



## CASE STUDY

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# The Benefits of Utilizing Plant Floor Information

Identify **BOTTLENECKS**

Identify **INEFFICIENCIES**

Identify **MORE MONEY!**



**This paper focuses on challenges facing Production and Operations managers today and how technology can be used to identify small improvements in all areas of manufacturing resulting in large overall improvements. Using the tools discussed, manufacturers have measured production and efficiency gains of 20-30% after implementation.**

**Trends in Production Environments:** Today's manufacturing environment is as competitive and demanding as it has ever been, with efforts to drive manufacturing costs down at an all time high. Customers are smarter than ever, competition has fewer barriers to entry, and the government is imposing tighter regulations. Not to mention internal competition, where upper management is seriously considering overseas labor, eliminating your manufacturing facility all together. Not long ago it was simply a matter of producing as much as possible, as fast as possible. Now production has become a science of predicting how much to make, when to make it, and with what resources. It has become a question of how to run

your manufacturing facility as cost effectively as possible in order to maximize returns and stay competitive.

Managers are looking at areas of improvement everywhere they can, from warehousing, to power consumption, to raw material waste, to quality issues (minimizing rejects), to increasing efficiency while increasing production rates, and more. The idea is that small percentage improvements (1-2%) in each area add up to large improvements overall (20-30%). The challenge is to identify these small improvements in a high speed, high production environment. If this is not challenging enough, system implementation must meet ergonomic and safety standards that are more stringent than ever. These are some serious challenges facing managers on the production floor and the ones that come out on top are the ones that take advantage of the tools available to them.

Technology has advanced at a tremendous rate in the past several years. In fact, technology can be blamed for a lot of the issues pressuring manufacturers today. The internet alone has made commodities out of the majority of manufactured goods on the market and given the customer the tools to shop features, price, and value for them all. Technology is not going to

disappear; the most responsible thing managers of today can do is to use it to their fullest advantage. Left unutilized and manufacturers risk their competition running away with the edge.

**Putting Technology to Work:**

Leading edge technology changes on a continual basis, always evolving, growing, and improving. Behind this leading edge technology standards emerge that have been proven and accepted by the industry. By attrition the strongest survive, the cream rises to the top. Several examples of this live on the plant floor, making the world of technology a bit easier to deal with. The smart managers of today will latch onto these standards and use them to their advantage.

The majority of manufacturing facilities/processes are already being controlled by some sort of processor-based system; a PLC, DCS, or PC-based controller. These controllers have been around for decades, battling with one another to become the accepted standard. While this battle is far from over, and will probably never be settled, it

should be noted that it is very healthy that this battle rages on as it has led to many advances in industrial automation. As each fights becoming a commodity, they strive to add value to the customer, which has led to developments in industrial networking, embedded web pages, increased speed and capabilities, and most importantly phenomenally low prices. As the war rages, one thing they all have in common is that they support a Microsoft Windows interface, the single most important standard that has evolved out of technology.

Much like the Beta/VHS wars of the 80's, Microsoft has emerged as the leader in the industrial marketplace. Virtually all of today's manufacturers in the industrial marketplace support the Microsoft Windows standards, and the standard Microsoft Windows interface, Ethernet.

What does that mean? Simply, that you have the ability to consolidate data on a single, common platform. It means that regardless of your current controllers, odds are you can pull the data off of them back to a Server PC and consoli-

date it with other data, data from other controllers, from other PCs or from your keypad. It means that you already have the tools in place that are required to interrogate your process equipment on a continual basis without you or someone else having to sit there and watch it. It means you already have the tools to better manage your process. It has become a question of how you want to use these tools, not if they are available.

The following tables are designed to generate ideas for ways to use data that may already be available on your plant-floor. These are examples of systems that have been implemented successfully and are in use by managers throughout the world. If it is not you, it may be your competition. Read through these tables and think of how the systems may apply to your operation and how they may benefit you. The tables are not designed to be all-inclusive, nor does each table need to be exclusive. Think of different variations, expand on these ideas and start using technology to your benefit; chances are it can be done with data that is readily available on your existing systems.

## Overall Equipment Effectiveness



Data Source	Results
Product/Batch ID	Measure the efficiency of process equipment against a known/fixed baseline.
Equipment Availability	This allows you to identify bottlenecks and target projects to eliminate them.
Equipment Downtime	Eliminating your prime bottleneck has a direct, net positive effect on your productivity.
Product/Batch Cycle Complete	In addition, you get the information required to base capital expenditures on quantitative data, rather than instinct
Product/Batch Reject	



## Preventative Maintenance

Data Source	Results
Equipment Downtime	Identify the primary causes of downtime and focus your efforts on correcting the cause.
Motor Runtime	Base your preventative maintenance schedule on a Motor Runtime Limit. All equipment has a mean time to failure, similar to the engine in your car, catch it before it fails and perform maintenance during scheduled downtime, not production time.
Motor Start/Stops	Keyway and gearbox failures can be correlated to starting and stopping, base your preventative maintenance schedule for this equipment on these numbers.
Stoke Counts	Valve, bushing, and bearing failures can be correlated to cycles, base your preventative maintenance schedule for this equipment on these numbers.
Operating Current	As certain equipment wears (saws, grinders, chippers, shredders, etc) the current will steadily rise. Base change-outs on these values, minimizing downtime related to too frequent change-outs and minimizing out of spec product/equipment damage by running too long with worn equipment.
Vibration Level	Protect equipment bearings by monitoring equipment vibration. Data can be used to detect bad bearings, or unbalanced loads which can help identify feeding issues.



## Quality Assurance

Data Source	Results
Product/Batch ID Product Measurements Operational Variables Line Speeds Temperatures Flow Rates Levels Pressures Operator IDs Operational Set points	Correlate quality of product with your operational variables. Identify causes of out of spec product and focus efforts on eliminating the variability that causes it.

## Traceability (Inventory Tracking)



Data Source	Results
Resource ID Vendor ID Operator ID Product/Batch ID Customer ID	Correlate resources/vendors with each product and/or batch. For product recalls, complaints, and/or praise identify responsible batch, vendor, resource, operator, and/or customers affected.  This feature can also be tied to your Quality Assurance process to identify operational variables/set points that resulted in the product condition and/or possible problems with your Quality Assurance process.

## Performance Tracking

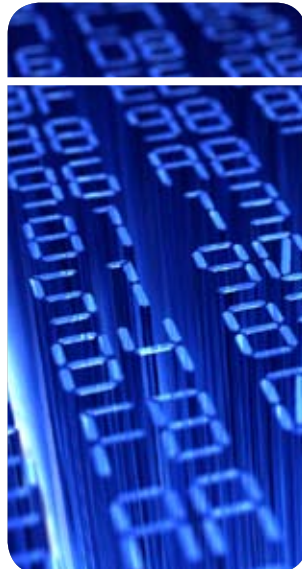


Data Source	Results
Operator ID Equipment Downtime Reject Counter Waste Production	Correlate each operator with important performance indicators. Quantitative data can be used to motivate and challenge operators, bringing the overall production and efficiency of a line to an all time high.

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## Automated Shipping/Receiving

Data Source	Results
Current Inventory levels Resource Schedule Barcode Receivables	Correlate your current inventory levels with your planned usage and predict when you are required to order new inventory. As new inventory is received, current inventory levels are automatically updated and warehouse location is recorded and stored.
Vendor ID Vendor Lead Times	Automatically order new inventory (via email) before supplies run low.
Customer ID Product/Batch ID Order Size	Fill orders automatically based on customer priority, ship date, or on a first come first serve basis. As Product/Batch is completed it is assigned to the customer's order. Once an order is completed, shipping is notified that the order is done and waiting to be loaded. You can even auto generate an email notification to the customer that the order has been filled, complete with a tracking number.



## Resource Planning

Data Source	Results
Resource ID Historical Cycle Time Product/Batch ID Order size Due Date	Based on the Product/Batch being ran, and the historical cycle time for that Product/Batch, allocate resources (inventory, equipment, and people) required to complete the process. Once allocated, as new orders come in, you can verify resource availability, experiment with different scheduling scenarios, and optimize your process. This is a powerful tool in determining production schedule, overtime requirements, and delivery schedules (finally, a tool for your sales force!).

These are just a few examples of how plant floor information can be used to benefit management decisions. These are ways to identify small improvements throughout the manufacturing environment that lead to a large overall improvement. With a little data manipulation and creativity, chances are these systems can be implemented with in-

formation and equipment already residing on the manufacturing floor. It is not uncommon to see 20-30% improvements in production and efficiency with this approach.

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