





Local Food Processing White Papers

THE EQUIPMENT QUESTION

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Farm to Institution New england

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Author: Nathaniel Brooks Design: Kathleen Nay

FARM TO INSTITUTION NEW ENGLAND

Farm to Institution New England (FINE) is a six-state network of nonprofit, public and private entities working together to mobilize the power of New England institutions to transform our food system.

Since its inception, FINE has focused on developing cross-sector connections between K-12 schools, colleges and universities, hospitals, and other institutions. Today, FINE serves those at the forefront of the farm to institution movement in the region, providing a forum to connect and share ideas, models, resources, and support.

FINE leads projects related to key issues identified by farm to institution leaders and acts as the backbone organization for farm to institution work in the region: we strengthen the network, convene stakeholders, conduct research, develop tools and resources, and communicate with key audiences.

NEW ENGLAND FOOD PROCESSORS COMMUNITY OF PRACTICE

The New England Food Processors' Community of Practice has provided a forum for processors of local food to share information, visit each other's facilities, and develop collaborative solutions to common problems. The group has helped representatives from seven New England food processing facilities become better equipped to meet and overcome their challenges, and share what they are learning with other processors in New England and beyond.

The major goals of the group were to help existing processing facilities become more efficient at processing local produce and meat for institutions and share best practices with new facilities. Participants have learned valuable information about topics like processing equipment, plant design, and food safety.

This publication is part of a series of four white papers, which complements our suite of seven case studies featuring members of the New England Food Processors' Community of Practice.

Download these publications and watch an introductory video about the group: www.farmtoinstitution.org/processors





INTRODUCTION

The food and beverage manufacturing industry in the United States is made of up of a small number of huge, diversified companies such as Tyson Foods, PepsiCo, and Nestle ("Top 100 2016") and a large number of much smaller players. According to the 2012 U.S. Economic Census, the 50 largest food manufacturers in the United States accounted for more than half of all food manufacturing value creation. Not surprisingly, the large manufacturers enjoy significant efficiencies of scale, keeping food prices low. As a share of income, U.S. consumers currently spend less on food than any of the 85 other countries for which data is tracked ("food expenditures"). In this competitive environment, new food entrepreneurs face a significant challenge when it comes to choosing equipment. On the one hand, the efficiency gains from automation are critical to managing labor costs and maintaining margins when consumers have become used to affordable food. On the other hand, because equipment makers serve a market dominated by large food manufacturers, the equipment to automate processing is typically expensive, engineered for large-volume runs, and highly specialized. Equipment may also be designed with relatively narrow tolerances, optimized for a particular type of produce grown elsewhere and unable to handle local varieties and variability. New processors are thus in a bind: they can't scale up production without the labor efficiencies appropriate equipment can bring, but can't afford the equipment until they've ramped up sales.

INDUSTRY OVERVIEW

Globally, the food processing equipment industry is estimated at some \$50 billion, and is expected to grow to more than \$70 billion within five years (Freedonia). While the U.S. market for processed foods is still the largest in the world (Markets & Markets) and is expected to continue growing slowly but steadily through 2020 (2.9% CAGR; PMMI), the real growth in processed/packaged foods is coming from emerging economies, particularly in the asia-pacific (APAC) region. These trends are in turn driving the market for food processing equipment. The value of the APAC market was estimated at \$16.32 billion in 2015 and "is expected to reach \$25.13 billion by 2020," largely due to demand from China ("Rising Demand"). Growing industrialization and urbanization are driving increased demand for the convenience of processed foods, as are shifting diets toward "higher value-added foods, such as meats and chocolates" ("Rising Demand"). While different industry analysts focus on different equipment makers, the consensus is that the market is fragmented and highly competitive, with "numerous large and small local and international suppliers" (Technavio). All of this adds up to an industry poised for growth, just not necessarily in the U.S.



Major food processing equipment players. (Compiled based on Technavio.)

Because the U.S. food market is mature, new food entrepreneurs in the U.S. face a B2B equipment market that is geared towards large processors. This means much of the available equipment is designed to handle large volumes at high throughput. The degree of sophistication necessary is thus significant, meaning equipment is costly. Spreading this capital cost over hundreds of thousands or millions of units is one thing; trying to absorb the cost into runs in the hundreds or thousands is another matter entirely. The emerging markets for processed food in other regions have supported the growth of equipment manufacturers more closely geared towards new food processors. New U.S.-based food processors may choose to tap these suppliers for equipment at the scale and price point that matches their business needs, and the prevalence of e-commerce platforms like alibaba (which in December 2016 listed more than two million entries for food and beverage machinery) make doing so far easier than it would have been twenty years ago. Nevertheless, importing equipment is hardly a panacea. New processors choosing this route face significant shipping costs, import duty, potential challenges with interoperability (U.S./metric), and greater difficulty in accessing technical support and spare parts.

A SIMPLE EXAMPLE

To understand the impact that the right equipment can have on the economics of a food business, it is helpful to consider a simple example: filling, crowncapping, and labeling a 12oz bottle of shelf-stable liquid product. The simplest approach, in terms of equipment, is to fill, cap, and label by hand. This has the advantage of requiring almost no investment in equipment (a simple hand-operated bottle capper, the Red Baron, is available for less than \$20) but requires significantly more time per bottle. Towards the other end of the spectrum, a custom bottling line with throughput capacity of 60 bottles/minute and automatic capping and labeling, costs upwards of \$80,000 but can bottle product 24 times as fast.



The hand-operated VPF108-SL. Source: Handy Filler Systems.

| Table 1. Three Approaches to Bottling | | | | |
|---------------------------------------|---------------------------|--------------------|--|------------------------------|
| Equipment | Capital Cost | Bottles per Minute | Labor and Facility Cost per Bottle ⁴ | Breakeven Point (Bottles) |
| By Hand ¹ | \$14 | 2.5 | \$0.233 | |
| Manual Equipment ² | \$863 | 4.3 | \$0.185 | 6,434 |
| Fully Automated Line ³ | \$83,480 | 60.0 | \$0.013 | 275,037 |
| 1 Hand-pouring, capping w | /ith Red Baron budget han | d capper. | | |

2 Filling with HandyFiller, capping with Colt Strong bench capper, labeling with EasyLabeler.

3 GI-3300 Automatic Pressure Filler, AC-TruCap-6 Inline Capper, KTM LCW 200 Wrap Labeling System from Busch Machinery.

4 Assumed labor cost of \$12.50/hr, facility rental of \$35/hr.



The AC-G13300 in-line pressure filler. Source: Busch Machinery

The difference in time per unit between these approaches is critical. Assume the hypothetical product retails for \$3.49 per 12oz bottle. Industry norm for distributor and wholesale margins are approximately 30% each, giving a distributor price of \$2.07 per bottle. A typical rule of thumb for food producers is to aim for gross margin of at least 60% (Wyshak, p163) meaning cost of goods sold of 40%, or \$0.83 per bottle. Taken together, this means that an established manufacturer could expect to earn around \$1.24 per bottle before fixed costs. A new food entrepreneur working by hand, however, would incur an extra

30¢ per bottle in labor and facility costs, meaning they would only clear \$0.94 per bottle, 25% less than in an established, fully automated facility.

New food businesses typically can't price their products dramatically higher than the range consumers are used to paying, yet the mature nature of the food industry in the United States means current prices typically reflect high levels of automation. To stay competitive on price, new food processors face downward pressure on margins that makes funding investment in equipment from earned revenue difficult.



While some manual and semi-automated equipment exists for filling liquids, for other applications intermediate options simply seem not to exist. Staff at the Center for an Agricultural Economy have struggled to find suitable peeling/chopping equipment to automate production of their Just Cut products (a line of lightly-processed local vegetables targeted at the school and hospital markets). Demand has expanded beyond what they could economically meet with hand work, yet specialized equipment such as carrot coiners cost tens of thousands of dollars and are engineered to process hundreds or thousands of pounds per hour, far exceeding the packaging and storage capacity of the current facility and more than the local sales of Just Cut products can support (Matthews). Even when the money can be found for one piece of equipment capable of processing food at a much higher rate, to use it efficiently often requires upgrading other equipment in the production line. When the Western Massachusetts Food Processing Center installed a 10 foot Liquid Nitrogen Tunnel to produce individually quick-frozen (IQF) vegetables, for example, they also had to invest in several new steam kettles and a new dicer to chop and blanch vegetables quickly enough to keep up. The machine, a Martin/Baron Model MBI 1-30-0006-01, was purchased used for a "bargain" \$20,000. By the time the expense of repairs, custom plumbing, and a reinforced concrete pad for the liquid nitrogen tank were factored in, the installed cost of the system came to more than \$100,000 (Waite).

BALANCING COST, EFFICIENCY, AND FLEXIBILITY

Unlike service industries, manufacturing of any type has many upfront costs (product development, insurance, licensing, facility, materials) before sales can begin. As illustrated above, the capital expenditure necessary for the automated systems to streamline food processing can add up quickly. This has important implications for entrepreneurs attempting to bootstrap their businesses, as well as those starting from a disadvantaged social/economic background. Because much of the equipment used in food processing is highly specific (the type of filler used, for example, depends on the product's viscosity and uniformity; the same filler wouldn't be used for both beverages and chunky soups or salsas) it also means that new food businesses face a tension between efficiency and flexibility.

While the efficiency that comes with automation is critical to driving down unit costs, it can come into direct conflict with the need for flexibility. According to the U.S. Specialty Foods Association, retail sales of specialty foods hit \$94 billion in 2015, up almost 20% since 2013 ("State of the Industry: 2016").

One of the main drivers has been an increase in product innovation, with examples such as Hampton Creek's Just Mayo and The Impossible Burger grabbing significant media attention. The importance of product innovation means having a production facility flexible enough to introduce new products in response to shifting consumer tastes. This is particularly important for new food businesses, which may still be developing products, adjusting recipes, and trying to find their market niche. Investing heavily in the equipment to streamline production of one product can constrain a company's ability to pivot or expand their product line.

CHALLENGES COMPOUND FOR COMPLEX PRODUCTS

New food businesses navigate the tradeoffs between cost, efficiency, and flexibility with every piece of equipment purchased. This is a difficult enough process when projecting sales for a single product with simple automation needs, as in the hypothetical beverage example above. Most food manufacturers, of course, produce multiple products. To illustrate how quickly the equipment issue compounds, take the example of a ready-to-eat product such as chilled vegetable soup. To ensure product safety requires multiple steps, with the potential for automation and specialized equipment to add efficiency (and cost) at each:

- **Vegetable washing.** By hand in a simple prep sink vs. using high-throughput automatic washing stations.
- **Vegetable slicing/dicing.** With a simple chef's knife vs. using commercial grade food processors, the largest and most costly of which are capable of processing thousands of pounds per hour.
- **Cooking.** On the range in stock pots vs. using steam-jacketed kettles holding 100+ gallons or continuous-feed rotary blanchers.
- Packing. By hand vs. using automated fillers, cappers, and labelers.
- **Chilling.** In the walk-in cooler (limited by the compressor, only feasible for small batches) vs. using a blast chiller or piping finished product through a custom cooling system.

In this more realistic example, the trade-off between capital expenditure and unit efficiency happens at each of six different steps. The potential labor savings are enormous, but the investment needed adds up quickly.



Processing carrots at Vermont Food Venture Center, Hardwick VT



Frozen vegetable products from Western Mass Food Processing Center, Greenfield MA

SUMMARY

The U.S. food processing industry is mature, dominated by a relatively small number of diversified behemoths and a growing wave of new food businesses bent on disrupting the established order. Shared use kitchens and culinary incubators are one means by which these new entrepreneurs are overcoming barriers to entry [see companion paper The Culinary Incubator Business Model], however the high capital cost of equipment, and a dearth of options geared towards small to mid-scale production remain a serious challenge. The global food and beverage equipment market is highly fragmented, with the few big players targeting large food processors and much of the growth happening in the same regions where demand for processed food is rising most rapidly: Asian countries (particularly China) and emerging economies such as Brazil. The small to mid-scale equipment being produced for these new and growing markets is not always accessible to U.S. businesses, or compatible with existing systems, and can be more



Western Mass Food Processing Center, Greenfield MA

difficult to maintain and repair. Equipment is an expensive investment that is difficult for new food entrepreneurs, especially those with limited access to capital, to justify before demonstrating traction for their products. At the same time, lack of automation means higher labor costs and lower margins, and makes it more difficult to launch a product and scale production.

RECOMMENDATIONS

Equipment Manufacturers

- Get more and more-affordable options into the marketplace. The rapid growth of the specialty food industry and the explosion of culinary incubators around the country points to a rising wave of small food businesses. Many of these businesses are tapping into generational shifts in consumer tastes towards artisanal food but still need the efficiencies that come with automation to compete and succeed. Increased offerings of smaller or inexpensive "entry and mid-level" equipment will find a ready market.
- Partner with culinary incubators to test products and build brand awareness. CommonWealth kitchen, a prominent culinary incubator in Dorchester, MA, has partnered with E3 to test and showcase new equipment. CommonWealth gets to offer clients access to cutting edge equipment, clients get to test and use the equipment before buying, and the company gets rapid feedback from users and a pipeline of potential customers.
- **Consider offering lease-to-own financing.** This model removes the upfront expense that prevents many new food processors from investing in equipment, as well as creating a recurring revenue stream for the business.

Culinary Incubators

- Aggregate demand to allow new or smaller processors to access expensive equipment. Having the right equipment to allow clients to efficiently scale up production is a critical advantage in the growing market for shared-use kitchen space. Developing a specialization (as, for example, the Western Massachusetts Food Processing Center has done with IQF products) can attract a pool of users with similar equipment needs.
- **Explore creative financing options.** Costs can be recovered through usage charges, incubators may be able to facilitate joint purchases, or serve as the recipient for external funding for equipment purchase.
- **Partner with equipment manufacturers.** As a single access point to many potential clients, incubators are well positioned to develop strategic partnerships with equipment manufacturers, as CommonWealth Kitchen has done with E3.

Funders and Nonprofits

- Help close the knowledge gap about current options. Nonprofits can undertake research into emerging equipment markets and serve knowledge aggregators. Unlike equipment dealers or e-commerce platforms, both of which have revenue-based relationships with equipment manufacturers, nonprofits can act impartially to connect potential purchasers to information and reviews from those who have used the equipment in the past.
- Lower the financial barriers to accessing equipment. The right equipment is critical to the success of many new food businesses. Investing to support the purchase of equipment by shared-use facilities such as the nonprofit Western Massachusetts Food Processing Center, and (through community partnerships) the for-profit Mad River Food Hub, enables them to better help clients succeed. Low-cost lease-to-own programs like the Vermont Equipment Access Program (VEAP; administered by the Vermont Community Loan Fund) are another path to helping new businesses get the equipment they need to succeed.

Government Officials

• Support low/no-cost access to capital for new food processing businesses. Programs like the Vermont Working Lands Enterprise Fund and the USDA Value Added Producer Grants help businesses access the capital necessary to invest in the equipment they need to succeed.

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