The *Independent* Solution Provider for Industrial and Process Automation, Quality & IT

ATS MES Excellence Centres

Wireless in the production plant

For various industries

www.ats-global.com

The *Independent* Solution Provider for Industrial and Process Automation, Quality & IT

Visual Quality Inspection

Part of the Lean Manufacturing Solution

"In today's high-tech world, there is still nothing that beats the human eye"

Following the 11-function model of Manufacturing Execution Systems (MES), part of a total solution is Manufacturing Intelligence, using real-time data collectors. Huge quantities of production data can be collected and this information can be analysed to improve production efficiency and overall equipment effectiveness (OEE). But with production quality standards higher than ever, how are manufacturers able to improve their processes, reduce scrap and downtimes, and deliver perfect product quality at the same time? This White Paper explains how visual testing can offer a very powerful part of the MES and Lean Manufacturing solution, using real-time data.

How valuable is real-time production data?

To many companies, this is worth thousands per hour or even more. Imagine how much companies lose whenever the production lines go down and parts cost over $1000 each to produce. This is the case for many manufacturers. To avoid downtime, many companies monitor nearly all of their processes in real-time, hoping to catch and fix problems before they disrupt production. For the most part, it works.

Goal for all current leading manufacturers is to constantly find ways of reducing downtime further and further through the use of real-time data. Analysts, consultants and other industry gurus have been preaching the virtues of real-time data collection for years, but few manufacturers have fully embraced the practice. Lately though, there are signs that manufacturers are showing more interest in mining real-time data.

More and more leading people in manufacturing are listing real-time data analysis as a critical component of any strategy for improving overall operations. However, wringing the greatest value from real-time data requires a technology infrastructure that allows the production process to be automated, controlled and monitored, but also that product quality doesn't decrease due to the increasing speed of manufacturing.

Secondly, the responsibilities for lean manufacturing are shifting more and more to the operators, as they are the people able to respond and act instantly on real-time information. Production lines are the "profit centre", meaning the line (and its operators) is responsible for production rates, uptimes, downtimes, scrap, and the quality of the actual products. **So what is the right mix of Lean Manufacturing technologies?**

The real-time Business Case

In a classical manufacturing enterprise, line operators use paper tick sheets, tables and charts showing production results. This information is presented to management at the end of a shift, a day or a week and the data is fed into an MS Excel sheet or local database, like Access. In fact, many of today's manufacturers still use these methods.

This way of processing data is highly subject to manual entries (and error) and human interpretation. The operator first enters production rates and downtime information onto his sheets, and his manager enters this data into his PC.

Obviously this method provides plenty of room for errors and is reactive instead of proactive. A rapid decision based on validated information cannot be made.

The real-time philosophy all starts with recognising a need to more efficiently and effectively analyse manufacturing and quality assurance data. To reduce the unreliable and time consuming manual processes that force test engineers to spend days creating reports, tick sheets and tables, Microsoft SQL (or other) Servers and databases, such as MS Access are implemented, often in combination with a selection of manufacturing intelligence tools. This of course provides the platform for fast decision making and improving production processes and equipment effectiveness.

Real-time Strengths

Using real-time data, quality departments can easily spot trends and patterns in the data - ultimately being able to respond faster to issues and make necessary changes to the manufacturing process. Simplified data presentation means executive decision-makers gain a better understanding of the entire manufacturing process. This streamlined tracking of production trends has reduced the time needed to identify failure points and improved mean time between failure (MTBF) ratings. Also, the availability of real-time, online data is ideal for

communicating data across the organisation and to other companies such as suppliers, partners and customers in popular formats including Web Browsers, Microsoft PowerPoint and Excel. The result is: improved product quality, faster time to corrective action, fewer repeat manufacturing errors and improved component accountability.

Real-time Weaknesses

Enterprises become dependent on the hardware and software of choice. The tools are (in principal) limited to the operating system on which the system is built and the package features (production reports, statistics, etc.) developed by the supplier. Another potential weakness depending on the produced parts is that human intervention becomes limited, which means exactly that; the lack of physical human presence.

Why the human eye?

The human eye is a highly advanced instrument to rate precise graduations of surface distress and to quantify potentially harmful deposits such as oil, grease or paint left on for instance engine parts. Quality assurance engineers use these unique instruments daily. They are trained continually and must make sure that the products they test maintain enterprise as well as international quality acceptance levels. The eye of these specialists is trained for this purposes, and no machine can beat it.

"At least for now, the eye has proven to be better than a machine. The best machines developed can't do this job any better than a well-trained human," says Hans Damman. Managing Director of ATS.

In many cases the difference between an acceptable deposit level and an unacceptable one is a matter of a few tenths of a unit. Ironically, in the product testing business literally millions of dollars are spent on high technology testing with state-of-the-art control and data acquisition equipment, yet the final determination of acceptability is the subjective rating applied by these experts.

Also, a fixed location, like a manufacturing plant, is not always the case. A field rating of produced engine or equipment parts can bring the need for a quick temporary solution thousands of miles away to a remote mine, or an engine plant in another country.

Although some limited success has been achieved in electronic machine vision and robotic applications, none have succeeded in providing the flexibility, reliability, accuracy and adaptability of the trained human eye.
So with the right tools available to mark product errors, quantify this information using real-time data, the enterprise will be able to eliminate recurring faults and become a true Lean Manufacturer, as well as work towards world-leading enterprise solutions following the Six Sigma principles.

Training

Not everyone has the ability to be a quality testing engineer, and those who accept the challenge often require up to six months of training on a single test type before producing reliable and acceptable ratings. However, in a production facility, this engineer must be proficient at more than just one test.

"I guess I could probably name a minimum of 60 different types of products that I test," said Garry Andrews, a quality engineer with 32 years of experience.

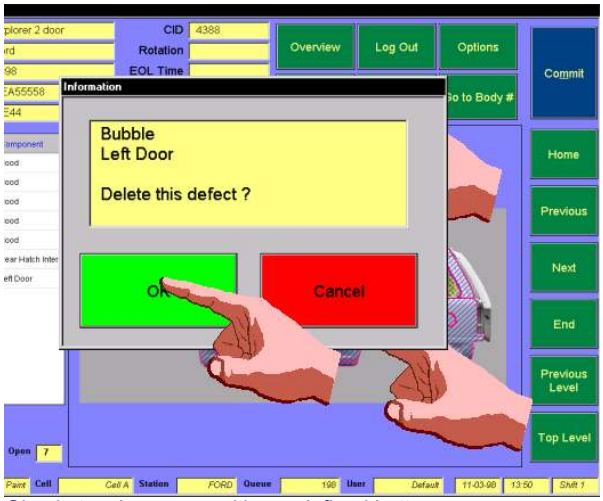
When one considers such a variety of products - with subjective ratings required on parts that include pistons, gears and oil pans, from a variety of engine blocks, Andrews estimates that a realistic training period for all-around proficiency might be more like three years. Included in this training is attendance at workshops, where quality assurance engineers are refocused to consensus opinion. Quality assurance staff in large manufacturing plants often has a combined experience of more than 120 years and routinely perform more tests than any piece of test equipment in the world. Regardless of the vast experience of these people, there are continuing internal quality checks, including re-examination of their own work from months or years past.

So how do we use the real-time data?

Not only deposits such as varnish, oil or sludge on auto parts are detected, the quality engineers must also log the error, and assign a value to its intensity. When recurring defects are marked, the real-time production system will recognize this error and notify the operator. This is an extremely powerful tool, because this helps solve the manual operation and it shows the operators when a particular defect continues.

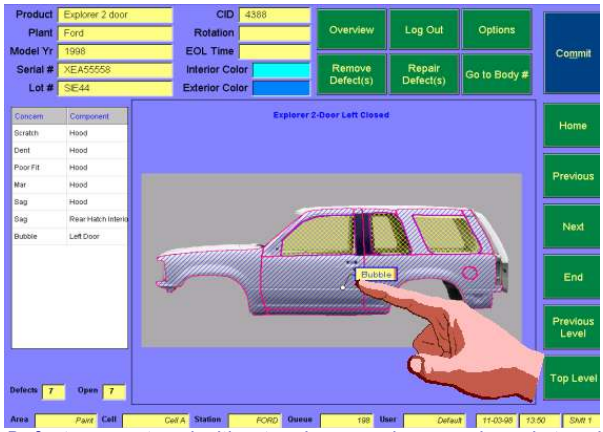
An operator could forget that he marked a particular error before, or his colleague working the next day is simply not aware. Thus the error will not be identified as a recurring fault. The reason may be for instance a tooling problem.

With the help of an inspection tool populating real-time data, the repeat-error suddenly becomes obvious, and can be solved within days, or sometimes even hours. Also, the operator can now mark an error and update a spreadsheet much faster by using a simple touch screen, because the particular defect is now common and can be given a pre-defined "button".



Simple touch screens with pre-defined buttons

To make life easier for the users, these packages are typically built up with data collection modules, layout managers for customised screens, administration and reporting modules and event services using messages via pagers, e-mail, fax or even PCB's (Process Control Boards) to notify personnel of the product quality status throughout the plant and off-site.



Defects are entered with a touch screen in seconds and stored in a real-time inspection system to prevent repeat-errors.

Industry Examples

Two examples in the automotive industry illustrate the benefits of using real time data in combination with visual quality

Automotive Paint and Assembly

An assembly plant was receiving vehicles from the paint area with a repair rate of 45 per 1000 units. By giving operators the tools to enter reasons for defects, analysis and correction it is now possible to automatically prevent repeat errors. The number of defects requiring rework has been reduced to 10-15 per 1000.

Vehicle seat manufacturing

A car manufacturer instructed its entire supplier group to start paying special attention to reducing the number of call back actions due to faulty parts. Their supplier of vehicle seats was able to reduce the number of errors saving 30,000 per month, with a total investment of 100,000, a payback of just over 3 months.

Mike James is Group Managing Director of ATS International B.V. and an expert on Lean Manufacturing Solutions. ATS operates globally and offers Consulting and Solution Services to global and local organisations.

The *Independent* Solution Provider for Industrial and Process Automation, Quality & IT

About ATS

ATS is an ***Independent*** **Solution Provider**, with over 20 years experience and a wealth of experience undertaking Continuous Improvement initiatives and Manufacturing IT solution design, deployments and 24/7 support assignments.