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Chapter 1

Where to Go Finding the Right Site

FOOD AND BEVERAGE FACILITY PROJECTS pose unique challenges in terms of location considerations due to several characteristics common to the industry:



Narrow profit margins require a location which provides minimal operating costs;

Short product cycles in a highly competitive arena require a location where the project can move forward quickly;

Products that are highly “environment sensitive” require a location with high quality, consistent and predictable operating conditions; and

Food safety regulations require a location that supports clean, reliable, and secure operations.

Selecting the best location often requires work at different levels of investigation. **Strategic Issues** such as the mission of other facilities in the portfolio, national variations in transportation, customer service requirements, taxes, labor availability, and utility costs must often be considered in any initial investigation. A strategy study will reveal the best general area or region for the new operation.

Community and Site Assessment often follows to analyze communities and sites within the favorable region and to identify any

Chapter 2

The Heart of the Matter

Process, Material Handling & Storage Considerations

For a Food Plant project to be successful, it must be planned from the inside out beginning with a careful analysis and documentation of the processing, packaging, and storage operation requirements. The full range of products and their packaging to be produced must be identified along with definition of the required capacity for each. Thorough documentation of this basic information is critical so that specialized technical and procurement personnel working on design and construction do not lose contact with the important focus areas of the project.

The tools normally used to define the products and processes include:

- Product Family and SKU Lists to include packaging requirements
- Raw material specifications and physical property data
- Packaging and Labeling materials specifications and physical data
- Finished Product data sheets, specifications and physical property data
- Process Flow Diagrams and P&ID's in the case of automated processes
- Material Balances and line capacity calculations
- Peak week work schedules
- Equipment Lists including utility requirements
- Staffing assignments by department, by shift, by sex
- Preliminary or final HACCP and product quality specifications
- Preliminary Standard Operating Procedures (SOP's) and Sanitation Standard Operating Procedures (SSOP's)

Many important operational factors must be included in the planning activity to ensure a good outcome.

Chapter 3

That's a Wrap Packaging Basics

Good packaging doesn't just happen; it's designed and delivered. And even a well-designed package requires a significant investment in quality equipment to fill, close, label, inspect and case the product. This section presents a brief overview of the major items associated with the package and the packaging system.

A Well-Designed Package

A well-designed package must achieve several goals simultaneously. First, it must protect the product from environmental factors that degrade product quality. Second, it should complement the use of the product. Third, it must present the product in a desirable and appealing fashion. Fourth, it has to survive the rigors of the distribution system. Fifth, and last, it has to "go the distance" until the product is consumed.

Three Packaging Types:

The primary package is the package that a single-serving or standard amount of the product comes in. A secondary package is typically a carton or a case that encloses a bundle or grouping of primary containers. Tertiary packaging typically refers to pallets, slip-sheets, and stretch wraps that deliver unit loads to a warehousing environment.

Primary Packaging

The major environmental factors that contribute to product degradation are light, oxygen, moisture, and heat. The selection of barrier properties in the primary package is critical to ensuring that the package protects the product. The design of the package may influence how the product is dispensed and/or stored in the consumer's household. Whether the product is designed for multiple use delivery or

Chapter 4

Keeping it Simple, Keeping it Right Designing the Building Envelope

THINK OF A BUILDING ENVELOPE as providing protection for the product within. It must insulate efficiently and control vapor flow while providing a durable interior and exterior finish. Two common building envelope systems are discussed below.

1) Insulated Metal (IMP) Panels

Prefabricated metal skinned insulated wall and ceiling panels (IMP) offer several advantages in their use in food processing operations. IMPs are very competitively priced in many areas; can be “customized” in their manufacture to meet different finish and thickness requirements; and can be easily and quickly installed in the field.

Key considerations in selecting an insulated panel should include:

- the thickness of insulation;
- the type of insulation; and
- the desired finish of interior processing areas.

Prefabricated panels consist of a laminated or foam insulated core, which offers excellent “R” values. Two-inch-thick polyurethane core panels will have an R-value of 17, three-inch-thick panels a value of R-24, and four-inch-thick insulated panels a value of R-32.

Insulation thickness choices should be a function of both internal processing and/or storage temperatures and external conditions on a year-round basis.

Facing on IMPs can be stainless or painted galvanized steel, Fiberglass

Chapter 5

Keeping the FDA at Bay

Food and Beverage Plant Construction 101

Process Areas

Unlike many manufacturing facilities, food plants must be constructed with cleanliness, sanitation and maintenance at the forefront of decisions on methods and materials of construction.

In processing areas, plants must be designed so that there are no cavities or voids where moisture, product, dirt, etc. can accumulate, which can lead to insect and/or rodent infestation and possible product contamination.

In plant design and construction, the following are critical items to consider:

- Wall surfaces must be designed to be impervious and easy to clean.
- Adequate clearance must be allowed around equipment for cleaning and maintenance.
- Any suspended ceilings used in process areas should be structural in nature, with personnel access to the "interstitial" areas between the suspended ceiling and the underside of the roof. This area can provide an excellent space to run utility piping and other needed services.
- Traffic aisles in process rooms need to be adequate in size and free of obstructions.
- Cross-contamination of raw/cooked products should be eliminated by the use of proper process flows and employee amenity areas.

Foundations

Normally, soil characteristics will dictate which type of foundation is most economical. A geo-technical investigation to determine what soil type and support capacity is necessary, which involves boring into the soil, retrieving and lab-testing samples, and preparing a soil report,

Chapter 6

Keeping it Running

Utilities, Controls and Refrigeration

Plant Ventilation and Air Conditioning

Balanced Air Movement

To meet current food safety and product quality requirements, it is vital to have a plant with controlled and balanced air flow. Air within the plant must flow from clean areas to less clean areas to avoid cross-contamination. Very critical areas such as ready-to-eat (RTE) product handling/packaging areas must have HEPA filtered make-up air supply and should be operated at a positive pressure with respect to the surrounding areas. Areas where raw agricultural materials or live animals are handled must be carefully isolated from all other plant activities. Very early in the planning of a new facility or plant expansion, it is important to develop a documented plant air balance scheme that reinforces the food safety plan.

Process-Specific Ventilation Issues

Some processes may require specific industrial exhaust ventilation techniques to prevent humidity, odors, allergens, and combustion products from escaping into surrounding work areas. Make-up air for these operations should be designed as a part of heating and ventilating systems in order to minimize energy costs. Many of the processes that require exhaust do not operate continuously. Therefore, coordinating the controls for exhaust fans and make-up air units can improve energy efficiency and eliminate unbalanced air flow.

When processing within a cooled environment, ventilation devices such as hoods are necessary. Vapors must be controlled and directed to other areas or to the roof where their effect is minimal. Exhausts may need to be fitted with filters or emission controls.

Chapter 7

Water, Water Everywhere Where It Comes From, Where It Goes

Water is becoming a scarce resource in many locations. Whether in an existing or a new food/beverage plant, water supply and wastewater disposal now may require new approaches for a variety of reasons including:

- Availability
- Quality
- Cost
- Sustainability
- Environmental control
- And community relations.

Water supply and wastewater disposal are critical issues which need to be addressed at the very earliest stages of project planning and new plant site selection.

Potable Water Supply

Food processors are required to use potable water for the following uses:

- Water to be incorporated into the product
- Water in contact with the product for washing, rinsing, conveying, etc.
- Water used to clean equipment and product contact surfaces
- Water used for employee sanitation such as hand washing

Food processors are required to obtain potable water from an approved public supply. Well water and treated surface water may be used as an option but only when it meets the same standards as "city water". Where it is available to processors, potable water from an approved public water supply is often the best choice since on-site sources must be reliably treated (chlorination or more) and sampled/analyzed/

Chapter 8

Green is Good

Sustainable Practices & Building Design reduce operating costs

Sustainability can inform and influence many of the facility design considerations described in this booklet: The continuing need to control fuel and operating costs (Chapter 1); deployment of reusable packaging (Chapter 3); power and cooling efficiencies (Chapter 6), and water treatment (Chapter 7), are examples.

Generally speaking, sustainable design looks at old problems in new ways and, aided by dramatic changes in the construction materials and process systems now available, provides new solutions which reduce both environmental impact and operating costs.



This green processing trend is expected to accelerate as merchandisers such as WalMart and consumers challenge the environmental impact of products, technology advancements continue, and market pressures increase.

Sustainable design considerations are often defined by the LEED™ (Leadership in Energy and Environmental Design) rating systems, popular in the United States. A description of this system is beyond the scope of this booklet, but the applicable principles are discussed later in this chapter.

“Green Thinking” addresses the following seven categories in Food & Beverage facilities:

Chapter 9

Food Plant Safety, Security and Alphabet Soup Explained

In recent years **Governmental Agencies** and **private standard setting organizations** have been very busy establishing new or expanded regulations, standards, and guidelines to enhance food safety and security. Most of these new requirements are not coordinated and some conflicts exist. Globalization of the supply chain presents the food processor with exports or imported raw materials with a real Tower of Babel when it comes to overlapping and conflicting requirements.

Fortunately, HACCP is well established and forms the common foundation for all of the different programs. While the ownership of Food Safety Programs normally rests within the QA function, the process, packaging, and facility engineers must provide certain physical solutions in planning, design, equipment specification, and construction to meet overall Food Safety goals.

HACCP (HAZARD ANALYSIS CRITICAL CONTROL POINTS) has become established as the safety standard throughout the food industry for both domestic and imported food products.

Begun over 30 years ago to prevent potential hazards that could cause food-borne illnesses in astronauts, the program has been expanded and approved by the National Academy of Sciences, the Codex Alimentarius Commission (an international food standard-setting organization) and the National Advisory Committee on Microbiological Criteria for Foods.

In the past, regulators and the food industry itself depended on "spot-checks" of manufacturing conditions and random sampling of final products in order to ensure food safety. As this approach tended to be reactive rather than preventive, it was seen as less efficient than the HACCP system, which was established by the FDA for seafood in 1995

Appendix

Food Establishment Guide for Design, Installation and Construction Recommendations

THE FOLLOWING CHART AND FOOTNOTES provide a listing of acceptable finishes for floors, walls and ceilings, by area:

	FLOOR	WALL	CEILING
Kitchen Cooking	Quarry tile poured seamless; Sealed concrete	Stainless steel; Aluminum; Ceramic tile	Clad fiberboard dry-wall; Epoxy-glazed surface; Plastic laminate; Plastic coated or metal
Food Prep	Same as above, plus commercial-grade vinyl composition tile	Same as above, plus approved wall panels Fiberglass reinforced polyester (FRP) panel; Epoxy painted drywall; Filled block with epoxy paint; or Glazed surface	Same as above
Food Storage	Same as above, plus sealed concrete; Commercial grade vinyl; Composition tile or sheets	Approved wall panels Fiberglass reinforced polyester (FRP) panel; Epoxy painted drywall; Filled block with epoxy paint; or Glazed surface	Acoustic tile; painted sheetrock
Other Storage	Same as above	Painted sheetrock	Same as above