

# CASE STUDY

## One pork belly sorter does the work of four people

### PORK BELLY SORTER

#### THE CHALLENGE

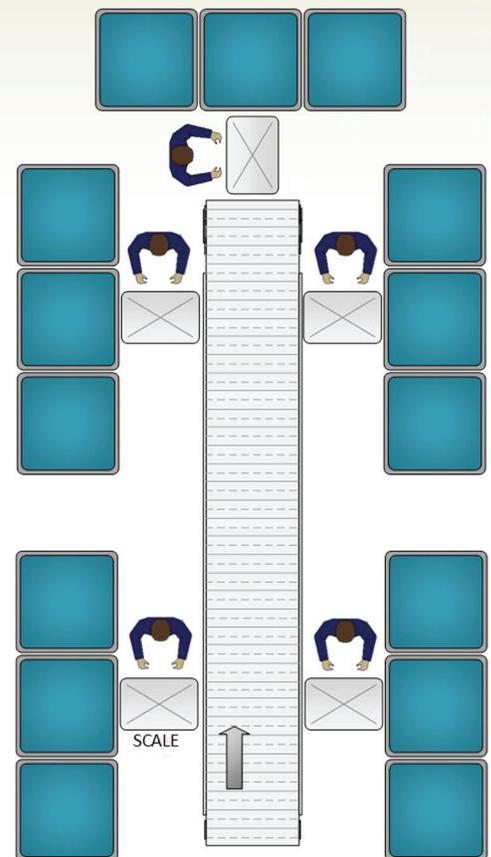
A pork processor was using an outdated belly sorting method in which five employees took bellies off a conveyor line, weighed them on a static scale, and then threw them into combos by weight (See fig. 1 below). This sorting method was *inefficient* in the following ways:

The conveyor was supplying bellies at a rate of 2,000/hour. That means that each operator had to grab a belly off of the conveyor, weigh it and sort each belly in less than nine seconds in order to keep up with the conveyor's pace. With bellies normally weighing approximately 20-lbs each, the manual exertion takes a toll on the body. Workers compensation claims are never far behind.

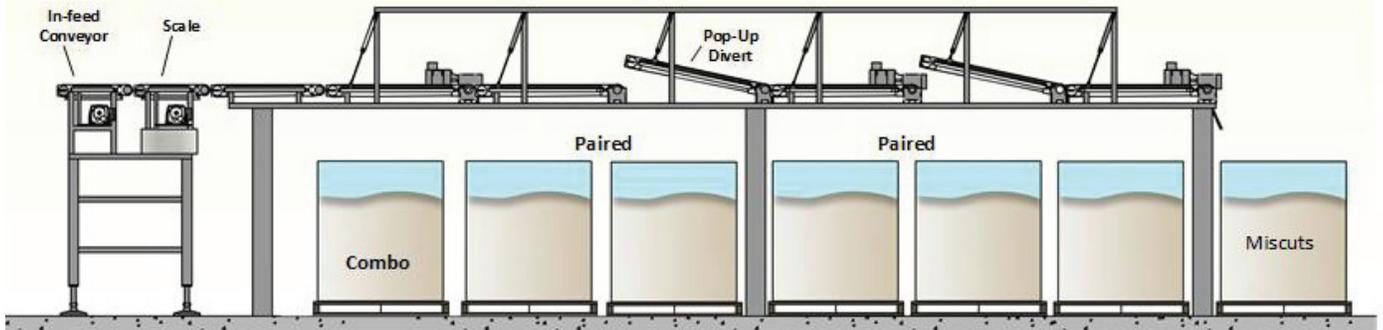
Weight data and belly quantities were also very difficult to collect. The plant didn't have any way to know how many bellies of a given weight range they were putting out or the outgoing net weights. That could lead to a major problem because incorrect categorization could lead to under/over-weight product going to the customer. At that point, the customer has the right to reject the product or they might not pay a premium for certain sizes.

In addition, one can see that combos (blue squares *right*) for various weight ranges are laid out in a chaotic manner. Workers would have to throw bellies into specific combos and would have to find another combo of the same weight range if theirs was full. This increased the chances that an employee could accidentally miscategorize a belly.

The process lacked consistency and the chance for human error and product damage was high. The only real solution for this problem was *smart automation*.



**FIG 1.** Manual Pork Belly Sorting Line (plan view): Pork bellies will arrive on the conveyor where workers will weigh and throw them into similar weight combos. The process is very labor intensive and prone to mistakes.



**FIG 2.** Automatic Pork Belly Sortation System (elevation view): Pork bellies are automatically weighed and then fall into the correct weight-based combo via pop-up diverts. This system is very accurate and requires only one person to manage the entire process.

## THE SOLUTION

We designed a sortation system that eliminated worker strain, significantly reduced sorting errors and reduced overall worker labor. The system was called an **Automatic Pork Belly Sortation System**.

## HOW IT WORKS

Pork bellies transfer from the customer's incline conveyor (*not shown*) and move onto the in-feed conveyor. After crossing the in-feed conveyor, the bellies then progress across the conveyor scale. Sensors installed on the scale detect the product. After the belly is completely on the scale, it begins to take in-motion weight readings. This in-motion weight value rivals most static scales.

The scale sends this weight information to the system's controller, which acts as a hub for all of the data and decision making. Once the product has been weighed, the controller takes the weight data and deciphers which combo the belly needs to drop into. An encoder determines the position of each and every belly on the conveyor. The controller uses this positional information to determine the activation of the appropriate divert.

The sorting conveyor is comprised of six different sections that have the ability to pop up in order to allow product to fall into combos directly below the conveyor. The controller activates these diverts at the proper location for each product ensuring that it reaches its intended destination. When the diverts activate, pneumatic cylinders lift the leading edge of the appropriate section upwards.

## THE COMBO ARRANGEMENT

The pop-up diverts correspond to one of seven combos (See fig. 2 above). Most bellies weigh between 18 to 22 lbs, so multiple combos are set up to reflect this common weight range. The first divert opens to a combo for bellies under 18 lbs, the next two are paired for 18-20 lb. bellies, and the following two are paired for 20-22 lb bellies. The last pop-up divert is used for product over 22 lbs., and a final combo was positioned near the end of conveyor to catch any bellies that didn't sort because of issues (i.e. snowball, miscut, etc.). The operator is equipped with a button near the scale that allows him to automatically divert bellies off of the end of the conveyor because of visible miscut issues.

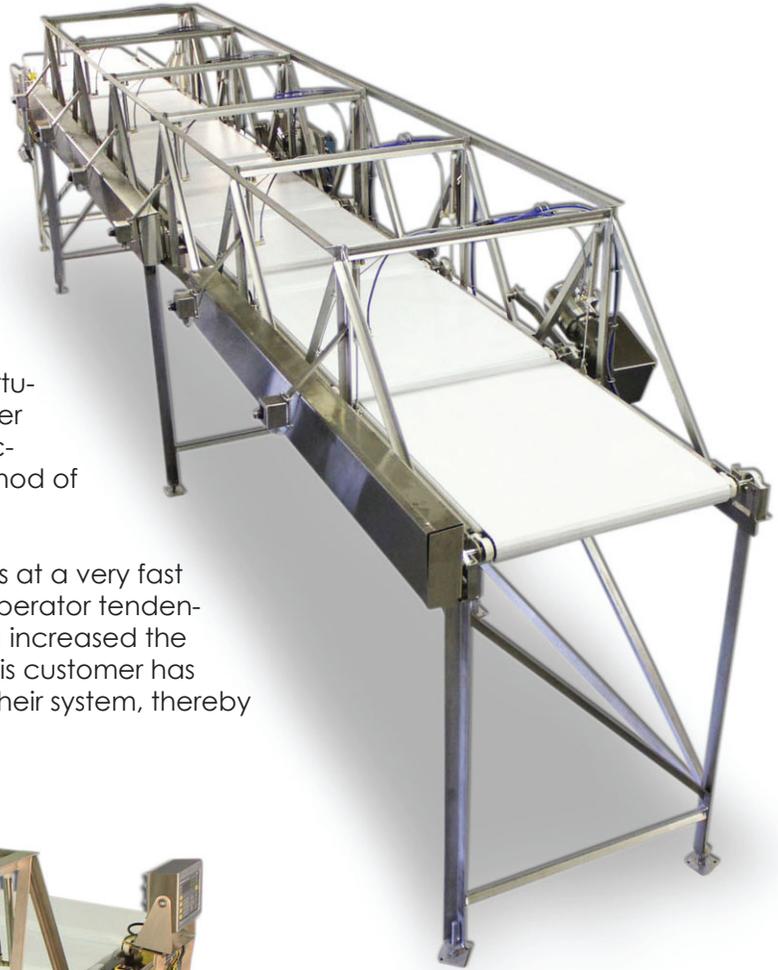
Swapping out combos is the final step in the process and we made it easy with an innovative feature. We installed lights at each divert that illuminate whenever a combo is full. A full combo can be based on weight or belly count. This lets the forklift operators move the full combo to the next stage and bring in an empty one. We installed a button at each divert that the operator hits when the empty combo is in place. This notifies the controller that the pop-up divert can be used again. This setup ensures that there is no downtime while combos are being swapped.

## THE RESULTS

The customer realized very quick savings and fast payback. While one person was still needed to manage the sorter, they were able to repurpose four individuals to other areas of the plant. With each person costing between \$35-45K per year, the system paid for itself very quickly.

Additionally, repetitive motion injury was virtually eliminated because personnel no longer need to throw the bellies. The sorter also occupied less space than the traditional method of sorting, resulting in more efficient floor use.

This customer is now able to sort pork bellies at a very fast rate with minimal mistakes. Elimination of operator tendencies (such as human error, fatigue, apathy) increased the consistency of sorting results. In addition, this customer has additional sorting capacity designed into their system, thereby accommodating future plant growth.



Automatic Pork Belly Sorting System



*With a little modification, this Automatic Pork Belly Sorting System can also sort hams, ribs, and loins.*

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