The formula for the perfect burger – part 2

by the technical team, Provisur Technologies, USA.

The focus of this article is to help guide processors of every size to better understand and master the process of producing better burgers. The information provided here is the result of many years of collaboration between processors around the globe and Provisur Technologies' own team of food scientists and applications experts.

The Provisur Technologies family of proven brands continues with the precise forming systems of Formax. Formax offers the multiple filling systems, exacting portion control and unmatched performance to add maximum value to the product.

Filling systems

Different fill systems are recommended for different meat matrixes. The fill systems used for premium ground burger processing are Standard, Tender-Form and Verti-Form. All these three fill systems are designed to deliver a different formed portion texture.

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, located near the rear of the patty.

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 bite or mouth feel that most consumers recognise as having a regular 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 and this dramatically changes the texture and cooked shape.

The Verti-Form fill system is not commonly specified when it comes to burger forming as it is regularly used for whole muscle products. Yet, some of the design features of Verti-Form technology can help produce a unique burger.

Its fill opening is much larger than other fill methods which minimises fill restrictions. This makes the Verti-Form fill especially helpful when a patty or chub contains inclusions such as peppers, onions or cheese. It keeps inclusions intact throughout the forming process, so they can be easily identified in the finished portion.

The Tender-Form fill system is designed to deliver a different, distinctive bite that has all the quality and taste of a premium burger.

The mould plate cavity fills through a series of holes like a grinder plate. Formax's design allows the product fibres to stand up through the thickness of the mould plate, so that when the customer enjoys the finished burger, he or she bites in between the separate columns.

Tender-Form produces the most tender bite and enhances the juiciness of the burger. Additionally, the vertical columns produced by the Tender-Form process allow for a more effective heat transfer, faster cooking and reduced freezing times.

The Tender-Form difference is easily identified by:

- Improved cook shapes and product texture.
- Reduced shrinkage.
- More consistent internal temperatures.

Like the Standard Fill, there are variations within Tender-Form that will change the finished texture and shape. Forming systems equipped with the Tender-Form fill system are the most versatile. These machines are capable of running all of the different fill methods just by changing tooling.

A system that was originally built with the Standard fill system will require an extensive conversion to run Verti-Form or Tender-Form fill at a later date.

Forming process

Mould plates are custom manufactured by Formax to meet the specific requirements of customers.

Virtually any size and shape of the opening can be designed to match very exacting expectations. Because of their very tight manufacturing tolerances, Formax mould plates deliver weight control within ±0.5%.

As little as 1.0g give away per patty can result in loss of potential annual revenue of $125,000 or more per forming line.

That is a pretty bold statement, but let's take a look at the numbers. If you are selling four premium 4.0oz (113.4g) burgers for $1 per lb, but the actual weight of each patty is 4.04oz (114.4g), for every 6,000lb that is ground, 60lb is given away.

Multiply that out by eight hours per day, five days per week and 52 weeks in the year, and that dollar figure grows rapidly.

In the tooling design process, Formax also provides full three-dimensional control over the portion sizes and shapes. So the options are virtually limitless.

The tooling design department at Formax can assist you in designing a distinctive patty that customers will recognise as your product and your brand.

Proper machinery settings

Just as in the mixing and grinding process, proper machinery settings and maintenance practices help ensure repeatable performance and maintain the highest product quality

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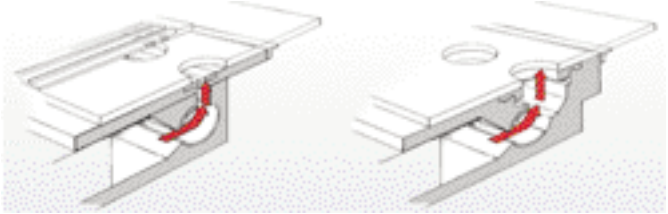
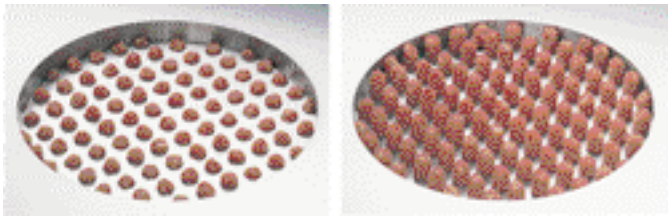
Standard fill system, left and Verti-Form fill system right.



Meat going through the mould plate cavity fills.



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throughout the forming process. At first glance, the Formax forming systems of today seem almost identical to the machinery manufactured almost 40 years ago. But, in reality, the path of the product flow has been constantly evolving, refined to provide the highest degree of food safety and decrease the amount of product working while offering the lowest true cost of ownership.

Systems equipped with Touchscreen PLC have much more exacting control over details like feedscrew rotation and fill timings.

Touchscreen operated machinery also has the ability to record 100 or more product codes for repeatable performance with maximum consistency.

The HomeStyle Patty System.

Multiple languages can also be selected for display on the user friendly touchscreen to suit changing requirements.

In order to make these adjustments properly, the operator must have a full understanding of the functions that are being programmed.

For example, feedscrews do not fill the mould plate cavity. Feedscrews are only designed to advance product into the fill area. Excessive feed screw rotation causes product overworking or over blending. The result to the product texture is similar to increasing the blend time in the mixer/blender – because overworking actually breaks down the product and separates the lean from fat.

Insufficient feedscrew rotation will not bring enough product into the fill area and results in incomplete or partial patties. Proper fill timing is crucial to forming a high quality, premium burger. Fill timing is the relationship between mould plate and forming plunger movement. In some fill applications, it is more desirable to fill the mould plate cavity as the plate is moving.

In other instances, it is preferable to apply fill pressure while the plate is stationary. Adjusting the fill timing changes direction of fibre alignment and changes the formed texture and cooked shape. One of the most important features of Formax forming equipment is that even machinery that is 40 years old is still capable of forming high quality premium burgers given the proper fill system, tooling and machinery settings. The newer control systems just make it easier to perform these adjustments.

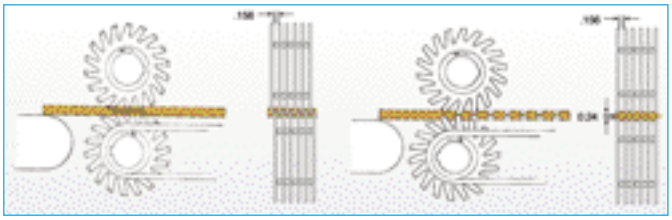
Forming pressure

One of the most frequently asked questions in regards to product forming is 'What is the proper product pressure to use for this application?' In answering this question, it is important to understand the role of forming pressure in the filling process.

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, which is why the forming pressure needs to be adjusted slightly higher.

The proper product pressure for each application is the minimum amount of pressure required to completely fill the mould plate cavity. Formax recommends 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 actual formed portion weight is determined by the product density and the volume of the mould plate cavity.



The cubing operation.

Value-added processes

After the patty has been formed, there are a variety of different options that will change the characteristics of the patty. Two of these options, offered by Formax, are cubing/perforating and the HomeStyle Patty System (HPS). Both options can 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. Cubing operations are performed using thin blades with sharp edges.

The blades are positioned so that they almost completely penetrate through the patty, causing a knitting action.

Perforation is performed with thicker, blunt edged knives. Perforation scoring is normally not as deep as cubing and 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 Formax HomeStyle Patty System (HPS) produces formed portions with irregular, broken edges that produce a 'handmade' finished appearance. The HomeStyle Patty System consists of any Formax forming machine, new or existing, and the specially designed HomeStyle Patty Conveyor.

The HomeStyle Patty Conveyor is available for any of the Formax forming systems, from F-6 to Maxum700. The HPS provides maximum productivity and superior portion weight control with a low cost of ownership.

Conclusion

The 'perfect burger' can mean many different things to different people, but at Provisur Technologies, 'perfect' means adding value to the product mix by maximising the quality of any meat matrix – improving profitability.

While there are many options available in the production of a premium burger, the Provisur family of proven brands offers full control of the raw materials from pre-grind to finished formed portion.

Backed by the superior grinding and mixing of Weiler, the unmatched bone and hard tissue removal of Beehive and the precise forming systems of Formax, Provisur Technologies can help processors of any size produce the truly 'perfect' burger.

Product development professionals and Provisur Technologies' team of food scientists and application experts can develop and design new products for the future today. ■

Table 1. Product quality troubleshooting guide for forming.

Problem	Probable cause	Remedy
Formed product cracking or layering (fresh)	Wrong size fill slot (standard fill)	In general, fill slot width will approximate the mould plate thickness
	Product not blended enough	Increase mixing/blending times incrementally to help evenly distribute additives and equilibrate temperature
	Product too cold	Check formula specifications. Raise temperature until problem is corrected
Partially formed portions	Insufficient product pressure	Gradually increase product pressure until portion fills completely. Do not use excessive product pressure
	Incorrect breather plate	Check for proper mould plate cavity/breather plate evacuation hole relationship
	Tender-Form Fill plate holes plugged	Check grinder knife inserts and plate for sharpness. Check Tender-Form fill plate and stripper plate for sharpness
Excessive product smear	Excessive mould plate/ spacer clearance	Remove nicks/burrs from mould plate and spacer set as per the 'tooling' section of the manual
	Dull grinder plate or knife inserts	Inspect and replace as needed
	Product too warm	Decrease product temperature by cooling in mixer/grinder