

Approaches to Adding Value in Processed Meats

Henry Morris

INTRODUCTION

Adding value to a meat product can take many definitions. For the consumer, adding value is a response to a perceived want or need. To the manufacturer adding value is producing and delivering products in specification to specific customer needs:

- Right Items
- Right Time
- Right Amounts

Edward Deming said *“The next step or process is the customer. The preceding process must always do what the subsequent process says”*.

From an operations perspective, marketing and sales (our customer) directs us to develop a product that meets certain specifications for their customer (supermarket/consumer). We add value to the process by maximizing raw material yields and focusing on operations details by removing non-value added activities. This is accomplished by utilizing innovative technologies in formulation, packaging and manufacturing.

CONSUMER NEEDS AND INNOVATION

Meat processors respond to the consumer and their perceived wants and needs in many innovative ways. Consumers are seeking products that allow ease of storage, preparation, and clean up as part of their time-constrained lifestyles. In terms of convenience, meat processors have responded through packaging innovations by making available many different packaging configurations that address the consumer's need for portion size and re-sealability. We have developed packaging that the product cooks in and thus increasing the convenience of meal preparation, enhances the product and reduces clean up and of course, time.

Operations is constantly being challenged by our customers such as Wal-Mart, Costco, & Sam's to reduce our carbon footprint. It is very important that as we design

new packaging, we look at ways to reduce the amount of packaging as well as convenience of use. We have also responded to our customers and shareholders to discover new and innovative ways to recycle more of the packaging generated through our plants.

Manufacturers are also developing innovative solutions for the consumer by manufacturing pre-cut, pre-sliced, pre-diced products for the inclusion into other dishes that the consumer prepares – thus eliminating time and preparation issues. Consumers are seeking ready to heat and ready to eat food solutions to fit their time constrained lifestyles. The manufacturing innovations that fit these needs include on-the-go packaging providing meal and snack positions any time, any place. Precooked products provide the consumer meal solutions with right sized portions and ready to eat products.

Through innovation in formulation or sourcing, manufacturers have responded to the consumer needs for products that are lower in sodium, leaner and natural and more flavor choices. Sodium reduction is accomplished by reformulation with a very close eye on maintaining the strict food safety necessary to participate in interstate commerce. Consumers deserve a choice. Therefore, we can provide them with multiple levels of source controlled products. Those choices can range from commodity pork, natural or increasingly selective trait products.

Consumers are gravitating to new taste experiences and twists on old favorites. The biggest example of this flavor twist is the prevalence of bacon flavored or bacon added products. These new combinations of old flavors have resulted in many new taste experiences. Bold and spicy flavors are also becoming prevalent as the popularity of television cooking shows has increased the consumers appreciation for new flavors.

MANUFACTURING INNOVATION

Manufacturing operations are utilizing many technologies to deliver the consumer needs, while striving to fit into the manufacturing systems at a fair price and still making a profit. We are constantly searching for technologies to deliver to the consumer the added value product that they desire in an effective manufacturing system. A few of these technologies include coextrusion for sausage products, the utilization of machine vision, and the incorporation of robotics.

Henry Morris
Senior Vice President Operations and Engineering,
Smithfield Foods
200 Commerce Street
Smithfield, VA 23430
henrymorris@smithfieldfoods.com

COEXTRUSION

Coextrusion is an example of innovative technology that is used by operations to satisfy consumer needs and meet operational priorities. Coextrusion systems make the casing as the sausage is produced by the extrusion of a continuous flow of meat batter and a layer of collagen. Material flows continuously and simultaneously through two pumps – one for the meat dough, the other for gel. The extrusion head determines the diameter of the sausage, while the secondary pump applies casing gel to the continuous rope of meat mass. This continuous rope feeds into a brine bath long enough to extract moisture from the casing gel and solidify the round shape of the sausage before cutting into individual links. The links are then predried, liquid smoked, redried, packaged and finally cooked and chilled, all automatically. This technology provides many benefits including product consistency with precise weight control and product uniformity in appearance. The coextrusion system utilizes a cook in package technology which enables to cook the product in its final consumer package which provides extended shelf life, and reduced pathogen risks. By cooking in the package, the links are pasteurized providing an almost shelf stable product with food safe protection. There are also reduced casing costs and environmental advantages since there is no casing disposal.

VISION

Machine vision is an innovative technology that is utilized in many different areas of manufacturing. Machine vision can be stand alone technology or it can work in conjunction with robots or control systems through the use of digital cameras, image processing and subsequent computer processing. Machine vision in operation can be described by a four-step process:

- Imaging – taking an image
- Analysis – analyzing the image to obtain a result
- Communication – sending the results to the control system and
- Action – taking action based on result.

One of the most common applications of machine vision is the inspection of meat products and packages. Just as human inspectors working on assembly lines visually inspect parts to judge the quality of workmanship, so machine vision systems use digital cameras, smart cameras and image processing software to perform similar inspections. Machine vision systems are programmed to perform narrowly defined tasks such as counting objects on a conveyor, reading serial numbers, and searching for surface defects. The inspections of finished product packaging include labels, code dates, seal integrity, and package appearance. The inspection of products includes examining for color, shape or other quality and specification parameters. Vision also allows us to inspect product and raw materials for defects or contamination along with fat and lean ratios.

With the use of vision, bacon can be graded more accurately and thus reducing the operator to operator variation. Vision can be used to provide feedback to equipment such as a bacon slicer. This allows the vision system to take a picture of each slice and determine grade and slicing thickness so that the consumer has consistent slices in their package without any half slice to make weight. This makes the slicer deliver an exact slice count with minimal giveaway and increases the amount of product sold as number one product while reducing the labor involved in grading.

Another example of vision systems is the inspection of product for quality attributes with connection to a control system. For instance, determine fat to lean percentage or belt coverage prior to an oven, and then signal control system to adjust power to match load; inspect finished product and feedback to a control system for adjustment.

Robotics has been around a relatively long time. Robotic technology has been involved in bar code systems, tracking and traceability. The ability to trace product results in reduced costs, but more importantly the ability to account for all product involved when there is a defect issue.

Meat operations are just beginning to recognize the value of using robots in areas beyond palletizing and boxing. As technology advances (especially machine vision), there will be more applications in handling product before packaging. We can eliminate human handling of product and reduce the risk of pathogen contamination. Even for product that will go through a thermal process, it can reduce the load to be treated.

Jeff Burnstein of the Robotics Industry Association reported that in 2011, robot sales increased 60% in food and consumer goods areas. Robots can be involved in and improve each step in the process. Since robots are especially good for repetitive, difficult tasks, their implementation can also cut down on the number of repetitive injuries. In addition to reducing employee injury, and managing varying product sizes, robots can minimize rising labor costs. Using robots to perform repetitive manual labor tasks proves to be cost effective, and workers can take on more satisfying, less dangerous tasks.

Robots also assist in solving difficult and repetitive strain ergonomic issues related to placing stacks of meat manually into packaging.

Meat processing has enjoyed the entrance of high speed robot technology into the packaging processes. USDA-accepted robots, enabled for the food environment, move products at higher rates than manual labor, reduce contamination risk, and provide consistent loading accuracy. Vision sensors are incorporated together with conveyor tracking, which emulates hand-eye coordination. Working with a robot, vision can provide location and orientation of product for the robot(s) to pick. The last piece for further incorporation is the development of innovative

gripping technology which handles thin and thick-sliced meat portions, chicken parts, fish, and cheese with ease.

Robots are also making an impact even farther upstream to some of the initial processing applications where the robot operates directly on the animal carcass. In these cases we see the common theme of increased yield—more consistently precise cuts, no variation due to operator fatigue, and reduced saw-blade usage. Improved sanitation is one benefit through robotics as there is 100% compliance to sanitation procedures, higher sanitation temperatures can be used, and no cross-contamination. There is an increased worker safety benefit as the robots remove repetitive tasks and can manipulate heavy, dangerous tools without injury or muscle fatigue. We have incorporated robotics in all areas of our processing from pork harvest with robotic splitters and eviscerators, to pork fabrication with robotic loin pullers, packaging of processed products from bacon slices to sliced luncheon meats. From a consumers perspective they see added value in consistent products.

One of the issues facing operations and the incorporation of robotics is communication. Almost all equipment suppliers are developing robots for their particular application. Unfortunately, in operations we put together an entire line or system with many different parts and functions. The issue arises when the robots are not integrated with each other or the adjacent pieces of equipment. For example a bacon slicing line has a bacon press, bacon

slicer, interleaver, check weigher, packaging machine, cartoner, and sometimes palletizing equipment. All of these pieces of equipment and the robotic technology must to be able to communicate with each other to slow or speed up the line as the product volume or quality varies. The total line needs to be integrated so that it functions as a single unit.

SUMMARY

Always remember, our goal is to take each product we make, from the time we take an order until we receive cash for that delivered finished product and add value for the customer. We must also examine each step to remove from that operation any or all non-value added activity so we can maximize profit. Adding value from the operations perspective is delivering products to the customer, while addressing their specifications, at a fair price and a profit. Manufacturing operations uses many innovative techniques to accomplish the goal of adding value. Either through innovations, directly with the product, or innovations in manufacturing to produce a safer, more consistent product, the customer receives an added value product that they desire.

REFERENCES

Robotic Industries Association. 2011. North American Robot Orders Jump 41% in First Half of 2011. www.robotics.org/news