Case study

Mass vision: identify bad steel inside a sealed box

Summary

We were able to perform work in hours that used to take days, and in a non-destructive manner that could have discovered the problem before it reached customers.

Situation

Customers complained of a rusting product. This was traced back to an unauthorized material change by the supplier. The supplier had adjusted the contents of the stainless steel, which was hard to notice and to test for.

The company sorted a few palettes into good and bad product. This required several days of work. First, boxes are opened. Then batch numbers are checked. Then a water spray test is performed: after several spray cycles, the product is set aside for a few hours, then checked for rust. This test is destructive and the product can no longer be shipped as new, even if found not defective. Finally, some bad batches were recognized.

Then at the warehouse, two days of full time work was spent examining a few hundred returns. Each package was opened and inspected for batch number. Bad batches were set aside, and good ones repackaged.

Product

The product was a stainless steel mandoline slicer, like this:

Work performed

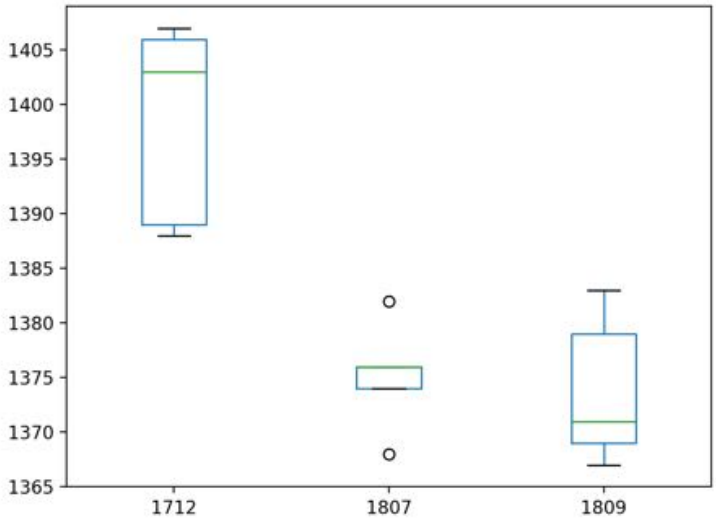
Measure the mass of two known bad batches and one good batch, to determine if they were differentiable. 5 units from each batch were tested. This process took a few minutes.

product set to test

measuring with our system

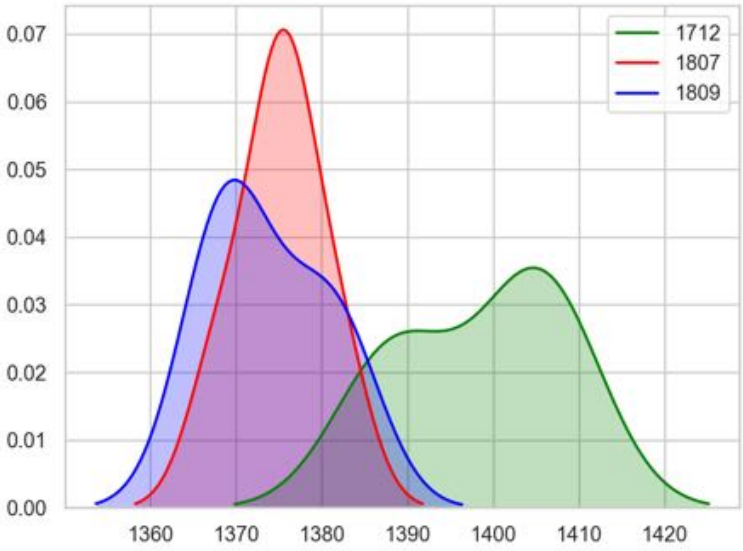
Results

Looking at the range of weights in each batch, there was a clear separation of the good and bad groups with no overlap. The vertical axis is weight in grams, and the good product is the left most box in the plot. The break between good and bad is around 1385 grams.



(Y: WEIGHT IN GRAMS, X: BATCH NUMBER)

If we look closer at the distribution of samples, it is clear the two bad batches are essentially the same. This means each item can be tested individually without knowing the batch number in advance; the three groups are more like two groups: good, and bad.



(X-AXIS: GRAMS)

Next Steps

Build a predictive model and perform statistical analysis development to allow discovery by running all units through the measuring process in quick succession.

Create the mathematical model and software to catch this situation if it is not known in advance that there were good and bad products; it was not unexpected to find two disparate means when the batches were analyzed as separate groups.

A predictive statistical model would allow discovery by running all units through the measuring process in quick succession. If each item were checked before shipping, it may be possible to identify before customer complaints and returns occurred in the first place, saving time and money.

Appendix:

measurement details, mean and std in grams:

	1712	1807	1809
count	5.000000	5.00000	5.000000
mean	1398.600000	1375.20000	1373.800000
std	9.343447	5.01996	6.870226

About Us

Measured Insight is the working name for a new company by *Eric Norman* and *Mark Wachtler* which is creating new technology for logistics.[3] *mass.insight* is a modular system for measuring the mass of an item and learning about it from the data, providing insight that was not previously available even at much higher costs.

They began working on this project full time in October 2018 and agreed to build a system for their first customer in December 2018.

Eric and Mark previously worked together to create the Cinder Grill which shipped over 1,000 units and was acquired. They met in graduate school where they won an international logistics competition run by an MIT club.