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Compare layouts, processes, pros and cons of 3 most common formulation methods in meat processing applications

3 Formulation Methods to Reduce Lean Giveaway for Processed Meats

This white paper outlines the three most common formulation methods to improve yields and eliminate costly lean tissue giveaway in meat processing applications:

Method 1 - Testing

Method 2 - Pre-Blending

Method 3 - Inline Fat/Lean Analysis

Assumed yield miscalculations — even those as seemingly minor as a 1% or 2% difference — has a dramatic impact on profitability for meat processors.

To put this in perspective, we've outlined an example below using 85% lean and 50% fat content to achieve a 73% lean point in a 5000-pound batch.

Each of the formulation methods discussed below — testing, pre-blending, and inline fat/lean analysis — has its advantages and disadvantages, including variations in general cost, equipment footprint, and overall accuracy.

Target Batch:	73%			
Lean Meat:	85%	Amount Needed:	3286	(Lbs)
Fat Meat:	50%	Amount Needed:	1714	(Lbs)
		Weight of Batch:	5000	(Lbs)

Example if Lean Point is +2% higher than above

Actual Batch:	75%			
Lean Meat:	85%	Actual Used:	3571	(Lbs)
Fat Meat:	50%	Actual Used:	1429	(Lbs)
		Weight of Batch:	5000	(Lbs)

Lean Give Away Assumptions

Based on 3 Batches/Hr	855
Based on 2 Shifts/Day	13,680
Based on 5/Days/Week	68,400
Based on 52 Weeks/Yr	3,556,800

285 lean giveaway if lean point is +2% higher

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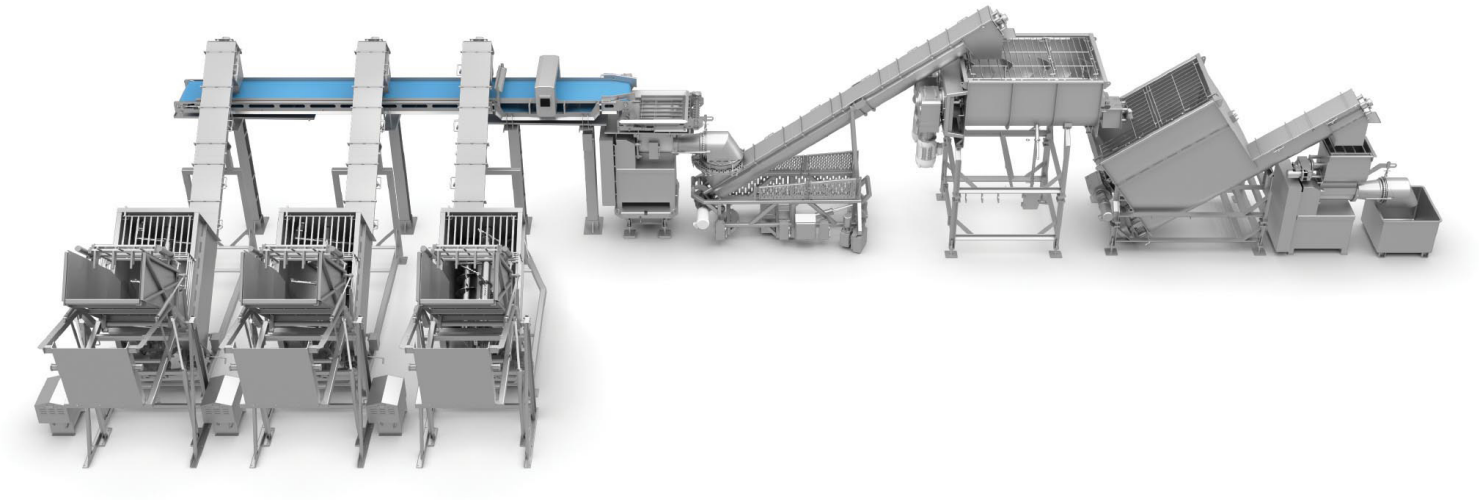
Method 1: Testing



In the testing method, processors take just a few samples from the batch to determine the lean point, or the ratio between fat and lean tissue. Differing lean points of whole-muscle trim are stored in surge loaders and can be metered out on demand. Using calculations based on the general lean point for each surge loader, the final mixer sends a request to the applicable loaders to begin discharging onto the metal-detecting belt and into the primary grinder to be loaded into the mixer. The surge loaders act in a loss-in-weight manner by using load cells to distribute product proportionally for formulation.

In a 5000-pound batch with a target of 73% lean product, for example, the testing program would calculate a requirement of 3286 pounds of 85% lean and 1714 pounds of 50% fat trim to reach the desired lean point of 73%.

The final mixer is also on load cells to determine when the load cycle is complete; once finished, it will then transition to the mix cycle. Upon completing the mix cycle, product samples can be captured manually or through an optional vacuum sampling device, then prepared and analyzed to verify the accurate lean point of the batch. Corrections, if necessary, can then be completed to bring the final batch into compliance.

(Note: The method outlined above is batch-by-batch production. Some processors use continuous blending.)

Method 1: Testing Overview

Advantages

- Least expensive method
- Offers smallest footprint

Disadvantages

- Does not guarantee accuracy
- Consumes more time than other methods
- Requires manual process steps

In this layout, the line starts with three dumpers. One dumper would contain fat, another lean and the third may be chuck or some other ingredient. These dumpers unload into a surge loader. The product travels out of the surge loader to a sanitary belt conveyor with metal detection. The product then goes into a primary grinder. A transfer screw transports the ground product into an overlapping paddle mixer blender. It is from this mixer blender that the samples are taken manually and analyzed to determine the actual lean point. The product is transfered into another surge loader and then to a final grinder.

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Method 2: Pre-Blending

Pre-Blending offers a seamless, accurate solution, but the equipment costs, added footprint size, maintenance, and sanitation requirements must also be considered. In this method, lean and fat are transferred into one of two pre-blenders. The goal is to create a homogeneous batch of each lean point (pre-ground) from which the final mixer can draw.

As with the testing method, product is sampled from each pre-blender and the results are loaded into the formulation program in the control package. Once loaded, product can be formulated quickly, accurately, and without disruption into the final mixer using load cells on both the pre-blenders and the final mixer.

For example, using the same 5,000-pound batch and 73% lean point example from the testing method scenario, we begin by submitting the exact feedback from our analysis of the pre-blended material.

With this analysis, it is quickly determined that the 50% fat is 52%, and the 85% lean is actually 83%, so the program will determine the batch now needs 3387-pounds of lean and 1613-pounds of fat to reach the desired lean point. Because the yield was properly assessed from the beginning instead of incorrectly assumed, no corrections are required during processing.

Method 2: Pre-Blending Overview

Advantages

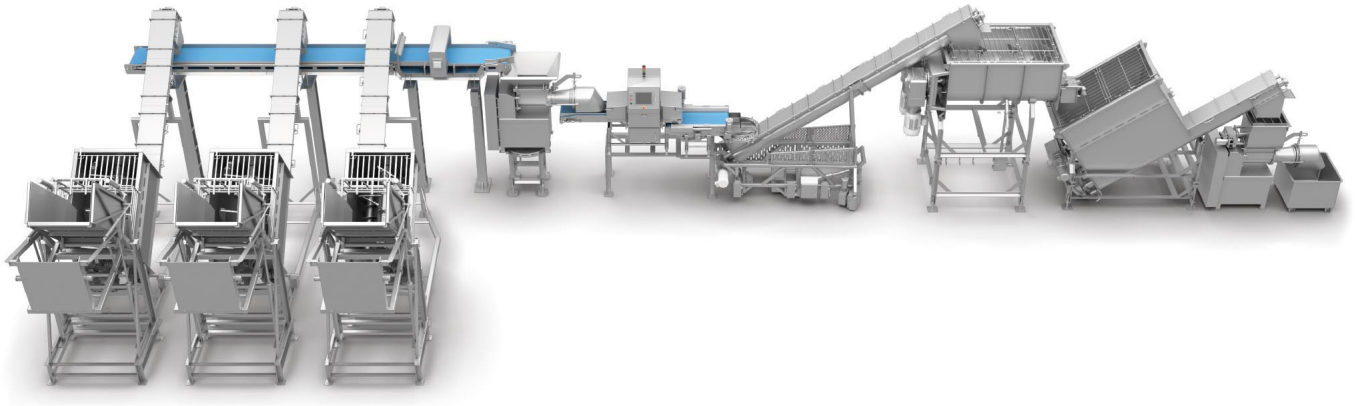
- Ensures improved accuracy
- Eliminates production delays by reducing mid-production downtime
- Utilizes measured lean points
- Eliminates the need for correction as testing is conducted prior to actual formulation
- Higher production volumes with greater lean-yield accuracy, especially beneficial to larger food-processing companies

Disadvantages

- More costly due to higher operational costs, including electricity, cleaning and other maintenance considerations
- Additional equipment requires larger footprint

In this layout, the dumper transfers product into a surge loader. The surge loader then transfers product to a sanitary belt conveyor with metal detection. The two-tier conveyor flips the trim meat for further inspection of contaminants and then product goes into the primary grinder. A pivoting incline screw conveyor transfers product into either mixer blender with both systems equipped with vacuum sampling for lean-point accuracy. The product is then transferred with another incline screw conveyor into a final mixer.

Method 3: Inline Fat/Lean Analysis



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(Note: The method outlined above is batch-by-batch production. Some processors use continuous blending.)

Method 3: Inline Fat/Lean Analysis Overview

Advantages

- Realize return on investment rather quickly despite higher upfront cost
- Ensures streamlined, continuous production with the added benefit of locating foreign material during processing

Disadvantages

- Most expensive method due to up front cost of x-ray units

This layout is like the testing method, with the addtion of the inline fat analyzer equipment. The three dumpers feed three surge loaders. The product is transferred to a sanitary belt conveyor with metal detection. The product then goes into a primary grinder. At this point, a fat analyzer is programmed for in-line testing and the upstream equipment will automatically adjust to tweak lean-points. Then the product travels the incline screw conveyor into an overlapping paddle mixer blender. The product is transfered into another surge loader and then to a final grinder.

Vacuum Sampler

The integration of a vacuum sample system in a Mixer Blender is an efficient way to take product samples. There is no need for equipment and production stops because the vacuum sampler is automatic and can be delivered at different intervals to provide a true test of product consistency.

Compared to manual sampling, the vacuum sample is more efficient and safer for the operator.

Mixer Blender

Mepaco's Mixer Blenders with single or dual agitation, are engineered to specific application parameters. Designed to produce homogeneous blends quickly and efficiently, Mepaco's Mixer Blenders provide results in increased productivity and yields.

For other food processing applications requiring thermal product change, these industrial mixing solutions have designs that include heating and cooling jackets and injection systems with applicable solenoid controls, manifold, injectors and exhaust cover.

Dumper with Pallet Retention

The optional Pallet Retention feature on the DP3000 Dumper, operates by separating the pallet from the combo during the dumping process. This feature reduces the risk of foreign matter getting into the food stream and contaminating the food production process.

The DP3000 Dumper can also include a liner hold-down mechanism that prevents the liner from separating from the combo and falling into the hopper.

Clean Sweep Surge Loader

The Clean Sweep Surge Loader mechanically clears food product between batches. Paddles sweep the sides of the tub and continually push product into the screw.

This solution reduces food waste and eliminates the need for personnel to have to manually clear product.

Options include different agitator configurations, customized safety grating, load cells, pneumatic covers on the screw conveyor discharge and electro-polished food contact surfaces.

Pivoting Incline Screw Conveyor

Pivoting Incline Screw Conveyors provide versatile production possibilities. These systems also have lowering and elevating capabilities for safe and efficient sanitation and maintenance.

Designed with different pivot configurations, articulating conveyors can also be configured wtih CIP (clean-in-place) systems, pneumatically controlled safety grating and covers, and electro-polished food contact surfaces.

Meat Processing Systems from Mepaco®

Grind and blend systems are the cornerstone of Mepaco's expertise. While the scenarios outlined in this white paper address common formulation methods, our team's formulation experience in grinding, complex ingredient blending, and various protein combinations enables us to develop customized solutions specific to each customer's unique application.

Mepaco®, part of the Apache Stainless Equipment Corporation, is one of four business groups under the Apache umbrella; other Apache groups include large ASME tanks, small portable vessels, and contract manufacturing. Available with a range of modifiable options, the Mepaco® product line specifically includes thermal processing equipment, mixers, blenders, augers, dumpers, sanitary conveyors, and material handling systems.

Backed by Apache's expertise in stainless and high alloy fabrication, Mepaco® manufactures meat processing solutions with the resources of a large commercial manufacturer and the customer focus of a small business.

A fully employee-owned company, Mepaco® exemplifies continuous improvement, efficiency, innovation, and commitment to customers. Our team members, who each have an average of 20 years of experience in specialties ranging from application support to equipment fabrication, form an effective team to provide reliable performance, diverse in-house control capabilities, and unmatched production solutions for industrial food-processing customers.

At Mepaco®, our mission is to ensure that all food-processing products are Reliable by Design, which covers performance, safety, sanitary design and durability for many years of use.

This white paper was developed with the collaboration of Mepaco's senior engineering team and application experts, with reference to Apache's archives.

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