view and looking out for them properly.

Cage or floor: there is a world of difference between the two. With caged chickens, the birds have no choices and it's mainly the farmer who calls the shots. In floor systems the hens can decide for themselves where to walk, lay their eggs or drops their faeces. As a poultry farmer you must bear this in mind and respond accordingly. You can influence their behaviour with food, water, light and other factors.

There are also great differences within cage and floor systems. In traditional cages the chicken can't do very much, but in bigger systems containing more than 40-50 hens, you need to take the birds' behaviour into account. In floor systems it makes a big difference whether the birds are free-range or the poultry house is fitted with a type of aviary system. In the latter case in particular, you will definitely need to take the birds' behaviour into account.
The hen prefers her living environment to be designed in such a way that there is a separate area for each activity: resting, laying eggs, scratching, eating and drinking, dust bathing. For resting, laying eggs and dust bathing she needs quiet places where she won't be disturbed by other chickens coming and going. A healthy accommodation naturally also includes the right temperature and the right amount of light, air, food and water.

These perches are at the top of the house where there are no other facilities. The resting chickens are not disturbed there, so they can get real peace and quiet. In cage systems there is very little room for birds to be able to rest undisturbed.

Differences between husbandry systems

There are various types of husbandry systems irrespective of the climatic conditions. In most countries hens are kept in small cages. In countries where these are banned, mini-aviaries or enriched cage systems may be a permitted alternative.
In floor housing chickens have much more room to move and are more free to exercise their natural behaviour. But in doing so they use more energy and therefore eat about 5 grams more feed a day.

There is also a risk of egg loss because hens can lay their eggs outside the nest. Avoiding floor eggs requires a lot of attention and work, particularly in the early morning. In case of floor eggs start walking through the hen house at about the time they lay their eggs, disturbing the hens that try to lay their eggs outside the nests. The choice of housing systems depends not only on local cost levels but also on society's demands in terms of animal welfare (laid down in law). And the choice must of course suit the poultry farmer and his staff.

Cage system

+ Most efficient method of poultry-keeping
– Birds are limited in their natural behaviour (animal welfare)
+ Less labour-intensive
+ Better hygiene (diseases spread more slowly)
+ Climate easier to control

Floor system

– When something goes wrong the consequences are more serious
– Higher management level necessary: behaviour is an extra factor to take into account
+ Birds can display their natural behaviour
+ Better image (meeting demands of society)
– More labour-intensive: a lot of extra work in the poultry house
+/– Ventilation systems work differently in floor systems (fewer chickens so less heat generated, susceptible to weather influences, reduced pressure ventilation not possible in free-range system)

Meeting the birds' behaviour in cages

Enriched caged systems also feature elements that allow birds to demonstrate limited natural behaviour, like mats for their nails or flaps that give them some privacy.

With caged systems there are several options, from very small cages (5 hens per cage) (picture right) to cages containing 30 or more birds (picture top).

Infections spread faster in a house with non-caged chickens than in a caged system because the chickens spread the germs all over the house and come into contact with other chickens' manure.

Open sided or closed poultry houses?

In open sided poultry houses there is often little that can be done about the temperature around the birds. But it is possible to place fans by the birds to cool them down. Curtains are often used to prevent the house from getting too cold at night.
If the temperature gets very high or low, the feed, the amount of feed and the feeding time will need to be adjusted accordingly.

Rearing

In open poultry houses or houses that allow a lot of light, the day length can't be shortened and you have to deal with the natural day length. Getting the birds into lay at the required time may be a problem, particularly during rearing. A modified lighting scheme may help.

In open houses climate control and lighting costs are limited, but so is your control over them. In many countries birds are housed in open poultry houses. The light can't be dimmed.

In closed houses the climatic aspects can be regulated, so you are in better control of your production. But a reliable power supply is essential and the costs of housing and climate control are high.

You can restrict the influx of direct sunlight with a roof that extends well beyond the edge of the building. When building a new poultry house, make sure the length of the house runs east-west. This is another way to restrict light influx at noon.

Climate management in high temperatures

The optimum house temperature for laying hens is about 25°C. Up to a temperature of about 30°C you will notice that the hen can still regulate her own temperature reasonably well. Above that you will need to provide cooling. A desert cooler can lower the indoor temperature quite significantly when the outside air is hot and dry. Make sure the incoming cooled air is not directed straight onto the birds.

If there is no cooling facility, ventilation can help prevent heat stress.

Chickens cool themselves down by evaporating moisture by panting. When chickens pant, the air around the head contains high levels of moisture. It is important to get rid of this air as quickly as possible so that more moist air can be given off. A few extra fans that provide more air movement and are directed at the birds are an effective way of dealing with high temperatures. You should see the feathers moving in the airflow. As they can't sweat, excessive cooling won't affect the birds as long as the air temperature is higher than 26°C.

These windows can be opened, but they can cause draughts and can only be open or closed. There is little control.

If it gets warmer or too warm, in floor housing you will notice that the birds are dust bathing more, ruffling their feathers and spreading their wings. Birds in a cage system are not able to do this, but they pant with their beaks open and spread out their wings. It is important to make sure that every bird in every cage has the best possible ventilation.

In intensive sunshine the roof of the poultry house can get very hot and the incoming air around the house can heat up to quite a high level. Spraying the roof creates a lot of condensation which cools it down. Atomisers installed under the roof of the house can also provide some cooling through humidification. But only when the relative humidity is not too high.

Provision for cool nights

In tropical regions the outside temperature can often drop well below 25°C at night, and even to around freezing point. In open sided poultry houses you will therefore need to close the curtains at night. In this photo you can see that these curtains can be pulled up. The cold air flow should not be directed at the birds. Birds in a strong current of air below 25°C can suffer from problems with colds (mucous) and sometimes coryza. In mechanically ventilated poultry houses, air inlets should be designed in such a way that the incoming air is directed to the ridge of the house where it will be mixed with the warm indoor air.

Ventilation

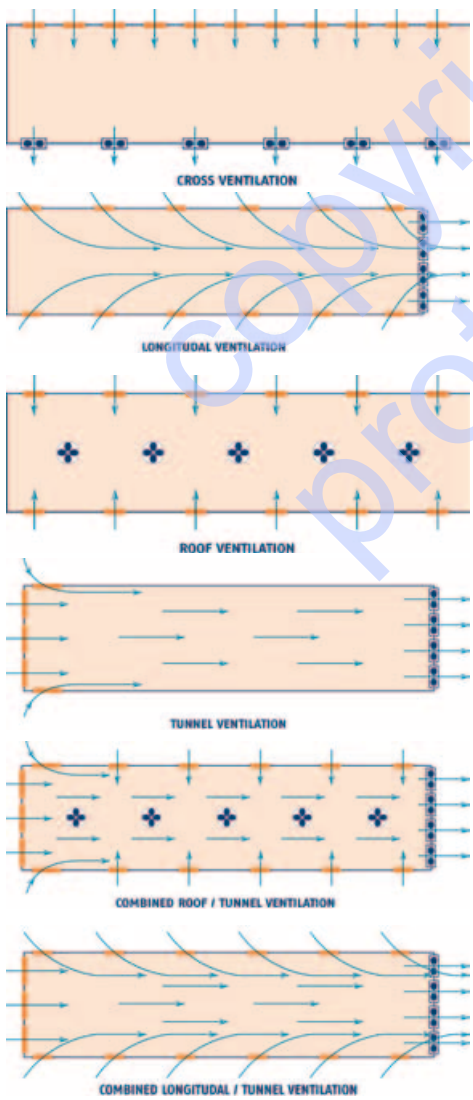
The house climate is determined by the combination of ventilation, heating and cooling. The choice of the ventilation system should be suited to external conditions. Simple or complex, the system needs to be managed. And even with a fully automatic system your own perception remains crucial (ears, eyes, nose and skin).

Natural ventilation

Natural ventilation doesn't make use of fans for incoming or outgoing air. The fresh air enters the house via open inlets, often fitted with controlled valves, panels or curtains. And leaves through the same openings and/or the roof. Natural ventilation is often seen as a simple and inexpensive system. Whether that is true depends on the results that can be achieved from such a poultry house.

Mechanical ventilation:

Even in areas where natural ventilation can work well, farmers are increasingly using mechanical ventilation. The investment and energy use are higher, but it offers more control options and thus it is more likely to have good results. The air is expelled by ventilators: the key word is underpressure. The slight negative pressure in the house pulls air in via all openings at a similar rate. It is therefore important that there are no openings besides the air inlet valves: they could disrupt the entire system!



Cross ventilation: *The air is expelled on one side of the house and fresh air enters through inlets on the opposite side. This system allows small, but also large quantities of air to move.*

Longitudinal ventilation: *The air intake valves are on the both sides of the house. The fans are placed in the rear wall. This system does especially well in those areas where the temperature differences are not too large (such as a maritime climate). Investment and operating costs are relatively low.*

Roof ventilation: *The fans are installed in ventilation ducts in the roof. The air intake valves are evenly distributed over the two sides of the house. This is often used for minimum ventilation in colder climates. Small quantities of air can be well managed. For larger quantities of air, the system is often more expensive because of the large number of fans and air ducts that are required.*

Tunnel ventilation: *The fans are placed in the back wall and air is sucked in through air inlets in the front wall of the house (or in the final few metres of the side walls at the front end). This creates relatively high air velocity. This high air velocity (up to 3.4 m/s) gives a cooling effect on the animals (chilling effect). This system is used when large quantities of air are required.*

Combinations: *Tunnel ventilation is often used in combination with a roof or longitudinal ventilation, for example. In that case, the roof/ longitudinal ventilation is used for minimum ventilation. When more is required these valves are closed and the tunnel inlets opened. An increasingly used concept.*

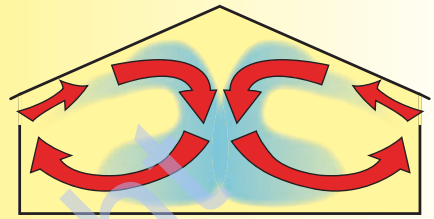
Assessing ventilation in the poultry house

In floor housing systems, the distribution of birds over the house tells you something about the quality of ventilation. But you can also assess the ventilation in other ways.

Enter the house with bare, wet arms or wearing shorts, go and stand in the parts of the house where there are too few chicks and feel whether there is a draught there. Check whether the litter feels cold. See whether there is a pattern in the way the birds are distributed throughout the house and whether this has anything to do with the position of the lamps, fans, air inlet etc. If you change the settings, give the chicks a couple of hours to adjust. Don't conclude too quickly that the change has not worked or is no good. Make a note of what you have changed.

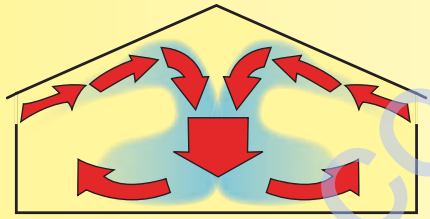
Avoid ventilation errors. Check all your equipment at set times.

Good ventilation

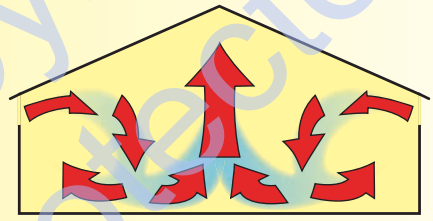


Poor ventilation with floor rearing

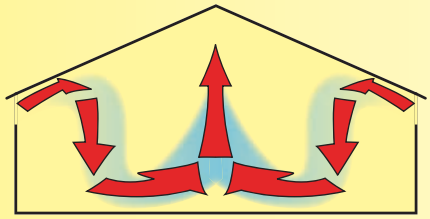
If you cannot feel it yourself, do a smoke test to see how quickly the air is flowing through the house. You don't have to take the chicks out of the house to do this. There are several options:



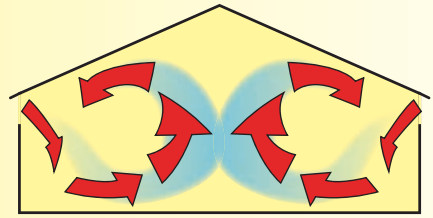
- The fresh, cold air in the middle sinks and there is little air movement at the sides.
- The chicks avoid the middle and go to the sides of the house, resulting in damp litter.
- Reduce the underpressure.



- The fresh, cold air sinks too quickly and is therefore not being heated up enough. The chicks keep to the outermost quarters and the middle of the house.
- This has created two empty strips down the length of the house: a zebra crossing effect.
- Increase the underpressure.



- The chicks move away from the edges and are mainly in the middle.
- The flaps are too tightly shut so there is too little air entering through each flap which dissipates too quickly.
- Open some of the flaps about two fingers more.



- In hot weather the flaps will turn.
- The air will pass right over the chicks at high velocity.
- This will make the air feel quite cool near the birds (wind chill effect). This should only be done deliberately if the ambient temperature is very high.

Source: Henk Rodenboog

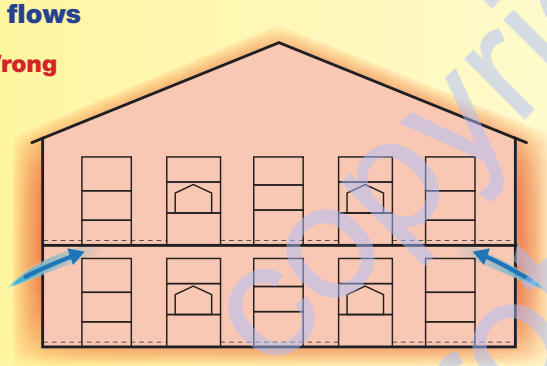
Climate under control

The climate in a house is a combination of temperature, air velocity, indoor air composition, dust and light. And very important: the (micro) climate around the birds is what counts! These factors can impact on one another. Get a climate expert to check both the climate computer and the climate once or preferably twice per year. The expert works with these systems every day and knows what the best setting should be. Sometimes it will be different from the manufacturer's recommended setting. The expert can also pick up on changes in the sensors which could indicate that the climate is no longer being optimally controlled. Naturally you should also be alert to signals that indicate whether or not the climate is right. Chickens might avoid certain places or huddle together, for example, or there may be a stuffy smell. You get used to bad air quite quickly, so go with the impression you get when you enter and leave the house.

When setting the house temperature, take the quality of the feather cover into account. A featherless hen needs a higher temperature and is more susceptible to draughts and air flows.

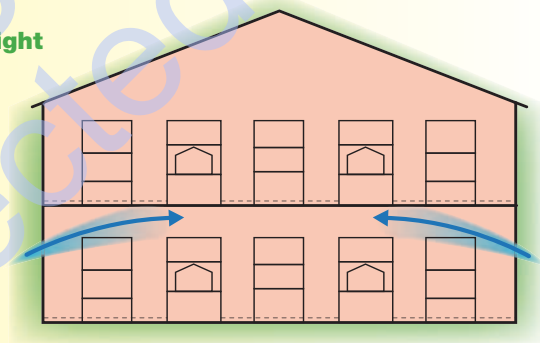
Air flows

Wrong



Bad air circulation can occur in houses with little volume and a relatively large number of obstacles. Air does not circulate properly in aviary houses that are too low. There are also places with no air movement in the middle of the poultry house.

Right



There is plenty of room above the tiers to allow the air right into the middle of the house. It is also less likely that there will be places without air movement. You can also direct air to the middle of the house with pipes or ducts from outside running along the ceiling to the middle.

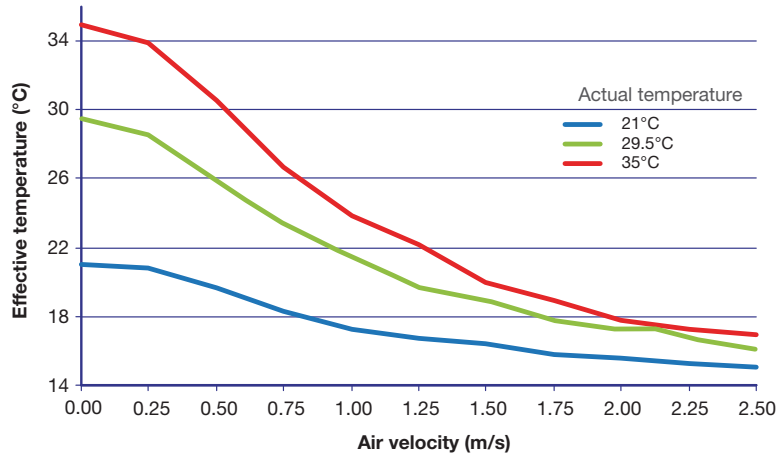
LOOK-THINK-ACT

What is wrong with this temperature sensor?

This temperature sensor is level with the top perch. That's too high. For accurate temperature measurement, it is important that the temperature sensors register the temperature where the chickens are. So it must be in among the chickens, but not in a position where the chickens can sit against it. Check regularly that the temperature sensors are working properly by hanging a good manual thermometer next to them.

Effective temperature (wind chill factor)

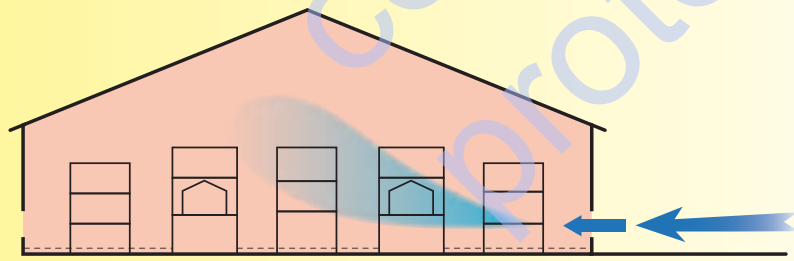
As it becomes warmer, poor ventilation can cause the air to become musty. This is one of the causes of feather pecking. So you will need to ventilate the house well, ensure a good air velocity and monitor the temperature. In a closed house, make sure the set minimum ventilation is appropriate to the number of hens, and assume 0.7 m^3/kg live weight per hour. Ventilation-directed air flow has a cooling effect on the hens, because the wind chill factor increases as the air velocity increases. Watch out for draughts. In houses with floor systems hens will avoid draughty places. The optimum effective temperature for hens in cages is 20 to 24°C. For hens in floor systems it is 18 to 22°C. Higher temperatures over long periods of time, particularly above 28 to 30°C, combined with high relative humidity can result in heat stress. In case of acute heat stress, hens sit with their beaks open and their wings spread out. Mortality is increased and production drops. Chronic heat stress has more gradual effects.



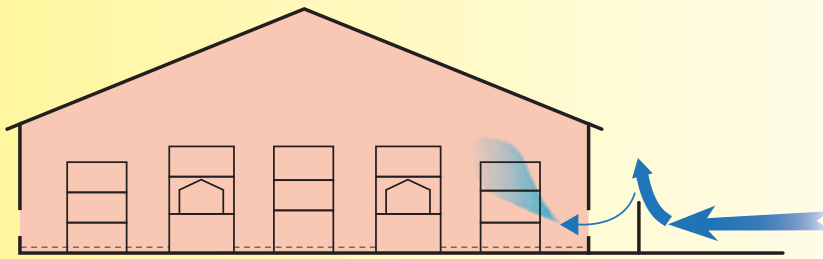
The temperature the chickens experience depends on the combination of outside temperature, relative humidity and air velocity. Higher air velocities in high outside temperatures can create a strong cooling effect. But watch out for draughts.

Wind: not too little, not too much

One disadvantage of natural ventilation is that there is virtually no ventilation when there is no wind. Use auxiliary fans to ensure sufficient air circulation. Fresh air can also reach the birds via the aeration of the manure belts.



In houses with natural ventilation, the wind affects the interior climate. Too high air velocities can create draughts, and draughts can also pop up at different places in the house.



An evergreen windbreak or vertical walls outside the range openings around the house is one way of reducing the effects of wind. In closed poultry houses, wind protection can be fitted in front of the air inlets.

Air

High ammonia and dust levels affect the chickens' mucous membranes and make them more susceptible to disease. In fact, too much ammonia can even cause blindness in chickens. You can smell ammonia from a concentration of as little as 20 ppm yourself. If you can smell it, the concentration is too high. Other gases like oxygen, carbon dioxide and carbon monoxide have no smell. Imperceptible to humans, excessive concentrations can be harmful to the birds, but also to humans. Ventilation not only brings fresh air into the house, it also removes residues in the air.
If you have several poultry houses, you may sometimes notice the hens in different houses doing different things. If the birds in one house are less active than those in another, this may well have something to do with the climate. Monitor it, or get someone in to do so, and improve your ventilation system if necessary. You can monitor most gases easily yourself using gas detection tubes. The table gives the standard levels for the main gases.

Concentrations of various gases

Gas	Standard level
Oxygen (O_2)	> 21%
Carbon dioxide (CO_2)	< 0.2% (2000 ppm)
Carbon monoxide (CO)	< 0.01% (100 ppm) (ideally 0)
Ammonia (NH_3)	< 0.002% (20 ppm)
Hydrogen sulphide (H_2S)	< 0.002% (20 ppm)
Relative humidity	60-70%

When you monitor the house climate, don't only do so at your own working height but also at the height of the chickens. With cage systems, take measurements at the bottom layer and the top layer.

Avoid wet litter

Wet litter is a source of ammonia and leads more quickly to digestive problems, coccidiosis and footpad problems (lameness). Keep the litter dryer by ventilating better (removing the moisture), increasing the fibre content in the feed (result: dryer manure) and stopping spillages of drinking water. Scatter grain so that the hens scratch the litter loose themselves.

You can see that the litter in this picture has become a hard crust. The litter was originally damp and was obviously not worked enough by the chickens.

Light

A properly lit house gives you a good overall view of the house and your hens. This applies to all types of housing systems. With floor systems, by distributing light throughout the living space and over time you can influence where the birds go and when, and whether they are active or rest. Day length and light intensity influence feed consumption and production.

Did you know that a hen...

- sees more colours than humans in daylight?
- sees the light of conventional fluorescent tubes as flickering? This does not apply to high-frequency lamps, which are also more economical to run.
- prefers at least 60 lux for eating, drinking and scratching?
- prefers semi-darkness for egg laying and roosting: 0.5 to 1 lux?
- recognises others of their species better in more intensive light (> 70 lux)?

Pros and cons of lighting systems

	Incandescent lamp	High-frequency fluorescent tube	Orion PL lamp*	SL-lamp	High-pressure sodium vapour lamp
Purchase price	+	--	-	+/-	+/-
Installation costs	-	+	-	-	++
Peripherals	+/-	+/-	+/-	+/-	+/-
Maintenance costs	+/-	+	+	+	+
Power consumption	--	++	++	++	++
Service life	--	+	+	+	++
Dimming	++	++	+	-	+/-
Light distribution	++	+	++	+	-
Spectrum display	+	+/-	--	-	--
Stroboscopic effect	++	++	++	--	+
Feather pecking/ cannibalism	+	+	++	--	+/-

++ = very good; + = good; +/- = average; - = poor; -- = very poor

** In laying hen houses with the Orion PL system, one half consists of red lamps and the other half of white ones.*

LOOK-THINK-ACT

Dark spots?

There are dark spots in some places under the racks in this aviary house. The hens will want to lay their eggs there. If you want to avoid floor eggs there, fit rope lights, for example, as shown in this picture.

Dust

There's no such thing as a dust-free poultry house. Litter, manure, feed and feathers all turn into dust eventually. Dust is bad for the health of humans and hens. Dust particles get into the lungs. In combination with ammonia, which affects the mucous membranes, this increases the risk of infection in the birds. Breathing in dust is also dangerous to human health, particularly:

- in high concentrations
- when you stay in the house for a long time
- with very fine particles.

What starts out as a seemingly harmless symptom like a tickle at the back of your throat, sneezing and coughing can turn into serious illnesses like bronchitis, shortness of breath, asthma or reduced lung capacity. Never underestimate the health risks of dust; it is best to wear a dust mask.

Types of dust

The smaller the dust particles, the deeper they penetrate into the lungs and the more harmful they are.
They are classified as follows:

- Inhalable dust: particles of less than 50-100 µm. You can inhale these particles, but you can also expel them via the cilia in the lungs.
- Thoracic dust or particulate: particles of less than 10 µm.
- Respirable dust: particles less than 4 µm. These are very small particles that come to rest in the alveoli and damage the lung function.

Dirt and dust in inlet valves and ventilation ducts cause more resistance. This reduces the ventilation capacity, so the temperature rises. The electricity consumption will rise unnecessarily.

Keeping the aisles in a house with cages clean helps to cut down on dust. Cleaning weekly prevents large amounts of dust from settling which can be disturbed again. Tip: Use a clean filter. An ineffective or old filter will cause the vacuum cleaner to re-expel some of the dust particles. So clean and replace the filter regularly. And don't forget to wear a dust mask yourself.

A lot of dust is released during vaccination. When doing these kinds of tasks, always wear a dust mask. Correct use of a dust mask reduces the risk of inhaling dust by 90%. Masks with an exhalation valve are more comfortable to wear. Use P2 masks as a very minimum.

Solutions for the future

1. Applying an oil film in floor housing systems: binding dust particles by applying a film of rapeseed oil or sunflower oil over the litter. This reduces the amount of dust by 50-90%. Downside: dirt becomes caked.

2. Water spray: settle dust by spraying with clean water. This reduces the amount of dust by 80% (coarse dust) and 50% (fine dust). Downside: relative humidity in the house can become too high, so the litter can get too wet.

3. Air recirculation with cleaning: outgoing air can be recirculated after cleaning (e.g. filtration, air washing). This reduces the amount of dust by 40-60%.

4. Ionisation: settle the dust by charging the dust particles by applying a voltage difference. The charged particles will then stick to earthed surfaces like the floor and walls. This reduces the amount of dust by about 35%.

These techniques have an additional environmental benefit: much less dust is emitted into the open air.

Spraying the litter with oil.

There is a voltage difference along the wire with protrusions (ionisation).

Activities and their dust scores

Presence between hens	Dust score
Delivery of layers	12
Removing birds (catching and loading)	12
Handling individual birds (healthcare etc.)	12
Collecting floor eggs in aviary and floor systems	12
Treating groups of hens (group vaccination)	6
Inspections among birds	3
Other activities in the house	
Cleaning the house	12
Removing dust from aisles, dry	12
Removing dust from aisles, wet	8
Scattering straw and litter	6
Mucking out chicken house with shovel/loader	6
Collecting eggs and inspecting in lobby	4
Inspecting from feed aisle during feeding in cage systems	3
Inspecting from feed aisle outside feeding times in cage systems	2

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The dust burden in the house varies depending on the activity. The dust score ranges from 1 to 18, with 18 indicating a very high dust burden and 1 a very low one. These figures do not represent the absolute quantities of dust but a combination of quantity and time. For example, removing hens generates a lot of dust but only for a short period; floor eggs generate very little dust but over a longer period. So the total dust burden of these two activities is the same.

Why free-range?

In various countries society at large has expressed the desire to have free ranging chickens. Consumers want chickens to be able to move about in the open air and not be cooped up in a poultry house all day.
An outdoor range can make a significant contribution to the well-being of the hens. Chickens that get outdoors are less likely to feather-peck. But you need to make the range attractive and safe for the birds and keep it properly maintained.

Health risk

In uncovered outdoor ranges birds are at much greater risk of being infected with bird flu by wild birds. With indoor housing you must also ensure that no other birds can get in and that your birds do not come into contact with other birds through the mesh.

Gimme shelter

Chickens only feel safe when there is shelter nearby. This can consist of natural vegetation or an artificial shelter. What is important is that the hens can stand under or next to it. This makes them feel safe from predators. Then if they get frightened by something they don't have to run indoors. Chickens that only feel safe indoors will hardly ever go outdoors.

In a system with a well-designed outdoor range, hens can exercise their natural behaviour to the full.

There is a gutter under the slats. The chickens cross the slats before they go into the house, so they carry less mud inside on their feet. Discharge the gutter into the manure tank.

Artificial shelter

Camouflage nets (left) disintegrate if they are left out in the open the whole year round, but are a good temporary solution after harvesting or when other forms of shelter are not yet fully operational.

The shelter on this farm (right) is portable. The chickens use it as a refuge when they take fright.

Covered range or winter garden

It's often not possible or feasible to provide a real outdoor range. In that case, consider providing a covered range, also known as a 'winter garden' or cold scratching area. The benefits for the birds are that there is daylight, a different temperature zone and some diversion. You can also use the winter garden to provide the chickens with a diversion:

- bales of alfalfa hay
- freshly mown grass
- barrels of normal grit or gizzard grit
- perches
- containers of sand.

Right: *On this farm, a strip of grass is mown every day and fed to the chickens.*

Wrong: *There is a lot of daylight in this covered range, which makes the chickens active. But there isn't even any litter to scratch in, so the chickens start feather pecking out of boredom.*
Inset: The same farm a few months later: lots of bald hens.

Right: *In this covered range, trees have been planted which will provide shade in the future. Drinking water is also available.*

New housing systems are increasingly designed around the hens' natural needs with a covered range. A covered range doesn't get muddy and prevents infection by wild birds.

Poultry
SIGNALS®

LAYER SIGNALS

A practical guide to layer focused management

‘Laying hens are not egg laying machines. Proper care requires knowledge of the animal and the capability to use this in practice. For optimal results.’

Not all poultry farmers maximise the full potential of their birds. Both kept in cage or floor systems, for a good performance during the production period, the management should be correct and efficient. But how do you know that what you are doing is right? Your chickens continuously send out signals: about their health, how well they know their way around their surroundings and whether they feel happy and comfortable.

Do you recognise the signals your chickens are giving? Do you know the difference between abnormal, runny droppings and healthy caecal droppings? Are you able to identify abnormalities of the egg and trace this back to the cause? And do something about it?

If you recognise the signs that point to potential problems, then make sure you are armed with information to take the appropriate steps to get your flock back on track. But to do so, you must know all the ins and outs of your own farm and be able to assess the impact these changes will have on your animals.

Layer Signals is a practical guide that shows you how to pick up the signals given by your animals at an early stage, how to interpret them and which action to take.

Poultry Signals® presents practical knowledge of animal-oriented poultry farming in an easy, accessible format.

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