DEVELOPMENT OF A DRY SAUSAGE PLANT

by
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If, for the purpose of this program, we assume that you are a client with all of the advanced marketing ideas and manufacturing technology as presented previously, we will have a challenging and exciting relationship. It is new ideas in marketing and manufacturing, as well as new equipment development, new building materials and process methods, that provide the need to expand and build new plants. Old plants, even though they may be inefficient, seldom seem to fall down on their own, as maintenance skills seem to keep them going forever.

The consulting engineer becomes part of the client's team and provides the special expertise that is needed when planning, designing, constructing and starting-up a new plant. A consulting engineering firm should have the background and proven experience, as well as the manpower that is needed to plan, design, construct and start-up a new plant. The client has an existing business to run and cannot be expected to have the time, experience, or manpower at hand to do all that a consulting engineering firm can do.

The development of a new dry sausage plant can be divided into four phases, which are: initial planning, detail planning, design and finally construction and start-up.

The first part of any project is the initial planning phase, where the client-engineer relationship is formed. Together they must review the client's needs, ideas and present operation.

Does the client need a new plant to expand or meet market requirements? Will the new plant be a replacement of an existing plant or is it to expand manufacturing capabilities? What are the client's ideas? What does he want to see in a new plant? What will the product mix be, that is, what products will he manufacture and in what quantities?

What kind of operation does he now have, and what does he expect to have in a new plant?

Does he manufacture an old world type product? Does he use natural casings, or artificial casings? Does the client use natural chance inoculation or manufactured starter cultures, and what does he expect to do in his new plant?

The client and engineer need to review the state of the art of the manufacturing of dry sausage. Does the client know the effect of new sanitation techniques and sanitary construction materials? Does the client have any trade secrets that may or may not apply in a new facility using new and high speed equipment? What are the project parameters? Just what does the client want at this time and what questions does he want answered?

These are just a few of the questions that must be answered during the initial planning phase of a project.

It will also be necessary to establish basic project budgets and time tables during the initial planning.

After initial planning questions have been answered and parameters have been established, then and only then, can we move into the second phase or detailed planning phase of plant development.

By this time, the client and engineer should have enough information to establish detailed parameters and a working project schedule. Flow charts and diagrams should be prepared for all products and processes. These should be reviewed by client's operating supervisors for their input. It is important that client's personnel be a part of planning. Their input is needed and must be considered. They are the ones that will operate the plant, and they can make it work (or not work).

Equipment should be reviewed by both client and engineer. If equipment is to be used for new applications, then tests should be set up to verify performance. In some cases it may be advisable to set up equipment tests and new operating procedure tests in the client's existing plant.

Equipment lists and cost estimates should be prepared as soon as equipment tests have been completed and final selections made.

After most of the major equipment selections have

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been completed, a basic floor plan should be developed and approved by the client.

Some time during this detailed planning phase, the site should also be selected. When the site has been selected and floor plan approved, then it is possible to develop the preliminary site plans. Developing a site plan requires consideration of many things, such as ground drainage, parking, employee access, trucking movement between plant and roadway, utility access and local customs and codes.

A general description of the structure and materials to be employed must be determined by the client and the engineer before they can move into the design phase of plant development. Before final design can be made, the engineer must review local building codes, type of building materials, type of architectural design to be used, future expansion needs, available energy sources, and other factors that might affect the final characteristic of the building.

An experienced engineering company can make an overall cost estimate at this time, before going ahead with the final design. The client can then decide if he can justify going ahead as planned, or if he must change the original parameters.

The design phase of plant development is relatively straightforward and uncomplicated if the planning phases have been well done.

In this phase, the engineering calculations and designs necessary to produce the architectural, structural, civil, mechanical and electrical drawings and specifications are made. These drawings and specifications are then used to secure bids to do the actual construction.

The architect/engineer may be in a position to do a turn-key job, and can provide a cost quotation at this time. Or, the engineer can continue on as the client's consultant, providing all or part of the services necessary for construction, equipment installation and start-up.

It may be advisable to have the consulting engineering company provide construction management during construction, equipment installation and start-up. It is the construction manager's responsibility to see that specifications are followed, contracts are completed on time, change orders are carried out and, in general, see to it that the best interests of the client are carried out and the job is completed on time.

The bids are reviewed with the client and contracts for each phase of construction are awarded to the best qualified contractors. Equipment is ordered based on written specifications and delivery dates are scheduled to correspond with completion of construction.

During start-up, the consulting engineering company coordinates the manufacturer's service representatives so that they are on the job when needed. They may also provide engineers with special training in manufacturing techniques, packaging, preventative maintenance, etc., to assist in the start-up.

Now that we have looked at a typical (or ideal) sequence, let's consider some special areas of interest.

With respect to processing methods, a primary concern is the type of cultures that are used. Many of the older and smaller manufacturers of dry sausage are still using natural or chance inoculation, and they are using special handling or aging or other trade secrets which aid in this chance inoculation. These inoculations come from the organisms that have set up housekeeping in the older existing manufacturing facilities. These organisms are in the wood beams, in the cracks and pores of the walls, ceiling and floors, as well as the seams and joints of the equipment. When these older plants are cleaned up and sanitized, they are only cleaned on the surface, and in a few hours, these organisms are right back where they can inoculate the next batch of sausage meat. Many fine products are produced this way, and as engineers, we're not going to get into the advantages or disadvantages of using natural inoculations in older plants. We will leave that discussion to the experts in food technology.

Our concern is in new plants. These new plants are constructed with different materials and use high pressure cleaning agents and foams which destroy 98% or better of the organisms that are available in the older plants to inoculate the sausage.

The framework of new plants are steel, not wood. The walls, floors and ceilings are covered in plastic, fiberglass, glazed tile, hard surface brick and epoxy paints, and it will take years for most of these needed organisms to develop and get a foothold, if ever. The cleaning equipment used in the cleaning of plants utilizes hot water, chlorinated detergents, iodized sanitizers, etc. that kill almost every organism in sight. As a result, the old trade secret may not work in a new plant.

Many new plants have gone to starter cultures to control the microbial growth. Controlled inoculations are also recommended when needed during the drying cycle. We do know of one plant that did not

want to use starter cultures in their new plant, so after the new plant was completed and cleaned up, they sent workers to the old plant and rubbed the walls with rags, and then returned to the new plant and rubbed the walls and equipment with the same rags. We understand that it took quite some time to transfer the organisms to the new plant, and they had to be very careful not to kill the organisms during clean-up.

The drying rooms of modern dry sausage plants offer many advantages over older conventional plants, in that today we have greater control of air in drying rooms. The drying rooms may be large rooms or small rooms similar to cabinet-type smoke houses. The sausage can be placed in separate green rooms, smoke houses and drying rooms, or it can be placed in one room and the air controlled to provide the required conditions for the green room cycle, smoking, cooking or drying cycle.

For products that require smoke, it is possible to add liquid smoke to the meat mixture or to spray atomized liquid smoke into the air stream. If natural smoke is used, it may be necessary to use one of the closed loop smoking systems that do not require venting smoke to the atmosphere. In some areas, the EPA will not give permits for smokehouses that emit smoke to the atmosphere. In most closed loop systems, the smoke is condensed by refrigeration, steam or water sprays and run to the sewer.

It is very important that sausages be hung correctly without touching and with sufficient spaces for air movement in the smokehouse or drying room. The uniform movement of air in the drying room is possibly the single most important factor in drying sausage. If the air distribution system is not designed correctly, this can be the hardest area of drying to control. If the air movement is not correct, you can get under-dried sausage or you can have a condition called case hardening, where the surface of the sausage is dried too rapidly to permit the moisture from the inside to escape.

The purpose of the drying room is to remove 30% or more of the water from the meat, so that the finished sausage will keep for long periods of time with little or no refrigeration. The actual drying time depends on the size and type of sausage, and its moisture content, temperature, humidity, and air changes in the drying room.

Today's instruments have reached a degree of sophistication where the temperature and relative humidity of a drying room can be held at a constant level. The typical drying temperature is between 45-55°F dry bulb, and the relative humidity is held at 75% or lower.

There are two basic types of air conditioning systems used today in dry rooms. The most common is the refrigeration-reheat system. In this system, the air returned from the drying room is circulated through a refrigeration system to lower its dew point and remove moisture, and then reheated to the desired temperature before being returned to the dry room. Some refrigeration systems circulate the air through a salt brine spray, but these systems may require special maintenance because of the salt brine.

A newer and more effective system is the hygroscopic liquid system. The temperature and concentration of this liquid determines the temperature and relative humidity of the air that is circulated through the system. The hygroscopic liquid has an affinity for water and, therefore, dries the air that passes through it. Part of the liquid is always being pumped back to a concentrator for moisture removal and *this liquid* is replaced by fresh liquid, thereby maintaining a constant concentration. The liquid temperature is controlled by standard refrigeration coils. This system has an advantage, in that the refrigeration and heat loads are greatly reduced. The hygroscopic liquid system has an additional advantage, in that the asceptic action of the liquid kills approximately 98% of the airborne mold spores and bacteria.

Due to better control, systems using hygroscopic liquid systems have reduced drying time and have eliminated the need for washing mold from the product during the drying process.

Modern material handling procedures help to keep inventories current, thereby preventing losses due to spoilage and excess shrinkage. Raw products are kept frozen until ready for use, then they can be tempered by microwave units. Fresh product is held on racks in refrigerated coolers where turnover of inventory can be better controlled.

Finished products are sold as whole pieces of sausage or sliced on high speed slicers and then vacuum packaged to ensure freshness.

Many new plants are computerizing finished product inventories, thereby reducing chance for errors and shortages.

It may be desirable to have separate facilities for employees handling raw products from those handling finished goods. Employees entering processing rooms are required to sanitize their hands and feet, as well as wear clean white clothes and head covering.

Every effort is made to design an effective, efficient, sanitary and profit making plant. The conservation of natural resources is considered a basic part of plant design. Cleaning systems should be designed to save on heat and water usage. Heat exchangers are installed to utilize waste heat, and in some areas solar heat is utilized to save on fossil fuels. Windows and skylights may be used so that all available light is realized.

As a result of owner/engineer teamwork and following the procedures outlined here today, a successful plant can and will be constructed.