



Big Data, OEE and SPC

The best of all worlds



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1 Introduction

More and more companies are implementing big data solutions. At the same time companies are also implementing OEE, SPC and Six Sigma projects to continuously improve their processes.

If these two developments are integrated, then a tremendously powerful solution emerges which will bring benefits to any continuous improvement process. In this whitepaper we will explain how big data solutions, OEE and SPC are already integrated by DataLyzer.

2 Data sources

A company has many data sources in many different formats. Some examples:

- PLC
- CMM
- Test equipment
- Gages, cameras, sensors with different kind of outputs
- Visual inspection and manual data entry
- Suppliers
- Etc etc

The most important challenge in building a big data solution is that the data makes sense. It is very easy to collect terabytes of data and store it in a warehouse but if the data is incorrect or cannot be related to other data then it is a waste of time and money.

Most data have a date and time stamp, but the question is how reliable this date and time stamp is. PLC data has a pretty reliable date and time stamp but if we do off line measurements of a product using a gage or visual inspection the date and time stamp has limited relation with the process data. If a subgroup is taken from the line it might take between 2 and 30 minutes before the product is measured. Often during a measurement, the date and time stamp of the measurement are added and not the date and time of production.

In some cases, if you want to analyze relations between different process steps date and time relations are not there anymore, because the products are buffered between process steps and time delay will vary.

Also, the nature of the data will vary. Typically, we will have variable and attribute data for measurements, but we also have time format for example for downtime.



3 DataLyzer solution

The solution DataLyzer offers in combination with the partners Inmation and FullFact has the following components:

- Inmation, a vendor-independent connectivity and information management system (Big Data solution)
- OEE Toolkit, a real time OEE solution
- DataLyzer Spectrum, a real time SPC solution

Inmation

Inmation offers a solution to collect data from any source in the company. All data for each object (tag) can be stored and retrieved.

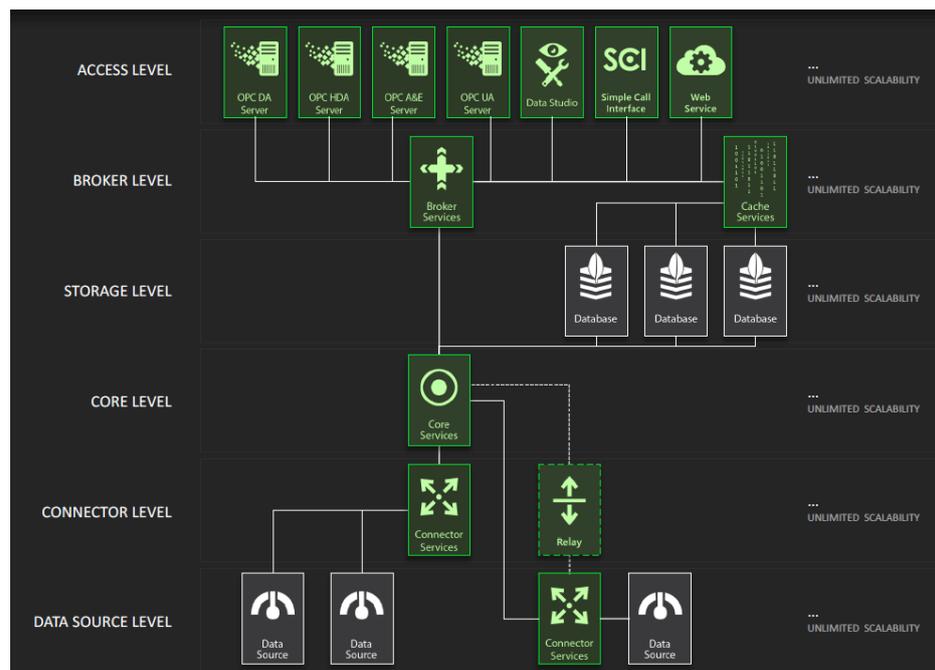


Figure 1: Inmation architecture



Data can be accessed in real time from anywhere in the company with the data studio tool.

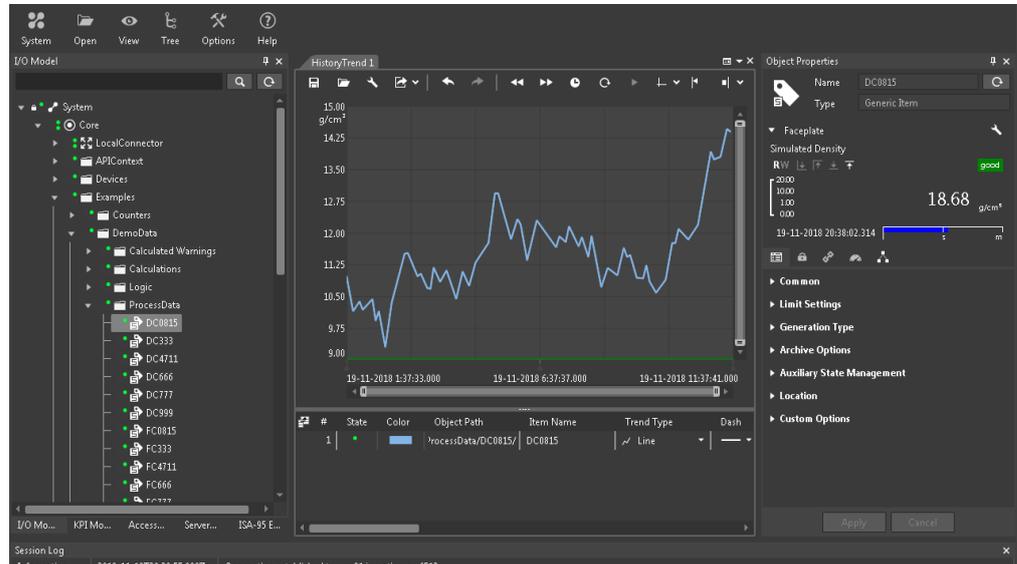


Figure 2: Inmation data studio

OEE Toolkit

The Inmation system is extremely powerful to drill down and get at all detailed data but it doesn't offer an OEE interface for the operators and management.

Downtime information can be collected in the toolkit system. The information is offered to operators so if downtime is longer than a specific threshold value the operator can assign the root cause and comments of what has happened in the process. During a shift the operator also selects order and product information.

At the end of a shift we have a complete overview of the downtimes.

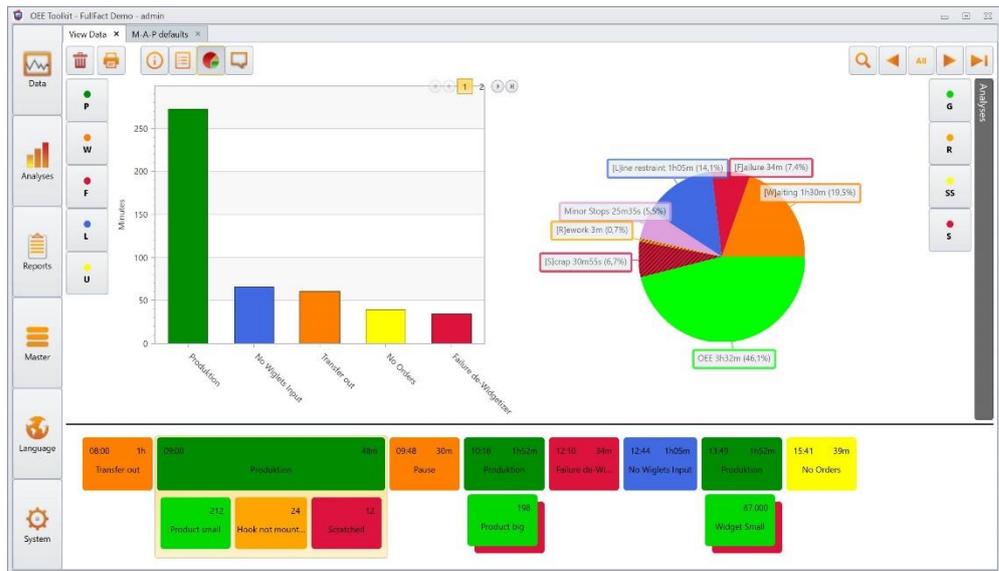


Figure 3: OEE Toolkit

SPC solution

Big data is not suitable to be presented for SPC analysis to the operator. The data needs to be aggregated and optional parameter information needs to be added, like operator name, order number, batch number etc.

DataLyzer offers a real time interface between Inmation and DataLyzer so data can be imported. When importing it is possible to take subgroups from the Inmation data and add tracking and tracing information. Tracking and tracing information can be taken from the OEE solution or from other data sources like ERP or MES.

If a process goes out of control, then that will be signaled in DataLyzer and the operator can start the out of control action plan.

Causes and actions can be added to subgroups as well as adding operator information about what happened and how the issue was resolved.



Figure 4: Control chart imported from Inmation

Defects and alarms collected by the PLC system can be aggregated as attribute charts.

This means that for any short stoppages or process problems you can drill down into a more detailed level to see what the root cause of a specific failure is.

In the DataLyzer solution data can also be collected from other sources like CMMs, gages and manual data entry on the shop floor or lab.

Problem solving

Because all detailed data is stored in a common database, a very powerful combination becomes available to drill down to the root cause of the issue.

For example, on the highest level we see the downtime of a process

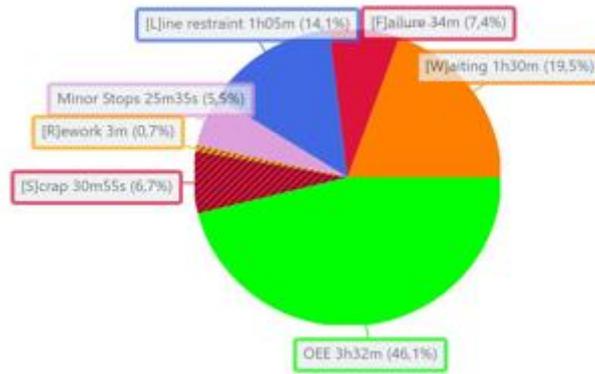


Figure 5: OEE Pie chart of a production run

The chart shows a large scrap percentage. In this example you can drill down into the related SPC chart to see in detail what the cause of this scrap is.

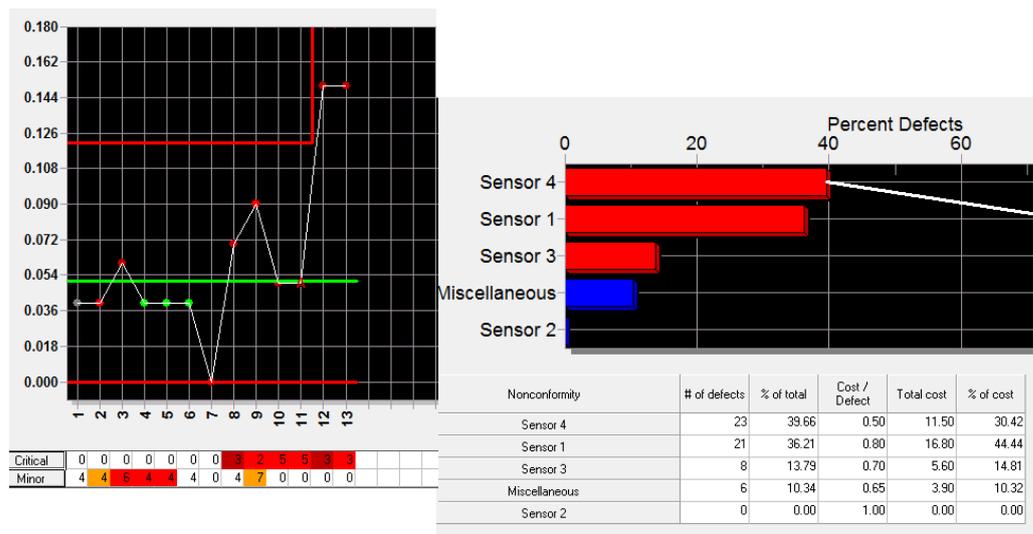


Figure 6: Detailed scrap analysis

The above chart shows the scrap percentage per selected time period.



In case you want to drill down even further you can use the Inmation system again where 100% of the data is archived to the millisecond.

Let's assume that we have an idea that 4 process parameters are influencing the scrap percentage and we have found some out of controls in a period of 4 hours. Then we can- for example - get a data table of the 4 process parameters aggregated per 60 seconds and we can instantly perform all six-sigma analysis with the DataLyzer tools.

In the example below you can see control charts, scatter analysis, Multi vari and the data table of historic data over a 4-hour period.

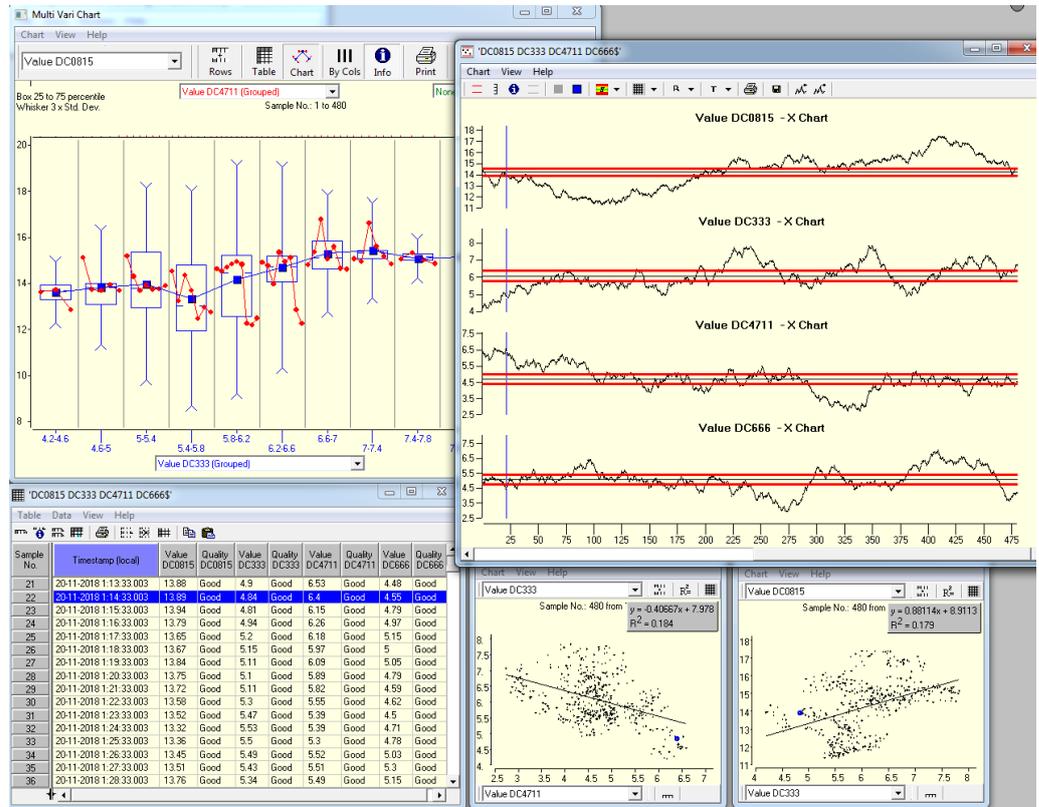


Figure 7: Detailed six sigma analysis of historic data



4 Conclusion

The combination of Inmation, OEE Toolkit and DataLyzer SPC solutions provides a company with a complete solution to collect data per millisecond, present the data in a meaningful way to the operator and management so they can react at the right moment in time to process disturbances. It also offers a powerful solution to drill down in detail in case of issues or customer complaints where 100% of the data is instantly available for analysis.