



# **Automation of meat processing**

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# Meat Industry 4.0: A Distant Future?

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## Implications

- The meat industry had experienced a significant transformation over the past century and more so over the past 25 years.
- Automation can now be seen in both primary and secondary processing of meat, but implementation depends on factors such as cost, and availability of a labor force.
- Currently, there is accelerated development in areas such as machine vision and robotics to replace more manual operations in meat processing plants.
- We already see smart meat factories, where conductivity and information are used to control certain operations.



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# Introduction

Automation has catalyzed a significant transformation in the meat industry of many countries in the last 25 yrs. Overall, the meat production chain is complex and affected by many factors, starting with breeding, moving on to farming (e.g., type of housing, nutrition, and veterinary treatments), transportation of animals, primary processing, further processing, and distribution to the end consumer.

**FARM TO FREEZER**  
DIRECT MARKETING ARKANSAS BEEF



Today there is still quite a lot of variation in the degree of automation, where small meat plants usually rely on manual labor, and large ones invest more in mechanization (note: this also depends on geographic location, labor cost, and availability).



VS



## DEEP DIVE

# Meat processors expedite plans to implement robotics as pandemic increases pressure

The future of meat manufacturing could include 3D scanners and automated cutting. Tyson, Smithfield, Cargill and JBS are all looking at ways to incorporate more automation.

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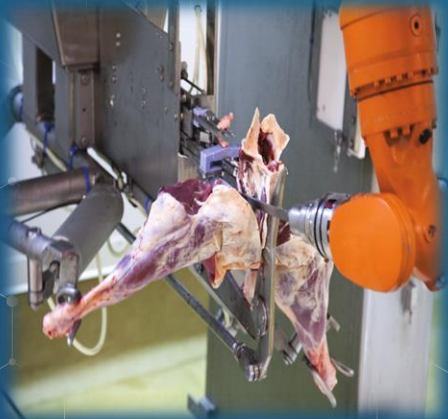


Lillianna Byington  
Reporter



- *Labor availability* (<https://www.fooddive.com/news/meat-processors-expedite-automation-as-pandemic-increases/588166/>). Meat processors have spoken for many years of the difficulty in sourcing labor. For some, this has become so difficult that they are turning to automation purely to supplement recruitment efforts.

# HEALTH & SAFETY



**Figure 3.** The Bladestop bandsaw that stops within milliseconds to minimize injury to operators.



**Figure 4.** The Beef Boning Unit eliminates the heavy pulling when boning out Beef aitchbones and knuckles.

# CONSTANT & CONSISTENT THROUGHPUT



**Figure 1.** Modern fresh and processed meat plants (a) fully automated forming line, capable of producing 200,000 identical nuggets per hour; (b) in line automated sorting at a fresh poultry processing plant. Courtesy of Marel.





# PRODUCT BENEFIT

*Product quality. With automation—particularly of cutting—you are likely to see improvements in the “quality” of the product. This may be as simple as the visual aesthetics, or it may be improved contaminant control or some other variable again.*

*Shelf life. Factors contributing to improved shelf life include lack of human contact and less surface area on the cutting face. Both factors are commonly improved through automation. Shelflife is particularly relevant for exporters who face a long freight time to get their products to market.*

# ACCURACY AND YIELD IMPROVEMENT



With improvements in automated processes—particularly in sensing technologies—accuracy of automated processing is constantly improving.

With improved accuracy, downstream processing can be easier, rework can be minimized, and it may be easier to Meet a customer's expected specification.

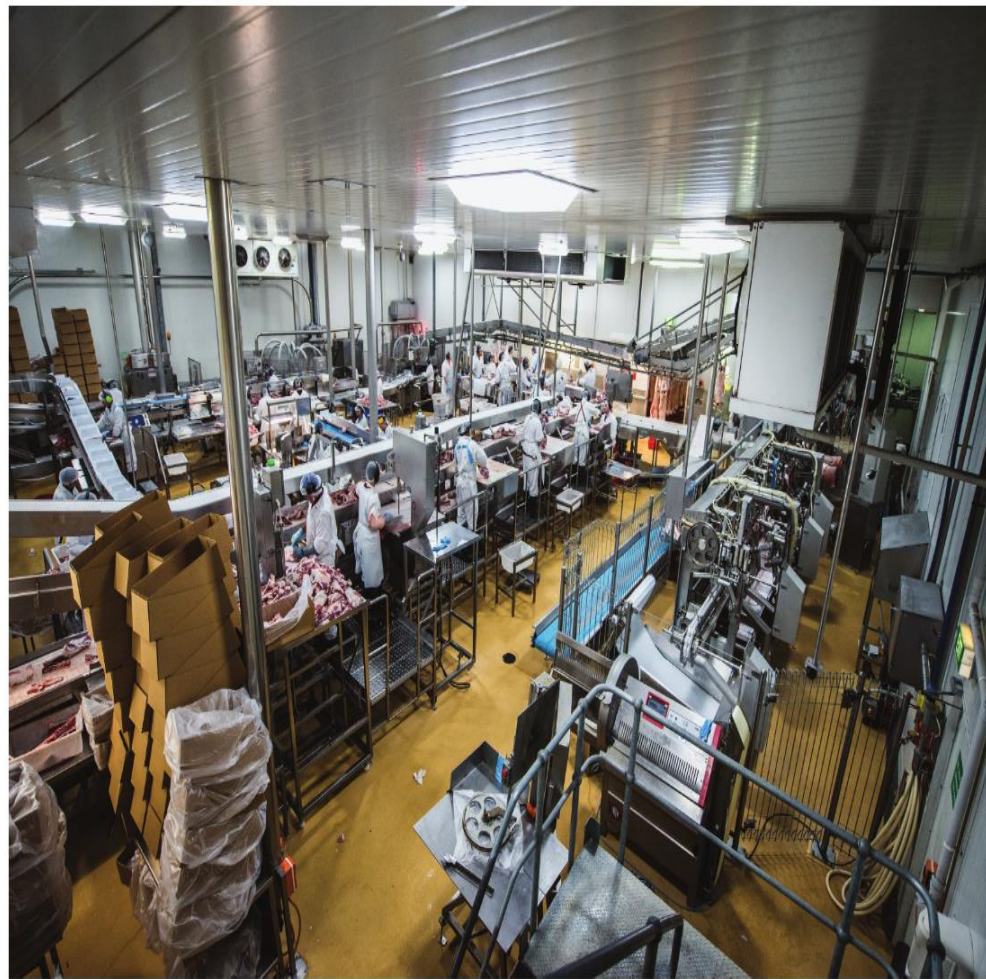


Figure 5. The consistent and predictable throughput of automated processing sets the “heartbeat” of the room.

# OPTIMIZATION

- ◆ Traditional grading provides the processor with a prediction of the value of a carcass to them based on the expected yield of finished cuts.
- ◆ With advances being seen in automated grading technologies (e.g. X-ray based as shown in Figure 6), we are getting better at predicting the expected value of the finished cuts for a range of cutting scenarios.

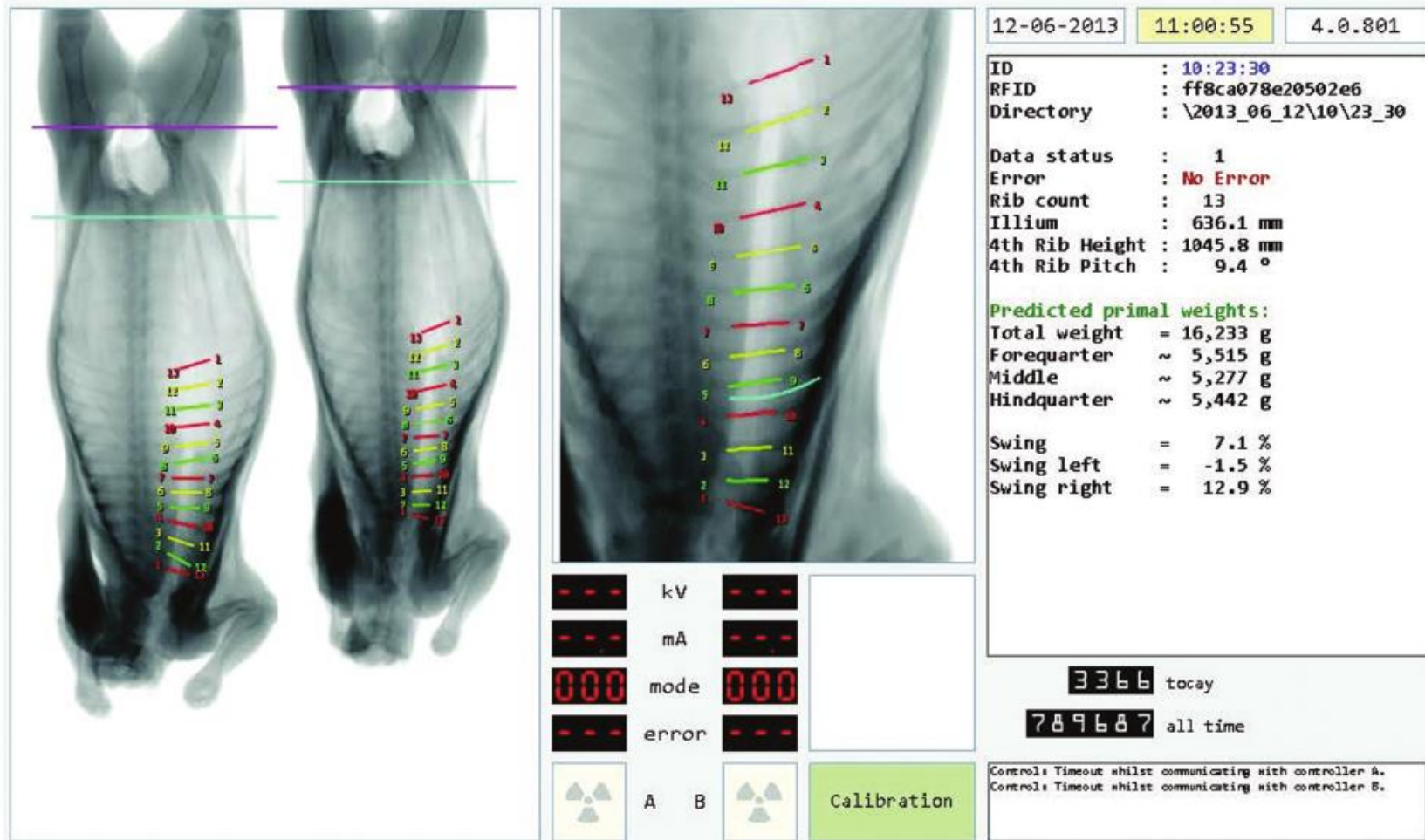


Figure 6. Technologies such as X-ray enable better prediction of the value of finished cuts.

# CURRENT CONDITION IN HOMETOWN





**Figure 2.** Computer-controlled meat portioning, using automated weighing and laser scanning (see the red line at the front) to get highly accurate target weights at a very fast speed (up to 700 slices/min). Courtesy of Marel.

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## Table 1. Advancements in line speed at primary broiler processing plants

Year	Line speed	Automation
1970	3,000	De-feathering
1975	4,500	Evisceration
1980	8,000	Meat harvesting
1990	9,000	Electrical stimulation
2000	10,500	Cut up
2010	12,000	Unloading
2015	13,500	Deboning
2020	15,000	Portioning

Data 1970 to 2015 from [Barbut \(2015\)](#).



# BIG CONCEPT

MODERNIZE ON MEAT  
PROCESSING PLANT THROUGH  
AUTOMATION  
COMPREHENSIVELY.





WANT BIG IMPACT? USE BIG IMAGE.

# CONCLUSION

It is fair to say that the challenges for machine builders in developing automation and for processors in adopting it are high. But they can be overcome, and the solutions are improving all the time. With care, and the right circumstances, the justification of automation can be very compelling. Will we see full automation lights-out operations in the future? Who knows...?



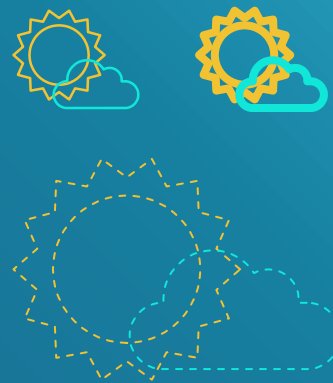
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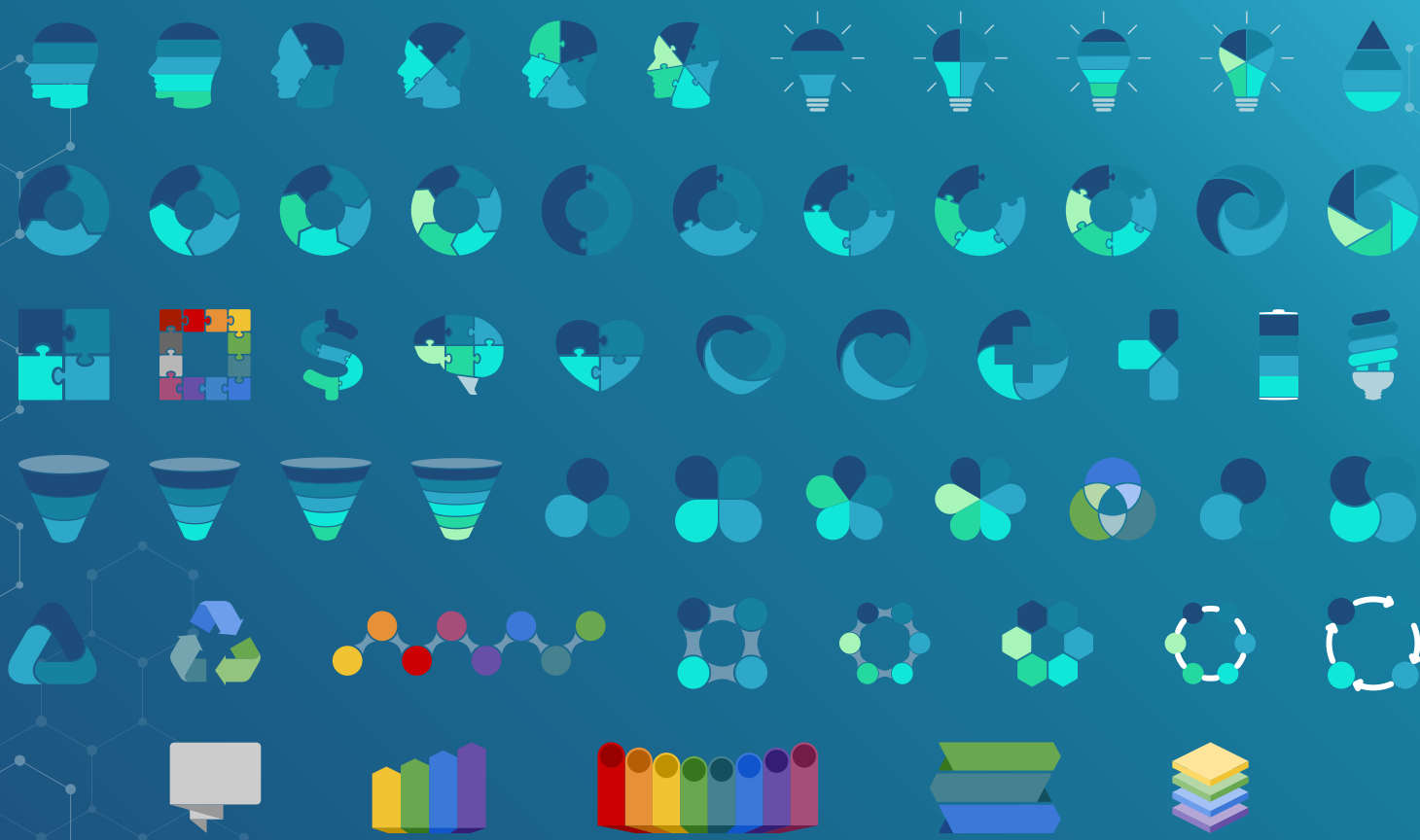
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