Improving product yield and profit margins in poultry dark meat deboning

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It is common knowledge that the popularity of dark meat poultry in the United states is growing. And why not? Chefs and consumers alike agree on the robust flavour profile of chicken thigh and leg meat. It is a welcome change from the blander flavour of breast meat – along with being a moister and more tender product.

As a result, more US restaurants – even white tablecloth establishments – have begun offering menu items that feature boneless, skinless dark meat made from boneless thighs and whole leg meat as the foundation of truly memorable entrée items.

This trend, combined with the increasing demand for poultry dark meat in America due to growing ethnic influences, is causing higher product demand – and an opportunity for poultry processors to obtain better margins for an 'upgraded' product in place of the bone-in leg quarter product that was the mainstay of the dark meat segment for so many years.

But even as plant facilities seek to meet the growing demand for deboned poultry dark meat, they face a number of key challenges, among them:

- Obtaining acceptable yields – and capturing as much meat as possible for the upgraded product instead of it going for a lower-grade product or scrap.
- Issues of product quality – eliminating the presence of bone fragments and knuckles in the deboned product while providing an undamaged product that looks great as well as tastes good.
- Labour and productivity concerns – ensuring that workers are armed with the proper training to debone dark meat product in sufficient volume – along with avoiding carpel tunnel syndrome or cumulative trauma disorders (CTDs) that are often by-products of working on the debone line.
- Compensation and pay issues – the ability to accurately tie worker compensation to product yield calculations as well as throughput (pounds per man-hour) achieved.
- Other factors – including the flow of production, work area layout, and the equipment footprint required for efficient dark meat deboning activities.

The YieldPlus system offers more productivity and profits by improving yields and throughput.

Some processors elect to run a debone line or employ automated deboning equipment to satisfy their dark meat upgrade requirements. Both approaches pose certain problems and challenges for operators.

Manual deboning

Depending on the skill level of the operators, manual debone lines using straight knives and/or manual scissors generally deliver yields ranging from about 55% on the low end to around 75% on the upper end for skinless thighs (finished weight as compared to input weight). The degree of operator training in knife usage, the type of product being deboned, and whether or not production incentives are being paid are factors that influence the yields being obtained.

In the case of lower yields, clearly unacceptable amounts of meat are being 'left on the table' along with the bones, knuckles and cartilage.

Labour turnover is usually a concern on manual dark meat debone lines. Deboning is a difficult and tedious procedure to perform well using a straight knife, and it requires focused attention and concentration over an eight hour workshift. Moreover, carpel tunnel syndrome and other cumulative trauma disorders are likely to occur over time with straight knife usage. Training workers on straight knife usage can also be a significant challenge, as it is one of the more difficult labour skills to master. For these reasons, processors find it difficult to attract and retain a skilled workforce for the debone function.

An additional challenge on manual debone lines is the difficulty of accurately measuring yields and other performance down to the operator level. Moreover, whatever calculations are being made often occur after the shift has ended rather than right at the time – and not at the operator level – thereby losing an opportunity to take immediate corrective actions that might improve productivity and performance.

As for the quality of the deboned product using straight knives and manual scissors, it is usually acceptable. Of greater concern is the slow, labour intense process that drives up the cost of production.

Production on manual poultry dark meat deboning lines varies by the operator, but typically ranges from 6-15 thighs per minute. Productivity typically drops off later in a work shift due to wrist and hand fatigue.

Automated deboning

In response to some of the labour and productivity issues encountered with manual debone operations as noted above, automated deboning equipment is an alternative that some plants have chosen to employ. The earliest automated deboning equipment dates back to the 1960s, but most interest and activity have stemmed from the 1990s onward.

Early equipment simply pushed chicken thighs through a rubber diaphragm. These rudimentary designs caused bone breakage along with an unacceptably high incidence of bone fragments left in the meat. Has the equipment been improved in more recent years? Perhaps, but automated deboning equipment continues to cause a number of problems:

- Automated processes often do not deliver matching yields or quality compared to manual processes – with yields typically stuck in the low-to-mid 60% range. Some of the yield loss is due to the presence of bone fragments and the need for rework activities that result in an 'over-trimmed' product – with valuable upgrade meat sacrificed in the process.
- Despite ongoing efforts to improve automated deboning equipment for better product quality, the incidence of bone fragments, knuckles and other unwanted material remains stubbornly high. In addition, the added re-work requirements can result in a finished product that is more 'mangled' in appearance and therefore less appealing.
- For all of the theoretical labour savings that automated deboning equipment delivers, these savings are often offset by the need for additional backup labour to inspect the deboned product and remove knuckles, bone chips and fragments. These 'cleanup' operations can add significant cost to the entire process. It can even result in a higher overall labour requirement than for manual debone lines – along with a lower throughput rate.
- There are ongoing costs associated with servicing and maintaining automated deboning equipment, such as changing wear parts such as rubber diaphragms. The parts are fairly costly and must be replaced often.

Moreover, any unscheduled equipment downtime can cause major headaches and loss of production revenue; such occurrences are inherently not a factor on manual deboning lines.

- Older automated processes tend to require a large footprint, and that is not even counting the re-work stations. More recent equipment designs require less space and are somewhat easier to incorporate into existing poultry cut-up lines. Even so, automated deboning operations typically require more plant space overall.

Service and maintenance

To ensure that automated deboning equipment operates cleanly and efficiently, it is necessary to take a disciplined approach to service and daily maintenance, typically using plant maintenance staff rather than simply plant labour personnel. Among the steps commonly taken to ensure proper automated deboning equipment performance are the following:

- Oil the machine daily.
- Replace diaphragms daily.
- Equipment disassembly, cleaning and reassembly performed by plant maintenance personnel (the daily cleaning operation takes approximately 30 minutes, in addition to a much more extensive two hour sanitation session weekly).

Depending on the model and age of machinery, the yearly maintenance hard cost on automated deboning equipment can range widely, from $25,000 to $55,000 – or even more on older machines.

Finding a better solution

When considering their qualities – both positive and negative – neither the manual debone line nor automated deboning equipment can solve all of the challenges associated with poultry dark meat deboning.

As a result, Bettcher Industries and Gainco have teamed up to offer the YieldPlus Debone/Trim Management System.

YieldPlus is a system that incorporates highly effective trimming capabilities along with sophisticated measurement and tracking to deliver the best of all worlds: high yields, high productivity, a better quality finished product, and improved bottom line profits. YieldPlus systems are designed using modular components.

This means that they can be engineered to fit into any existing (or planned) processing floor operation. They can be set up for single- or two-sided operation, with multiple workstations to accommodate workflow or footprint requirements as well as single or dual by-product takeaway conveyors. But even with this design flexibility, at the heart of every YieldPlus system are four major elements:

- **Automated weighing, distribution and takeaway.**

Incoming product is batch-weighed and automatically distributed to operators at a rate that each individual worker can handle, so no 'offline' training is needed.

Incoming product is automatically distributed to each ergonomically designed operator workstation. A receiving bin holds the incoming product until the operator is ready for the next batch. Batch integrity throughout the entire process ensures individual operator accountability along with complete confidence in the performance tracking data. Also, historical data gauges each operator's performance over time.

- **Debone and trim processes.**

Operator stations are equipped with Whizard Series II Trimmers from Bettcher Industries. These tools, in conjunction with the YieldPlus system, deliver significantly higher dark meat yields compared to automated deboning equipment – often 6-8% more. Increased yields come not only from the trimming tools used, but also from the individual operator accountability and pay incentive functionalities that the YieldPlus system provides.

Deboning procedures using Whizard Trimmers reduce the risk of bone or other foreign matter contamination to near zero. They are also much easier to use than straight knives, reducing the incidence of stress and strain on the wrist, preventing cumulative trauma disorders (CTDs) from occurring, and minimising end-of-shift productivity drop-offs due to hand fatigue.

Moreover, compared to training on straight knives, most workers can become proficient operators far faster – typically in two weeks or less.

Whizard Series II Trimmers also produce a better looking finished product in thigh and whole leg deboning operations because the cut is cleaner; there is no forced separation

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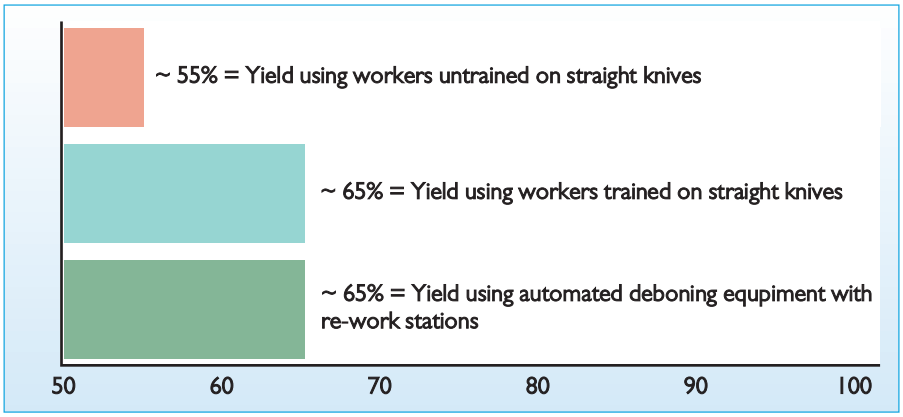
Fig. 1. Dark meat debone lines: Expected product yield using manual knives or automated deboning equipment (skinless thighs).



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of the bone from the meat and the tissue is not damaged.

Bones, knuckles and fat, along with any defective pieces from the infeed batch, are then sent downstream automatically to value-added or render operations.

● **QC inspection.**
YieldPlus systems have integrated inspection stations that enable QC personnel to measure specific quality defects. Multiple modes are available, such as 100% inspection or random inspection, making it easy to closely monitor and coach operators who have a history of higher defects.

● **Data collection and management.**
The YieldPlus system provides real-time reporting of yields, quality, pieces-per-minute and other user-defined data. If desired, performance data can be posted for each workstation 'as it happens', so individual operators receive immediate and objective feedback from their line supervisors.

Statistical reports are available in real-time, covering data such as hourly shift performance, historical performance, and comparisons.

These reports are valuable tools for tracking operator, shift and departmental performance history, as well as conducting employee performance reviews.

If desired, processors can also establish employee incentive pay programs and incorporate those incentive calculations into the reporting.

Use of these online, real-time measurement, accountability and pay incentive functions results in incremental additional yield improvements of 1-2%, which translates into hundreds of thousands of dollars in additional revenues annually for a typical poultry processing plant.

Which system is best?

No one system is perfect for every processor. To help narrow your choices, here are key questions to ask when evaluating different dark meat deboning systems:

- How much money and margin are we currently making on dark meat?
- At what price will we be able to sell the upgraded dark meat product?
- What amount of yield improvement can I expect to obtain with the system?
- Will the system improve throughput without sacrificing yield and quality?
- Does the system improve worker safety and comfort and will it reduce CTD claims?
- Is this the best system to measure production performance at the level of detail we require?
- How much operator training will be required?
- What will be required of my support staff, including maintenance and IT personnel?

ROI comparison	Typical debone operation	Trimmers and YieldPlus system
Total pounds per hour (raw weight)	3,360	3,360
Operators	20	20
Thigh yield	0.64	0.70
Total finished product weight (lb)	2,150.4	2,352.0
Finished pounds per operator per hour	107.5	117.6
Number of production hours	16	16
Finished product weight per day (lb)	34,406	37,632
Finished product weight per week (lb)	172,032	188,160
Finished product weight per year (lb)	8,945,664	9,784,320
Market value of thigh meat ($)	0.95*	0.95*
Annual finished thigh meat revenues ($)	8,498,381	9,295,104
Finished thigh increase/improvement: $796,723		

* Georgia F.O.B. Dock Broiler/Fryer Parts Price - August 21, 2010

Fig. 2. The YieldPlus economic impact: How much additional revenue can a YieldPlus Debone/Trim Management System deliver to your bottom line compared to a typical debone operation? Shown above is a comparative example for a thigh deboning operation, with calculatons based on market value of 95.0 cents for thigh meat.

- Does the system utilise closed or open software architecture?
- How much floor space will the system require?
- Is the system designed for easy sanitation and cleanability?
- What is the expected total 'cost of ownership' of the system (installation, operation, maintenance)?
- How quickly can we 'ramp up' the system?
- How quickly will the system 'pay for itself'?
- Will I be competitive with other plants if I adopt this system?

Warning signals

As you weigh alternative dark meat deboning system suppliers, be sure to consider these additional factors that may affect your final choice:

- Is the reputation of the supplier strong or weak?
- Is the supplier's installed base of systems extensive or spotty?
- How extensive is the supplier provided training and ongoing support you will receive?
- How 'robust' is the design of the system? (Think about components such as automation features, load cells, air cylinders, collection belts, rubber diaphragms, wiring requirements, use of tubs and their quality).
- How 'complex' is the design of the system? Are there more 'bells and whistles' than necessary or too many electronic elements?
- Considering the future, is the system easily expandable? Is it modular? Is it movable?

Operator training

There is no such thing as a 'flip-a-switch' solution for effective dark meat deboning.

The system also requires operator training and ongoing support. Built on decades of experience supporting meat trimming activities in line operations all over the world, Bettcher Industries offers complimentary training that includes:

- Training of workers using a rotation system prior to installation of the main deboning line.
- Bettcher yield specialists on hand during system installation.
- Hands-on training of staff on trimming techniques to increase production speed by 100%+ and increase yields to 70%+ after one month.
- Frequent follow-up visits.
- Advice to production supervisors on managing employee performance plus 'train-the-trainer' consultation.
- On-location support to knife room personnel on blade sharpening, other maintenance issues, and system parts.

Summary

With the rising popularity of poultry dark meat, processors are seeking better tools to optimise product yields, throughput and plant profits.

Traditional manual deboning processes using straight knives can suffer from insufficient yields, product quality issues and unacceptably high labour turnover rates.

Automated deboning solutions, while sometimes reducing labour requirements, often leaves bone fragments and knuckles that affect the quality of the meat and require additional labour to remedy.

The YieldPlus Debone/Trim Management System is an interesting new alternative that delivers higher productivity and profits by accurately measuring operator performance and significantly improving product yields, while also preserving the quality and integrity of the deboned meat. ■