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AUTOMATED TOOL MANAGEMENT PROGRAMS

Improving ROI Through Effective Process Improvement

White Paper

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This white paper takes a close look at the process of manual tool management versus automated tool management. An in-depth examination of process improvement methodologies, a case study, and associated ROI calculations offer compelling evidence to justify an upgrade to automated identification systems. We'll examine ways to save money, improve productivity, increase tool life, reduce waste, and increase machine up-time through effective machine tool management.

Tool Management Overview

Competition is brutal in today's machine tool world. Profit margins are skinny, and there is a constant need to re-think and re-invent obsolete production processes. Time, cost, and productivity issues are always at the forefront. One area in the machine tool world where immediate and significant increases in productivity, tool life, and ROI can be achieved is the adoption of effective tool management systems both in the tool room and on the manufacturing floor.

Outdated documentation methodology in the tool room, potential tool loading errors on the machine, and mis-coded tools and potential errors in tool transport can contribute to a significant loss in productivity, down-time, tool damage, and unnecessary waste in machining operations.

Manual Tool Management

Did a tool crash cause a new tool to be brought on line – or did the tool simply break? Was a replacement due to normal wear or did the tool fail due to excessive wear or inadvertent operator intervention? Manual entry is inherently inefficient. With a manual system, verification of hand written data can rarely be documented. How much information falls through the cracks, causing an expensive lack of operational control?

The Manual Process

In manual data recording operations, a tool is assembled in a tool holder, and measured. Offsets are documented – often on hand-written tags attached to a transport rack that's wheeled to individual machining centers. The physical tag creates a huge potential error-point. Can anyone say with absolute certainty that the tag itself is correct? And did the tag even make it to the machining center with the tool? Mistakes like these can cause excess tool damage and premature tool failure, creating thousands of dollars in scrap annually.

Manual Data Entry

After the tool rack is relocated to the individual machining centers, an operator reads the tool data and offsets, and then enters this data into the machine controller. This is another potential error point. James D. Kinkade in his article, "Using Automatic Identification Technologies for Logistic Support on Battlefields of the Future", Thesis, Naval Post-Graduate School, March, 1996 quotes "1 error in 300 keystrokes in a manual entry mode". How many key-strokes do your operators make each day, week or year?

After the tools arrive at the machining center, tools are loaded onto machine tool magazines – another potential error point. Are individual tools located in their proper position? A tool loaded in the wrong pocket on a tool chain can cause a tool crash or worse, damage or destroy the machine's spindle, costing tens of thousands of dollars in tool loss, machine damage, and lost production time.

Unreliable Technology

In the past, companies have tried with limited success the use of both linear and 2D bar coding combined with central data basing to manage machine tool information. Because these technologies are optional in nature and are difficult to implement in the machine, they can be prone to the same shortcomings as manual practices. Damaged or obscured barcodes can lead to losses in productivity and untraceable information, eliminating any potential savings or even worse, forcing the use of manual methods as backup.

Automatic Tool Management Process Improvements

In comparison to the manual scenario above, automatic tool management systems can instantly provide an alert if a tool crashes, provide with certainty the reasons why a tool crashed, and provide that information whether or not it was broken, whether or not normal tool wear occurred, and whether or not excessive wear is causing premature tool failure.

Electronic Data Entry

Automatic tool management systems eliminate several potential points for error. A tool is assembled in a tool holder, measurements are conducted, and tool data/offsets are electronically registered. The tools are then inserted in a rack for transport to machining centers.

When an operator enters tool offset data in a “manual mode”, the potential exists for misplaced data, entry data errors (remember the one in 300 keystrokes example), and data points that may have simply been forgotten. Dispensing with printed or hand-written tool information on tags eliminates the issues of physically losing tags in transport, misentered data due to illegible writing on the paper tag, and lost information that may have rubbed off the paper tag. At the machining center, several more potential error points are also eliminated. An operator loads tools from the rack into the tool changer/magazine and the machining center automatically reads all applicable tool information for fail-safe operation.

In summary, with automatic tool tracking methodologies, misleading or potentially erroneous data is eliminated, removing the issues of:

- Tool Crashes
- Broken Tools
- Operator Setup Errors
- Excessive Wear
- Lost Tool Tracking
- Operator Interference

And improving the process of:

- Machining Traceability
- Recurring Setup Problems
- Using the Right Tools
- Monitoring Normal Wear
- Proper Tool Processing Validation
- Monitoring Base-line Wear

Hand Written Data Tag

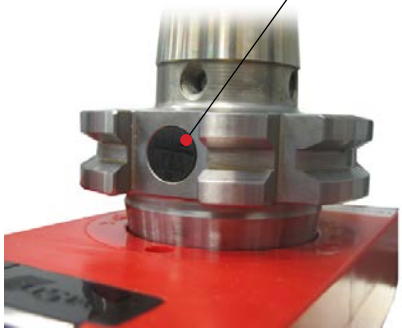
Automatic Information Tracking

By inserting electronic chips on tool holders, information can be dependably, repeatedly, cost-effectively, and accurately validated. In the following example, 19 different parameters have been recorded on a simple, effective data carrier:

Automated Tool Tracking: Large amounts of information can be tracked with each tool

Tool Status bits

- Tool in use
- Tool life pre-alarm
- Tool life expired
- Tool is broken
- Tool is locked
- Tool is in spindle
- Tool life deactive
- Tool has oversize



Data	Value
Line Number (where tool is used	Head Line 4
Machine Number	C21
Pocket Number	18
Tool Number	TP305
Tool Serial Number	8397739
Geometric Tool Length	25.725
Geometric Cutter Comp.	35.225
Wear Tool Length	-4.200
Wear Cutter Comp.	6.010
Tool Life Max Counts	150
Tool Life Warning Counts	125
Tool Life Remaining Counts	85
Preset Date (Time, Day Month, Year)	17:35, 20, 02, 06
Installed in Machine (Time, Day Month, Year)	15:22, 20, 02, 06
Removed (Time, Day, Month, Year)	08:18, 18, 02, 06
Serviced (Time, Day Month, Year)	10:27, 18, 02, 06
Cycle Count	3066

Automotive Plant Case Study

In a real-life scenario, roughly $2 million per year in savings was experienced in a North American transmission manufacturing plant. (Extremely heavy machining operations occur in this segment of the automotive industry).

The following statistical summary regarding overall cost savings in this transmission operation offers a compelling rationale to justify incorporation of automated tool management systems. Paper and pencil information registration versus the benefits of automation are obvious:

Automatic Tool Management Saved Roughly $2 Million/year at Automotive Plant

Manual Tracking

Broken Tools
- Quantity: 175/year
- Down Time: 10 min
- Down Time Cost: $700/min
- Broken Tool Impact: $1.225M

Tool Utilization
- Utilization: < 65%
- New Tools: > 2500/year
- Lost Usage: $590,000
- Tool Setters: 8
- Tool Setter Salary: $600,000
- Total: $1.19M

Total Cost: $2.42M

Automatic RFID Tracking

Broken Tools
- Quantity: 20/year
- Down Time: 10 min
- Down Time Cost: $700/min
- Broken Tool Impact : $140,000

Tool Utilization
- Utilization: < 92%
- New Tools: < 1700/year
- Lost Usage: $91,800
- Tool Setters: 4
- Tool Setter Salary: $300,00
- Total: $391,000

Total Cost: $0.53M

Average tool cost: $675

Implementation Costs

In the example below, costs for 12 machining center upgrades, 2 presetter upgrades and 8,000 RFID chips totaling $292,000 are listed:

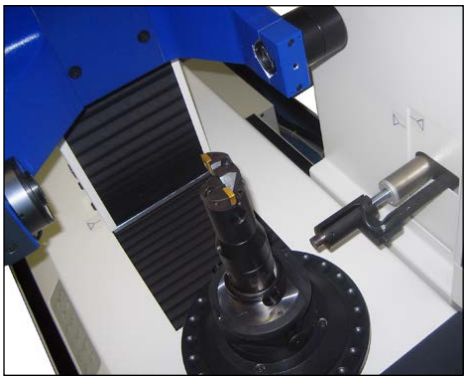
Machining Center Upgrades (12):	$48,000
Presetter Upgrades (2):	$4,000
RFID chips (8,000):	$240,000
Total Costs per:	$292,000

Cost of RFID chips for tool holder

$30

Cost of Presetter Upgrade

$2,000



Cost of Machining Center Upgrade

$4,000

The Payoff

If we examine both fixed and variable costs in our transmission manufacturing example and compare it to previous costs related to the obsolete methodology, $1.69 million in yearly savings is realized. Not listed are potential “hidden” savings like those that improve productivity, reduced stress on employees, improved parts building quality, and so forth.

Measurable Results

Concrete, tangible, measurable results can be achieved by an upgrade to an automated tool management system by:

- Elimination of hand written information
- Elimination of manual entry of tool offset data at the machining center by an operator
- Reduction on tool crashes
- Increased tool utilization
- Reduction in tool room staffing

Automatic Tool Management ROI Calculation

Fixed Costs	
Machining Center Upgrades (12):	$48,000
Presetter Upgrades (2):	$4,000
RFID chips (8,000):	$240,000
Total Fixed Costs:	**$292,000**
Variable Costs:	
MRO Parts:	$30,000/year
Maintenance Costs:	$50,000/year
Training:	$10,000/year
Total Variable Costs:	**$90,000/year**

Yearly savings	
Broken Tool	$1.085M
Tool Room Staff Reduction:	4
Tool Utilization:	$799,000
Sub Total	$1.884M
Amortized Fixed Cost:	($104,633) (3Year)
Variable Cost:	($90,000)
Total Yearly Savings:	$1.69M

It's Worth the Investment

In tool management, the "pros" for implementation of automated tool management systems almost always outweigh the "cons". These systems work. They can be implemented on new or existing machines, have a long history of success, and can provide companies in a wide variety of manufacturing disciplines extremely significant savings.

In contrast, the use of manual or unreliable technologies like barcodes can cost thousands of dollars a year in tooling costs and machine damage, plus higher scrap and lost productivity. Use automated tool management to get a grip on your machining process and immediately begin to see real savings and process traceability.

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