



CASE STUDY NEWMARKET FOODS



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In 1991 NewMarket Foods, the large meat processing subsidiary of J. Sainsbury's, concluded that their existing slaughterhouse required either extensive renovation or replacement to meet the new EC 1992 requirements.

An initial analysis resulted in a new pig processing abattoir being constructed on the existing site, capable of processing 20,000 pigs/week, with the old abattoir building making room for the new processing plant to be installed to meet NewMarket Foods' growing UK and export markets. The new abattoir was completed towards the end of 1993, and this article describes the technical details of the project and the construction methodology. The new plant is now probably the most technically advanced and hygienic pork processing unit in Europe.

In November 1991 FJB Systems were engaged to carry out a process design and feasibility study to analyse the cost differences and advantages of proceeding with a total renovation of the existing abattoir as against studying three possible sites for a new abattoir within the NewMarket Foods' existing land boundaries. FJB Systems are a food engineering and management know-how company that specialises in abattoir and meat processing plant design and project management. FJB Systems' personnel have been selected from meat plant managers and engineers to have a good working knowledge of meat works operations, while at the same time having the necessary technical qualifications and experience to design and manage the construction of such facilities. When a project is taken on by FJB Systems, a team of such specialists is put together to work exclusively on the project and is matched according to the project's needs.

The initial pre-project analysis, carried out by FJB Systems, consisted of putting together detailed process layout drawings for two separate sites and accurately estimating total construction costs. The existing abattoir was very closely analysed and detailed proposals for modification of the plant were drawn out and costed. Against all of the three options, a full management analysis was also carried out, so that the relative benefits of one project against the other could be carefully assessed. The conclusion reached in this initial analysis by FJB Systems was for NewMarket Foods' management to decide to opt for a new abattoir, but to build this new plant on NewMarket Foods' land, but in a new field, adjacent to the existing plant and on the other side of the A143 trunk road leading to Bury St. Edmunds. The principal reason for choosing this site was to allow more room in the existing food processing plant for expansion at a later date. The new field site also ensured that the killing and dressing section of the overall operation was a distinct, separate factory from further processing.

The FJB Systems design allowed for the building of a new abattoir only, covering facilities for lairages, killing, scalding and dressing as well as provisions for the processing of inedible offals. The design allowed for a bridge to be built across the A143 road to convey carcasses and edible offals to the existing plant chillers and offal processing areas. The entry and exit to the new plant thus only dealt with inedible products and processing staff accordingly, thus keeping the inedible parts of the overall operation totally separated from the further processing facility.

NewMarket Foods, UK

Location - Bury St Edmunds, UK

Technical Details - Assessment of existing site refurbishment against new site build.

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With respect to detailed design, the following concepts were included:- The lairage was designed to hold 1,500 pigs, but laid out in straight, long lairage sections to ensure at a later date, if so considered necessary, moving gate units would be able to be added to improve stock handling and reduce labour costs. The lairages are heated for holding pigs over night in cold weather.

The stunning and sticking design of the plant was laid out to Sainsbury's latest thinking with respect to producing the best quality meat product possible. In this respect, CO2 stunning equipment was installed, using the Butina unit from the existing plant. The unit consists of a pit with rotating gondola cages which drop the pigs in batches down into the CO2 pit for immediate stunning, prior to being discharged by means of a stainless steel chute onto a moving top sticking and shackling conveyor. Sticking is carried out in the horizontal position (prone sticking) and the blood is conveyed to a blood pumping system by means of stainless steel inclined chutes situated underneath one side of the moving top conveyor. Shackling of the pig carcasses takes place at the end of the conveyor, after bleeding is complete, when the pigs are raised by means of an elevator to the conventional overhead rail system.

The reasoning behind the stunning and sticking design rests with meat quality. Sainsbury's consider that CO2 stunning eliminates the possibility of blood splash, which can occur with electrical stunning systems, while prone sticking ensures that the hind legs are not strained by the overhead conveyor during this critical period, which in turn ensures that the leg meat does not become tough.

After sticking and bleeding, a modern, conventional scalding tank with automatic load and discharge and pull-through facilities has been used. In the initial stages of the design much discussion and assessment of vertical scalding systems was undertaken, but it was finally concluded that the only advantages of vertical scalding systems at this stage of the technology concerned hygiene rather than better scalding. Several plants were viewed where such vertical scalding equipment had been installed and it was concluded that with respect to the vertical spray scalders it was still necessary to have the total head and shoulder of the pigs submerged in the spray collection bath, and this being the case, no improvement could be seen with respect to hygiene compared with a conventional scald tank arrangement. As far as the vertical systems using water vapour scalding was concerned, Sainsbury's could not be satisfied that such systems scalded satisfactorily for their requirements, despite the improved hygiene possibilities of such an arrangement. Accordingly, the conventional, modern pull-through type scald tank was chosen.

Dehairing is achieved using Stork rotary dehairing units working in series with automatic hair removal installed underneath the units. After placing the pigs back onto the overhead rail, the carcasses move through a whipping machine for further polishing and then through a mild gas scalding unit and then a final whipping machine for final polishing prior to moving on to the evisceration section.

Considerable assessment took place with respect to automatic bunning units, but it was finally considered that no unit as yet was sufficiently developed to operate satisfactorily. Evisceration and the opening procedures are conventional with a pan-type evisceration conveyor for green offals and a hook-type conveyor for the red offals.

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The detain area, located after the inspection point consists of a walking beam system with an oval shaped ring system inside of which is housed the condemned room. Within this room there is a special Simo pre-breaker and pump, which allows all rejected material from the detain conveyor to be thrown through chutes into the centre room and into the pre-breaker and the broken condemned material is then pumped through to the inedible skips to take away for rendering. Carcasses which have been trimmed and re-inspected are then automatically returned onto the main dressing conveyor. We believe this detain area is of significant improvement in design, compared to conventional systems, as used in the industry.

One particular important provision that has been included in the latter part of the dressing line is the hip suspension arrangement. The system employed places the carcass into a hip suspension position and removes the gambrel hook. From extensive tests carried out by Sainsbury's, it has been concluded that carcasses hung from the hip rather than the gambrel and held this way throughout the whole chilling cycle results in considerable improvement on tenderness with respect to legs and loins.

Apart from the main dressing line procedures as described above there are various other interesting design features that have been incorporated within this plant. The ventilation system has been designed to provide some 30 air changes/hour and the system has been so arranged that all edible departments are pressurised, while the inedible departments covering the inedible offal areas and condemned areas achieve their air change requirements with extraction fans. This arrangement ensures that all openings into the edible departments, whether from inedible departments or from the outside, receive a constant air flow from the edible department to the inedible area. This prevents flies and insects making their way into the edible area of the plant and it also ensures that air-borne bacteria will always move to the inedible areas. We consider this as a most important requirement in any well-designed food processing installation.

Another area of interest concerns the dressing floor stands. After much deliberation on this point, it was decided to build the dressing floor stands, starting from the bung opening area through to the completion of inspection as solid concrete units integral with the floor of the department. By building stands in this manner, the floor topping used throughout the plant is made integral with the concrete stands, providing a smooth, continuous, integral hygiene surface over the stands and the floors. The services required for the different electrical and water services have been built into the interior of the concrete stands which have access hatches for maintenance, and this greatly reduces the complexity of the pipework with its unhygienic effects which are common in the industry.

All areas of the new plant, other than the lairage have been built with insulation panel walls. These insulation panels, which are (100mm) thick, use polystyrene as an interior and glass board for the internal finish, and they connect onto the floor by means of integral concrete curbs, which again have been overlaid with the floor topping. The insulation panels were chosen as being the most hygienic wall surface, rather than using conventional blockwork render and tiles or fibreglass finish, as well as in the long-term considered as being more economical. All areas of the plant other than the lairage, the stunning and sticking section and the scalding section also have insulation panel false ceilings, which again ensures that these departments become hygienically sealed from the roof and service systems, ensuring there will be no fallout from dust and overhead obstructions which, unfortunately, is a common problem in abattoirs. The overhead conveyor system has been designed with circular galvanised steel droppers which protrude through the false ceiling and above the false ceiling and connect the conveyor to the primary steelwork above the insulated ceiling. This ensures that all areas above the conveyors have the minimum of steelwork within the hygiene envelope, which

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ensures minimal fallout from overhead and allows easy and effective cleaning.

In order to ensure that there are no unsightly and unhygienic service pipelines overhead, all services are incorporated in the false ceiling space, above the insulation panel ceiling. This is achieved by dropping the service through the insulated ceiling down to the equipment in question in one vertical line dropper installed in stainless steel. These services comprise the sterilising water system, hot water wash-down, hand wash basin and equipment wash water system and compressed air lines, as well as electrical services, the main services of which are run in the roof space on cable trays.

The services themselves have been designed on the basis of using steam in a central services department to heat incoming cold water by means of plate heat exchangers to the respective required water temperatures for sterilising wash-down and handwash facilities, and the heated water is held in three separate insulated hot water holding tanks. From here the respective systems are pumped through an overhead reticulation system in the roof space of the processing departments with a return back into the hot water holding tanks. This system ensures that immediate hot water is available at all points in the plant and particularly at the steriliser points and the correct system pressure is available for all items of equipment.

The electrical services have been designed on the basis of an incoming high-tension supply passing through the necessary transformer installation and then into a medium voltage distribution board. This board feeds separate sub-distribution boards to cover the mechanical services, the specialised processing equipment and the ventilation plant. All electrical distribution is again taken through the roof space of the respective departments, thus ensuring a minimum of electrical equipment and wiring is actually present in each department. Lighting has been effected by using high frequency strip lighting flush with the insulated false ceiling which ensures minimum energy consumption while maintaining up to 650 lux lighting levels at operational points down to 250 lux in non-operational areas.

The steriliser and equipment wash units were specially designed by NewMarket Foods and built to order and comprise an integral standing unit for every operator on the dressing line to allow that operator to wash his equipment and sterilise it between processing every individual meat carcass. In order to save energy and water, the unit has electric eye sensors which operate the water system only as and when required. This system is unique and complies in every respect to Sainsbury's and EC requirements with respect to preventing cross-contamination between carcasses which in practice rarely, if ever, is achieved in plants in the EC.

The edible offals are trimmed and washed in a special offal preparation area adjacent to the dressing line and are then packed into aluminium trays which in turn are then placed into specialised wheeled trolleys which are then in turn placed onto a mechanised overhead trolley conveyor system. This conveyor system takes the trolleys with the edible offal across the new bridge over the A143 road and runs adjacent to the bridge pig carcass conveyor and then drops the trolleys by means of a specialised lift down into the existing NewMarket Foods offal chilling and packing area. This arrangement ensures that all edible product is conveyed over the bridge to the existing NewMarket Foods processing plant, meaning that both all edible offal and carcasses are conveyed across the bridge, which leaves only inedible material to be serviced in the new offal departments of the new abattoir.

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In the new abattoir building, facilities have been made available for a casings cleaning department, a mucosa recovery section and a casings sorting operation. Sorted casings are removed from the plant by means of road transport and all waste material and condemned material is blown by means of suitably located blow vessels through the roof space of the new building to an enclosed skip collection area.

The decision to proceed in building a new abattoir on the opposite side of a main trunk road on the existing factory was made in December 1991 and a most important requirement was speed of completion to meet the EC deadlines, bearing in mind the state of the existing abattoir. Under these circumstances, FJB Systems recommended proceeding with a design and construct contract whereby FJB Systems prepared process drawings and detail specifications for contractor tendering, the details of which were completed in early January 1992 and tenders received by the following month.

The basis of this recommendation to proceed with a design and construct contract was to select the building contractor early with an agreed process layout design, and this allowed the building contractor to proceed immediately with the construction of the foundations and the building frame, while the detailed design of the process and mechanical and electrical services could be carried out in parallel. This resulted in the possibility of a total project completion within 15 months compared with a conventional contracting approach whereby up to one year could be spent on detailed design and tendering and a further twelve months in the construction. The total completion time from conception to operation can therefore be reduced from some 24 months to 15 months.

FJB Systems are specialists in the design and project management of abattoirs and many of our staff have extensive world-wide experience of over 25 years in implementing abattoir schemes using these techniques.

Apart from FJB Systems' almost unique contracting procedures, their experience of the long-term requirements of the EC and USDA veterinary standards is extensive. This experience has been obtained from operating and building plants in Australia, New Zealand and South America for many years, where products produced were prepared and sold almost exclusively to the US, EC and Japan.

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