

Improving animal welfare in poultry slaughterhouses

How to reduce stress, suffering and ease handling



Eyes *on*
Animals

Watching
out for their
welfare

Electricity or gas?

To date the electrical water-bath is still the most-used stunning system for poultry in Europe. However, due to advantages for animal-welfare and meat quality, gas stunning systems are becoming more and more popular. Moreover, the use of the electric water bath - due to stricter European animal welfare requirements - has become technically more difficult. For this reason almost all broiler slaughterhouses in The Netherlands have switched to gas stunning systems that use low concentrations of CO₂ to render birds unconscious. Ducks and most laying hens though are still stunned by an electric water bath even though for these birds gas stunning is also a more humane option.

In recent years, Eyes on Animals has visited several poultry slaughterhouses in Europe to help improve animal welfare. We look at animal behavior, the handling of the animals and the design of the slaughter line, including the stunning installation. This has given us a good sense of the advantages and disadvantages of using gas or using electric waterbath stunning.

A concern with CO₂ stunning is that CO₂ induces breathlessness, fear and respiratory irritation before birds are rendered unconscious. These things can be reduced by using low CO₂ concentrations and (in some systems) adding O₂ to the gas mixture. However, some suffering still occurs and cannot be prevented. During our visits we observed that birds show stress signals like head shaking, restlessness and deep inhalation for approximately 30-50 seconds.

This suffering caused during CO₂-gas stunning, though, cannot be compared to the extreme fear and pain birds experience during the manual unloading and shackling when using the electrical water bath stunners. During our visits of poultry slaughterhouses using the electric waterbath we observed that birds heavily flap their wings, scream and breath fast during unloading and shackling. These are all signs of pain and extreme stress. It is also known that live shackling causes fractures, dislocations and bruises.¹ Using an electric waterbath also causes very painful 'pre-electrical stuns' and a considerably high percentage of birds are not stunned adequately.²³

- ☑ Eyes on Animals strongly discourages the use of electric waterbath stunning because of the many animal-welfare disadvantages. (see table below).
- ☑ Inhaling CO₂ causes stress and breathlessness. We therefore strongly encourage the industry to switch to a non aversive gas or a brand new system of stunning that does not cause such pain and stress.



Water bath stunner ©Eyes on Animals



Gas stunner ©Meyn

ADVANTAGES AND DISADVANTAGES OF ELECTRIC WATERBATH AND GAS STUNNING

ADVANTAGES		DISADVANTAGES	
Electric waterbath	CO2 gas stunning	Electric waterbath	CO2 gas stunning
The stunning itself is direct.	Birds can often remain in the transport crate / drawer during stunning. They do not have to be removed manually or mechanically (live tipping).	Birds are grabbed out of their transport crates and shackled by their legs, left hanging upside down for 30-60 seconds. The chickens show stress and pain signals, such as flapping their wings, screaming, rapid breathing and escape attempts. Shackling also causes injuries, such as fractures, bruises and dislocations.	Birds experience stress and breathlessness for 30-50 seconds when exposed to CO2.
	Birds do not have to be shackled by their legs and left hanging upside down. This prevents a lot of pain, stress and injuries.	There is a high risk of painful pre-electric shocks because the wings touch the electric water bath before the birds' heads, and thus they are not yet stunned.	
	Painful pre-electric shocks are avoided.	The current is not distributed well because the resistance differs per bird. As a result, a significant proportion of the birds end up not being adequately stunned.	
	High rate of effective stunning if used correctly.		

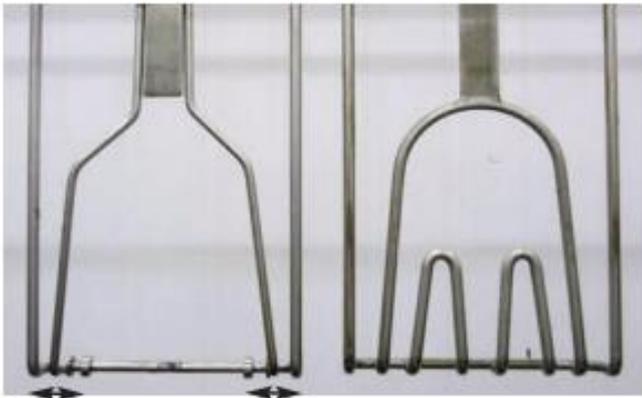
Electrical waterbath stunners - improvements

We strongly discourage the use of electrical waterbath stunning as this method causes serious animal-welfare problems, like fractures, dislocations, injuries and fear during shackling, very painful 'pre-electrical stuns' and a considerably high percentage of birds not being stunned properly.⁴⁵⁶⁷⁸⁹ If slaughterhouses however decide to keep using waterbaths we would strongly recommend the following options to at least slightly reduce the stress and pain it causes.

Improve shackling

Compliant shackles

The leg size of birds can differ enormously due to housing conditions, breed and body development. If shackles are used in a fixed size, there is a big chance that they are too tight for some birds, causing pain and injuries when their legs are forced into the shackle. Therefore use compliant shackles to reduce pain and stress caused by high pressure on legs. Compliant shackles adapt to the size of the birds' legs, as they are flexible. As a result, there is less pressure on the legs, causing the birds less pain and reducing violent reactions such as heavy wing flapping.



Left: compliant shackle, right: normal shackle ©HSA

- Provide compliant shackles to reduce pressure on the legs.

Sufficient space in between the birds

If the birds can touch each other when flapping their wings, they have been shackled too close together. Increase the empty space in between the birds. If birds touch each other, they can hurt each other and stress, blood spots, and fractures occur. Placing the birds further apart will also reduce the chance of electric shocks passing from one bird in the water bath to the next one in line.



Make sure that there is enough space between the birds so that they do not hit each other with their wings in panic

- ☑ Make sure there is sufficient space between the birds so that they do not hit their wings against each other.

Touching birds during shackling

Scientific literature shows that live shackling causes a lot of stress, pain and injuries, such as fractures, bruises and dislocations. Shackling is done manually. If the birds flap their wings heavily during shackling, gently place your hand against the birds' breast, hold their body or legs for a while, or gently push them against the breast supporter strip while you walk with him.



Violent reaction when hanging live broiler chickens.

A hand under the breast calms the bird.

- ☑ Hang the birds calmly so that the chance of wing-flapping and breaking free from the shackles is as small as possible.
- ☑ Provide good breast support along the shackle line. For more information, see the [chapter about reducing pain and stress with a breast supporter](#).
- ☑ If a bird flaps nevertheless, gently put a hand under the breast or walk a bit along with the chicken while you hold her or him lightly against the breast supporter.

As short as possible

Live shackling is painful, stressful and causes injuries including bruises and fractures. Moreover, birds do not have a diaphragm like we do. When they are hung upside down by their legs, the organs press down on the lungs and air pocket, which means they cannot breathe properly. Therefore, best is to not shackle birds at all. If there is currently no alternative at your plant, at least make sure that the amount of time birds are left hanging upside down is as short as possible. Legally, poultry may hang for a maximum of 1 minute. But shorter is better. Always prevent the shackle- line from stopping, as any delay will prolong animal suffering.. If there is a delay or a breakdown in the line, remove the birds immediately from the line.



Hanging upside down is stressful, painful and makes breathing difficult.



© Rogier Trompert Medical Art

- ☑ Make sure that the time spent hanging is as short as possible to limit suffering.

Avoid obstructions

When birds are shackled, all the obstructions they bump into cause extra stress and pain. One of the things we see regularly is that birds - when shackled - collide with stacked crates. Or that the conveyor belt with crates (which the birds are taken out of) is too close to the shackle line, so that the birds are dragged over the tops of crates. Place the crates at the correct distance from the shackle line and ensure that they are not in the way.



Prevent birds from being dragged over or bumped into the crates when being placed on the shackle line.

- ✔ Make sure that the birds do not encounter anything at all - with the exception of the [breast supporter](#).
- ✔ Remove the crates and / or containers underneath the shackle line !

Breast supporter to reduce pain and stress

As of December 2019 all slaughterhouses in the EU are obliged to put a breast-strip underneath the shackle line to reduce the stress of hanging.¹⁰ A well designed breast-strip gives the birds support under the breast - so the birds can lean on it. This will reduce the pressure on the legs so that the birds experience less stress and pain. We prefer to call it a “breast-supporter”.

A breast supporter should be made of a solid piece of non-conductive material. The strip should be solid and smooth, without any obstacles in it like bolts that could cause injury. The strip should start where the birds are first shackled until the moment they enter the waterbath. The strip should block the view for the birds, to prevent them being scared of activity around them. The photo below shows how such a breast-system should look like. For slaughterhouses that slaughter several types of poultry (breeds), it is important that the breast supporter be height-adjustable.



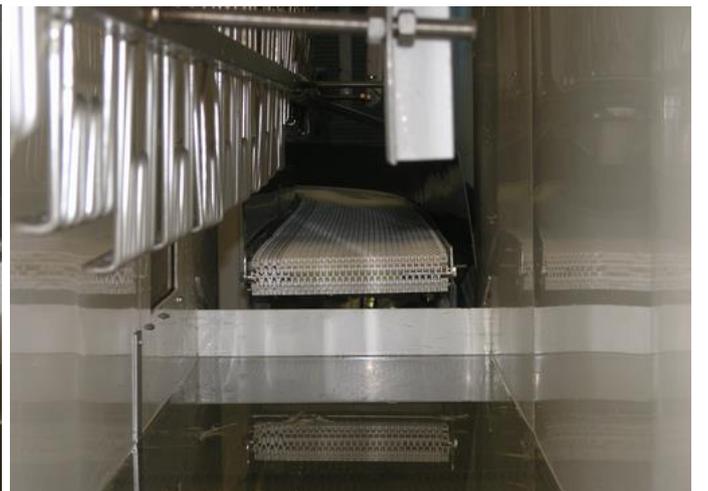
Breast supporter that prevents birds being disturbed by activity around them. ©Meyn

Please see this document from Humane Slaughter Association (HSA) for technical details on breast supporters: <http://www.hsa.org.uk/downloads/hsagn7electricalwaterbathpoultry1.pdf>

- ✔ Make sure the breast supporter is positioned so that it really supports the birds.
- ✔ Install the breast supporter from the shackling area all the way to the water bath - so that the birds receive support throughout the entire hanging period.
- ✔ The breast supporter must not conduct current. So make it out of non-conductive material.
- ✔ Make sure that the breast supporter is made out of a smooth material – there should be no screws or bumps on it as these can injure the birds. It is important the weight of the birds is partly supported and the birds bodies glide along it smoothly.
- ✔ Choose a breast supporter that is designed in such a way that the birds have a limited view on the rest of the slaughterhouse. (see photo above). This prevents birds from seeing stressful stimuli.

Conveyer belt to support breast

Even better than a breast supporter as indicated above, is a conveyer belt underneath the shackle line. A conveyer belt will give support to the birds breasts even more than a strip in contact with the breast does. A conveyer belt will also keep the birds in a more upright position which will decrease their fear and pain. Of course one must pay attention that the birds cannot fall or become loose and walk off. The conveyer belt should be always rigid, as birds will struggle if the conveyer belt is bendable. If the birds have been shackled, the worker should fold the wings into a closed position to prevent pre-electrical stuns.



*Conveyer belt system to reduce suffering caused by shackling
HSA and BSI Schwarzenbek*

©Jeff Lines - <http://www.silsoersearch.org.uk/>,

Please also see the HSA **Guidance Notes No.7 on Electrical Waterbath Stunning of Poultry:**

<http://www.hsa.org.uk/shop/publications-1/product/electrical-waterbath-stunning>

- A conveyer belt is the best option for reducing pain and stress of live, hanging birds.

Prevent pre-electrical stuns

It is extremely important that pre-electrical stuns be prevented. A pre-electrical stun means that the wing, or other body part, is in contact with the electric-water bath before the head is. This means the bird gets an electric shock while s/he is still conscious and fully sentient. Unfortunately, pre-electric shocks are a common welfare problem. ¹¹ Eyes on Animals regularly sees birds get pre-electric shocks. Electric shocks

are known to be *extremely* painful. The head should therefore always touch the water first and immediately, so the bird is rendered unconscious straight away.



The turkey first touches the water bath (pre-electric shock) with its body - this causes extreme pain!

Turkeys in particular are at high risk for getting pre-electric stuns because their large wings often hang below their head .



Turkeys are at extra risk of pre-electric shock because their wings hang very low, much lower than their heads.

Pre-electric shocks are not only a welfare issue, but also cause carcass damage and have a negative impact on meat quality.¹² The HSA has published an interesting paper on preventing pre-electric stuns:

<http://www.hsa.org.uk/downloads/technical-notes/TN16-prevent-pre-stun-shocks-waterbaths.pdf>

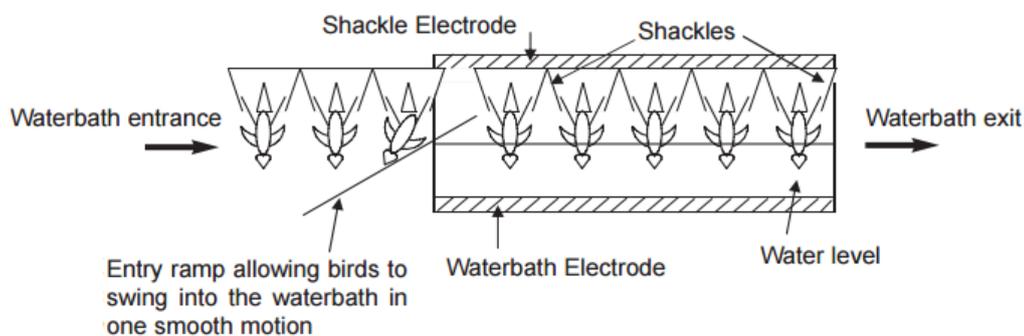
- ✔ When using an electric water bath, always check that birds do not get pre-electric shocks.

Inclined ramp at the entrance of the waterbath

To prevent pre-electrical-shocks the slaughterhouse must build a steeply inclined ramp at the entrance of the waterbath. The ramp should extend over the water, so the birds get drawn up the ramp and then their heads automatically swing down directly into the water, in one movement. In this way the birds head and wings will enter the water together, so - if they receive sufficient current from the waterbath - the birds will be stunned immediately. Please see the drawing below by HSA.

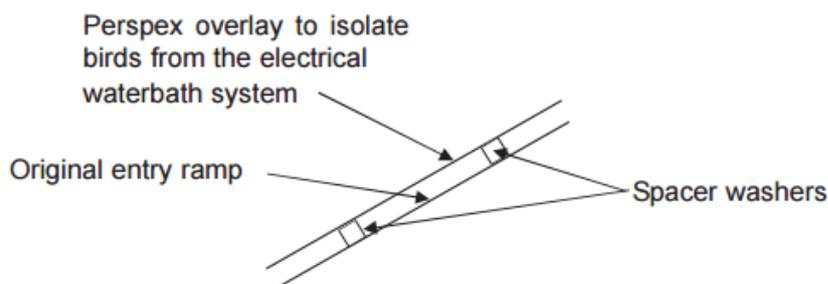


Inclined ramp attached to the waterbath



Drawing HSA. HSA Guidance Notes No.7 on Electrical Waterbath Stunning of Poultry:
<http://www.hsa.org.uk/shop/publications-1/product/electrical-waterbath-stunning>

- ✓ It is extremely important birds do not receive pre-electric stuns by the entry ramp itself. This happens if the ramp is not isolated from the rest of the stunner. **Therefore always isolate the ramp.**
- ✓ It is crucial that water from the bath be prevented from getting on the ramp, because this water can become electrified, causing birds to get pre-electric shocks. Using a Perspex layer on top of the original ramp can help. Use spacer washers in between to prevent water flowing out onto the birds, but flows between the two layers underneath. Please see drawing below from HSA.



Drawing from HSA. HSA Guidance Notes No.7 on Electrical Waterbath Stunning of Poultry:
<http://www.hsa.org.uk/shop/publications-1/product/electrical-waterbath-stunning>



Space between inclined ramp and water bath stops water from getting on the ramp

- ✓ Another option is using PVC rods on top of the original ramp. Any water that splashes onto the entry ramp will flow down either side of the rods and does not come into contact with the birds moving up the ramp. Please see drawing below from HSA.

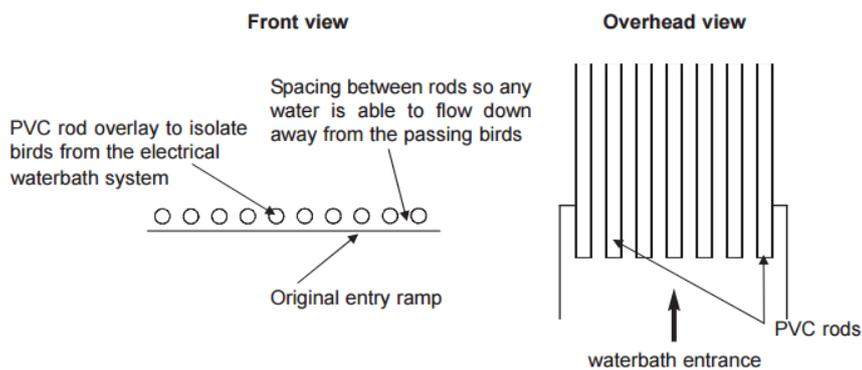


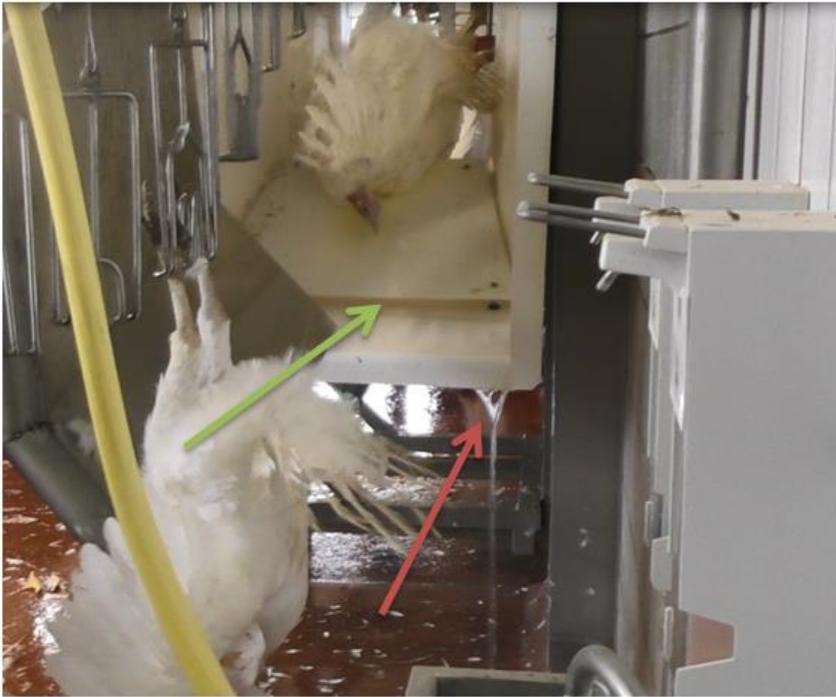
Figure 4 Side and overhead diagram of how the entry ramp can be isolated from the electrical waterbath system by PVC rods

Drawing from HSA. HSA Guidance Notes No.7 on Electrical Waterbath Stunning of Poultry:
<http://www.hsa.org.uk/shop/publications-1/product/electrical-waterbath-stunning>

- ✓ Make sure that birds do not get pre-electric shocks by using an inclined ramp. Because of the inclined ramp the birds' heads come with a slight swing directly into the water bath.
- ✓ Make sure that no water from the electric bath ends up on the ramp. This water can contain residual current. Provide a double layer so that this splash water can flow away.

Water level inside bath

Make sure the water bath does not flow over, as electrified water might touch the birds before they are unconscious. By making a double layer at the entrance to the water bath, you ensure that water (which nevertheless flows out of the water bath) flows underneath the top plate. This prevents water that may still contain residual current from making contact with the birds.



A double layer prevents birds from coming into contact with water that may still contain residual current. The water then flows between them.

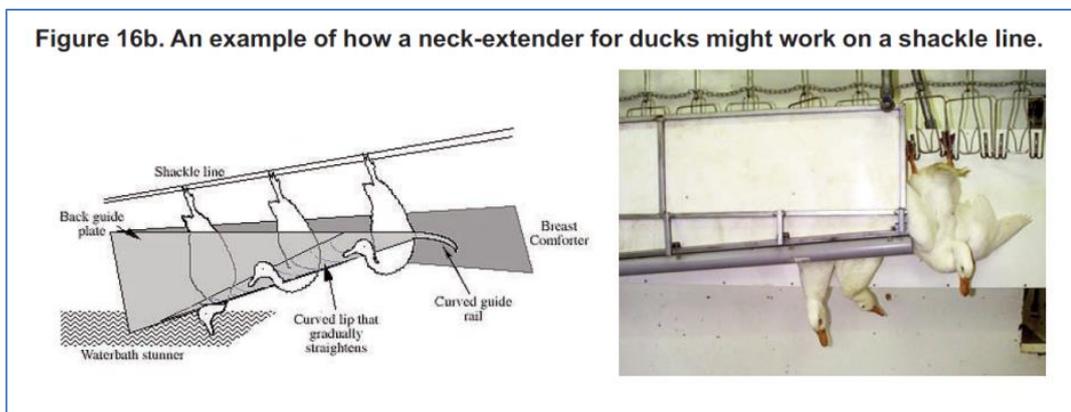
- ☑ Make sure that no water from the electric bath ends up on the ramp. This water can contain residual current. Provide a double layer so that this splash water can flow away.

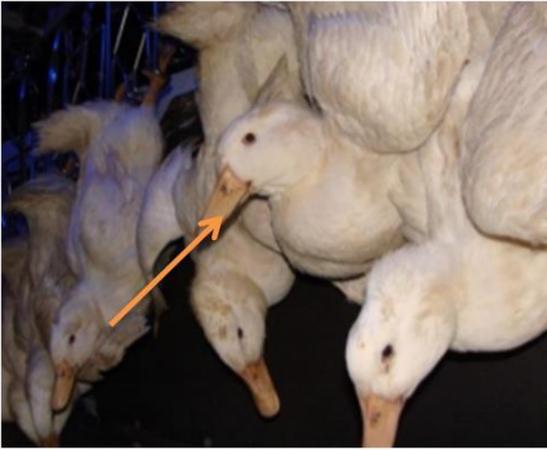
Ducks – Head guide and lowered shackle line

Sometimes birds are not properly stunned because they lift their heads just before the water bath. As a result, the stunning is not effective, or the water bath is even completely missed.

When stunning ducks, lifting of the head is a common problem (see photo from HSA below). The breast or beak is therefore in contact with the water bath first rather than the head. It means that the duck first experiences a very painful shock. The muscle contraction then drops the head into the water. Only then will the duck get stunned. Pre-electric shocks are not only a welfare issue, but also cause carcass damage and have a negative impact on meat quality.¹³

We recommend that the slaughterhouses install a head guide plate, so that the ducks cannot lift their heads up in the last part of the shackle line, assuring that their heads enter the electric water bath first. This plate must be made of plastic so that it cannot conduct current.





Eenden tillen hun kop op waardoor het puntje van de snavel en de borst eerder contact met het water maken dan de kop.

Photos and drawings: HSA, Jeff Lines

To ensure that ducks touch the water bath directly with the head, the water bath can be raised or the shackle line lowered locally. Thus the ducks (if they lift head up) are still completely submerged in the water, causing direct stunning. In England, head guide plates and locally lowered shackle lines for ducks in water bath stunners are used almost standardly.

- ☑ In the case of ducks, provide a head guide so that they cannot lift the head immediately before they enter the water bath.
- ☑ Make sure the water bath is sufficiently high - so that ducks that lift their heads are fully submerged. Optionally, the shackle line at the water bath can also be lowered locally.

Gas stunning – reduce suffering

Which gas stunning system?

There are many different gas stunning systems in use. In Europe, Stork, Meyn and Anglia Autoflow are the most important suppliers. There are often several models per supplier. Anglia Autoflow and Stork offer models with 5 and 3 stunning phases. Newer models often work with more than 3 phases - so that a lower CO₂ concentration is used at the beginning and the exposure to the CO₂ is less aggressive. Because of this, the stunning often takes a little longer. This reduces the stress and breathlessness that birds experience when exposed to CO₂. There are also important differences between suppliers.



Below is a table showing the differences per system and model.

	ANGLIA AUTOFLOW (GAS)		STORK/MAREL (GAS)		MEYN (GAS)
	3	5	3	5	5
Number of stunning phases ¹	3	5	3	5	5
Phase 1.	25-30% CO2	25%	30-35% CO2 + 30-35% O2	20-23% CO2 + 25% O2	18% CO2
Phase 2.	30-40% CO2	30%	70% CO2	30% CO2 + 20% O2	28% CO2
Phase 3.	55-68% CO2	35-40%	70% CO2	40% CO2 + 15% O2	34% CO2
Phase 4.		50%		60% CO2	38% CO2
Phase 5.		>60%		70% CO2	62% CO2
Stunning duration ²	3-3,5 minutes	5-7 minutes	3 minutes	5 minutes	6 minutes
Adding oxygen ³	No	No	Yes	Yes	No
Live tilting ⁴	No	No	Yes	No	No
Stunning in crate ⁵	Yes	Yes	No	Yes	Yes
Stunning on one level? ⁶	No, belts above and next to each other	No, belts above and next to each other	No, belts above and next to each other	Yes	Yes

1. The higher the starting concentration of CO2 (phase 1) and the less number of stunning phases, the more stress birds experience.
2. The longer the stunning duration, the less stress birds experience because the build-up to a higher concentration of CO2 is slower.
3. Oxygen addition reduces the feeling of breathlessness.
4. Tipping the birds out of the transport crates is often very stressful because birds fall on top of each other. You want to avoid this and use a system where the birds can be stunned without being first removed from their transport crates.
5. If birds can stay in the crate during stunning, stressful actions, such as tipping alive or manually removing the crates, will be avoided.
6. With a multiple level stunning system, there is more movement of crates / containers (bends, up or down movements). For birds, (abrupt) movements are stressful. Ideal is thus to stun the birds on one level without any curves or other movements.

To minimize stress in birds, we recommend a gas stunning system with:

- ✓ A minimum of 5 stunning phases.
- ✓ A start concentration of maximum 20% CO2.
- ✓ A stunning duration of at least 5 minutes.
- ✓ A system where crates and containers are moved as little as possible.
- ✓ A stunning system where birds do not have to be removed from their transport crates/containers.



Measuring stress during stunning

In gas stunning systems, birds are exposed to increasing concentrations of CO2. The higher the starting concentration, the more stress the bird experiences. Keeping concentrations lower at the beginning and increasing gradually (more phases) is better.

Behavioral observations

Gas stunning systems have windows to observe the behavior of the animals when exposed to the CO2. To measure animal welfare, the initial phase is relevant - here the birds are still conscious. The moment when birds lose their balance, is often also the moment when they lose consciousness. During stunning with CO2, birds experience stress for about 20-50 seconds. The challenge is to minimize this stress. To determine the extent to which birds experience stress, Dr. T. Grandin prepared a table. When birds show virtually no behavioral change, the stunning is perfect. When there is a lot of flapping of wings and escape attempts, animal welfare is seriously affected.

Welfare Ranking of Bird Reactions During Insensibility Induction

Behavior	Ranking
No change in behavior from the time the birds enter the gas until they fall over (lose posture)	Excellent
Gasping only, with no other change in behavior from the time the birds enter the gas until they fall over (lose posture); Most birds with no wing flapping and a few birds with weak intermittent flapping	Acceptable
Gasping, combined with continuous wing flapping from the time the birds enter the gas until they fall over (lose posture)	Not Acceptable
All birds flap continuously or attempt to climb out of the container from the time the birds enter the gas until they fall over (lose posture)	Serious Problem

(Temple Grandin, Colorado State university, 2010).

- ☑ Make sure the windows are clean - so that the birds can be clearly observed.
- ☑ Make sure there is just enough light to be able to observe the chickens.
- ☑ Make sure the light is of the same intensity both outside and inside the gas tunnel.
- ☑ Observe the behavior of the birds with each shift in accordance with the above table – if you see a lot of stress related behavior, then take action. Let someone else also observe the birds from time to time; this is how you prevent operational blindness.
- ☑ When several birds flap their wings or are very restless (eg escape attempts) well-being is at stake - have your system checked! Note: flapping also means meat-quality loss.

Birds lying on their backs

Another parameter to assess the well-being of birds is the number of birds lying on their backs after stunning. If birds are lying on the back, it often means that they have jumped up during the exposure to the CO2 because of fear or that there have been violent convulsions (muscle spasms). It is known that convulsions often occur around the time when unconsciousness occurs. Some of the birds will experience the convulsions consciously (well-being is affected here) and others will already be unconscious at the time of the convulsions.

Furthermore, there are individual differences, that is, one chicken loses consciousness before another one. When some of the birds have convulsions, the other birds that are still conscious will panic. Convulsions are thus very undesirable for the welfare of the animals. Convulsions also lead to loss of quality (bleeding and fractures). Gas stunning systems with 3 phases or less often have a lot of birds lying on their backs



because the exposure to high concentrations is quite abrupt and it is often started with a higher concentration of CO₂. This results in more stress and therefore more birds lying on their backs.

- ✓ Check the number of birds lying on their backs after stunning. With good systems this is less than 1% of the birds.

If there are problems with stunning, such as too much stress-related behavior, convulsions or ineffective stunning, we advise you to contact a consultancy firm or research institute specialized in poultry-stunning. In the Netherlands, for example, this is Wageningen University & Research: <https://www.wur.nl/>

Other consultancy firms:

<http://pbtech.co.uk/>

<http://www.silsoereseearch.org.uk/animal-welfare/jeff-lines.html>

Checking stunning efficiency

Electric waterbath

It is known that during stunning with an electric water bath a considerable percentage of the birds is not properly stunned. This happens because several birds are run through the water bath at the same time and the current is not evenly distributed. The one bird gets more electric current than the other bird. In the case of an electric water bath, the current cannot easily be increased because there is then damage to the meat, such as blood-spots.

In order to effectively stun the highest possible percentage of birds, it is important that the head of the bird enters the water bath in one quick movement. If the birds do not immediately contract the muscles when they are in contact with the water bath, or the birds still flap their wings, or try to raise their head, then the strength of the current is too low. There is then a great chance that the bird, once he or she leaves the water bath, is paralyzed but still sensitive to pain when he or she is cut. Even though the bird no longer responds to stimuli, the bird can still experience pain and stress.

To check the effectiveness of the stunning at individual level, the following can be looked at:

- ✓ On contact with the water bath, the bird **immediately contracts its muscles** - there is therefore no flapping or righting reflex during the stunning. If the bird does not show an instant tonic muscle contraction - for example the bird flaps the wings or lifts the head up - the current is likely too low.
- ✓ **Natural blinking.** Check whether the bird blinks its eyes in case of a threat. If this is the case, they are not properly stunned. Also if birds follow movements with the eyes, they are not properly stunned.
- ✓ **Muscle tension in the neck.** Lift up the head: an effectively stunned bird has no muscle tension in the neck. The head should be limp and floppy.
- ✓ **Rhythmic breathing.** There should also be no rhythmic breathing. This can be seen, for example, in movements of the cloaca.
- ✓ **Reaction to cutting with the knife.** If the birds react to the knife, they can still experience pain. The birds are then not properly stunned.
- ✓ **Limp and silent. The birds hang lifeless on the shackle line and no longer make any noise.**



If birds react to touching of the eyelids, they are not properly stunned

Note: The absence of rhythmic breathing, muscle tension, eye reflexes and reaction to the knife does not guarantee that the animals well stunned. Brain measurements have shown that birds can be just paralyzed, but still experience stress and pain.



If the bird raises its head during or after stunning, it is not properly stunned!

If there are signs of birds being improperly stunned it is of great importance that the settings are checked right away. Maybe the current is too low, there is a current leakage or (some) shackles do not have good contact with the earthed rubber bar (overhead electrode). Contact an official consultant or specialized research center immediately if (some) birds show signs of consciousness. In the Netherlands, for example, this is Wageningen University & Research: <https://www.wur.nl/>

Other official consultants for electric waterbath stunners:

<http://pbtech.co.uk/>

<http://www.silsoereseach.org.uk/animal-welfare/jeff-lines.html>

www.wur.nl

Gas stunning

If a gas stunner is correctly used, the percentage of birds effectively stunned (> 99%) is considerably higher than for the electric water bath (<90%). Nevertheless, it can happen that birds recover after the stunning or are not stunned sufficiently. For example, when a bird has respiratory problems (the CO₂ is then not



properly inhaled) or the CO₂ does not reach the birds well because the occupation level is too high (the birds are too crowded together or density is too high). Furthermore, problems can arise if birds are not exposed to the gas for a long enough time (when increasing the slaughter speed). There may also be technical problems, for example with the supply of the gas.

To check the effectiveness of the stunning at individual level, the following can be looked at:

- ✓ **An eyelid reflex.** Here the eyelids are touched to see if the bird reacts. If this is the case, they are not properly stunned. Even if birds follow movements with the eyes, they are not properly stunned.
- ✓ **Muscle tension in the neck.** Lift the head of the chicken and then release it: the head of the chicken must fall down limply without any sign of tension.
- ✓ **Rhythmic breathing.** There should also not be any rhythmic breathing. This can be seen, for example, in movements of the cloaca.
- ✓ **Reaction to the knife.** If the birds react while being cut, they can still experience pain.
- ✓ **Limp and silent.** The birds hang limply on the shackle line and no longer make any noise.

If birds show signs of consciousness they should be re-stunned immediately. It is of great importance that the settings are checked right away. If the settings appear correct, then contact must be made immediately with the manufacturer of the stunning system.

Back-up stunner

All slaughterhouses must have a back-up stunner in the case that their normal stunning system breaks down or needs repair. A back-up is required by law. Slaughterhouses with a gas stunning system often have an electric water bath as a back-up system. In order to shackle the chickens, they are sometimes tipped out of their transport containers while fully conscious. Live tipping causes a lot of stress and often also injuries. Make sure that suffering caused by live-tipping is limited as much as possible. See the chapter "[Live tilting](#)". It is also important that the back-up water bath is designed so that suffering is avoided as much as possible. See the chapter "[electric water baths - reduce suffering](#)".

Many slaughterhouses use cervical dislocation (neck break) or percussive blow to the head on birds that are ill or do not appear to be well stunned. In birds heavier than 3kg the breaking of the neck is forbidden. Eyes on Animals advises slaughterhouses to purchase a small electrical stunning device so that individual chickens can be stunned humanely.

Breaking the neck causes a lot of pain and death does not occur immediately. In the event of a blow to the head, there is a risk of missing or not hitting hard enough, causing the bird to suffer severely.

Stunning devices that are suitable are for example the Cash poultry killer and the Zephyr or Ted stunner. More information: <http://www.bock-industries.com/info1.html>

- ✓ Make sure the back-up electric water bath is designed to minimize stress and pain. See the chapter "[electric water baths - reduce suffering](#)".
- ✓ If chickens have to be tipped alive for the back-up stunner, make sure that this happens as quietly as possible.
- ✓ Provide a small electrical stunning device to kill birds that are not properly stunned or are ill.



Live tilting

In the older gas stunning systems of Marel / Stork and electric water bath stunners, birds are sometimes removed from the containers fully automatically. The containers are opened and tilted. The chickens fall or slide down through a chute, where they end up on a conveyor belt. The conveyor belt is often at right angles to the chute - which cause the chickens to fall against and on each other and injure each other with their claws. The shorter the conveyor belt and the higher and steeper the chute - the more stress and injuries arise.

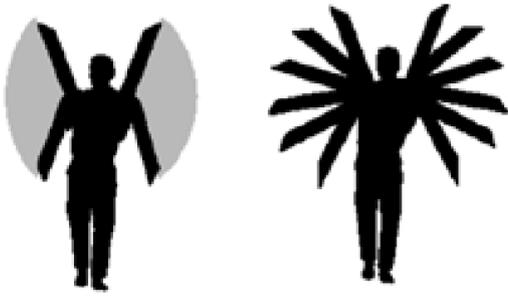
The tilting movement sometimes has to be repeated several times, because not all the chickens fallout of the containers during the first time. Also, chickens can be stuck in the containers (their claws, nails or wings caught in the sides) causing them to seriously panic and injure themselves during repeated tilting. The tilting often happens quite abruptly. Not only does the fall (on and against each other) cause injuries, chickens will also be injured by flapping their wings in the containers when they get tipped over or fall out. They hit the sides of the containers, causing them to injure themselves.

- ✓ **Living tilting causes a lot of stress and often also injuries. We strongly discourage live tilting.**
- ✓ Make sure that the tipper is set so that tilting is as quiet as possible.
- ✓ Make sure the chute is not too steep and that the chickens do not fall from a great height.
- ✓ Make sure the conveyor belt is wide enough for the number of chickens - to prevent piling up and suffocation.

Prevent noise and vibrations

Chickens are sensitive to sound and vibrations. They hear up to 10.000 Hertz, which means they can even hear people whisper. At 80dB or more chickens experience stress - especially when these sounds are abrupt. In slaughterhouses, loud noises are mainly produced by, for example, chains of the conveyor line, the washing area, forklift trucks, alarms and (pneumatic) equipment. There are various options for damping noise in a slaughterhouse. For example, by insulating the ceiling, placing sound walls and using electric forklift trucks instead of forklift trucks with an engine.

Birds are even more sensitive to movement. They have extra senses in their feet and skin to detect vibrations from the air or floor. This is necessary in order to find crawling insects and to see predators coming. Birds see more detail in movement than do humans because they see more observations per second. This is necessary in order to detect small moving insects. Chickens can process up to 250 images per second, while humans can process up to only 30 images per second. This also makes birds very sensitive to movements of people or machines.



Left: how people perceive movement. Right: how chickens perceive movement.

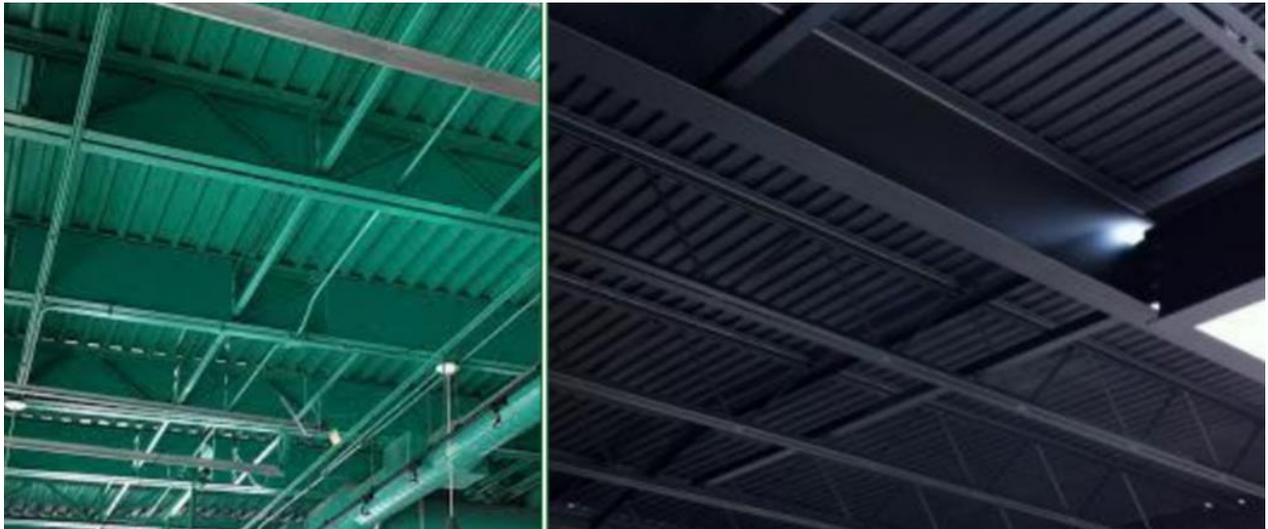
To prevent stress, fast and abrupt movements must be prevented. For example, when the chickens are moved with the fork-lift truck or via the conveyor belt. Make sure that the assembly line for the crates / containers is not jerky, does not make sharp turns or has bumps. Make sure that the employee on the forklift truck drives calmly, does not make too many turns or suddenly brakes.



Make sure that transporting the chickens is calm, so no sharp bends or abrupt movements

Birds are easily stressed by sudden and loud noises and vibrations. Therefore:

- ✓ Workers should do their work as quietly as possible, without shouting or yelling. Shouting, running, jumping and waving causes stress and panic among the birds.
- ✓ Avoid jerky, fast or unexpected movements. The movement of birds (for example while in their transport containers on the conveyer belts or on the fork-lift or when unloaded and placed on the shackle lines) should be carried out smoothly, steadily and calmly and without any obstructions.
- ✓ All processes in the slaughterhouse should make as little sound as possible and vibrations should be prevented.
- ✓ High ceilings should be prevented to reduce echoes and noises. It is better if ceilings are low.
- ✓ To reduce the noise level in the slaughterhouse, we recommend sound-absorbing materials.



Ceilings with a low-noise design and sound-absorbing material

- ✓ The noise of machines (pneumatic) can be redirected to different rooms using piping.
- ✓ Activities that create a lot of noise, such as the truck wash area, should be located as far away from the anima- area as possible. If necessary, install sound-absorbing walls.
- ✓ Use electric forklift trucks instead of forklift trucks with a petrol engine to reduce noise.

Good lightning

Chickens not only have the three basic color cones like humans (red, yellow and blue) but also an ultra-violet light cone (UV). Therefore they can see far more colors and shades than humans can. With the UV cones chickens can easily find shiny bugs, berries and fruits, because they reflect UV-light.

Therefore birds are very sensitive to colors, especially colors that are bright (high wavelengths). Birds sense light through their eyes and through photosensitive cells in the brain. Long wavelengths of light (towards red end of the spectrum) penetrate the skin and skull more efficiently than short wavelengths. From these observations it has been reported that blue light has a calming effect on birds. ¹⁴



Blue light has a calming effect on birds ©Eyes on Animals



Slaughterhouses should therefore pay special attention to light in the premises where live birds are handled.

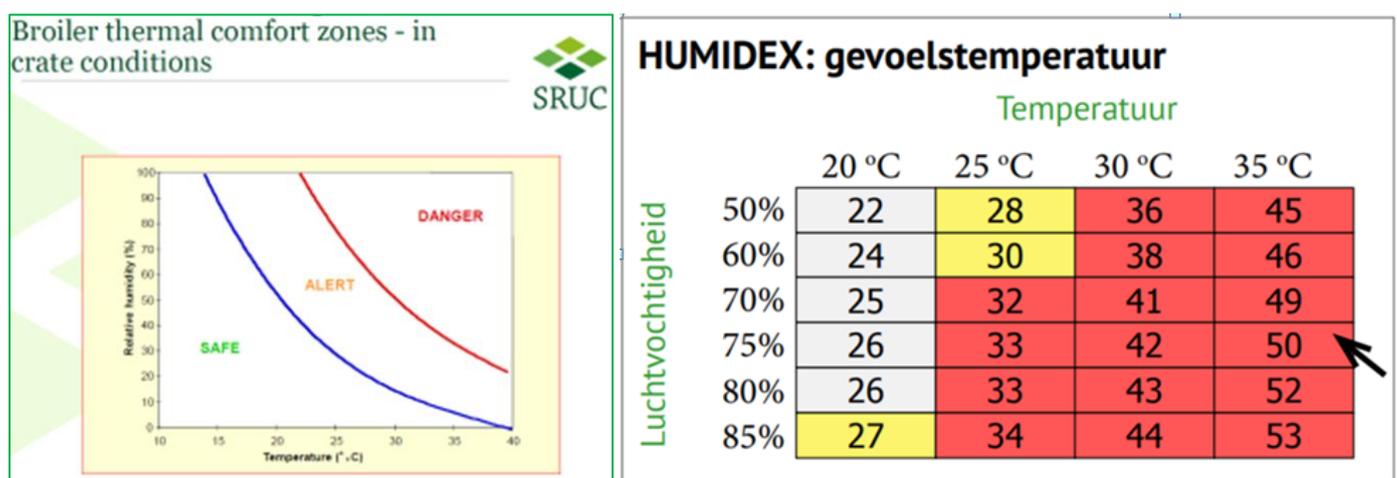
- ✓ Bright lights and bright vivid colors stress birds and should therefore be avoided.
- ✓ Blue light calms the birds and is recommended in the parts of the building where live birds are handled or waiting.
- ✓ Bright lights, such as on a forklift truck, are stressful for the chickens. Keep it as dark as possible in the slaughterhouse

Extreme weather conditions

Heat and cold stress can cause high mortality and financial loss. A chicken does not just die suddenly from cold or heat - it is preceded by a long period of unacceptable suffering. It is very important to prevent heat and cold stress. The temperature comfort zone of birds varies enormously per specie. For example, the temperature comfort zone for fast-growing broilers and young well-feathered hens is between 10-15 ° C and for spent hens - which are often less well feathered and have little body reserves - between 22-28 ° C. Broilers are more sensitive to heat stress, while laying hens are more sensitive for cold stress

Heat stress

Birds cannot sweat. They lose their heat by breathing. Heat stress occurs at a high ambient temperature. Humidity plays a major role here: the higher the humidity, the faster a chicken experiences heat stress. See the graph below. If no wind or good fans are present, it will soon become stuffy in the crate or container. The hot and humid air that the chickens produce is in fact not sufficiently discharged. Heat stress is therefore primarily a risk when poultry-trucks are stationary, or containers are stacked on top of each other in lairages when air circulation is poor. It is known that mortality rates during transport increases during warm weather. Long lairage time increases death rates.^{15 16} But even in the winter, chickens can experience heat stress when there is insufficient ventilation in the crates / containers, for example in the slaughterhouse's waiting room.¹⁷



Luchtvochtigheid is een belangrijke factor bij ontstaan van hittestress

- ✓ Doe regelmatig een meting van de temperatuur in de kratten/containers. Zorg dat deze in de veilige zone valt.



Loading and ventilation of poultry trucks

Birds in the middle and front part of the truck are at the highest risk for heat-stress. In these parts of the truck the air circulation is most poor and temperatures and humidity can quickly rise to dangerous levels. Birds loaded in the crates in this part of the truck should therefore be less crowded to improve air circulation. To improve ventilation some containers/crates in the middle row(s) of the truck should be left empty.



Birds in the middle and front part of the truck are at the highest risk for heat-stress.

There are several options to increase the air circulation in a truck. For example, fans can be installed on the sides and front of the truck. It is also possible to use trucks where the hot air can escape via the roof – via roofs that can be lifted or have air grills to help dissipate the built-up heat.

Leaving empty space between the crates / containers (horizontal and vertical) also provides more ventilation. Finally, headroom is often limited for poultry. By using higher crates / drawers, heat can better dissipate. Also provide a roof in a light color and made with insulated material, so that sunlight is reflected and heat is not absorbed. Slaughterhouses can encourage their suppliers to take measures against heat.



Truck with roof that can be raised and air grills in the roof to let hot air out ©Eyes on Animals

In Turkey, Eyes on Animals saw a poultry truck that was designed with an empty passageway in between the two rows of containers to increase ventilation and so fresh air can reach all animals. This design also allows all animals to be accessed. Some rabbit trucks are also designed this way. Eyes on Animals highly recommends this design.



Trucks with passageway in the middle. On the left: poultry truck, on the right: rabbit truck ©Eyes on Animals

- ✓ Make sure supplying transport companies use trucks that have roofs that have air grills and can be raised to help dissipate warm air that collects at the top.
- ✓ Make sure supplying transport companies also leave some crates in the middle row of the truck empty and decrease loading density in those areas of the truck known to become hot.
- ✓ Use crates / containers with sufficient headroom so that a lot of air can pass over the birds.
- ✓ Provide a roof in light color and made out of insulated material, so that sunlight is reflected and heat does not get absorbed.

Arrival

Trucks regularly have to wait at slaughterhouses until it is their turn to unload. This waiting time can cause welfare problems, as temperature and humidity can build up quickly. Ideally, slaughterhouses have a sufficiently large lairage and enough unloading platforms so that, in the case that several trucks arrive at the same time or there is a fault in the slaughter line, the crated birds do not have to wait on board stationary vehicles but can be unloaded quickly. If that is not the case, at the very least shade for the loaded trucks should be available. For example, next to a row of tall trees that also provide wind. The slaughterhouse should also have many industrial and mobile fans that can be placed along the parked poultry trucks. It is important that the fans are sufficiently high and large, so that all drawers / crates are easily reached.



Fans to improve ventilation inside a stationary truck and trees to provide shade. © Storteboom



Fans and a row of trees at GPS slaughterhouse in Nunspeet, NL.

- ✓ Prevent long waiting lines at the slaughterhouse as much as possible so that trucks don't have to park and wait.
- ✓ Make the lairage area sufficiently large to be able to unload the supplied chickens immediately. Provide approximately 20% extra space in the event of a malfunction.
- ✓ Provide shade if trucks have to wait outside. Trees provide shade and wind.
- ✓ Purchase big mobile fans to improve air circulation in stationary poultry trucks.

Lairage

Fans

Birds must be able to rest properly in the lairage area. A lairage should not be a stressful area or it defeats its purpose. A good climate is essential here. In a stationary container / crate the air quickly becomes stuffy. Even in the winter this can be a problem. Good fans are therefore indispensable in the lairage area of a poultry slaughterhouse. In addition to the fixed fans (on the wall and the roof of the lairage), also provide a few extra mobile fans which can be used wherever needed.



Permanent fans along the side wall of a poultry lairage area in the Netherlands ©Storteboom

- ✔ Install big fans inside the lairage to improve air circulation inside the stacked crates.
- ✔ Provide a few extra mobile fans that can be used in places where it is needed.

Misting systems

In order to further cool the air quality in the lairage, a misting system can be used. Misting systems should always be used in combination with good fans. The fine mist cools the air and the fans ensure that the air humidity does not rise too much.



Fan with misting system ©GPS

- ✔ A misting system can provide further cooling of the air. Always use this in combination with fans.

Arrangement of containers and crates

It is very important that the crates / containers are set up in such a way that there is enough space to supply fresh air and to evacuate hot air. Airways must therefore be created between the crates / containers. The higher and wider the stacks of crates, the more difficult it is for the heat from the birds in the middle of the load to escape. Heat also rises - make sure that the stacks do not get too high and that

there are also fans from above! In addition, chickens must have sufficient headroom. If there is enough space above their heads - the heat cannot be properly evacuated and sufficient air cannot be supplied.

- ✓ Make sure that there is sufficient space between the stacks of crates / containers (airways) so that sufficient air can flow through to dissipate heat. Please note: even in cold weather, heat stress may occur in stationary crates / containers with insufficient ventilation.
- ✓ Ensure sufficient headroom in the crates / containers, so that there is enough ventilation above the chickens.
- ✓ Ensure that the fans are positioned so that all crates / containers are cooled.
- ✓ Do not make the stacks too high. Chickens at the top are the most at risk of heat stress.

Water system

Poultry, such as laying hens and older breeding broilers, are often caught and loaded into crates/containers in the early evening when it starts getting dark outside. They are slaughtered however many hours later, namely the next morning or afternoon. This means that they have had no water for about 12-20 hours. With such long waiting times, it is crucial to offer the birds water. But even if the waiting time is shorter, providing water remains important especially in the summer months. We therefore advise slaughterhouses to have water systems available so that birds in the stacked crates inside the lairage can be given the chance to drink..

At Van der Meer in Dronrijp they have a drinking system that they can hook onto the sides of the crates, providing 2-4 drink nipples per crate.



Drinking water system at Van der Meer in Dronrijp (NL)

- ✓ Provide a water system in the lairage area..

Cold stress

When chickens are cold, they start to huddle. For laying hens, it is recommended that the temperature in the crates does not drop below 12 degrees to prevent discomfort or death from hypothermia. For broiler chickens, this is 5 ° C. In the case of spent hens, the temperature at which they feel comfortable lies



between 20-28 ° C. Laying hens cannot tolerate cold because they often have poor plumage and few body reserves.

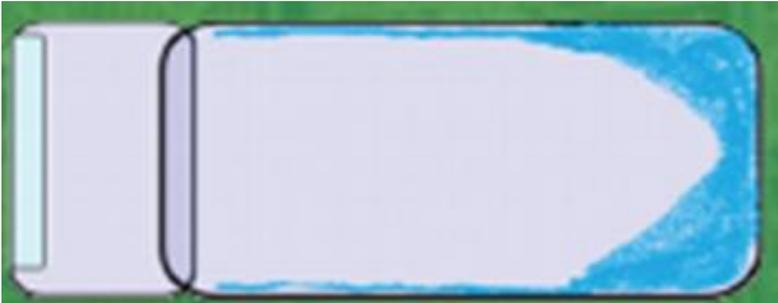


Spent hens often have poor plumage; they are therefore sensitive to cold stress

- ☑ Regularly measure the temperature in the crates/containers. Make sure it falls within the safe zone.

Transport conditions

Cold stress is primarily a risk during transport (driving) because the heat produced by the chickens is not retained. The cold wind created by driving can quickly cause hypothermia in birds. Birds at the rear and side of the poultry truck are at the greatest risk of hypothermia.



Top view of a poultry truck- the birds loaded in the rear and along sides of the vehicle are at most risk for hypothermia.

In cold weather, a thick tarpaulin that is sufficiently long and wide to protect all birds should be used. This tarpaulin is also important to protect the birds from rain and wind, especially in cold weather. A double purpose tarpaulin is ideal: depending on the weather conditions, you can switch from a thin tarpaulin to a thick one. The firm Cuppers produces a dual purpose tarpaulin. See photo below.



Dual purpose tarp which can be quickly changed depending on the weather

When chickens are wet, they run an increased risk of hypothermia. It is for this reason that it is illegal to load wet birds. Chickens can get wet if it rains during catching and loading, or when the chickens have an outdoor run. Make sure all birds are dry and protect them from the elements during catching, loading and transport.



This tarp doesn't protect all the chickens



This tarp is too short

- ✓ Make sure that the birds are protected from cold, wind and rain by means of a good tarpaulin of the correct size. Make sure the tarpaulin is long enough to also protect the birds loaded on the bottom level.
- ✓ To avoid hypothermia, the temperature in the crates/containers should not be lower than 12 ° C for laying hens and 5 ° C for broilers.¹⁸
- ✓ Make sure that chickens that are wet are not transported - they are at great risk of hypothermia.



Access

Access to animals during transport is a legal requirement in the EU legislation. Unfortunately in practice, whether it be crates or containers, access to poultry is often impossible.

Most crates and containers are built without any access doors and as soon as the birds are loaded and stacked, they become prisoners. In case of emergency or breakdown in the slaughter line (that causes long waiting lines) or when birds have body parts caught, become injured or get stuck on their backs, intervention is not possible.



Birds on their back need to get emergency care, otherwise they will die. Access is not only legally mandatory but also vital. ©Eyes on Animals

Eyes on Animals has therefore pushed industry to use crates with access doors. The Dutch Plastic company Coevorden already makes crates with two doors, one for access (on the side) and one to load the birds (on top). Sometimes the birds are also loaded via the access-door on the side. If the access doors are big enough this can be beneficial for bird welfare as loading via the access doors prevents the need to stack crates.



Crates with access doors built by Coevorden and used by Tijs de Koning transport ©Eyes on Animals

Meyn and Marel, big companies that produce equipment for slaughterhouses, recently manufactured containers with access-doors. Via these access doors birds can be given care or inspected when needed. Also in Turkey we have seen a poultry truck with access doors.



Meyn container now designed with access door



Poultry truck from Turkey with access to the birds



Newest Marel containers with access doors so that a bird lying on its back can be put upright

- ✔ Use crates or containers with access doors so sick, weak or injured animals can be given care, water or be euthanized humanely. If these access doors are big enough they can also be used to load birds. These access doors should be big – so birds can easily be reached and the doors can also be used to load birds.

Camera surveillance

Nowadays, more and more slaughterhouses have camera surveillance in their slaughterhouse. This is a good development because it can help improve animal welfare. In practice, however, we see that the captured images are (can be) used only to a limited extent. They can often only be watched live - in the hustle and bustle of the day this is forgotten or there are insufficient details visible. We therefore recommend drawing up a protocol with:



- How often the images are viewed; for example, 2-3 times a day at varying times for 20 minutes.
- By whom the images are viewed; preferably by animal welfare officers who alternate.
- To whom any misconduct / violations must be reported .
- A plan of action in the event of misconduct / violations being detected. After how many warnings, for example, will an employee be dismissed.

Once a week a short consultation can take place in which findings and possible improvement points can be discussed. Here, for example, it can also be discussed whether the images are of sufficient quality and whether the cameras are well positioned. Furthermore, images can be useful for training purposes. We also recommend the use of intelligent camera techniques - such as recognizing birds that have not been properly stunned, after which an alarm goes off automatically.



Camera surveillance at various locations in the slaughterhouse at GPS

- ✓ Create a protocol for the use of the camera images.
- ✓ Hold a consultation once a week to discuss findings and points for improvement.
- ✓ Use intelligent camera systems to recognize, for example, poorly stunned chickens.



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