



## Multi-Variable Analysis

Altremis Ltd is the only Multi-Variable Analysis consultancy in the UK. We can help your business become more reliable, more efficient, more consistent, safer and in turn achieve exceptional levels of customer satisfaction. In these tough economic times, you need to be at the best at what you do all of the time.

### Overview

Multi-Variable Analysis can help your business with:

- ✓ Problem Solving
- ✓ Optimisation
- ✓ Trend Analysis
- ✓ Gap Analysis
- ✓ Sensitivity Analysis
- ✓ Linking and Overlaying Data
- ✓ Identify Key Process Variables

### What is Multivariable Analysis?

Multi-Variable Analysis is used to make sense of your process and operations and challenge your organisation's myths, theories and norms. It can be used to solve problems, optimise conditions, challenge supplier specifications and help you understand when your processes are at their best and worst.

Altremis Ltd uses a IT tool called Curvaceous® Visual Explorer (CVE) to analyse vast amounts of data and then make sense of it in a visual form. The tool is a depart from the normal statistical graphs, charts and trends. This is something that makes complex mathematical relationships simple and intuitive so that nearly everyone can understand what is happening. They say that maths is the only universal language.... well it is now!

Our experts can visually show relationships between variables and how sensitive they are to your product quality. And because its visual everyone in your organisation will be able to understand it in a short period of time and see things for themselves. As a result gaining buy-in is accelerated and the benefits of change can be realised sooner.

### So what do you have to do?

- Collect historical data.
- The software interfaces with Microsoft Excel. Just provide us with data that is time stamped and put it in an Microsoft Excel file. In the first instance it does not really matter whether this is per second, minute or weekly. As long as the data is representative of your process we can do the rest.
- We can overlay data and make comparisons between product runs and look for differences.
- Tell us the criteria for good quality and bad quality products or services.

### Then what happens?

- Following our analysis, we will run a workshop on your premises inviting those people in your organisation that know the your process or service inside and out.
- We will then share our findings and observations highlighting differences or anomalies and then work with you to identify the root cause.
- Following the workshop we will then generate a summary report of our findings, observations and recommendations.

## Case Studies

### UK Plastics Facility

Our experts recently worked with a UK plastics company to help them realise around £180k of savings per year using our Multi-variable analysis software.

The plastics company makes hundreds of products across 3 manufacturing lines. The company goal was to be lean and offer maximum flexibility in terms of rapid product changes to keep inventories low and storage costs down but at the same time maintaining world class safety and quality standards.

### Case Study 1 – Root Cause Analysis - £80k/year Saving

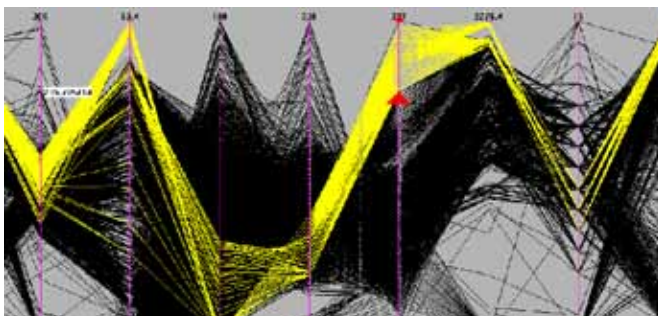
**Objective:** To determine root cause of knife wear problems on pelleter plates.

**Background:** An extruder pushes hot molten plastic through a heated pelleter plate to create long strands of plastic. The pelleter plate is heated by passing hot oil through it. The process is very similar to forming spaghetti strands. As the hot plastic strands pass through and exit the pelleter plate they are cut by high speed rotating knives. The knives cut the strands to form pellets. Knife wear is measured and indicated by the current amperage of the motor turning the knives. A high motor amperage indicates excessive knife wear. The pellets are then consequently cooled, dried and transferred for packing.

**Problem:** The facility was experiencing excessive knife wear on a specific family of products resulting in poor pellet quality. This led to excessive operational downtime, operator intervention, off-quality material and customer complaints.

**Analysis:** Using our multi-variable analysis software, data was collated from the last 10 product specific runs. The analysis looked at approximately 12-18 months worth of plant data. This included all measured weighing and process variables, set points and quality data.

**Results:** Within a very short time it was found that excessive knife wear was related to the temperature of the pelleter plate and the high degree of process variation within the pelleter plate temperature control loop. The pelleter plate temperature was found to be too low thus knife wear was increased at low temperatures.



**Figure 1 – Yellow lines show the conditions when knife wear was at it's lowest**

**Benefits:** The temperature set point conditions for the pelleter plate were increased along with loop tuning work to reduce the temperature variation.

The facility went from an average of 7 to 8 knife changes per product to just one knife change (at the start of the run). In terms of downtime, knife wear, off-quality generation, reduction in customer complaints to zero the estimated saving for the facility was about £80k per year.

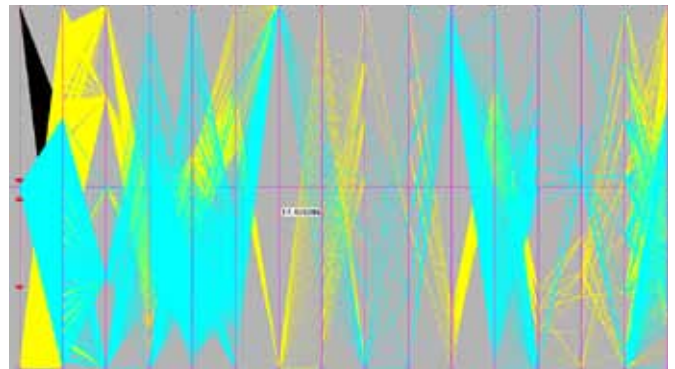
**Case Study 2 - Solving the Plant Mysteries - £100k/year saving**

**Objective:** To solve 'plant mystery' as to why a specific product would suddenly go off-quality for no obvious reason.

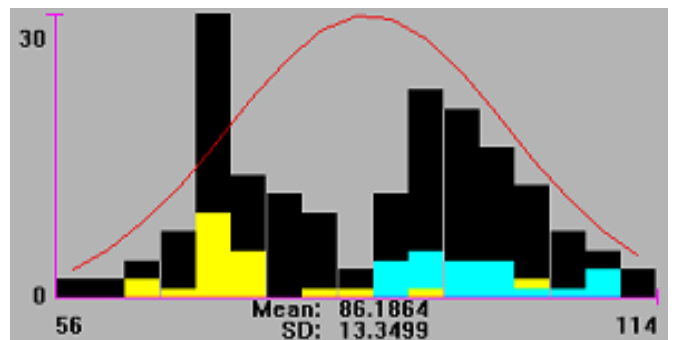
**Background:** The facility operates three manufacturing lines. Two of the three manufacturing line pelleter plates are heated using a common hot oil system that responds to the set point temperature demands of the product. Depending on the product family these temperature demand can vary considerably.

**Problem:** The facility was experiencing a number of problems with their highest quality and highest volume product on one of their manufacturing lines. Operators were finding that for no apparent reason the product quality would suddenly decrease and even go off-quality without any indication.

**Analysis:** Using our multi-variable analysis software, data was collated from three specific product runs; (i) excellent, (ii) average and (iii) poor plus all the data from the other two manufacturing lines when these product runs had occurred. The three runs were compared and contrasted in relation to all plant measured weighing and process variables, set points and quality data.



**Figure 2 - Screenshot of data overlay of 3 runs**



**Figure 3 - Screenshot of data overlay of 3 runs in standard distribution format**

**Results:** The analysis quickly discovered the root cause of the problem to be subtle disturbances in the hot oil boiler system upon start up of the other manufacturing line causing a drop in pelleter plate temperature and hence off-quality material.

**Benefits:** Further investigation of the performance and capability of the hot oil boiler system were carried out. It was found that the boiler capability had not evolved in-line with the facility's growing product diversity and increasing throughput demands. In the short-term, the facility production schedule was managed to avoid certain products running on different lines at the same time. The medium to longer terms objectives were to increase the capability of the hot oil boiler system. From this work, it became clear how important the pelleter plate temperature was to the product quality and how sensitive it was to temperature variation. Pelleter plate temperature is now recognised as a key process variable with the company's other facilities worldwide.

The estimated savings for the company was around £100k per year.