Chapter 9

CENTRAL KITCHENS

The central kitchen, or food production facility, is the heart of the centralized or commissary foodservice system. The central kitchen usually is a very large and complex facility. When building a new central kitchen or renovating an existing building, there are a multitude of factors that must be considered to ensure its efficiency and effectiveness. The purpose of this chapter is to address issues that a school foodservice director would need to consider in planning and implementing a central kitchen. The following areas will be discussed:

- Human resource issues
- Layout and design of the facility
- Equipment
- Maintenance
- Purchasing
- Warehousing
- Communications
- Transportation
- Waste management
- Computer systems
- Miscellaneous operational issues
- Challenges/problems in operating a central kitchen
- Changes directors would make in their central kitchen

Human Resource Issues

There are several human resource issues that must be considered when planning a centralized foodservice system and others that must be addressed when implementing the system. Each of these issues will be discussed.

Employee Expectations and Fears

Employees often fear change, and implementing a centralized foodservice system means major changes. There may be a change in where one works, who one works with, and the type of work itself.

Green (1997) studied a school district that changed from a conventional to a cook/chill foodservice system. She found that the number of routine job increased and that autonomy and communication decreased; yet, this did not have a negative impact on employee job satisfaction. She contributed this to the fact that the school foodservice director considered employee needs when making the system change.

The research of Kim and Shanklin (1999) found that employees changing from a conventional foodservice system to a centralized cook/chill system were resistant to change and showed discomfort early in the process. These researchers recommend that managers encourage employees to participate "during the transition period, help them understand the reasons for implementing a new system, and prepare them for changes in job content and work environment (p. 67)."

School foodservice directors who have converted from conventional to centralized foodservice systems report that employees are resistant to change and often fear that they will lose their jobs. Thus, it is important to communicate with employees throughout the process of considering, planning, and implementing a centralized foodservice system. These also are times when employees can be involved in the process.

Nature of the Work

The basic nature of the work in a central kitchen differs from that of a conventional on-site kitchen. Characteristics of the central kitchen work environment include:

- **Heavy Lifting**. Central kitchens purchase food in larger quantities and employees handle greater quantities of product, resulting in heavy lifting requirements for some workers.

- **Repetitive and Monotonous**. Central kitchens operate using principles of economy of scale, so food is produced in very large quantities. As a result, workers have less variety of tasks and those tasks often are very repetitive. For example, the assembly workers may stand in one place for several hours doing one task.

- **High noise levels**. Central kitchens often are very large and open with little ways to baffle noise. The large equipment and activity in the kitchen often make it a very noisy environment.

- **Larger equipment results in more reaching.** The size of the equipment in a central kitchen increases dramatically over standard equipment. For example, central kitchens may have a 400 gallon steam-jacketed kettle compared to a 25 or 50 gallon kettle in a conventional kitchen. This often requires more climbing and reaching to cook and to clean the equipment.

- **Refrigerated work environment.** Some areas in the central kitchen may be maintained at refrigerator temperatures to ensure food safety. For example, the cold food preparation area and the assembly of carts for each school in a cook/chill system often are maintained between 38 and 41 degrees. Also, the person in charge of refrigerator and freezer storage areas spends a large amount of time in cold work environments.

- **Rigorous standards**. Most standards are followed more rigorously in a central kitchen than in conventional kitchens. For example, hairnets or bonnets are required for everyone in the central kitchen. All employees are required to wear uniforms. Rules such as no jewelry are followed.

Because of the nature of the work and the strict compliance to standards and rules, there may be more employee morale problems in central kitchens. Managers will need to be aware of this possibility and take actions to improve morale.

Employee Safety

Employee health and safety issues often are greater in central kitchens than in on-site kitchens. The work often is much more physically demanding. Often, there is heavy lifting. There is more twisting and turning required of employees. There also are more repetitive motions, which may result in boredom.

Some of these job characteristics may have negative health impacts on employees, especially work-related musculoskeletal disorders (WMSD). Examples of WMSD include back pain, wrist tendinitis, and carpal tunnel syndrome. WMSD occur when there is a mismatch between the physical capabilities of the human body and the physical requirements of the job. Ergonomic changes may be made to alleviate a mismatch and reduce the number of WMSD that occur in the workplace. Additional information about ergonomics can be obtained at the Occupational Safety and Health Administration's web site (www.osha.gov).

There are many ergonomic risk factors that might be present in the central kitchen, including force, awkward postures, contact stress, repetition, static postures, and cold temperatures. Physical work activities and conditions that might create these risk factors (OSHA, 2001) include:

- Exerting considerable physical effort to complete a motion.
- Doing the same motion over and over.
- Performing motions constantly without short pauses or breaks.
- Performing tasks that involve long reaches.
- Working on surfaces that are too high or too low.
- Maintaining the same position or posture while performing tasks.
- Sitting for a long period of time.

- Using hand and power tools.
- Working at stations where edges or objects press hard into muscles or tendons.
- Moving objects that are heavy.
- Reaching long distances horizontally.
- Reaching below knees or above shoulders.
- Moving objects a significant distance.
- Bending or twisting during manual handling.
- Standing on floor surfaces that are uneven, slippery, or sloped.

There are engineering controls or changes to a job to eliminate or reduce the presence of musculoskeletal disorder hazards that should be considered. These engineering controls may be related to workstations, tools, facilities, equipment, materials, and processes used in an operation. Examples of actions that can be taken to minimize negative employee consequences in a central kitchen include:

- **Facility Design.** When designing the facility, careful attention must be given to planning the following:

  - height of work surfaces.
  - distances required for reaching within a work station.
  - avoiding sharp edges of counters and other work spaces.
  - distances that materials will need to be carried
  - flooring surfaces.

- **Labor Saving Devices.** When planning the central kitchen, attention should be given to the use of hoists, carts, and other devices that would minimize lifting. Special equipment, such as portioning equipment, can be purchased to do repetitive tasks. The design of tools, such as knives, should be evaluated to make sure that they are ergonomically the best for the function performed.

- **Stretch Breaks**. Employees can be given time for stretch breaks, which could help to minimize injuries.

- **Safety Consultant.** A safety consultant could be hired to develop safety plans for the department. OSHA also provides a free consultation service designed to assist employers in the following ways:

  - identify potential hazards in the worksite.
  - suggest general approaches for solving a health or safety problem.
  - identify kinds of help available if further assistance is required.
  - develop occupational safety and health management systems.
  - provide training and education for managers and employees.

Additional information about OSHA consultation services can be obtained from the OSHA website: http://www.osha.gov/oshprogs/consult.html.

- **Safety Committee.** A safety committee could be established to work on safety issues for the department. Employees also can be involved in identifying potential hazards that could cause musculoskeletal disorders.

- **Safety Teams**. Teams of employees can be formed to establish and implement safety procedures.

- **Safety Manual**. A manual focused on safety may be developed. In addition, the SOP for the department should be reviewed and injury prevention strategies added when appropriate.

- **Training.** Employees will need to have special training. For example, employees should receive training on proper ways to lift. Training on proper stretching and exercise also could be useful for preventing employee injuries.

- **Material Safety Data Sheets.** The material safety data sheets (MSDS) must be current for all chemical products used in the central kitchen. The MSDS must be easily accessible to the employees in the operation. Often, a notebook containing all the appropriate MSDS will be maintained in the area in which the chemicals are used. For example, a notebook would be located in the dishroom that would contain sheets for the detergent, sanitizer, rinsing agent, etc. used in the area. In addition, a master set of MSDS would be maintained in the central food production office.

Training

Training of employees for the central kitchen will be important for the success of the operation. Training is one strategy to ease employees' apprehensions about change and improve their ability to adapt to change. Even if employees have lots of foodservice experience, the equipment and procedures used in a central kitchen will be different. There will need to be initial training on use of equipment and on the SOP to be used. Training also will be needed to ensure that employees know and follow the SOP related to HACCP. This is important because of differences in food handling procedures and the increased potential impact of a foodborne illness. In addition, ongoing training will be needed to ensure that the operational goals and standards are met.

Scheduling

The scheduling of employees in a central kitchen differs from that of on-site kitchens. Many central kitchens operate 23 or 24 hours per day. In some communities, they are the

only employer who runs a 3-shift operation Sunday through Thursday. Bakers may begin work at 3 a.m. while other workers may begin work at 6 a.m. The goal of a central kitchen is to utilize the facility as much as possible.

Staffing

The staffing for a centralized foodservice system differs from that required for conventional kitchens. In centralized foodservice systems, there usually are fewer staff hours needed at the satellites and more staff needed at the central kitchen. Likewise, the skill level of the staff may shift. There may be fewer skills required at the satellites and more skills required at the central kitchen. In fact, there may be a need to hire some specialty employees for the central kitchen, such as a baker, for which salary requirements will be greater than for traditional cooks. The change in salary requirements has been a problem for some school districts, so the school foodservice director may need to negotiate with the school district human resource manager to ensure that the appropriate staff can be hired. Some of the position titles that might be expected for a central kitchen include:

Central Office Staff

- Foodservice Director
- Quality Control/Sanitation Supervisor
- Purchasing Agent
- Area Managers (10-12 schools), Field Supervisors
- Accounting Clerk

Central Kitchen Production Staff

- Cooks
- Assistant Cooks, Production Workers
- Bakers
- Bakery Assistants
- Packaging/Assembly Workers
- Catering Manager

Warehousing/Transportation Staff

- Warehouse Supervisor
- Warehouse Workers
- Forklift Operator
- Truck Driver

Maintenance/Sanitation Staff

- Maintenance Workers
- Custodians/Sanitation Workers
- Warewashing Workers
- Laundry Workers

Satellite Staff

- Satellite Manager or School Leads
- Foodservice Assistant

These titles are just examples. Often within a category, there may only be one title to give more flexibility. For example, production worker may be a title in a central kitchen that would cover individuals assigned to work in the bakery, hot food production, or packaging/assembly. Also, likely only two position titles would be used in the warehouse, a warehouse supervisor and a warehouse worker (which would require the ability to operate a fork lift).

Layout and Design of the Facility

The layout and design of the central kitchen is based on the following factors:

- Efficient flow of work
- Ease of movement of products through the facility
- Productivity of employees
- Functional areas
- Equipment
- HACCP
- Durability
- Special purpose space
- Other considerations

Efficient Flow of Work

The layout and design of the central kitchen is based on efficiency of product flow through the foodservice system. The flow of food should move in one direction, do as little crossing paths as possible, and move the shortest distances possible.

The functional areas impact the flow of the operation, and thus, the design of the kitchen. In a central kitchen, food moves through different pathways depending on the type of food. One example of food flow is shown in the flow chart in Figure 9.1.

Based on the flow of food through the system, the layout can be developed. Figure 9.2 shows a rough floor plan of a central kitchen facility using cook/chill technology. Note that there are separate areas for receiving and shipping.

One consideration in the central kitchen is the total amount of space required and the space needed for each functional area. In addition, adequate space will be needed for aisles to accommodate cart movement, forklift movement, and the use of pallet jacks.

Case in Point

Jefferson County Public School District, Louisville, Kentucky central kitchen serves 149 sites and about 98,000 students. The central kitchen is 68,000 square feet. The approximate square footage by area is: 20,500 for centralized receiving, storage, and distribution; 6,300 for cold food preparation; 5,200 for hot food preparation; 8,200 for bakery; 3,200 for catering; 1,750 for office space; 1,200 for employee dining/break/meeting area; 800 for lavatories/lockers; and 8,800 for mechanical support areas.

Figure 9.1 Flow Chart of Food in a Central Kitchen Using Cook/Chill

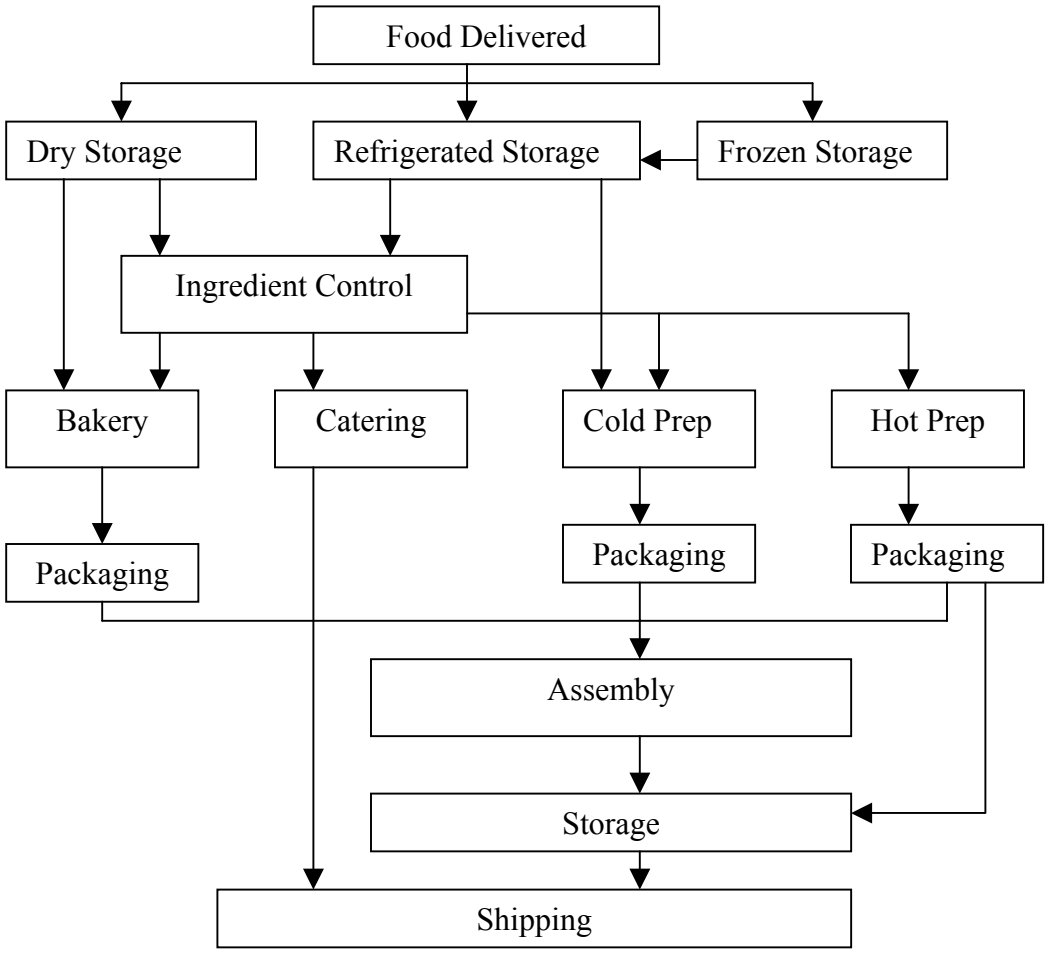
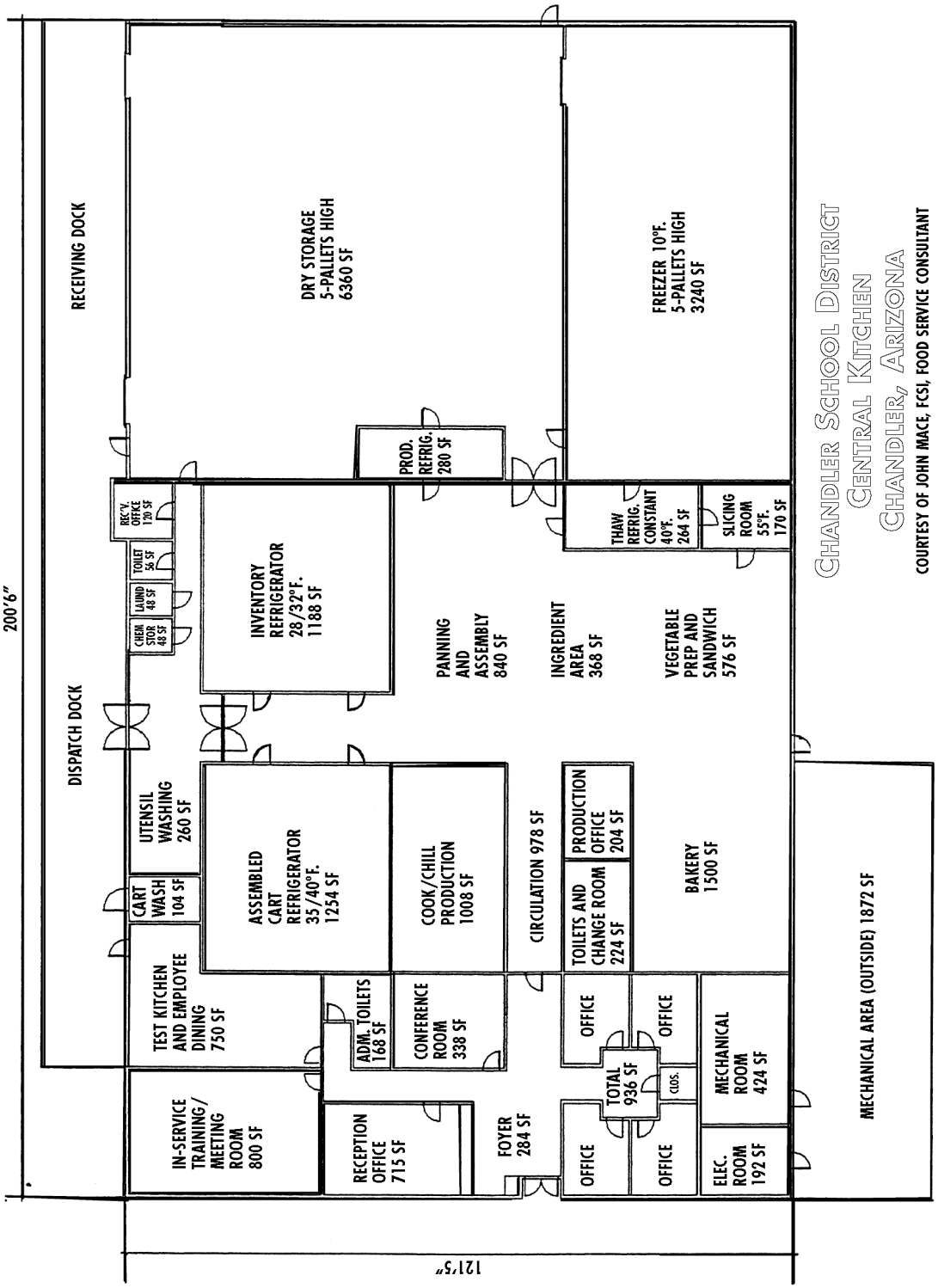


Figure 9.2 Floor Plan of Chandler, Arizona Schools' Central Kitchen Using Cook/Chill



Productivity of Employees

The layout and design of the central kitchen needs to take into account employee productivity. Space needs to be adequate to complete the work required, but not so large that employees spend lots of time walking from place to place. Efficiency in labor use will drive layout decisions.

Functional Areas

The functional areas for central kitchens vary, but the typical functional areas include receiving, storage of raw product, hot food preparation, cold food preparation, bakery, packaging, assembly, storage of prepared foods, shipping/distribution, and dish/pot and pan washing. Some central kitchen facilities have a separate catering kitchen depending on the type and volume of catering they do.

Equipment

The equipment and how that equipment is grouped will influence the layout and design of the operation. The equipment required and the layout will depend on the menu items produced and the functional areas. Equipment will be discussed in more detail later in this chapter.

HACCP

Hazard Analysis Critical Control Point programs will influence layout and design decisions in the operation. HACCP issues related to layout and design were discussed in Chapter 8.

Durability

The durability of the central kitchen is an important consideration in planning the layout and design of the facility and in selection of finishes for walls, floors, etc. One of the major areas of concern of central kitchen directors is the durability of floors. Flooring material should be selected based on its durability, ease of cleaning, and safety.

Special Purpose Space

There are several auxiliary areas that may need to be included in the central kitchen complex. The inclusion of these areas and the space allocated varies depending on the functions anticipated for the central kitchen.

Training/Test Kitchen. A test kitchen may be very useful in the development of new products and procedures for the central and receiving kitchens. It is useful to have a test kitchen that replicates conditions in school kitchens. When new products are developed,

they can be tested using actual conditions and equipment. Also, the test kitchen can be used to develop procedures for reheating, serving, and HACCP.

Catering Kitchen. Often central kitchens do catering for special events in the school district. If the volume of catering is significant, separate space is desirable. This area would be equipped with smaller volume equipment.

Conference/Training Rooms. Space should be considered for meetings and training sessions. The room should be wired for audio-visual and computer applications.

Other Considerations

Flexibility. Some flexibility in the use of the kitchen needs to be considered in planning and building the central kitchen because needs of the operation change over time.

Ability for future expansion. The central kitchen should be planned based on current as well as future needs of the district. Since it often is difficult to predict the future, consideration should be given to options for future expansion of the space if there is a need. Many existing operations have had to add space, especially freezer and refrigerator space. It is much easier to do if it is planned for in advance.

Case in Point

In 1997 Pittsburgh Public Schools increased their storage capacity by about 13%. They added 1,026 square feet (SF) of dry storage, 1,019 SF of refrigerated storage, and 1,586 SF of freezer storage. The total square footage of the new addition was 3,024. They also reconfigured space within their facility to meet their storage needs.

Elko County School District, Nevada opened their central kitchen in 1988. Later, they added 240 SF of refrigerated storage and 480 SF of freezer space to meet their storage needs. The director found that more products were being purchased that required refrigeration or frozen storage than originally planned.

Equipment

The equipment for a central kitchen is selected for its basic function and for its ability to increase the efficiency of food production. Factors considered in selecting equipment include cost, durability, ease of cleaning, and ease of use. In addition, equipment must meet the standards of the appropriate recognized national testing laboratories, such as the American Gas Association (AGA), American Society of Mechanical Engineers (ASME), Canadian Gas Association (CGA), Canadian Standards Association (CSA), National Sanitation Foundation (NSF), and the Underwriters Laboratories (UL). Equipment specifications, typical equipment for a central kitchen, equipment maintenance, and emergency plans will be discussed.

Equipment Specifications

Specifications must be developed for each piece of equipment to be purchased to ensure that the equipment meets the needs of the operation. There are four types of specifications that can be written:

1. Qualified Products List,
2. Design Specifications,
3. Performance Specifications, and
4. Item Specifications.

More specific information about developing equipment specifications can be obtained from *A Guide for Purchasing Foodservice Equipment* (1998) and *The New Design Handbook for School Food Service* (1997).

Specifications include information about electrical requirements, plumbing requirements, steam requirements, and mechanical requirements. Specifications also contain information about freight and delivery and installation requirements. Warranty and extended warranties also may be included in a specification.

Any other special requirements or instructions also are included. Examples of special instructions might be installation instructions, removal of old equipment, or training requirements. With the uniqueness and scale of central kitchen equipment, training by the manufacturer often is desirable. Remember, anything that is not included in the specification will not be done!

Typical Equipment

The types and sizes of equipment used for a central kitchen are different than that used in conventional foodservice systems. The following equipment is typically found in a central kitchen:

Warehouse/Storage

- Freezers and refrigerators
- Hoists/lifts (These also may be found in other areas, such as bakery, where lots of heavy lifting is required.)
- Forklifts, pallet jacks
- Scales

Ingredient Control

- Scales of varying capacities

Hot Food Production

- Can opener with automatic dumping
- Steam-jacketed kettles
- Pumps/fillers
- Blast or tumble chiller

Cold Food Production

- Slicers with automated weighing
- Vertical cutter mixers
- Wrappers

Bakery

- Mixers
- Proofers
- Ovens
- Depositors

Assembly/Packaging

- Conveyor
- Fillers
- Packaging/wrappers
- Meal baskets and dollies

Sanitation

- 3-compartment sink
- Dishwashing machine. The size and type depend on decisions about what dishwashing is done at the central kitchen or at the satellites. The use of disposables also impact the dishwashing equipment required.
- Cart washers

In addition, specialty equipment is purchased for tasks specific to an operation. For example, Saint Paul Public Schools Food Service has a machine to form hamburger patties because they opt to make their own patties. Portland Public Schools Nutrition Services has an automated roller/cutter for making cinnamon rolls because of the quantity they produce. Minneapolis Public Schools Food Service had a piece of equipment

manufactured for them that dispenses a pre-measured amount of dry cereal that can be packaged.

Equipment Maintenance

A preventive maintenance plan for equipment must be in place to ensure that the central kitchen can meet the production demands of the school district. The impact of an equipment breakdown in a central kitchen would be large due to the number of schools and students served by the facility. Also, because of the quantities produced it would not be feasible to substitute other methods or equipment as would be done in an on-site kitchen. Thus, procedures must be in place for preventive maintenance.

Often there is a maintenance person hired strictly for the central kitchen. This individual is responsible for implementing the preventive maintenance program. Having a maintenance staff reduces the likelihood that an equipment breakdown would occur. This individual/s would become very familiar with the pieces of equipment (and their quirks!) in the operation.

Contingency Plans

There will need to be contingency plans developed for the central kitchen. For example, what would be done if there were a power outage. How would food be prepared? What would be the backup menu? If a contingency plan is in place from the outset, when a need arises, things will go much more smoothly. One school foodservice director in a district with a central kitchen warns that a power outage will happen!

Maintenance

Maintenance for the central kitchen and the equipment are an important ongoing task. Once the central kitchen is operational, maintenance usually becomes the responsibility of the foodservice department. In addition to implementing a preventive maintenance plan for equipment, there needs to be ongoing upkeep of facilities. The cost of maintenance needs to be included in the operating budget of the school foodservice department.

Purchasing

Purchasing is different for centralized foodservice systems than for conventional foodservice systems. Centralizing purchasing for a district will increase the purchasing power of the school district due to the high volume of food and supplies used. Centralization of purchasing often results in a need for fewer drops, which further decreases costs. This purchasing power provides additional purchasing options.

Districts may continue to use traditional purchasing methods or use a prime vendor, but now the district may buy items by the truckload. Many school districts are purchasing directly from manufacturers.

CASE IN POINT

Saint Paul School Food Service negotiated 1-year fixed price contracts (with the option for three 1-year renewals) with manufacturers for high-use products such as chicken nuggets and chicken patties.

Detailed specifications for products used in a central kitchen need to be developed. These specifications include information such as pack size, quality, and formulations. For example, if the protein content of the flour varies, the large quantity recipes may not yield desired results. Thus, it is critical to specify the exact product needed.

The food and supply items purchased for centralized foodservice systems often vary considerably from those purchased for conventional foodservice systems. Often, items are purchased at the little or no end of the purchasing continuum and the production is done at the central kitchen (or the value added).

The quantity purchased increases dramatically giving more purchasing efficiencies. This may change the frequency with which purchases are made. Depending on the operation, a prime vendor contract may be selected.

Managers in centralized foodservice systems often can make good use of money by decreasing the amount of inventory maintained in the warehouse. Often, just-in-time (JIT) purchasing can be done with vendors delivering products more frequently so money is not tied up in inventory. The foodservice director of a centralized foodservice system can leverage buying power to get the best possible prices and service.

Warehousing

The central kitchen will require a large inventory of food and supplies. This necessitates that adequate warehousing facilities are planned and that SOP are developed for the warehouse function. One change that school foodservice directors with central kitchens noted is that items look very different in the warehouse. In conventional systems there are a few cases on shelves where in the central kitchen warehouse there are pallets of goods stacked high on shelving.

Planning the Warehouse

When a central kitchen is planned, the warehouse is an important consideration. The warehouse includes space for dry, refrigerated, and frozen storage. The following factors need to be considered:

Size. Careful analysis will need to be done to determine the square footage of space required for each type of storage. Several areas need to be considered:

- **Menu analysis** to determine the types of items that will be served, the form in which the items will be purchased (ready-to-eat, partially processed, made from scratch), and the types and number of ingredients required to prepare the recipes. What percentage of items will be purchased in the frozen, refrigerated, or dry form?
- **Forecasting** the number of meals served will be required.
- **Purchasing methods**, such as frequency of deliveries of various types of products and quantities purchased to get the optimal price, need to be reviewed.
- **Commodity** items, volume, and timing of distribution impacts storage space needs.
- **Future needs** also must be anticipated. For example: Is growth in enrollment in the school district anticipated? Are there any new programs anticipated (such as after school snack programs or a universal free breakfast program)? Will catering services be expanded? Will the menu change? Are there anticipated changes in the commodity program?

Size of the warehouse is one of the areas that directors of central kitchens often mention when you ask their advice in planning. Almost always, they say to include more space than you think you will need! There are examples of warehouses that store products three and four pallets high and two pallets deep. Some directors recommend only going three high because of the difficulty in getting the pallets down and taking inventory.

Location of Warehouse. The location of the warehouse is another important consideration. Ideally, the warehouse will be connected to the central kitchen for ease of product movement. In some cases, warehouse space may be located separately due to space limitations, but this may cause some problems, such as increased time in moving products, increased cost of labor, and decreased control over products. Another issue related to the location of the warehouse is its accessibility for deliveries. Much of the product will be delivered by tractors with semitrailers. This requires adequate access to the delivery docks, and space for movement of these large trucks must be planned. The height of the docks should be appropriate to the size of trucks making deliveries.

Layout and Design of the Warehouse. The warehouse space needs to be planned with efficiency and product movement in mind. There should be a good flow from the delivery dock to the storage areas and, ultimately, to the food production areas.

Products for the volume used in central kitchens will be delivered on pallets, requiring forklifts for moving the pallets. Warehouse space is required to allow for the movement of the forklifts. Adequate aisle widths are required for the forklift to back up and maneuver through the warehouse.

There may need to be space for isolating commodity deliveries for tracking purposes. These needs should be identified in the planning stage and planned for in the design of the facility.

Inventory Control. Inventory control is important to ensure that the appropriate products are available when needed and to control costs. Two types of inventory methods are needed: perpetual inventory and physical inventory.

- **Perpetual Inventory**. A perpetual inventory is a continuous record of purchases/deliveries and issues of food and supplies. A system, including the use of a computer program, needs to be in place to ensure that a perpetual inventory can be maintained.
- **Physical Inventory**. A physical inventory is an actual physical count of products on hand that is done on a periodic basis, usually monthly. The physical inventory is done to verify the perpetual inventory. This inventory should be done by someone other than the individual who maintains the perpetual inventory.

Inventory turnover is the frequency at which the inventory is being used. Inventory turnover rates often are calculated and monitored to ensure that there is not too much inventory in stock. Inventory turnover is an indicator of how well resources are being managed. Inventory turnover is calculated using the following formula:

$$\text{Inventory Turnover} = \frac{\text{Annual cost of goods sold}}{\text{Average \$ value of inventory}}$$

Staffing

A qualified person is needed to manage the warehousing function of the central kitchen. This individual needs to be able to operate a computer system to track products.

Additional staff may be needed depending on the size and volume of the central kitchen. The warehouse staff needs to have skills and training in forklift operation. In

addition, they need to have training about the products they will handle and food safety/HACCP procedures.

Communication

Communication is important for the efficient operation of a central kitchen. Due to the large size of the facility and transportation of food to satellites, communication will be more challenging and important than in conventional foodservice systems. Consideration will need to be given to systems that can facilitate communication, such as walkie talkies, radios, cell phones, and pagers. Telephones need to be located in various work areas to facilitate communication. Computer systems also can allow for e-mail communications, which can be particularly useful ways for satellite managers to communicate with staff at the central kitchen.

Transportation

Centralizing food production necessitates the transportation/distribution of food to the satellites or receiving kitchens. This requires that the school foodservice department have trucks to transport the food. Trucks may be owned by the department or transportation services can be contracted. A cost analysis should be conducted to determine the feasibility of both options. Many school foodservice directors prefer to own trucks and be responsible for transportation.

Trucks. There needs to be a determination of the number and types of trucks for making deliveries for the school district.

- **Number of trucks.** The number of trucks needed will depend on the number of satellites, size of satellites, amount of product that is delivered from the central kitchen compared with products that are delivered to the school by the vendors, and the geographic proximity of the satellites to the central kitchen.

- **Refrigeration.** A decision will need to be made about whether food will be delivered hot or cold. If the food is delivered cold, refrigerated trucks should be purchased. If the food is delivered hot, refrigerated trucks would not be necessary, but hot transport equipment (insulated bags or containers, heated carts) will be needed.

- **Type of Fuel.** Either gasoline or diesel fuelled trucks could be selected.

Drivers. Trained truck drivers will need to be hired. Depending on the size of the truck and local regulations, a commercial driver's license may be required. Contingency plans need to be in place for the absence of a driver.

Delivery schedule. A delivery schedule needs to be made for the school district. Several factors need to be considered in determining the delivery schedule:

- **Receiving kitchen work schedules**. It may be desirable to have deliveries at the receiving kitchens when a staff member is on duty. This is not always the case. In some districts, the driver delivers the carts to the satellites and rolls them into the refrigerators for use the next day.

- **Scheduling around school playground and busing schedules.** When traffic (buses, cars, and children) is heavy, it would be undesirable to make food deliveries.

- **Traffic between central kitchen and schools.** The amount and timing of traffic would impact the development of delivery schedules.

- **Access to secured buildings.** There may be times of day when there is no access to the building.

Facilities. The satellite facilities will impact transportation. When planning new satellites, consideration should be given to locating the delivery area in a place that is convenient to the satellite kitchen and can be accessed by a delivery truck. The dock needs to be the appropriate height so that the truck can back up and carts can be rolled out of the truck. There are examples of situations where the dock is either too high or too low, which makes unloading carts extremely difficult.

Communication. There needs to be some communication devices available for each driver. That could be radios, cell phones, or pagers.

Contingency Plans. Contingency plans are needed for situations such as inclement weather, truck breakdowns, and traffic. There also may be a need to have emergency deliveries to satellites if something is missing from a delivery. Most centralized foodservice systems have an extra truck and may have a van for emergency deliveries.

Waste Management

Waste management is a major part of managing a central kitchen. There will be large quantities of cardboard boxes, metal cans, and other packaging materials that must be removed from the facility. In addition, there is a need for food waste and grease disposal.

Trash/Grease Removal

Some of the packaging waste can be recycled. Many central kitchens compact cardboard boxes and have them picked up for recycling. Metal cans also may be recycled. Often the decision to recycle is based on the costs of pickup compared to the costs for trash removal. Grease also can be sold for recycling purposes.

Dumpsters for trash should be conveniently located. In the same area, bins for any recycled items would be maintained.

Food Waste

Central kitchens often create a lot of food waste. Food waste can be discarded, or some facilities pay a local pig farmer to pick up the waste.

Some food still is good and may be donated to local food banks/feeding programs. For example, Saint Paul's central kitchen donates nearly expired food and food that has not been served to the local Second Harvest Food Program.

Lee, Shanklin, and Wie (2001) conducted a study of waste in a central kitchen and three satellite schools. They found that during a 5-day period 135,992 meals were produced and food waste totaled 7,691 pounds or 51 cubic yards at the central kitchen. Cardboard boxes represented 41% of the waste and food comprised 35% of the waste by weight. They estimated that the central kitchen could divert 65 tons of food waste from landfills by composting, and the volume of cardboard sent to landfills could be reduced by 60%. They found that centralizing food production decreased the total waste generated per meal. This study indicates that recycling and composting strategies should be considered by central kitchen directors to decrease the amount of waste sent to landfills and to decrease the cost of waste removal.

Computer Systems

Computer systems are very important for central kitchen operations; however, there appears to be a lack of integrated software programs that meet the needs of central kitchens. Many school foodservice directors use basic spreadsheet functions for their financial records and word processing programs for maintaining their forms. Almost all have point-of-sale computer systems at the satellites to be able to track participation.

Miscellaneous Operational Issues

There are several other operational issues that school foodservice directors must consider. Often, these issues were not relevant to on-site kitchens in schools.

- **Pest Control.** An integrated pest management program needs to be established, including SOP that include general prevention practices. In addition, the school foodservice director would contract for the services of a licensed, certified, and reputable pest control operator to implement pest control procedures.

- **Security System.** A security system may be needed for a free-standing central kitchen facility.

- **Parking.** Adequate parking space will be needed for the employees of and visitors to the central kitchen.

- **Snow Removal.** In climates that have snow, a plan for snow removal must be in place. Often, the school foodservice department will have a contract with an independent company to handle snow removal.

- **Landscaping.** Free-standing central kitchen facilities need landscaping and lawn care. These services may be contracted to an outside provider.

- **Cash Handling.** Cash handling procedures need to be determined. Cash receipts may be sent to the central kitchen administrative staff for processing. Some large school districts even have an armored car pick up cash deposits.

Challenges/Problems in Operating a Central Kitchen

Once the central kitchen is built, there are challenges that face the school foodservice director. A group of 12 experienced directors of central kitchen operations developed a list of challenges/problems they have faced in operating a central kitchen. Their experiences may provide directors considering a central kitchen with assistance in avoiding some of the pitfalls. These challenges relate to the customer, planning for the future, employee/labor, equipment/facilities, and operations.

Customer
Perceptions of food quality loss
Staying "customer focused" not "system focused"

Planning for the Future
Plan for future
Handling/managing growth
Inflexible or incompatible Federal and/or state regulations

Employee/Labor
Training
Only employer who runs a 3-shift operation, Sunday through Thursday
Work ethic of employees
Heavy, repetitive, monotonous work (like a production line)
Maintaining a standard for line speed
Cold (refrigerated) work environment
Acceptance of change
Fear of job loss
Retraining staff
Labor problems
Blame shifting

Equipment/Facilities
Maintenance
Equipment limitations
Flexibility limitations
Need for a backup plan if the system fails (power loss, storms, etc.)

Operations
Schools (satellites) returning equipment
Availability of appropriate sizes of packaging
Cost of meal production
Forecasting production (menu mix)
Transportation
Planning theme days (hard to please all schools in system)
Using commodities (for pre-plate, not for cook/chill)
Logistics—creating flexibility in an inflexible system
Getting schedule information and changes
More operating challenges
Timing—much must be done in advance so accommodating changes is HARD!
Health and sanitation risks; for example, the food safety risks are much higher when very large numbers of children are fed

Changes Directors Would Make in their Central Kitchen

Once any project is complete and in operation, a school foodservice director will identify beneficial changes. The 12 central kitchen directors identified changes they would make related to the building layout and design, equipment, and personnel.

Building Layout and Design
Ability for future expansion
Plan for more flexibility

Good floor
- ✓ Durable
- ✓ Sanitary
- ✓ Cleanable
- ✓ Safe

Training/test kitchen (useful to test kitchen to replicate conditions in school)
Conference rooms
Area for catering
More bathrooms
More space in general
More storage space
Separate bakery and cook/chill inventory area (refrigerators/freezers)
Administration close to operation/production area
Freezer storage on distribution side
Widen aisles (8' is not enough)
More attention to dock heights
Layout

Equipment
Constant equipment upgrade and repair (transport hard on equipment)
Computer system with hard wiring
More freezer and cooler storage

Personnel
Plan for an extra truck and driver
Eliminate contract trucking and do self-operated
Be prepared for different standards for central kitchen personnel (jewelry, hairnets, morale issues)
Connect central kitchen staff with students
Time clocks

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