



WHMA 2015 Processing Equipment Manufacturer Panel

February 19, 2015

CIRRIS
SYSTEMS

komax WIRE

 **Schleuniger**



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Overview of Presentation

- Introduction
- 5S and Lean Principles
- Performance and Availability Factors with respect to OEE
- Quality with respect to OEE
- Conclusion
 - List of questions that each company should review and rank by importance
- Q/A session



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Introduction

**“If you cannot Measure it, you cannot Improve it.”
(Lord Kelvin)**

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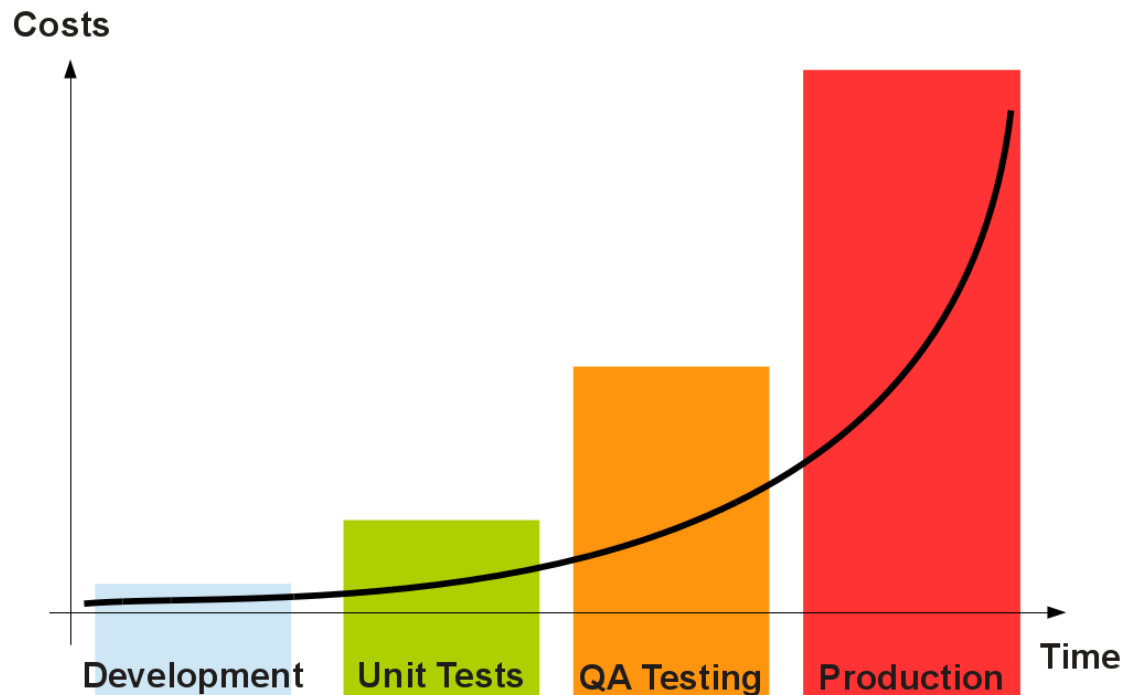
When do you catch a defect?

The Cost of Defect



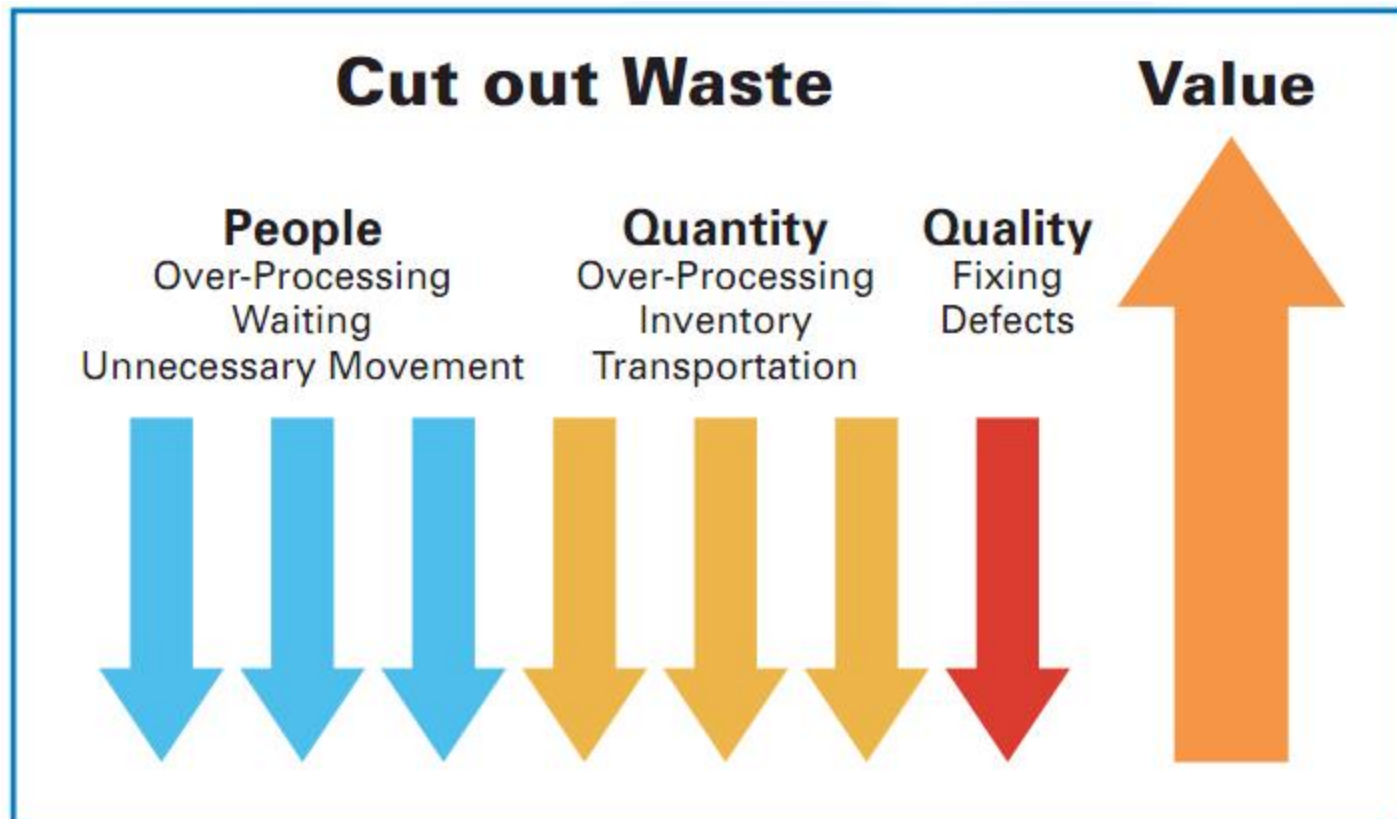
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Costs increase the later defects are found



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Waste



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Focus on minimizing:

Lean focuses on the elimination of waste in a process



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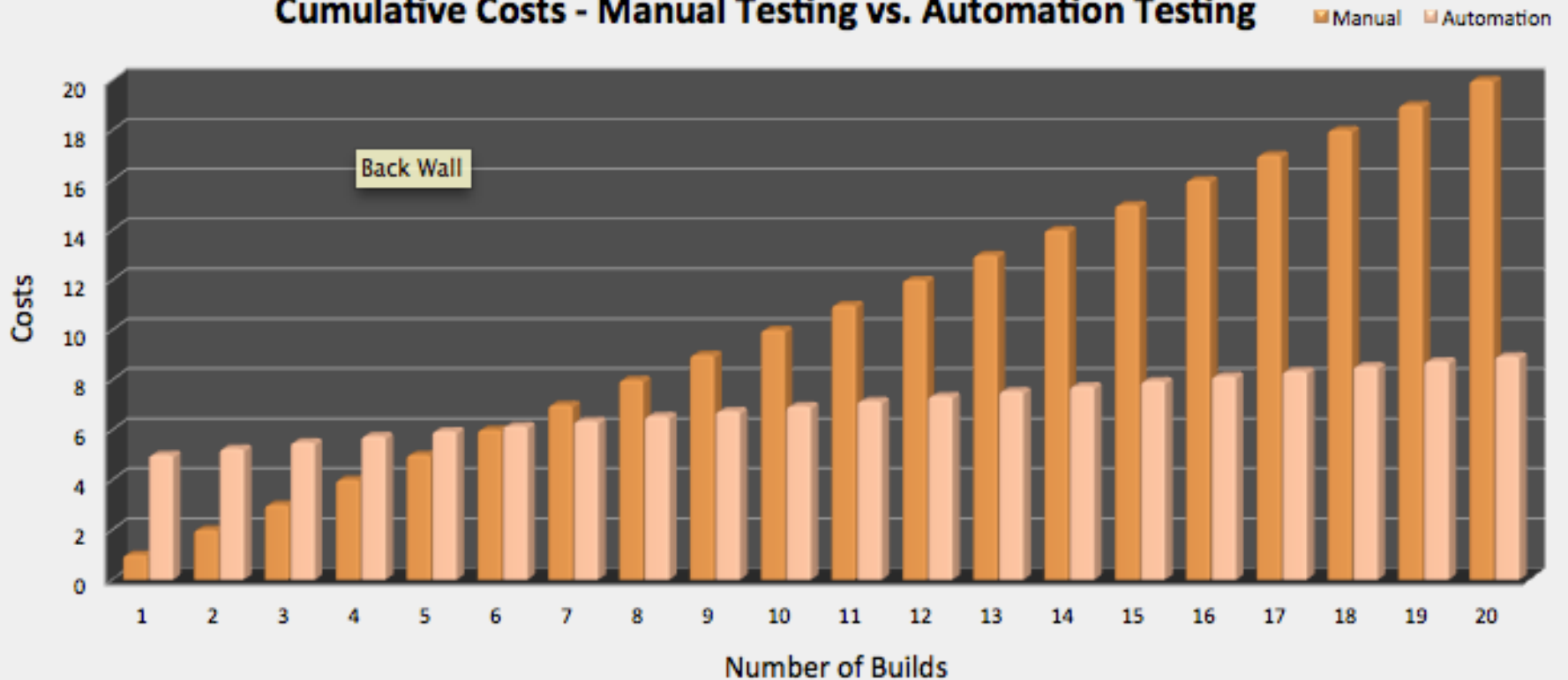
Storage, processing, inventory, waiting, overproduction...
waste!



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Initial costs vs. long term costs

Cumulative Costs - Manual Testing vs. Automation Testing



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5S Explanation



Sort

When in
doubt,
move it
out –
Red Tag
technique



Set in Order

A place
for
everything
and
everything
in its
place



Shine

Clean and
inspect
or
Inspect
through
cleaning



Standardize

Make up
the rules,
follow and
enforce
them



Sustain

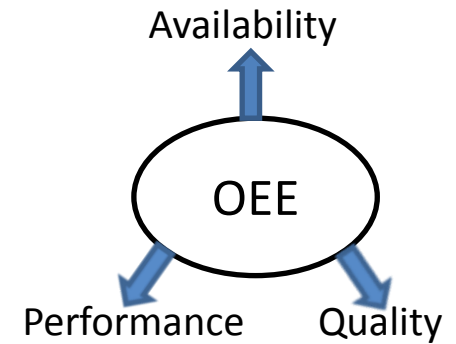
Part of
daily work
and it
becomes
a habit

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Performance and Availability Factors of OEE



- What is OEE (Overall Equipment Effectiveness)?
 - OEE is essentially the ratio of fully productive Production Time to Planned Production Time. It quantifies how well a machine (or line) performs relative to its design capacity, during the periods when it is scheduled to run.
- Why is OEE important?
 - Supports continuous improvement processes
 - Provides benchmarking between machines, lines and plants
 - Provides a consistent way of measuring production effectiveness
 - Helps to identify, track and reduce losses
 - Shortens equipment ROI through increased utilization
 - Decreases costs through waste elimination
 - Increases customer satisfaction through quality improvement

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How is OEE calculated?

- **OEE % = Availability % X Performance % X Quality %**
- A World Class OEE is a value of 85% or higher
- Typical factories have an OEE of 60%, so most factories have lots of room for improvement
- Each factor has its own world class target value:
 - **Availability:** 90% or higher
 - **Performance:** 95% or higher
 - **Quality:** 99.9% or higher (six sigma)
 - **A 90% x P 95% x Q 99.9% = an OEE of 85%**



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Availability

- **Availability** is defined as the ratio between Operating Time (Uptime) to Planned Production time
- How is Availability % calculated?
 - **Availability % = (Operating Time / Planned Production Time) x 100**
- Factors that negatively affect Availability are:
 - Machine Downtime
 - Equipment failures
 - Tooling damage
 - Unplanned maintenance
 - Machine Adjustments / Setups
 - Changeovers
 - Material shortages



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Ways to Improve Availability

- To improve availability, you need to keep track of any downtime events and the reasons they occurred
- Implement Preventive Maintenance programs
 - Track number of machine / tooling cycles
 - Replace tooling at specified intervals
 - Perform scheduled maintenance during scheduled downtimes
 - Keep stock of commonly used spare parts
- Reduce Changeover times
 - Utilize machines that feature tool-less changeovers
 - Use programmable machines with memory storage capability
 - Use barcode scanners to call up jobs stored in memory
 - Use a Manufacturing Execution System to optimize jobs and send them automatically to the production machines (reducing keystrokes and possible errors)
- Ensure all required materials and tooling are on hand for the next job

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Performance



- **Performance** is defined as the ratio between the Actual Production Rate to the Ideal Production Rate
- How is Performance % calculated?
 - **Performance % = (Actual Run Rate / Ideal Run Rate) x 100**
- Factors that negatively affect Performance are:
 - Small stops (< 5 min)
 - Misfeeds or jams
 - Tooling damage
 - Insufficient operator training
 - Equipment age / wear
 - Reduced speed
 - Worn tooling

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Ways to Improve Performance

- To improve Performance, you need to track the production rate of your equipment as a ratio to the ideal production rate.
- Ensure operators are properly trained
- Use quality materials (wire, terminals, etc.)
- Implement PM programs to ensure machines are kept in top condition



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Quality with Respect to OEE

- **Quality** is defined as the ratio between the number of good parts produced to total parts produced
- How is Quality % calculated?
 - **Quality % = (Good Parts / Total Parts) x 100**
- Quality is a deal maker or breaker
 - While machine availability and performance are important, poor quality can render productivity improvements useless.

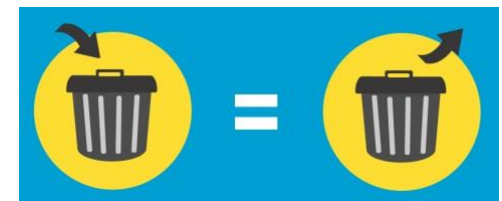
You Can't Build Fast Enough To Make Up For Bad Quality!

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- Factors that negatively affect Quality are:
 - Improper Program Setup
 - Erroneous programming
 - Incorrect or incomplete data
 - Operator entry errors
 - Improper Machine Setup
 - Wrong Tooling
 - Applicators - Blades
 - Wrong materials
 - Using low-quality or defective equipment and tooling
 - Worn presses, applicators
 - Poor quality or damaged blades
 - Using low-quality materials
 - Wire – Terminals – Seals
 - Quality Output Starts with Quality Input



G.I.G.O.



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Ways to Improve Quality

- Prevention vs. Detection
 - To improve quality you need to learn from your rejects.
 - Analyze data
 - Do you know your F.P.Y. rates?
 - Perform root-cause analysis
 - Implement process improvements (you can't "test in" quality)
- Assure proper training
 - Setup personnel
 - Machine operators
- Perform Regular Machine Service, Maintenance and Repair
 - Track number of machine / tooling cycles
 - Replace tooling BEFORE it affects quality
- Use available technology
 - Software and Networked machines to eliminate operator entry errors
 - Integrated Quality Tools to assure proper setup and monitor quality during production

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Using Automation to Improve Quality in Wire Processing

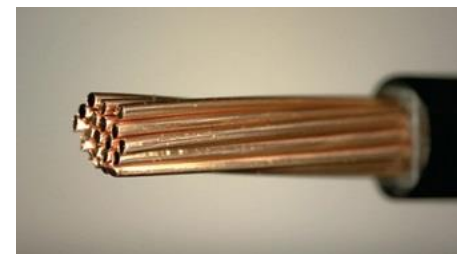
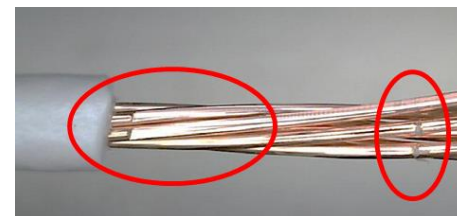
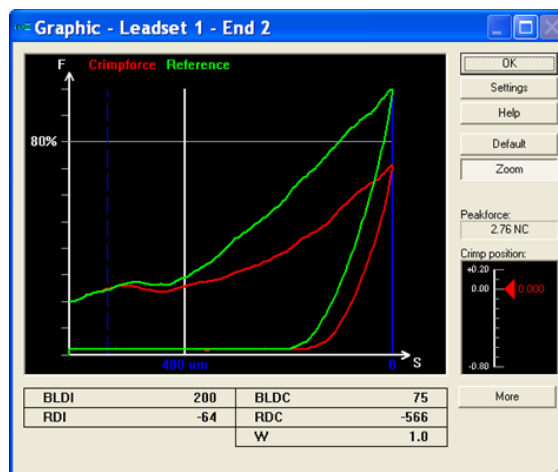
Integrated Quality Tools

Pre Production

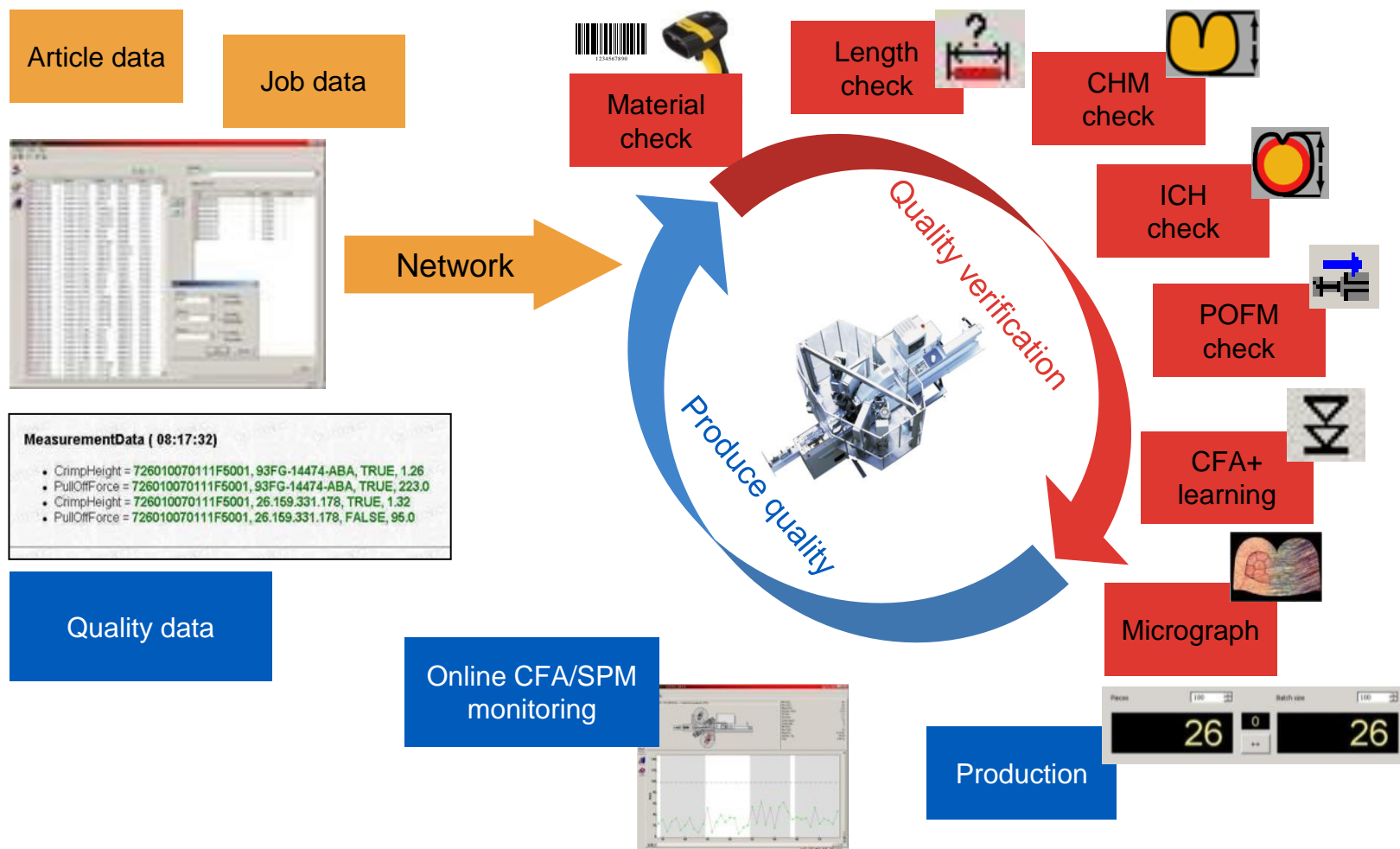
- Barcode Scanner
- Crimp Pull Test
- Crimp Height Analysis
- Length Check
- Cross Section Analysis

During Production

- Crimp Force Monitoring
- Automatic Core Detection
- Strip Quality Check



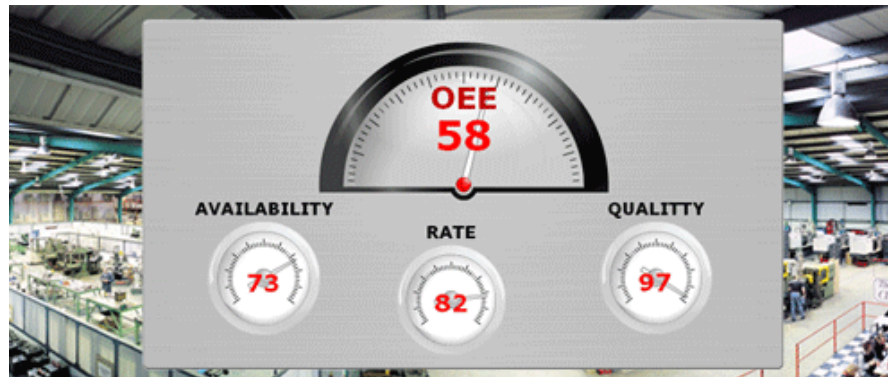
Using Automation to Improve Quality in Wire Processing



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Benefits of Tracking Overall Equipment Effectiveness:
(= Availability % X Performance % X Quality %)

- Higher availability of machines and equipment
 - Increased machine uptime
 - On time delivery to the customer
 - Improved machine capability
 - Increased produced rates
 - Improved product quality
 - Stable and reliable processes
-
- The easiest way to track OEE is to network your processing machines and use Manufacturing Execution Software to calculate the OEE automatically



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Please rate the following statements on a scale of 1 to 5 with 1 being Completely Disagree and 5 being Complete Agree.

	Completely Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Completely Agree
My ERP can interface directly to my MES (Manufacturing Execution System).	1	2	3	4	5
My operators do not have to enter data into machines for each job. (If directly tied into an MES, jobs are automatically programmed into the machine when a work order is scanned.)	1	2	3	4	5
I know exactly how long it takes to set up each job.	1	2	3	4	5
I know exactly when each job was started and completed (using barcode scanners) and average production rate.	1	2	3	4	5
I know when each wire processing machine is running or sitting idle and the reason it is sitting idle.	1	2	3	4	5
I use an MES to optimize work orders in the best sequence, taking changeover times, due dates, available machines and personnel into consideration.	1	2	3	4	5
I integrate mandatory Quality Assurance tests (crimp height, pull test, micrograph, etc.) into the process.	1	2	3	4	5
I have quality safeguards to ensure the operators are using the correct materials (wire, terminals, etc.) A barcode scan of each material could provide a solution to this problem.	1	2	3	4	5
I know what machine, tool or operator produced which circuit and when.	1	2	3	4	5
I maintain a central database of crimping specs, material specs, pull force data, engineering change notices, etc. that is available for all machines.	1	2	3	4	5
I know what obstacles I will encounter, and how I will get around them.	1	2	3	4	5
I know the exact percentage of completion of each order on the factory floor and which orders are behind schedule and why.	1	2	3	4	5
I can easily collect and use data on my processes.	1	2	3	4	5
I know how many cycles each machine, applicator or tool has produced and when maintenance should be scheduled.	1	2	3	4	5
I have cost-reduction targets in place.	1	2	3	4	5
I have cost-reduction efforts in place.	1	2	3	4	5
I can easily identify and eliminate unnecessary costs.	1	2	3	4	5
I am identifying problems/defects in a timely manner.	1	2	3	4	5
I know the Overall Equipment Effectiveness (OEE) of every wire processing machine in my entire factory.	1	2	3	4	5