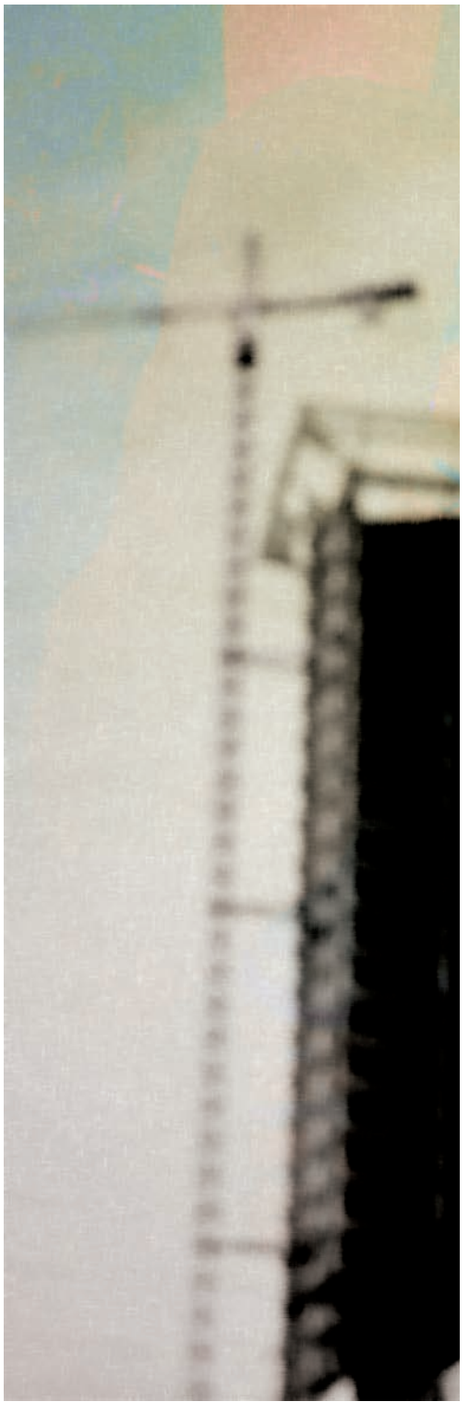
Designer trends

Careful plant design is the key to helping abattoir operators meeting these challenges of mounting legislation, soaring costs and tougher consumer demands for convenience, argues Carina Perkins



Regional authorities are the best place to start when planning a new site

ALL ABOUT PLANNING

The first, and arguably the biggest, challenge for any abattoir new build or renovation in the UK is to obtain planning permission. "Before you spend any money, you have to get permission," explains Edwin Bowater of FJB Systems. "An operator can spend a lot of money on plans, layouts and structural designs, only to find they never had a chance. You ought to get agreement in principle before anything else."

These days, getting planning permission for a slaughterhouse is not an easy task. Abattoirs used to be built on out-of-town sites, away from any complaints or objections, but urban sprawl has brought many of these facilities into suburbia, making any extensions or refurbishments a planning nightmare. Even plants that are built in rural areas now face objections, often from urban professionals who want to protect second-home investments from the perceived unpleasantness of a slaughterhouse operation. "There have not been many applications for abattoirs approved in the past 10 years," admits Bowater. "We know of one plant in East Anglia which took over four years of perpetual battles to get permission. It is not surprising really, we live in a hands-off consumer culture and people don't want to face the reality of where their meat comes from, let alone have it in their back yard." It is critical, therefore, to choose a site on which you have the best chance of obtaining permission. Bowater recommends that consultation with the area's local planning authority is the best place to start. "If there is an industrial allocation, you will have a far better chance than if it is a rural one."

Aside from planning permission, there are several other factors to take into account when choosing a site, including odours, noise and practical considerations – such as the road infrastructure for livestock vehicles and refrigerated lorries. Most importantly, there needs to be the means for efficient and hygienic wastewater disposal. "Something difficult to establish, but ideal, would be a site next to a wastewater treatment plant," Bowater says. "If the site has no foul drainage capacity, or the authorities refuse to treat your waste, that would be a problem."

Once a suitable site has been identified, and planning agreed in principle, the second step in the design of a plant is the process layout – a footprint plan of the facility, which is hinged on what the plant will process. "Any operator thinking of setting up an abattoir must be clear about what they are processing," says Bowater. "Do they want to slaughter one species or three? Will they process by-products on site? Are there cutting and boning requirements?"

The best way to approach the process layout is to draw up a comprehensive business plan, establishing requirements such as throughput, what species will be handled, processing facilities and by-product disposal. Once such a business plan has been drafted, it is possible to start designing an interior layout plan to suit the process while meeting hygiene regulations.

Bowater recommends hiring a consultant with experience in the meat industry. "It is amazing how often people spend huge amounts of money on wonderful beacons of architecture, only to find out that the building is not fit-for-purpose as a slaughterhouse. Architects do a wonderful job, but they do not know anything about meat processing."

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GREEN CREDENTIALS

Environmental factors, such as energy efficiency and water consumption, are key considerations when designing a modern abattoir, for a number of reasons. Firstly, energy costs are soaring and this is starting to have a major effect on the profitability of abattoirs, which rely on large amounts of energy for steam and refrigeration. Secondly, environmental regulations are becoming increasingly strict – with the combined pressures of the Climate Change Levy, EU Emissions Trading Scheme and the government's new Carbon Reduction Commitment (CRC). Operators need to ensure that their plants can meet energy reduction targets. Finally, consumers are demanding food with a carbon-friendly footprint, and supermarkets are starting to put pressure on suppliers to improve their environmental performance. A recent survey by food business advisor Grant Thornton revealed that just over one-third of food suppliers to UK supermarkets had to give an account of their environmental performance when tendering for supply contracts with leading multiples. Nearly half had been proactively approached by the major multiples to discuss ways to make their trading greener. "Showcasing environmental credentials as part of the tendering process to win contracts to supply supermarkets is becoming more frequent and symptomatic of a substantial change that is ongoing within the grocery supply chain," says Ian Carr, food and agribusiness expert at Grant Thornton.

Although energy-efficient »

POINTS TO **REMEMBER**

- **Get planning permission** This is arguably the biggest challenge for any new build or renovation
- **Choose carefully** Decide on a site where you have the best chance of getting permission
- **Decide on the process layout** What will you be processing? How many species? What other requirements are there?
- **Keep it green** Environmental factors – energy efficiency and water consumption – are important
- **Do not forget animal welfare** Consumers care and government is starting to take notice
- **Design well** A state-of-the-art abattoir does not come cheap, but clued-up design can help cut costs

» equipment can be more expensive, it is much more practical and cost-efficient to install it in a new plant than it is to install it retrospectively. Small to medium-sized enterprises can get Energy Efficiency Loans to buy such equipment. And larger operations can apply for the Capital Allowances Scheme. "There is a range of energy- and water-saving equipment which can be incorporated into a design and result in money savings in the long run," says Bowater. "One useful example is rainwater harvesting systems, which catch rainwater from the roof. This can then be used to wash down the lairage."

In an abattoir, the starting point for environmentally-friendly design is the refrigeration system. Primary chilling can account for up to 80% of an abattoir's total energy usage and efficient refrigeration can save vast amounts of money over time. Small details, such as intelligent fans and plastic curtains, can make a difference, and larger investments such as Liquid Pressure Amplification (LPA) systems and evaporative condensors can lead to significant energy savings.

For the modern abattoir looking to lead the way in energy efficiency, renewable energy systems, such as anaerobic digestion plants, are a consideration. "Renewable energy is becoming part of the planning restraints and requirements for new businesses," explains Bowater. "If you are looking to retrofit, paybacks of this technology are extremely long, but in new buildings it is much more viable."

ANIMAL WELFARE

Environmental performance is not the only challenge laid down by the modern consumer. The rising tide of the celebrity chef has brought with it a wave of concern over animal welfare, as well as increased consumer awareness about meat and its origins.

This concern has been matched by government legislation, a number of assurance schemes and stricter demands from retailers about slaughterhouse conditions. So a modern plant must ensure these conditions are met, while maintaining profitability and efficiency.

There are numerous advantages to a plant with high welfare specifications. Keeping animals calm and happy reduces the risk of operator injury. Also, stressed animals produce poor-quality meat and improving welfare will ensure that stress is minimised at the point of slaughter. When it comes to animal welfare in an abattoir, the obvious areas of focus are the lairage and slaughter facilities. A key principle in the design of these areas is to minimise »

Professor Temple Grandin in contemplative mood

STUNNING RESULTS

Professor Temple Grandin casts a professional eye over the Crewe livestock mart

Grandin stands as quietly as the livestock in the pens of Somerset's new flagship multi-million pound regional agricultural centre, just off junction 24 of the M5. Her experienced eye watches the movement of the animals, as they wait to go through to the auction ring. She momentarily points. "That animal will move over there," she says, as the stockman tries to get it to go in the other direction. Seconds later it does indeed go to where she had predicted.

The Colorado State University professor is widely recognised as one of the world's leading authorities on animal behaviour and has recently been on a short tour of south-west England and Scotland, which took in some of the leading facilities in livestock farming and meat production.

Global player

Professor Grandin is a global player, who has designed facilities in countries across the world, including the US, Canada, Europe, Mexico, Australia and New Zealand. In North America, almost half of the cattle are handled in a restrainer system that she designed for meat plants. Curved chute and race systems that she has designed for cattle are used worldwide, and her writings on animal behaviour have helped many people reduce stress in their animals during handling. She has also developed a scoring system for assessing the handling of cattle and pigs at meat plants, a system now used by many large corporations to improve animal welfare.

The professor is very much concerned with practical issues on the farm or in the plant. "If an animal does not want to go into a race, he will stop," she says. "This will be because he sees something he does not like, maybe a reflection. Some animals will get half way into a stun box then stop, because they can see people moving around under the door. That can be resolved by putting a piece of rubber under the door so they cannot see under. If animals do not go through a facility, find out why. It's no good yelling at them, because that will just make them excited."

Much of the professor's work has been in this area. She says that people who handle animals should understand the 'flight zone' (animal's personal space) and the 'point of balance' (at the animal's shoulder). "Good design and technology make the job easier, but it's not a replacement for good stockmanship," she says.

Design errors

While it is easier to design from new, a lot of older facilities can be made to work better, she says. "For example, if cattle slip on the floor of a stun pen, because it doesn't have a non-slip surface, they start to panic." Professor Grandin admits she has seen some "horrible" [designs of] restraining boxes in use in the UK. And she is not impressed by the design of some stun boxes that have slippery floors and a step that means the floor is higher at one end of the box than at the other. Although this is designed to allow the stunned animal to roll out of the box easily, it means that, on entry, the animal cannot stand properly and becomes agitated, making the job of a quick, accurate stun more difficult.

The best design of stun box is one with a deeply grooved flat floor and a hydraulic system that pushes the animal out after stunning.

The professor is now involved in measuring the impact of various stunning systems on animal behaviour, measuring how many slip, fall, are moved on through electric prodding, and the amount of noise that animals make while they are in the system. Mistakes cannot be eradicated completely, she says, but an acceptable rate of slipping is 3% of throughput, while one fall in 1,000 movements is to be expected.

Looking to the future, Professor Grandin says greater industry transparency and a better understanding of the agricultural sector by governments is essential. "Officials need to get out on farms to understand how things happen and the plant people need to be more open and not hide behind a chain link fence," she says. "We need to open up doors."

Jody Sheckter: His farm specialises in buffalo

LESS STRESS

When Jody Sheckter, winner of the 1979 Formula One (F1) World Championship and owner of biodynamic and organic meat business Laverstoke Farm, designed his £2.5m abattoir, he was determined to ensure it would offer the highest standards of animal welfare.

Sheckter was particularly concerned about the lairage and slaughtering facilities, because his farm specialises in buffalo, which are susceptible to stress. In order to ensure the facility was as welfare-friendly as possible, he enlisted the help of Professor Grandin.

The most noticeable feature in Laverstoke's lairage is it's curved chutes, which take advantage of the natural circling behaviour of cattle and sheep; animals think they are going back where they came from, and cannot see people and other moving objects at the end, which could be frightening. "The lairage also has natural lighting, with no big gutters or reflective surfaces on the floor. The bottom of the gates are obscured, so that smaller animals such as sheep are not faced with larger animals on the other side," adds accounts and business development manager Emmanuel Crusiaux.

Following Grandin's visit, Sheckter also altered his stun box to make it more welfare-friendly. "We cut a hole in the front of the box, so the animals are not faced with a blank wall and they are much calmer as a result," says Crusiaux. Although Laverstoke's abattoir is relatively small, its principles can be applied to larger plants. "It is vital to ensure animals are as calm as possible," says Crusiaux. "All the care taken to produce good meat would be for nothing if they are stressed at the point of slaughter."

» handling and, wherever possible, make the most of animals' natural instincts. Experts such as Professor Temple Grandin [see box, page 22] have done a huge amount of research into how design features relate to animal behaviour and stress levels, and forward-thinking operators in the UK are redesigning their plants to accommodate her advice [see case study above].

In the UK, several associations and bodies deal with the welfare of livestock at slaughter. Compassion in World Farming (CIWF), the Humane Slaughter Association (HSA) and the Farm Animal Welfare Council (FAWC) – an independent advisory body set up by the government – all offer advice on lairage design and stunning practices to maximise welfare.

According to the FAWC's report on the welfare of red meat animals at slaughter, every lairage should have a raised unloading bay, so that the animals are not forced to descend down a steep ramp, a procedure that risks stress and injury. Sharp turns should be minimised, reflective surfaces covered and lighting made as natural as possible. The lairage must be big enough to match the plant's throughput without overcrowding and there should be isolation pens for animals sick on arrival. Additional space should be provided to cope with incidents such as slaughter line breakdown or wet animals, which must dry before they can be killed. The floor surfaces in the lairage should be non-slip to reduce the risk of slipping and the building should be well-ventilated to ensure that temperature, humidity and ammonia levels are kept under control.

When it comes to stunning animals, there is still some debate regarding which are the most efficient, welfare-friendly methods. According to Heather Pickett, research officer for Compassion in World Farming (CIWF), gas stunning is the most humane method available for pigs and poultry. "Gas systems minimise handling and enable you to stun the animals in groups," she says. "With poultry, gas systems mean that you don't have to shackle birds upside down; they can just come in their modules and be gassed in situ, which avoids an awful lot of stress."

Most gas systems for pigs currently use carbon dioxide, but CO_2 stunning has been criticised after several studies revealed that CO_2 gas causes severe respiratory distress for 20-30 seconds. "CO_2 is an aversive gas; it is very unpleasant to breathe in and painful for the animals in high concentrations," say Pickett. Welfare groups recommend systems that use non-aversive gas mixtures, such as argon and nitrogen.

With dwindling returns, operators need to plan to process everything from the animal that they possibly can

For cattle, penetrative captive bolt stunning is still regarded as the best method. Welfare experts agree that if a stunning box is used, it should be narrow, so the animals cannot turn around, and have non-slip flooring. If an animal stands quietly, it is much easier to stun it effectively.

The main crux in future plant design lies in the need for operators to meet the often conflicting challenges of environment, hygiene and welfare, while struggling with lower margins and rising costs. Bowater predicts that, to counter high costs, designs will focus on maximising a plant's margins through by-product processing. "Operators should plan to process everything that is viable and get as much back from the animal as possible," he says.

A state-of-the art abattoir does not come cheap. But an abattoir designed to face these challenges head-on is more likely to survive the years ahead. ●