Home-style burgers: part 1

Superior grinding and mixing play a big role in the creation of the 'perfect' burger

by Jay Stewart, Provisur Technologies Inc, USA.

Search for 'burgers' on your Instagram app today and you are likely to confirm the importance of two trends affecting the business of ground meat processors and the customers they serve. Pictured on your mobile device will be thousands of gourmet burgers, as well as the teens and millennials who are obsessed with finding and photographing the 'Perfect Burger'.

Yes, this largest generation in history is continuing its love affair with ground beef, but they truly want it 'their way'. To them, that means a more natural, more healthful and wholesome appearance, as well as the superior taste they crave. And millennials are not alone in their quest for a healthy alternative or a less guilty pleasure. Preferences across the generational divide are trending toward a home-style appearance and heft. Whether it is sliders or mega-burgers, every segment of the food service industry is reacting to the changing market dynamics.

So, what's 'premium' today?

Five years ago, a 'premium' burger was nothing but a standard burger or two thin patties with premium toppings and a curated bun. Today's premium burgers are more focused on the meat, be it Angus, Kobe, Sirloin or Chuck. Once selected, a premium process is required to move it from farm to table at a margin that can sustain a processor's business.

How to get started

Just as the market demand for premium burgers has increased, so has the pressure to produce tasty and attractive home-style burgers both well and profitably. To succeed, processors have discovered, requires a premium process and specialised equipment. The process begins, of course, with the selection of the specialised equipment needed to mix, grind and form the protein in ways that will elevate the quality of your raw materials to Instagram-worthy status.

Pre-grinding

Pre-grinding is a production step intended to reduce whole muscle meats and trim to a size that will facilitate blending to a pre-determined lean point. Premium burger experts recommend using a large 19mm hole-plate to accomplish the desired outcome. The principal reason for a larger pre-grind particle size is to reduce the exposed surface area of the particle itself. Larger particles move more efficiently through the material handling equipment and facilitate more positive displacement through the final grinder.

Pre-mixing or pre-blending

There are two generally accepted methods of blending pre-ground batches to the desired lean point: a true pre-blend method and a pre-batch process. In both options, the amount of mechanical energy applied to the raw materials must be minimised. Therefore:

- All product contact surfaces of the mixing equipment must be highly polished to reduce the effects of friction.
- An overlapping and counter-rotating paddle configuration and an unload screw are advised to ensure a timely and homogenous mix. A paddle RPM of 13 has shown to be most efficient.
- The total mix time, including chill time, should not exceed three minutes.
- The contents of the mixing/blending system should be quickly and efficiently discharged at a rate of approximately 816kg/min.
- Discharge is best accomplished with an unload screw rather than with paddles or ribbons through small doors.

Final mixing/blending

To achieve a homogenous mix at the desired lean-point usually requires a final mix or blend. The homogeneity of the batch is critical to assuring the proper lean-point is obtained in each patty, chub or tray. The standard deviation should not exceed 0.24% fat in the final mixer/blender. In most applications, there are also requirements for chilling in the final mix or blend. Bottom injections of liquid carbon dioxide (CO_2) or liquid nitrogen (LN) are the most efficient means to accomplish the chilling of the meat.

Final grinding

Here is where equipment can really begin to make a significant quality difference in the final production of premium burgers. Certain technologies can be credited with improving product quality, increasing grind rates, maximising bone and hard tissue removal and reducing operating costs. The final grinder is used to reduce the particle size to the desired dimension, normally from 1.6mm to 5mm. In certain applications it can be even larger. More than 95% of the meat should pass through the grinding plate on the first pass.

The benefits of this high efficiency include:

- Uniform cutting of the strands is assured.
- Fat/lean separation, pressure at the plate and temperature rise are minimised.
- Hard-tissue elimination is more efficient.

One vital element of the final grind is hard-tissue elimination (bone removal) in one continuous operation. The key to success is preventing hard tissue from accumulating behind the grinding plate. An important design feature for processors to seek is a grinder plate, auger and cone that allow bone and hard tissue to migrate easily to large, contoured removal ports in the centre of the plate. This combination further assures optimal output.

Experts recommend that extraction take place early in the production cycle rather than later. Older, less advanced final grinding systems will remove only very small amounts of this material and discard the material at the end. This methodology has a negative impact on the quality of the finished patty.

By insisting on systems with unmatched meat recovery capabilities, processors can remove a higher volume of quality product from the grinding system and still enjoy higher overall yields. Today's best technologies are producing total yields exceeding 99%.

Because the final ground product has such a high surface area as compared to pre-ground material, low impact methods that reduce meat-to-equipment and meat-to-meat interactions are recommended. Because meat carts, vats, combos and belt type conveyors have very little affect on the material, they are the preferred means of material handling after the final grind.

Conclusion

Utilising the above procedures and practices will result in ground beef with optimum quality with the desired characteristics and texture for forming. Close adherence to the practices will yield a consistent product, batch after batch.

Part 2 will look at better forming techniques and technologies.

Home-style burgers: part 2

Form follows function in the creation of home style burgers

by Jay Stewart, Provisur Technologies Inc, USA.

While superior grinding and blending of ground beef play a big role in the creation of burger taste and texture, it is high quality forming equipment that helps processors to create the handcrafted look that today's consumers associate with the farm-to-table dining style they are willing to pay premium prices to enjoy. Though often associated with younger consumers, Millennials are not alone in their quest for a burger that appears more healthful and 'natural'. Preferences cross the generational divide and are trending toward a home-style appearance, heft and mouth-feel among every age and income group.

How to get started

We continue our process review immediately after the final grinder has been used to reduce the particle size of the ground beef to the desired dimension, normally smaller than 5-mm. Hard tissue has also been eliminated, early in the final-grind process.

The keys to success in premium burger production include both a premium process and specialised equipment. After the proper raw materials have been selected, expertly mixed and ground to exacting specifications, the forming/filling process becomes critical to the creation of the look and taste that will bring customers back again and again Just as improper product preparation can adversely affect the quality of the raw materials, the choice of the wrong forming machine or filling system can cause premium materials to produce formed portions of inferior quality.

Filling systems: choose wisely

While different fill systems are recommended for different meat matrixes, it is often said in the industry that, 'your product determines the fill'. Different systems are designed to provide processors with flexible choices and more precise solutions.

In general, the three primary options available to processors wishing to produce premium burgers can be categorised under the descriptors that leading machinery supplier Provisur Technologies categorises as Standard Fill, Tender-Form and Verti-Form. All three filling systems are designed to deliver a distinctive texture in the formed portion, as well as processing flexibility, consistent portion weight and other features that add value and make possible a home-style product appearance.

Standard Fill: the name says it all

The Standard Fill System is the most common fill system for forming ground beef patties. With Standard Fill, the mould plate cavity is filled through a narrow opening, or slot. The patty is filled from the rear toward the front, causing the product fibres to be aligned in that direction. This fill system delivers the mouth feel that most consumers recognise as having a regular or expected burger bite.

There are many variations of Standard Fill. Different slot opening widths and angles will change the direction of the fibres and their alignment. These options can dramatically change the texture and cooked shape.

Verti-Form fill:

While Verti-Form is a trade name owned by Provisur Technologies, it is, nevertheless, descriptive of a technology that can be effectively used in the creation of unique, premium burgers. Regularly specified for whole muscle products, Verti-Form technology can help produce a unique burger. Its fill opening is much larger than other fill methods, which helps minimise fill restrictions. This larger opening is perfect for the production of patties or chubs with inclusions, such as peppers, onions or cheese. These ingredients are able to pass through the opening intact, where they can be easily identified in the finished portion.

Tender-Form fill:

The Tender-Form Fill System is designed to deliver a distinctive bite that delivers all the quality and taste of a premium burger. The mould plate cavity fills through a series of holes, similar to a grinder plate. This unique design causes the product fibres to stand up through the thickness of the mould plate. When the consumer enjoys the finished burger, he or she bites in between the separate columns. This technology produces the tenderest bite and also enhances the juiciness of the burger. Processors and dining establishments also benefit because the vertical columns produced by the Tender-Form technology allow for a more effective heat transfer, faster cooking, reduced burger shrinkage and faster freezing times.

FAQ: What is the correct forming pressure?

Forming pressure is the measurement of the product's resistance to flow. Cold or stiff products offer more resistance to movement than warm or soft products.

The proper product pressure for your specific application is the minimum amount of pressure required to completely fill the mould plate cavity. Experts recommend beginning with minimal pressure and gradually increasing it until the mould plate cavity is fully filled. Product pressure is not a weight control device. The product density and the volume of the mould plate cavity determine the weight of the formed portion.

Value-added processes after forming

After forming, several other technologies can be used to apply value-added characteristics to the patties. Among these are cubing/perforating and the HomeStyle Patty System. These optional techniques not only improve product appearance, but can also help decrease the amount of time and energy used to cook or freeze a patty, and deliver a 'handmade' texture and appearance.

The Cuber-Perforator is an accessory conveyor that is added directly after the forming machine's takeaway conveyor. The system employs a series of scoring wheels, or knives, that mark the top and bottom surface of the patty. The design of the scoring wheel differentiates the cubing from perforating. Perforating operations are performed using thin blades that almost completely penetrate the patty, causing a knitting action. Cubing is performed with thicker, blunt edged knives. Cubing scoring is often utilised to help freezing and cooking gases penetrate the patties more easily. As such, it takes less time or energy to fully cook or freeze a patty.

The growing popularity of the HomeStyle Patty System (HPS) is due to the irregular, broken edges of the patties it produces. A specially designed Home-Style Patty Conveyor produces that 'handmade' appearance. The combined use of the Tender-Form Fill System with the HPS produces a finished patty unlike anything else on the market today. The HPS provides maximum productivity and superior portion weight control, in addition to the heft and look that today's burger consumers are craving.

Conclusion

The 'Perfect Burger' can mean many different things to different people, but, by any measure, 'perfect' means adding value to the product mix by maximising the quality of any meat matrix and improving profitability in the process.

War on profit waste

The new Provisur Bone Cannon joins the war on protein and profit waste

by Jay Stewart, Provisur Technologies Inc, USA.

Begin a conversation about 'advanced meat recovery' outside the intimate confines of the meat processing industry and you are sure to face many blank or confused stares. Among red meat industry insiders, however, there may be no hotter topic or more important key to next-level profitability.

What other topic, after all, combines the essential benefits of sustainability, waste reduction and labour cost savings? All of these benefits, of course, can be accrued from a robust red meat recovery program using the latest in advanced technology to increase efficiency, reduce processing costs and increase profit margins.

Let us define the opportunity

Advanced Meat Recovery (AMR) requires relatively new processing technology that is used to separate the remaining beef or pork from the animal's bones after the vast majority (90-95%) of the muscle has already been stripped away using conventional techniques.

This new technology uses minimal pressure to separate remaining meat from each bone inserted into the machine, minimising bone breakage, while preventing bone pulverising and grinding. The ejected bone is still recognisable after meat recovery and the beef or pork recovered maintains a high-quality texture that appears similar to ground or minced product of 2-3mm.

This 'new breed' of recovered meat maintains a high value. It is structurally sound and can be further processed. In the Americas and Australia, this product can be blended in various ways with trim or ground meat. Within Europe, it is permissible to use this recovered pork in consumer end products like bologna, meatballs and sausages without further blending.

Talking pounds and pounds sterling

As both labour costs and product values have continued to increase within the beef and pork industries, achieving meat recovery as close to 100% as possible has become the holy grail of many processors. Attaining anything close to this goal without an automated solution, however, is next to impossible.

Today, the average beef processor is sending to rendering between 4 and 8kg of red meat per head processed. Similarly, the average pork processor is selling between 1-2kg of lean meat to rendering per head processed, often at rendering values that are a paltry 10-15% of the value paid for beef or pork trim. Even for mid-volume processors of 260,000 heads per year, the annual value of meat that can be recovered and classified as 'trim' is significant.

Using a conservative 4kg per head recovery level on this easily scalable level of 260,000 beef processed per year, it is easy to calculate a conservative value of beef trim recovered at more than £1.78 million GBP annually. Even after discounting the negligible value received for beef product currently sent to rendering, the average mid-volume processor can conservatively move an additional £1.5 million GBP to the bottom line for each year of AMR technology use.

Additionally, the labour savings accrued from an investment in AMR technology when compared to an automated pneumatic or circular knife system can also be impressive. With far fewer operators required, an investment in an efficient AMR system can often be recovered in as few as nine months and full payback rarely takes more than 18 months. Also speeding payback, the daily yield increases of AMR, when compared to an automated knife system normally exceed 50%.

The process is simple, the rewards are impressive

Created in 1994, the AMR process requires just three pieces of relatively low-cost technology: a Pre-sizer, a Bone Cannon (Press-separator), and a SEPAmatic soft tissue belt separator. As illustrated by the numbers above, the return on this investment can be achieved in a remarkably short period of time.

Here is how the machinery is used:

1) Beef or pork bones with remaining meat after hand carving are transferred from the pre-sizer into the hopper of the Bone Cannon.

2) A press is used to compress the bone and meat, taking care not to crush or severely break the bones. Useful, well-textured product exits through holes in the chamber.

3) Bone waste exits the machine from the bottom to a takeaway conveyor. Good product is piped to a desinewing machine (Belt Separator) to remove any remaining hard tissue.

The high-value product resulting from this AMR process can be used in a wide variety of final beef and pork products. In the USA, Canada, Latin America and Australia, AMR is labelled as trim and is frequently a component in hamburgers, dry sausages, tacos, burritos, meatballs and similar popular consumer products. In Europe, there are multiple labels for this meat but it is generally used in similar end products, depending on national regulations.

AMR boasts sustainability benefits, too

In addition to the financial rewards previously highlighted, AMR contributes significant environmental benefits. Reductions to the waste stream are obvious since less protein is wastefully being burned off in rendering and trucking expenses are reduced. Additionally, better use is made of each animal raised as part of the food supply chain. Corresponding reductions in power and water usage can also be calculated.

With all of these efficiency and economic benefits available to processors, as well as the public's growing interest in the industry's sustainability efforts, it is safe to believe that 'advanced meat recovery' will not remain a background topic for much longer. Expect the Bone Cannon from Provisur Technologies to make some noise in the UK beef and pork industries.

The whole muscle advantage

How to form poultry products with the natural texture and shape consumers demand

by Jay Stewart, Provisur Technologies Inc, USA.

Consumers love poultry. Data show that consumption is up, and that demand is growing – especially for boneless products, thanks to the versatility, convenience, consistent portion sizes and ease of cooking they provide.

Understanding the process of whole muscle forming is essential for processors striving to produce profitable products that have consistent portion size, shape, texture and taste that exceed customers' expectations.

The secret to creating whole muscle portions with similar quality and texture as cut muscle lies in optimal product preparation, appropriate machinery settings along with fill system and tooling selection.

Forming whole muscle pieces allows processors to form consistent weight controlled portions with the whole muscle 'bite' and appearance that customers prefer. Regular portions translate to savings for producers with less giveaway, more consistent cooking time and more effective removal of bone and hard tissue during preparation.

The Five Rules of Product Preparation

The secret to success in forming whole muscle poultry lies in product preparation. Following five basic rules will help maintain the whole muscle integrity of the finished product.

Rule 1: Start with whole muscle. Using large whole pieces of poultry is essential for producing a superior formed product with natural texture. High quality whole muscle product batches must contain no less than 80% full size whole muscle pieces. No more than 20% poultry tenderloins or rough ground trimmings should be used; and of this 20%, no more than 3% should be emulsified skins or emulsified globular fat.

Rule 2: Make base material muscle sizing similar to finished portion size. The size ratio between whole muscle pieces and finished portion sizes is one of the most important issues to be considered. If the target size for the formed portion is 50g or more (sandwich size), whole trimmed split poultry breast pieces would be most appropriate. For final raw portion sizes between 11 and 44g (nugget shapes or tenders), reducing the size of the breast meat through a slitting device or 'kidney' grinder plate will produce a higher quality finished portion.

Rule 3: Marinate and blend product according to established guidelines. Infusing marinade before blending and chilling helps hold muscle pieces together and defines the signature flavour profile. Too little marinade risks poorly flavoured product or muscle pieces well bound together. The recommended amount of marinade is at least 3% of the product volume and no more than 15% of the total mix. Selecting the proper blending equipment that includes vacuum to fully infuse muscle pieces with marinade is critical. Consequently, processors should use a vacuum tumbler, like those made by Lutetia, with carbon dioxide (CO_2) or nitrogen gas injection for chilling to marinade and chill raw meat materials. Using paddle or ribbon style blenders will ultimately cause some degradation in the integrity of the muscle pieces.

Rule 4: Control temperatures throughout the process. Product temperature is critical in the initial preparation stages. If the muscle pieces are too cold or frozen, the muscle will not easily accept the marinade in the desired amount. Improperly chilled product also increases mixing cycle times and challenges muscle integrity. Based on experience, Formax recommends an ideal temperature range of +1.5-3.0°C. Proper chilling produces a more uniform temperature and texture, resulting in more consistent formed portions. A post chill vacuum is recommended to help disperse the gases and improve temperature and textural consistency. When the product is too warm, muscle pieces may not properly hold the marinade, resulting in inconsistent formed portion texture and yield loss.

Rule 5: Gentle handling is everything. While proper product preparation is the most important part of high quality whole muscle forming, the product must be handled gently from start to finish. While binders can hold pieces together, a damaged product will never offer a true whole muscle bite or appearance. Mixing must be gentle enough to maintain muscle integrity during the batching process and proper feed screw and pump design along with fill timing are critical to whole muscle integrity and final product quality. Too much feed screw rotation results in 'overworked' product and muscle pieces will become irregularly reduced in size. In forming, large cavity lobe style pumps should be used to reduce product shearing and emulsification and careful attention should be paid to fill timing to prevent product being damaged by being pushed against the solid face of the filling chamber.

Beyond Preparation

Once the preparation process is complete, attention turns to the fill system, tooling design, and filling pressure, which all play important roles in forming high quality whole muscle poultry products.

The type of product desired will determine the proper fill method. For trim or smaller muscle pieces like nuggets the Formax Verti-Form filling system would be most appropriate. For large whole muscle portions using large muscle pieces Port-Fill would be selected. Tooling design determines more than the finished portion's size and shape; it determines the product's cooking and freezing times, too.

One of the most frequently asked question about forming whole muscle poultry pertains to forming pressure and the amount required to retain the product's natural texture and quality. The weight of a formed portion is determined by mould plate cavity volume, not the product pressure. The three factors in determining forming pressure are product formulation, product temperature, and fill method.

Poultry processors are increasingly embracing state-of-the-art equipment and processes to ensure their products meet the increasing demand for high-quality, whole muscle poultry products. Provisur Technologies' food scientists and applications engineers are always ready to help design systems and processes to optimise customer's whole muscle poultry production.

Automated transfer technologies

New methods of automated raw material transfer are reducing labour, improving hygiene and providing processors with added efficiency

by Jay Stewart, Provisur Technologies Inc, USA.

While many processors of beef, pork, chicken and fish have already optimised both preparation and further processing machinery to maximise efficiency, a select few have discovered an untapped source of profitability in the 'gap' between these stages of production.

Among the best of the intelligent, automated transfer technologies bridging this gap is one aptly titled Feed the Former™, which has proven to be a safe and effective method of feeding ground, shredded and other raw materials from grinders and mixers into multiple formers, stuffers and holding hoppers.

This intelligent, totally flexible automated transfer process is now globally proven technology, producing measurable results, including:

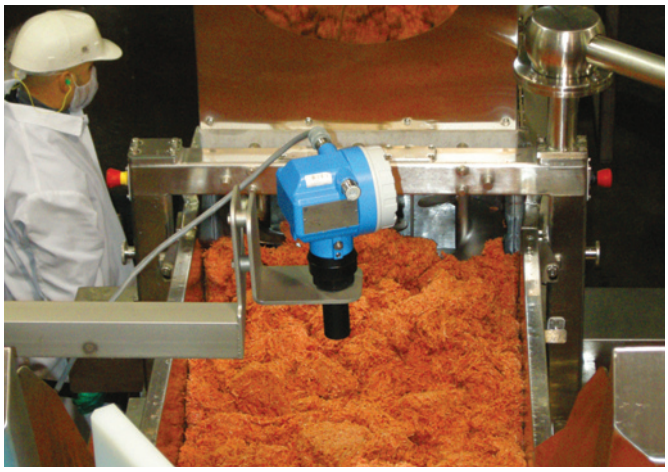
- Improved process efficiencies.
- Substantial capacity and yield gains.
- Labour optimisation and savings.
- Enhanced food and worker safety.
- Water and chemical use reductions.
- Accelerated return on investment.

A close look at the typical transfer process – before and after automation – makes it easy to see the advantages and rewards of conversion to these flexible and automated transfer systems and to understand the rapid return on investment for producers of value added products.

Manual transfer systems have well known flaws

Under the old process of moving product from mixers and grinders to further processing machinery, plant workers would typically load up to 160kg of ground meat into wheeled carts. Those carts are then laboriously moved from the grinder or mixer through the plant to a column dumper where machines like a patty former can be loaded. Carts are frequently overfilled and sometimes jostled, resulting in the loss of edible product, as well as unsafe, slippery footing.

The resulting yield losses from meat spillage can also be significant when manual transport systems are employed. Processors who have



installed a FTF automated transfer system have later reported reductions in edible product loss that range as high as 7%.

Goals set, savings realised

The decision to install an automated transport system is usually evaluated based on factors related to expected increases in product quality (edible percent totals) and better utilisation or savings in labour costs. When measured, the FTF system has consistently exceeded expectations on both of these counts.

In this evaluation process, labour savings are easy to measure. Because the system is extremely flexible and components configured to meet specific application needs, existing personnel can usually be reassigned to more productive tasks than transporting and washing the mobile carts. It typically requires only two people per shift to operate and supervise the FTF system, which is more sanitary and easier to clean.

Integration with existing equipment

In addition to new line installations, automated transfer systems can usually be added to existing plant machinery and processing lines. The option to use conveyors or pumps provides broad flexibility in the design process and allows equipment to be tailored to specific processor needs.

Additional throughput achieved from existing equipment

It is common, after installation of automated transfer systems, to learn that existing machinery like formers now run at a higher capacity than ever before – even when leaving the stroke speeds the same. This added efficiency can often be credited to the consistency automation provides. While people on the plant floor, for instance, are often prone to overfilling the forming machines, which stresses the process at the mould plate level, this quality-control problem is eliminated by automation. Furthermore, the intelligence provided by the control scheme prioritises on-time delivery of raw material to the forming machines, minimising machine idle time.

Greater return on investment realised

In addition to the easy to calculate benefits of added throughput, more consistent product quality and better labour optimisation, processors who automate their material transport systems often discover significant savings in the plant expansion projects they are able to avoid. As one processor expressed, his plant's added efficiency was achieved through automation, without adding brick and mortar or the disruption of current operations due to extensive remodelling and reconfiguring of production lines.