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TEMPLE GRANDIN INSTRUCTS, INFLUENCES AND INSPIRES STUDENTS TO SUCCEED IN THEIR CAREERS AND IN LIFE

CO_2 stunning is considered one of the most reliable slaughter methods in terms of animal welfare and meat quality

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As early as 1853, a British anesthetist, Benjamin Ward Richardson, designed a gas stunning chamber to humanely stun slaughter animals. Today, controlled atmosphere stunning (CAS) is a slaughter method where small groups of animals are placed in a container with an atmosphere that consists of an asphyxiant gas, typically argon, nitrogen or carbon dioxide, causing them to lose consciousness.

Modern era CAS systems date back nearly 70 years, and in the last three decades a steady expansion of CAS technology in pig, turkey and broiler slaughter has occurred. In North American plants, carbon dioxide is the gas of choice due to ready availability and lower cost. For these species, CO_2 stunning has proven to be one of the most reliable methods for attaining consistency in terms of good animal welfare and meat quality.

Unlike electrical stunning or concussion stunning, controlled atmosphere stunning does not produce instantaneous insensibility. The period of time between the initial exposure to CO_2 and actual insensibility is referred to as "the induction of insensibility." There has been controversy at times about the process when videos show birds or pigs in an agitated state in the chamber during the induction phase.

These observations are not considered as a rejection of the CAS process. On the contrary, well designed and managed CAS systems have been shown to improve animal welfare rather than exacerbate distress.

Terry Geertman, co-owner of Midway Machine Technologies, a company that developed a CAS system for turkeys in 1999 and the early 2000s, said, "The induction phase of gas stunning, where the bird is taking in CO_2 until it becomes unconscious, is the most critical. If the induction phase is done incorrectly, there is negative reaction from the bird, through wing flapping and signs of agitation. But when the induction phase is done correctly the bird easily becomes unconscious."

Temple Grandin, professor of Animal Science at Colorado State Univ., reinforces that notion. "You have to have a good induction. You've got to ask 'what is behavior like before loss of posture?' A little beak opening or head shaking is an OK trade-off. If they try to get out of the box, an escape motion – that's a bad induction. When chickens have a bad induction, they go berserk."

THE TRADE OFF

Well-designed CAS systems with consistently good induction have provided a platform for improving animal welfare. Grandin says the short period of minimal distress is worth the gains that a group stunning system provides.

"With all of these systems there's a trade-off. With hogs, you've really improved handling. You don't have to line them up, and you can eliminate electric prods with a CO_2 system. A little discomfort during induction is a fair trade-off for better handling. It's the same thing with chickens (and turkeys). You've eliminated putting live birds on the rail, which is super stressful."

Although the design is different by the species, CO_2 stunning systems for pigs, turkeys and broilers hold several things in common:

1) A successful induction to insensibility must be achieved by the CAS system. Observed behavior before loss of posture should include minimum excitability and no escape behavior.

2) CAS systems allow the movement of animals to the stunning equipment in groups. This eliminates the stressful task of moving pigs in a single line, or hanging sensible birds upside down on a shackle chain.

3) Moving pigs and poultry in groups requires careful planning of the method for delivering animals to the stunning equipment. Integrated systems that automate handling in the plant optimize the calm delivery of animals to CAS equipment.

4) There are tradeoffs with CO_2 stunning. CO_2 is an aversive gas for pigs and poultry.

"When chickens have a bad induction, they go berserk."

– DR. TEMPLE GRANDIN

Well designed and managed controlled atmosphere stunning systems have been shown to improve animal welfare rather than exacerbate distress.

"If you treat the bird right, the meat quality goes up, the yield goes up, and the end result is an immediate return on investment."

– TERRY GEERTMAN

A good induction with the appropriate CO_2 concentration is less stressful for the individual animal than the stress of handling prior to the stunner in other systems.

5) Human error of individual stunning is eliminated.

LEADING THE WAY

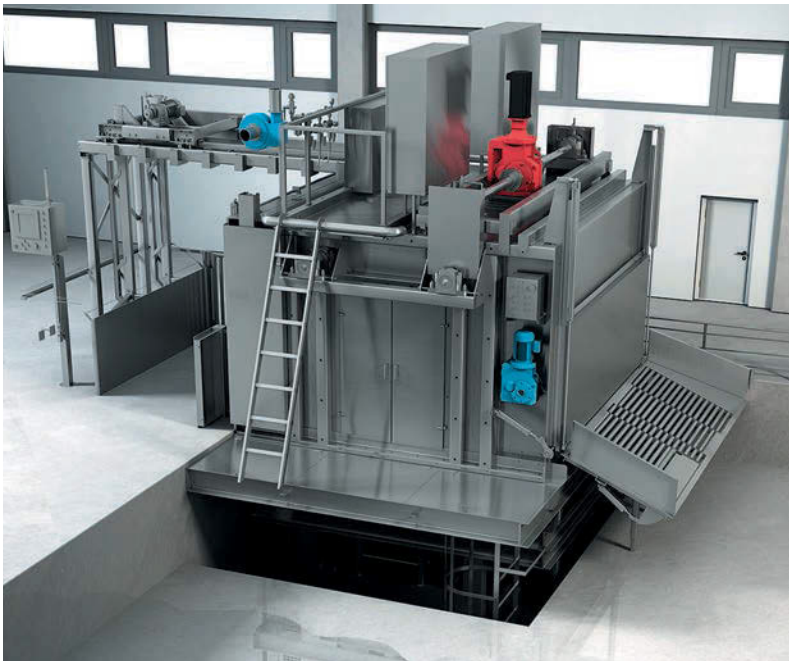
Modern efforts at CO_2 stunning for pigs can be traced back to Hormel and Oscar Mayer plants in the early 1950s. These systems did not gain widespread use, and were abandoned in the US by the early 1990s.

In Europe however, events followed a different course. CO_2 stunning for pigs was introduced in 1970 by Wernberg Engineering in Denmark. By 1972, also in Denmark, Butina ApS was formed to produce a patented CO_2 stunning system for pigs. Butina, in concert with the Danish Meat Research Institute improved on the Hormel CO_2 stunning model. The updated and upgraded system gained rapid acceptance in pork plants in Denmark and Germany, soon achieving a global presence.

The initial goal of Butina's sytem was to improve meat quality. Electrical and concussion stunning that were the industry standard for pigs in the 1970s and 1980s caused a number of quality issues including blood shot meat, broken backs and poor meat color.

Butina's concept was that a calmer, quieter entry to insensibility would improve meat quality. That theory proved true in real life production situations, and soon the company couldn't build systems fast enough. By 1988, the company had 100 installations, mostly in Europe. In 1999, Butina re-introduced CO_2 stunning to the United States.

In the Butina process, pigs are loaded into a gondola in small groups (2 to 8 pigs). The gondolas are mounted on a Paternoster system (think Ferris Wheel). After loading, the gondola descends in to a CO_2 dense pit with a concentration of approximately 90 percent CO_2. In a timed journey through the pit, pigs undergo CO_2 induction and become insensible.



SFK LEBLANC

SFK LEBLANC's CO_2 Stunning System delivers optimum animal welfare, hygienic design and safety for stunning operators.

In the ascent phase from the bottom of the pit, the pigs are then slid out of the gondola onto a conveyer where they are bled, never regaining consciousness.

The system delivered on its design, providing good stunner efficacy and improved meat quality. In an effort to improve loading efficiency for the gondola, an unforeseen benefit occurred that provided the biggest welfare boost: pig handling became markedly less stressful.

Collette Kaster, the executive director of the Professional Animal Auditor Certification Organization (PAACO), has worked with and around Butina systems since the late 1990s. She notes, "It really became meaningful for humane handling when they introduced the group loading system. You were able to move pigs as a group into the Butina. This was a continuation of what they've done in grow/finish, on the truck, and at the plant. The electric prods were removed at that point because the pigs moved more readily as a group. So it wasn't gas vs. electric stunning; it's really that the handling became a big, big difference with the group loading system."

Increasingly, equipment manufacturers are

Butina

Butina's CO_2 stunning systems have earned the praise of industry veterans, including Collette Kaster, executive director of the Professional Animal Auditor Certification Organization (PAACO).

capitalizing on the group handling benefits of using a CAS system. SFK LEBLANC started working with Danish hog slaughter plants in 1931, and has been involved in developing advanced systems for pork slaughter and processing ever since. Today, the company offers a state-of-the-art integrated controlled atomosphere stunning system which incorporates the handling benefits of group pig movement.

With North American offices in Kansas City, Missouri, and Quebec City, Quebec, SFK LEBLANC's CO_2 Stunning System delivers optimum animal welfare, hygienic design and safety for stunning operators. The automated pig handling system leads groups of animals into gondolas where SFK LEBLANC's patented CO_2 system renders the animals insensible before being tipped out of the stunner and onto a conveyor for shackling. In addition to the welfare benefits of group handling, the company's integrated system provides a quieter environment for the pigs.

"Noise levels in the barns and the lairage/stunning areas were reduced by 20 percent with the CO_2 stunning system, providing a stress-free environment," the company reports.

INNOVATIVE APPROACH TO INDUCTION

The Humane Aire Controlled Atmosphere Stunning system built by Midway Machine Technologies of Zeeland, Michigan, has an innovative approach to CO_2 stunning that overcomes the issue of adverse reactions by poultry. Developed by engineer Roger Draft, the Humane Aire system utilizes low stress handling technology from the farm all the way through to slaughter.

Terry Geertman of Midway Machine describes an attribute that has made the Humane Aire system uniquely successful. "One important point differentiates our system from others. Other systems use a gradual fill to achieve induction. Gradual fill is when you take the CO_2 from zero and you bring the level up until the bird goes unconscious. It is during this process that the birds become agitated. The most effective induction was to have a chamber precharged with 30 percent CO_2, but the existing CO_2 sensors prevented that from happening. We did the research and developed a proprietary sensor that holds the level at 30 percent and allows for a quicker induction."

After the induction phase, the birds are conveyed through an air lock into the second stage at a higher $C0_2$ level to achieve the irreversible stun. "We're a two-stage process – induction and irreversible stun," Geertman says.

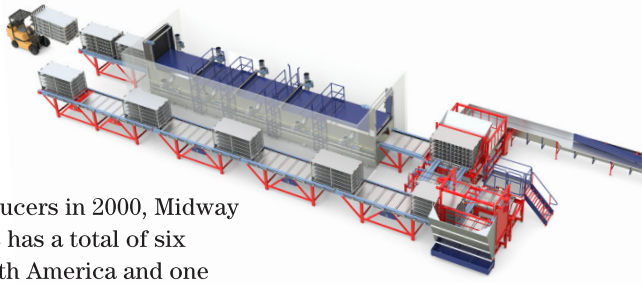
A FULLY INTEGRATED APPROACH

Prior to the Humane Aire CAS system, catching birds on the farm, putting them in cages, removing them from the cages at the plant, and manually hanging them upside down on a shackle line was highly stressful to the birds resulting in bruises and broken wings. Handling highly agitated 40- to 50-lb. tom turkeys was dangerous to workers, and the shackling job had the highest injury rate among turkey plant workers.

Grandin reiterates that one of the key advantages to CAS systems is the ability to move animals in groups to the stunning area. The Humane Aire CAS system capitalizes on that characteristic by creating an integrated system that spans the process from farm to plant. This fully integrated approach means there is less stress on both people and birds.

Midway Machine has partnered with poultry transport equipment leader Bright Coop Inc. to use the leading technology to handle the turkeys on the farm with minimal stress: "Our cages are designed in a way that you can load the bird into cages with equipment, resulting in hands free from the farm to the shackle line," Geertman says.

At the processing plant, the cages are unloaded with an overhead crane and placed on a conveyor to be fed through the CO_2 system. Once the birds are irreversibly



Humane Aire

Humane Aire's CO_2 stunning systems are utilized by several turkey and chicken processors in North America, with new installations planned in 2017.

stunned, they are slid out of the cages, conveyed and oriented feet up so they can be shackled. Instead of lifting the birds, the handlers only have to shackle the legs.

But that's not the end of the process. To prevent cross contamination between farms, an important consideration with regard to avian influenza, the cages go through a washing and sanitizing process. The trailer that hauled the cages likewise goes through a separate wash and sanitizing process. The sanitized cages are then stacked on the sanitized trailer, where they can return to the next farm for a load of turkeys and maintain the biosecurity of the system.

Humane Aire's integrated approach addresses the multiple issues around humane handling, worker safety and food safety. Geertman says, "We're proud of the fact we've addressed the issues from the farm through the plant. If you treat the bird right, the meat quality goes up, the yield goes up, and the end result is an immediate return on investment."

Since the initial system installed at Michigan Turkey Producers in 2000, Midway Machine Technologies has a total of six turkey systems in North America and one system currently being installed. A broiler installation is planned in early 2017 along with several others.

"We've made several improvements through the years," Geertman says, which include better cage cleaning, easier bird hanging on the shackle line, cage improvements to load turkeys 'hands free' at the farm, and automatic CO_2 level control.

"We continue to develop the processes and methods to improve bird handling from the farm to the shackle line," Geertman says. "We also believe it is important to develop real solutions and equipment in a way that is sustainable and has a return on investment. So, it is a win-win for both consumer and processor that will stand the test of time."

Fully integrated CAS systems like Butina and Humane Aire reinforce the concept that good animal welfare is good business. M+P