

## Sand, Glue and Paper...

3M Atherstone is a manufacturer of industrial and retail abrasives. This does involve Sand, Glue and Paper but there is a far more complex story to relay about the manufacturing quality, and the complex processes that are used to make reliable abrasive products. The utilisation of Wonderware's products to fully control and understand the production process is exemplary.

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The Atherstone site has existed for over thirty years, seeing all stages of production technology and product varieties. Today 3M Atherstone benefits from Wonderware's range of industrial software products supplied by SolutionsPT. System integrator Capley Marker of Risley, Warrington, has supported the site for nearly ten years.

These ten years have seen a high degree of technical change in which InTouch HMI was the catalyst. The early adoption of InTouch SCADA as a simple visualisation tool has

The implementation of this technology on this scale on a plant with such a long experience of production has been fully embraced by both process operators and maintenance alike. The experience of product variability through manual processes can still be remembered, and the associated lack of traceability of events and actions. The control produced by InTouch HMI supervised systems over the last 10 years has resulted in "hands-on" manual control being lost, with product consistency being vastly improved, this being recognised by all involved. For example, if there is any failure in the system then operators do not take over manually; they wait for things to be put right. Highlighting the importance of this control of the process is that the process is simply not run without the InSQL and SPC systems, as quality can neither be known or guaranteed and also because of the need to verify their process to end customers.

### The process contains several sections that are supervised through InTouch systems:

The "First Coating Line" was the initial process to be supervised by InTouch. It controls the line that adds the anticoagulant to the abrasive product, by controlling oven temperatures, airflows and web tension. It communicates with a PLC using DDE server, the ServoDrive controller and the Colour Gauging System using specially written DDE servers. The tight schedule for the project led Capley Marker to recommend InTouch SCADA rather than using the 3M standard system. The system was installed on schedule and provided more facilities than any of the other systems 3M had previously used.

There is a great deal of liaison between different 3M plants and the coating line quickly became the 3M showpiece system establishing InTouch as the new standard, not only in



Finished product

been expanded into an all-encompassing control solution, standardised across the plant. Features such as recipe handling, batch tracking, SPC (Statistical Process Control), downtime analysis, OEE (Overall Equipment Efficiency) are to be seen in the application. This culminated in the use of Wonderware Historian, the real-time database as the major plant diagnostic tool.



**View of Kettles**

Atherstone but at other 3M sites in the UK and US.

The Flexer system provides local control to the web-splicing end of the coating line. Communicating with Pdc using NetDDE, the extruder system controls the extruder unit that adds adhesive to the back of the web to bind with one of several backing materials.

The second major project had the largest impact to productivity and quality. The product is dried through a large seven bay oven system. The location of a particular product in this long process was not known at any one time, as product changes are done on a continuous process basis. Therefore optimum oven control when changing from one product to the next could not be provided. It was found to be possible to estimate the product start and end positions with good accuracy by monitoring the drive speeds and therefore linear movement, and show this as differently coloured sections representing particular products within a “moving sheet” on the InTouch display. Suitable new control setpoints being applied when a product change-point was calculated. This produced a significant change in product quality and consistency and generated the next significant project of improving the drive system.

Three InTouch systems are used for local control of the new drive systems for the process. They communicate with the PLC and Drive Link Network. The MakerSPC provides SPC, through Wonderware’s SPCPro, of the thickness of the backing, binder and mineral, taking values from a gauge system. This was a major step in control sophistication as production control was previously done manually and off-line via samples and drawn up at the end of the day. This is now done in real-time and after the process operators found confidence in the system the control loop was closed automatically, linking to the InTouch. The plant is now not operated without this system.

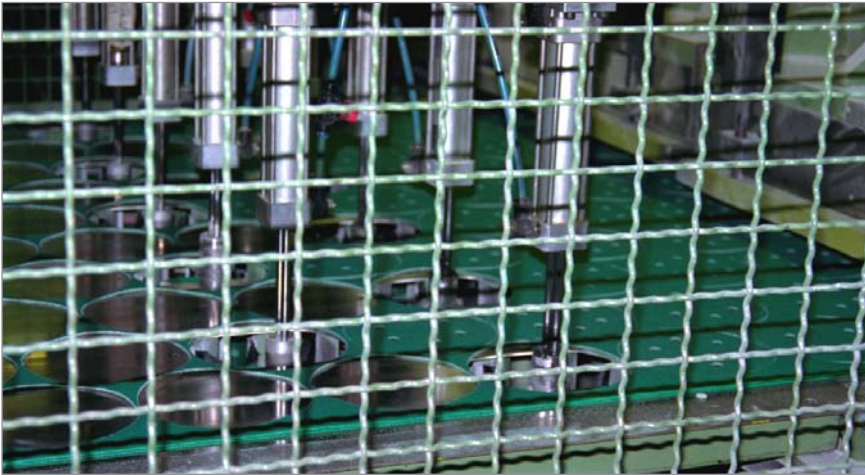
The latest system controls the Kettles, these are vessels that are used to prepare the adhesive for the coating process. The system was designed in such a way that it provides batch control for the supervisor to build up individual sequences for each product. The initial development of this system required in-depth investigation into the products and their production methods, this was done by 3M working closely with Capley Marker. The outcome led to rationalisation of raw materials - which then enabled cost-effective automation of the process and subsequent improvement in quality and reduction in waste.

At the final stage of the production process, bulk product is stored ready to be called into converting. The Converting Plant is a stand-alone section of plant and cuts the rolls of abrasive into discs and sheets that are the finished product. This system enables the set-up of schedules, and monitoring and storage of all the details associated with a customer’s order.

Year 2000 upgrade saw the 11 InTouch PCs upgraded and networked and data collection networks from the PLC’s and Link networks dedicated to a single machine to improve the communications. There are 7 PLC’s on one network plus 3 on another. The system has Uninterruptible Power Supply mains-support and primary and backup domain controllers for the network. An InSQL system sits on another PC collecting data from all the other systems. Approximately 5000 tags and 4 Factory Office nodes currently extract data from the system. About 100Mb of data is acquired daily, requiring the in-built compression and real-time acquisition power of InSQL to handle such a volume. Additionally, 3M Atherstone uses Wonderware UK’s S-Plan support programme, giving extra backup to the resource deployed by Capley Marker.

The InSQL [Wonderware Historian] system was one of the first to be installed in the UK. It was purchased because it appeared to have the potential to enable quality to be monitored. There was no overall plan for its use but it was installed on a “lets see what we can do with it” basis. There was an initial plan for the InSQL to collect data for the process engineers to improve the control of the plant. This was done, but the real breakthrough came as a result of a process engineer taking the product under his wing and analysing the process data in detail. The resulting solution of a major plant problem that had intermittently bugged their process for thirty years suddenly raised the profile of the InSQL. Additional funds were made available for further data collection. The most unexpected use of the InSQL system was by the maintenance personnel. Both electrical and mechanical maintenance team leaders

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### Punching operation

have a node on their desk and this is intensively used in the investigation of the status of the plant before a breakdown. These two team leaders have pushed for various improvements and more data to be made available. This has also led to a culture change from one of responding to faults to one of predicting faults and eliminating the potential causes before the fault occurs. Many of the causes of downtime are more clearly seen through InSQL displays rather than relying on information from the operator that could be wrong or misleading. The Quality Assurance department InSQL data on a real-time basis, with the added facility of looking at stored and archived data where post-production analysis or comparisons are required.

The unanticipated benefit from the implementation Wonderware products is the total acceptance of the vital information that it provides to the maintenance engineer. The general assumption being that such data is the realm of the process engineer alone. A Senior Maintenance Engineer, said “the benefit to 3M by developing this technology with Capley Marker has allowed us to fully understand and continually make improvements as market demands are placed upon us”, and of the benefit of the InSQL investment “when we have made it right once, we can make it right many times”. The three-cornered relationship between Process Engineering, Maintenance Engineering and Capley Marker has provided 3M Atherstone with a well-integrated and well-understood production facility. The mutual understanding of these parties has led to the controlled evolution of suitable control, monitoring and data systems to make 3M Atherstone the leading supplier of abrasives for many diverse industrial, laboratory and retail applications. With production of just one product being 500,000 pieces every 24 hours this is more than a simple process of sand, glue and paper!

*Wonderware UK wishes to thank the following companies for their valued contribution to this success story...*

**3M Atherstone**  
**[www.mmm.com](http://www.mmm.com)**

**CAPLEY MARKER Ltd.,**  
Greenwood Court, Taylor Business Park, Risley, Warrington WA3 6DD  
Telephone 01925 765855 Fax 01925 765736  
**[www.capleymarkerltd.co.uk](http://www.capleymarkerltd.co.uk)**



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SolutionsPT  
Wonderware United Kingdom and Wonderware Ireland, Unit 1 Oakfield Road, Cheadle Royal Business Park, Cheadle SK8 3GX  
+44 (0)161 495 4698

[info@wonderware.co.uk](mailto:info@wonderware.co.uk)      [www.wonderware.co.uk](http://www.wonderware.co.uk)