

# Boxing Clever

## Problem Cause Solution: Checkweigh

### PROBLEM

The production line packed product into individual cartons, passed them over checkweigh and metal detection machines before final collation into an outer carton. The reject rate at the metal detection machine was high and once product had built up in front of the reject bin's level sensor, the whole line would stop. The operators would empty the reject bin, restart the line and immediately have to go back to empty the bin again. They believed that the problem had always been there but that it was now worse due to the recent increase in line speed.



*We discovered the real problem was not the volume of rejects, but the type of rejects...*



A small team made up of operators and support personnel, observed the problem closely and were encouraged to apply the problem solving training that they had received, starting with clearly defining the problem. They began by making the following observations:

- Some of the boxes were underweight but more than half were within weight specification
- 2 boxes were often rejected together, not just 1
- The number of rejects was higher on start up
- The number of rejects was higher at higher run speeds.

### CAUSE

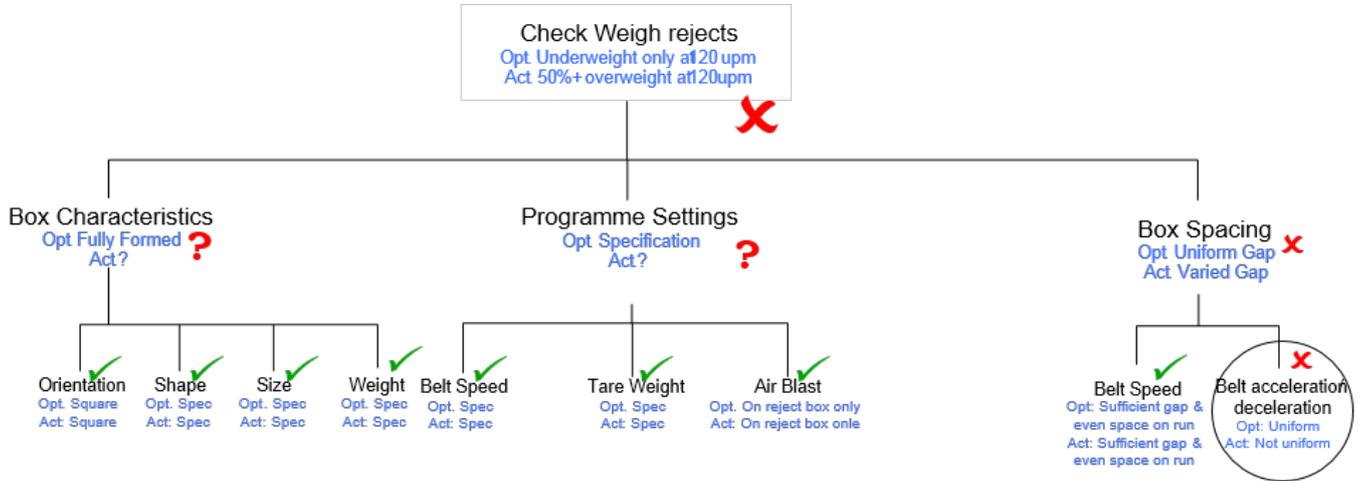
Many theories existed as to why correct weight product was being rejected, including that the line was running too fast to cope. To avoid gut feel, the team were encouraged to develop the top level drivers which could cause such rejects. They determined that:

- The product must 'sit' within the weighing area of the machine, hence the box characteristics of size, orientation etc are important
- There must be a space between products so that the checkweigh machine can weigh each box independently
- The machine settings must enable good product to pass whilst out of specification product must be removed.

The operators had never had the time before to stand back from the problem and observe it like this. What they discovered was that the real problem was not the volume of rejects but the type of rejects. Correct weight product, which should not have been rejected, was being rejected alongside underweight product. This dramatically increased the number of rejects and caused the reject bin to fill up more quickly.

## CAUSE

Each of these top level drivers was developed further as can be seen from the following driver tree:



Measuring, and comparing to optimal, all the box characteristics and the programme settings revealed no errors.

To observe the box spacing the line was videoed and the video played back in slow motion. The spacing between boxes appeared to be consistent when the line was running but one of the team members noticed that the spaces between boxes after the line had stopped was not consistent. The behaviour of the boxes when the line stopped and restarted was recorded and reviewed. The boxes appeared to 'slip' on the belt during start-up and shutdown causing the gap between them to change. Boxes where the gap had closed significantly were then

treated as one unit by the checkweigh machine. They were rejected, being over the maximum permitted weight, hence why there were more rejects noticed on start up than during normal running and why 2 boxes were often rejected together. Increasing the line speed only exaggerated the problem. The root cause was found to be due to the uneven acceleration and deceleration of the transfer belt

The poor positioning of the reject shut-off sensor made the symptoms worse. The operators noted that, despite the reject box being able to accommodate a minimum of 10 rejected packs, the sensor tripped the line off after only 5 rejects.

## SOLUTION

Once the root cause had been identified it was easy to implement the solution; acceleration and deceleration settings could be adjusted within the control panel. The action log is shown below:

DRIVER	ROOT CAUSE	ACTION	WHO	WHEN	EFFECT OF ACTION
<b>Belt acceleration / deceleration</b>	Start/stop causes boxes to gather up – when too close they are rejected by checkweigh	Reset acceleration / deceleration in control panel to sustain box spacing	CT (Engineer)	Complete (5th May)	Significant reduction in rejects

Once the adjustment had been made, only underweight boxes were rejected. The bin required less frequent emptying but to assist further, the line shut off sensor was repositioned higher up in the bin increasing the amount of product that could be rejected before triggering a line stoppage.

**The final result - significantly fewer short stops and less frustrated operators.**

