

**Tim Bowser**  
Food Process Engineer

**S**electing and purchasing food processing equipment can be time consuming and difficult. This fact sheet presents a five-step method that makes this task more manageable. The five-step method is outlined in Figure 1.

The first step in selecting and purchasing food-processing equipment is a clear identification of the need. The expense of purchasing and installing capital equipment can be a tremendous burden for any business. Questions should be asked such as:

- Will the business profit more from the fulfillment of this need compared to other needs?
- How will this item fit in with, or satisfy future needs?
- Is the need consistent with the businesses' long term goals?
- Does the need satisfy a safety or regulatory requirement?
- Will the end result improve product quality?

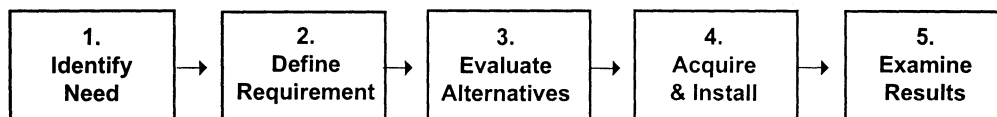
Once the need has been clearly identified, the second step in selecting and purchasing food-processing equipment is to define the requirement. What will satisfy the need? This step requires the most work, but achieves the highest reward. A complete definition of your requirement will enable you to effectively communicate with potential suppliers. The result minimizes confusion between the purchaser and the supplier, allowing firm bids that eliminate hidden costs. Customer dissatisfaction and frequency of equipment returns or retrofits are reduced.

One type of document that is commonly used by government and industry to define requirements is called a specification. Over the years, specifications have been stereotyped

as being unnecessarily wordy and confusing. This need not be the case. A good specification should be brief, simply worded, and useful for the intended purpose. Unfortunately, a recognized specification format does not exist for food processing equipment; however, the author has developed a model based on experience in the food industry. An example specification for a product filler is given in the appendix.

Useful specifications often include, but are not limited to, the following information:

1. **System description** – a detailed narrative of the operation and functioning of the equipment or system being specified, including a definition of the product to be processed, the container and/or other packaging used for the product (if applicable), systems interface, and performance criteria.
2. **Project conditions** – information relating to the system in which the equipment is to be installed and operated. This section usually includes details on available utilities and the operating environment.
3. **References** – identification of standards directly pertaining to the manufacture and components included on the specified equipment. Examples are: Dairy and Food Industries Supply Association, Inc. (3-A); United States Department of Agriculture (USDA); Food and Drug Administration (FDA); American Welding Society (AWS); Occupational Safety and Health Association (OSHA); and the American Society of Testing Materials (ASTM).
4. **Materials** – specification of materials of construction including gaskets, metals, composites, plastics, rubber, and coatings.



**Figure 1.** Five-step method for selecting and purchasing food processing equipment.

5. **Controls** – indication of, as a minimum, the level of control desired (fully automatic vs. manual) and may provide a detailed description of the control logic, operating sequence, and control panel layout.
6. **Maintenance and Service** – detailed description of any repair and ongoing maintenance requirements necessary for the equipment.
7. **Manufacturers** – lists of any required manufacturers of parts or sub assemblies such as motors, switches, pumps, valves, drives, steam handling components, and controls. Many organizations require that machinery be equipped with parts made by their preferred manufacturer to reduce spare parts inventory and minimize training requirements for maintenance technicians and operators.
8. **Submittals** – lists the specific information about the equipment required for bidding and/or supplying the specified equipment. Examples are utility usage, drawings, quotations, equipment weight, foundation requirements, warranties, manuals, and spare parts kits or spare parts requirements.
9. **Inspection and acceptance testing** – an inspection notice alerts the supplier that the purchaser wishes to inspect the equipment during and/or after the fabrication and construction phase. An acceptance test requires a functional test of the equipment prior to shipment. The requirements for the inspection and acceptance test should be described in detail, including timing and the consequence of failed tests.
10. **Delivery** – information relating to the preparation (crating and protection) and delivery of equipment, including the desired date of delivery or deadline and the actual address for equipment delivery.
11. **Equipment Identification** – details pertaining to nameplate, tags, and labels that will be permanently attached to the equipment.
12. **Safety** – a listing of safety requirements for the equipment such as operator guards, unique environmental concerns, and product safety.
13. **Bonuses and Penalties** – Bonuses and/or penalties specified for the equipment manufacturer may be appropriate to help achieve certain critical goals such as equipment delivery or installation date and equipment performance.
14. **Business information** – details relating to the financial soundness and reputation of the equipment supplier. For example, credit rating, time in business, list of references, share of market, percentage of international sales, and repeat sales.
15. **Demonstrations** – requires the supplier to provide a list of users of their equipment with similar installations that can be visited for demonstration purposes.
16. **Installation** – can the company provide competent personnel to assist you with or conduct the installation of the equipment? What rates do they charge, including expenses (travel, food, and lodging).



**A clearly defined method can make the task of selecting and purchasing food processing equipment more manageable. Many suppliers will be open to negotiation during the evaluation of the proposed purchase agreement.**

One can easily develop a specification template that can be used to write custom specifications for food-processing equipment needs given the following items:

- example specification given in the appendix
- list of items often found in specifications (given above) edited and rewritten to include the general details pertaining to your installation site and process

The template will contain the boilerplate for future specifications, such as site conditions, delivery addresses, a list of references, manufacturers, equipment identification requirements, and others. Blanks can be left in the template for parameters that are specific to a given project. The template then can be used to write specifications for equipment by filling in the blanks, deleting unnecessary information, and adding new details pertinent to the equipment and process requirements. Each specification written for a particular project should receive a unique title and number to avoid mix-ups.

Once a detailed specification has been written, the third step in the selection and purchase process is to evaluate the possible alternatives. This step begins by sending your specification to the most capable suppliers that can be identified. Lists of suppliers are available from catalogs such as the Thomas Register of American Manufacturers (Thomas Publishing Company, New York) and online resources such as the Food Explorer and Food Online. A list of online resources is given in Table 1. At least one industry organiza-

tion, the Food Processing Machinery and Supplies Association (FPM&SA), Alexandria Virginia, maintains its member database and provides free consultation aimed at linking potential customers with their members.

Telephone each potential supplier to determine their capabilities and obtain or verify the contact information needed to send them your specification. Send a complete specification to each potential supplier on your list. You can expect to receive a formal bid within about two weeks. Review and compare bids to determine the most likely alternative for your operation. Obtain legal assistance, if necessary, when evaluating the terms of the proposed purchase agreement. Many

suppliers will be open to negotiation during this stage of the process. Use this opportunity to obtain the most competitive value and price. Remember that the lowest bid may not completely provide for your immediate and future needs.

Act on the best alternative and purchase the equipment. The delivery, installation, and startup should proceed smoothly, as a result of efforts to develop a detailed specification. The last step in the equipment selection and purchasing process is to examine the results. What could be done differently the next time to improve the process? Review the five-step selection and purchasing process and make notes of improvements for future reference.

**Table 1. List of online resources of food processing equipment suppliers and information.**

<i>Web address</i>	<i>Organization/ Sponsor</i>	<i>Comments</i>
www.thomasregister.com	Thomas Publishing Company	Comprehensive catalog of equipment manufacturers
www.foodexplorer.com	Cahners, a subsidiary of Reed Elsevier, plc	Extensive listing of food processing equipment and ingredient suppliers. The definitive source.
www.foodonline.com	VerticalNet, Inc.	Resource for the food industry professional. Including articles, technology trends, software downloads, library and community events
www.foodprocessing.com	Putnam Publishing Co.	Resource associated with the magazine, Food Processing
www.worldfoodnet.com	Institute of Food Technologists (IFT) and the International Assoc. of Food Industry Suppliers	Resource for the food industry professional including a virtual exhibit hall, forums, online seminars and member assistance
www.fpmisa.org	Food Processing Machinery and Supplies Association (FPM&SA)	Member data base and free service to help link potential clients to member suppliers
www.packnet.com	Packaging Machinery Manufactures Institute (PMMI)	Packaging machinery only. Searchable member database and links to member web sites.

# Appendix

## PURCHASE SPECIFICATION FOR PRODUCT FILLER

SPECIFICATION NUMBER: 227-FIL-1

The Oklahoma State University  
Food and Ag Products Center  
Stillwater, OK

### CONTENTS:

1. System Description
2. Project Conditions
3. References
4. Materials
5. Controls
6. Maintenance and service
7. Manufacturers
8. Submittals
9. Inspection and acceptance testing
10. Equipment identification
11. Safety
12. Delivery

### ISSUE INFORMATION:

<i>REV</i>	<i>DATE</i>	<i>DESCRIPTION</i>	<i>PREPARED</i>	<i>CHKD.</i>	<i>FAPC APPR.</i>
0					

## **1. SYSTEM DESCRIPTION:**

- 1.1. Process Description: Fill flowable solids, liquids, slurries and suspensions into containers covering a wide range of product physical properties and container dimensions and volumes. Filler to be food grade and approved for used in commercial food processing facilities.
- 1.2. Performance Criteria: Operator controlled, intermittent fill, using volumetric measurement to within +/- 5% of setpoint. Physical uniformity and temperature of product to be maintained.
- 1.3. Product Parameters:
  - 1.3.1. Liquids, slurries and suspensions varying in viscosity from 1 to 50,000 centipoise.
  - 1.3.2. Flowable solids with the longest particle dimension less than one inch.
  - 1.3.3. Temperatures from 35 to 195 F.
- 1.4. Process Parameters: Capacities of up to 30 containers per minute. Rigid and collapsible containers will include glass, plastic, metal, and paper with volumes to 1.0 gallon. Operator will manually place and remove container to be filled. Option for future automation desired.
- 1.5. Equipment Elevation: Working level should be adjustable within a convenient range for operators that range from 5'-4" to 6'-4" tall.
- 1.6. Systems Interface: Level control on fill hopper to interface with pump control. Possible future interface for automated conveyor infeed of containers and discharge to automatic capper.

## **2. PROJECT CONDITIONS:**

Site Utility Data. The following utilities are available on site:

- 2.1. Electrical           110V, 20 amp, 60 Hz  
                              220V, 20 and 30 amp, 60 Hz  
                              440V, 30 amp, 60 Hz
- 2.2. Steam: Medium Pressure   60 psig  
                  Culinary                   100 psig
- 2.3. Potable Water               60 psig, 70 F
- 2.4. Hot Water                   60 psig, 160 F
- 2.5. Compressed Air             100 psig

## **3. REFERENCES:**

Design and fabrication shall comply with the applicable sections of the latest editions and addenda of the following codes and standards:

- 3.1. American Society of Testing Materials (ASTM)
- 3.2. American National Standards Institute (ANSI)
- 3.3. American Welding Society (AWS)
- 3.4. Current Good Manufacturing Practices (cGMPs) in compliance with CFR Title 21, parts 210,211, 607, and 640.
- 3.5. Food and Drug Administration (FDA)
- 3.6. National Electrical Manufacturer's Association (NEMA)
- 3.7. Occupational Safety and Health Association (OSHA)
- 3.8. Dairy and Food Industries Supply Association, Inc. (3-A)

## **4. MATERIALS:**

- 4.1. All surfaces shall be fabricated of cleanable materials that are corrosion resistant.
- 4.2. All support structure shall be corrosion resistant and cleanable. Interiors of pipes and structural members shall be completely and permanently sealed from the environment.
- 4.3. No galvanized or painted surfaces.
- 4.4. Tri-clamp style connections shall be used.

- 4.5. All electrical enclosures will be rated NEMA 4X.
- 4.6. RTD temperature probes shall be used with a redundant element.
- 4.7. Equipment to be portable, mounted on locking casters with hard rubber surface, and sealed ball bearings.

**5. CONTROLS:**

- 5.1. Provide minimum automatic controls to operate the equipment or system, including filler bowl level control and manual fill switch.
- 5.2. Allow at least 25% free space in electronic enclosures to allow for system expansion and future add-ons.

**6. MAINTENANCE AND SERVICE:**

- 6.1. All components shall be installed to facilitate “quick-change” where possible.
- 6.2. Equipment configuration and features shall allow ease of access for routine servicing and maintenance.
- 6.3. The equipment shall be suitable for operation in a pilot-plant environment, subject to wash-down with hot water and cleaning chemicals.

**7. MANUFACTURERS** (blanks are inserted in place of the actual name of manufacturers):

- 7.1. \_\_\_\_\_ controls and electrical components
- 7.2. \_\_\_\_\_ and DC drive systems
- 7.3. \_\_\_\_\_ electric motors, wash-down, continuous duty, TEFC, food grade, C-face
- 7.4. \_\_\_\_\_ steam control valves, air operated, fail-close
- 7.5. \_\_\_\_\_ steam pressure regulators
- 7.6. \_\_\_\_\_ steam traps, separators, strainers, and air vents
- 7.7. \_\_\_\_\_ hydraulic and pneumatic fittings and controls
- 7.8. \_\_\_\_\_ air cylinders
- 7.9. \_\_\_\_\_ circular-chart recorders

**8. SUBMITTALS:**

- 8.1. General: Vendor selection will be made from submitted quotes and documentation. Vendor shall state any exceptions or clarifications to the quote specification. Equipment number shall be referenced on all documents. All information requested must be received by the bid due date of \_\_\_\_\_.
- 8.2. The quote shall include the following items:
  - 8.2.1. Spare parts list and part cost. The spare parts list shall provide part numbers, USA source and stocked supplier name, address, and telephone number.
  - 8.2.2. General arrangement drawings with outline dimensions and operations and maintenance access dimensions.
  - 8.2.3. Equipment weights.
  - 8.2.4. Electrical power requirements.
  - 8.2.5. Utility requirements (air, water, steam, etc.).
  - 8.2.6. Warranty.
- 8.3. Quote will be submitted to and evaluated by:  
The Oklahoma State University  
Food and Ag Products Center  
Stillwater, OK 74078  
Phone: 405-744-6688  
FAX: 405-744-6313  
Attn: \_\_\_\_\_

**9. INSPECTION AND ACCEPTANCE TESTING:**

Oklahoma State University reserves the right to inspect and test the fully assembled, piped, and wired equipment prior to shipment.

**10. EQUIPMENT IDENTIFICATION:**

- 10.1. Supply a permanent, engraved nameplate to identify the machine that includes the following information:
  - 10.1.1. Manufacturer name and address
  - 10.1.2. Serial number
  - 10.1.3. Model number
  - 10.1.4. Date of manufacture
- 10.2. Supply permanent, engraved nameplates for the control panel.
- 10.3. Label all instrument readouts and lights on control panel. Label all equipment inside (rack mounted instruments, relay buses, power supplies, circuit breakers, terminal blocks, etc.)
- 10.4. Identify conductors at each termination with wire numbers using permanent type marker.

**11. SAFETY:**

- 11.1. Furnish an approved electrical disconnect and air bleed-off disconnect (all components vented to room atmosphere) at operator access points.
- 11.2. All guards shall be interlocked to stop equipment movement if opened.

**12. DELIVERY:**

- 12.1. Vendor shall furnish all materials, equipment, labor, and engineering necessary to fabricate shipping container, prepare for shipment, and ship equipment prepaid to:  
Food and Ag Products Center  
Oklahoma State University  
Corner of Monroe and Farm  
Stillwater, OK 74078  
Phone: 405-744-6071
- 12.2. Equipment shall be protected from damage during shipping due to rough handling, fork-trucks, and weather. Equipment shall be mounted securely on a pallet or skid.

## **The Oklahoma Cooperative Extension Service** *Bringing the University to You!*

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; home economics; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and based on factual information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, Title IX of the Education Amendments of 1972, Americans with Disabilities Act of 1990, and other federal laws and regulations, does not discriminate on the basis of race, color, national origin, sex, age, religion, disability, or status as a veteran in any of its policies, practices or procedures. This includes but is not limited to admissions, employment, financial aid, and educational services.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Samuel E. Curl, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. 0999 GB.