WIRELESS GAGES TAKE DATA COLLECTION TO NEW LEVELS
AGENDA

• New Industrial Revolution
• Traditional Quality in Manufacturing
• Measuring Data Collection
• Gaging Becoming Digital
• Wireless Data Collection
• Integrated Wireless
• Benefits of Seamless Data Collection
DIGITALIZATION IS CHANGING THE MANUFACTURING WORLD

• Technology and the internet increasingly influence manufacturing

• The next Industrial Revolution will be based on data

• Data from new measuring technologies will make production more individual, flexible and faster
GETTING READY FOR INDUSTRIAL REVOLUTION 4.0

- Many phases to the Industrial Revolution
  - 1.0 Water power and the Steam Engine
  - 2.0 Electric power and mass production
  - 3.0 Computerization and Advances in Product Quality
THE DEVELOPMENT OF REVOLUTION 3.0
COMPUTERIZATION AND ADVANCES IN PRODUCT QUALITY

- The Old Method of Building Quality
  - Batch of parts machined
  - Sent to quality lab for inspection
  - Good - shipped to customer
  - Bad – reworked or scrapped
  - All depended on Quality Department for part qualification and what went wrong with the process
SHORTCOMINGS OF THIS TRADITIONAL METHOD

• Reactive by nature
• Prevents shipment of bad parts but does not prevent bad parts from being made
• Costs with labor, materials and inefficiencies
• Lag time between manufacture to qualification which can make understanding of the process error harder to determine
GO- NO GO METHOD – SIMILAR TO FIXED GAGING

- Fixed limit gages were one of the cornerstones for interchangeable manufacturing was built upon.
  - Consistent in their form and dimension
  - Portable
  - Simple and easy to use – anywhere for easy correlation
  - Economical
  - Only recognizes deviations so severe that it makes the part good or bad

- Provides Part Quality Control – part good or part bad
THE NEED FOR “REAL” DATA

- A “New” concept of using data to prevent bad parts
- Requires a system to track deviations that are a fraction of the part tolerance
- Ability to analyze to uncover potentials for fatal defects before they occur
OTHER REASONS FOR COLLECTING DATA

- Measure and Monitor Process
- ISO/Quality Requirements
- SPC Measurements
- Equipment Function Check
- Calibration Check
Statistics was a branch of mathematics long before variable gaging. The availability of variable data from gaging allowed for applying statistics to the control of industrial processes.
STATISTICAL QUALITY CONTROL IN THE WORKPLACE

SPC started to become widely used in the 60’s - 70’s for control of the process through the use of control or pre-control charts – Although SPC has been around since the 40’s

Often plotting points or writing numbers into a manual created graph.
Hand Tools – Calipers and micrometers with a scale built in

Versatile
Variable data

Variable gaging compares the part to a master gage and reports the deviations
Easier to use
Provides a higher accurate form of variable data
MANUAL DATA RECORDING – PEN AND PAPER
SO MUCH DATA – SO MANY ERRORS

Factors Affecting Accuracy and Throughput:
- Measurement must be suspended in order to record measurement
- Missed or incorrect cell entry on spreadsheet/form
- When measuring, the value can change while being inspected causing uncertainty of the result

Source: Starrett Bulletin No. 578

• For a Typical 500 piece measuring test
• 26 errors recorded
• 5% of data incorrect
• Time consuming
• Repetitive
• Not a fun thing to do
• In the 80’s the advent of PC’s and microprocessors made data analysis easier

• Data had to be manually entered into the computers
Factors Affecting Accuracy and Throughput:
- Measurement must be suspended in order to record measurement
- Missed or incorrect keyboard entry into spreadsheet/form
- When measuring, the value can change while being inspected causing uncertainty of the result

Source: Starrett Bulletin No. 578
TODAY DATA COLLECTION IS COMMON

• Industrialized digital standards are widely accepted making digital data collection widespread

• Most electronic gaging has some form of hard wired digital connection available
30 YEARS OF DATA COLLECTION

- Electronic data collection occasioned a major improvement in data quality
- At the same time gaging started to go digital – providing the ability collect and store this information
WIRED OR WIRELESS DATA COLLECTION
DATA OUTPUT WITH GAGES MAKE DATA
ANALYSIS COMMON

• For a Typical 500 piece measuring
test
• 0 errors recorded
• Does not affect the measurement
process
• Saves time
• Now it is fun!

Factors Affecting Accuracy and Throughput:
• Data collection is part of the measurement process
• No interpretation or memory errors
• What displayed is what is read by the computer –
no chance of changing results
• High efficiency – no data collection time

Source: Starrett Bulletin No. 578
MORE DIMENSIONS – MORE DATA

- As measurement data becomes easier there becomes more demand for data collection
- In some cases many gages provide multiple results and therefore multiple gaging results need be collected
WHAT HAPPENS WHEN THERE ARE NUMEROUS CHECKS TO BE MADE?

- In some cases many gages provide multiple results and therefore multiple gaging results need to be collected
- A cable is required for each gage
- Cables get tangled and interfere with the measuring process
- Multiplexers are required (costly) to network all the cabling
Often the part must be measured on the machine or the part is too large to carry to the gage

Long cables can become safety habits

Likely to break and potentially take the gages with them
Recently wireless transmitters have become an add-on to digital gaging:

- A proprietary transmitter
- Usually a cable for the gage to the transmitter
- A proprietary receiver
- Software for data management
- Very costly
BENEFITS OF WIRELESS GAGING AND DATA COLLECTION

- Ensure trouble free data collection
- Made gages more portable
- Cleaned up the cable nest
- More costly than wired systems
- Some ergonomic issues with add-on boxes – placement, cabling etc.
THE NEXT STEP – WIRELESS INTEGRATION

• Build the transmitter into the indicating device

• Use the controls on the tool to transmit data (or keyboard, timer, footswitch)

• Transparent operation to the user

• Same display to indicate successful data transmission
ELIMINATES COSTLY “ADD-ON” MODULES

- Significantly reduces cost of wireless data transmission
- Saves > $300 per device compared to other ‘add-on solutions"
DIGITAL PRODUCTS WITH INTEGRATED WIRELESS

- Digital Tools with the wireless transmitter built in -
  - Powerful Digital Indicators
  - Versatile Digital Calipers
  - Great Value
  - Secure
  - Long – single battery life
  - Simple data transmission
  - Great range of transmission
  - Excellent ergonomics
BUILT AROUND ANT™ PERSONAL NETWORK TECHNOLOGY

• ANT™ is a proven protocol for ultra-low power practical wireless networking applications.

• Designed for 2.4 GHz operation, ANT is perfectly suited for any kind of low data rate sensor.

• ANT-powered nodes operate for months/years on a coin cell battery compared to hours/weeks for other technologies.

• ANT+ facilitates the collection, automatic transfer and tracking of sensor data for monitoring of all personal wellness/gaging information.
SIMPLE – EASY TO IMPLEMENT RECEIVER

- Size of typical flash drive
- Three channels per receiver
- 8 devices per iStick
- 4 receivers per Marcom Pro
- Transfers information to any Microsoft program (Excel, Word, etc)
- Third party software

i-stick receiver is no larger then a standard USB flash memory drive
ABILITY TO CREATE A “PERSONAL GAGING NETWORK” OF WIRELESS GAGES

- Within the users work station the data collection is transparent to the operator
“PERSONAL GAGING NETWORK” FOR TRANSPARENT DATA COLLECTION

- **Single Gage** –
  - One gage measures one dimension on multiple parts

- **Multiple gages in Sequence** –
  - Multiple gages used in sequence on the same part

- **One Gage System with multiple readouts** –
  - Custom fixture gage uses multiple readouts and all data gathered in sequence base on footswitch (or keyboard entry)
ABILITY TO CREATE A “PERSONAL PROCESS CONTROL NETWORK” OF WIRELESS GAGES

• Make the measurement at the machine
  • Direct measuring feedback to machine controller
  • Machine off-sets created and used
    • Prevent bad parts from being manufactured
    • Correct for tool wear
    • Predict tool life
  • All for free and no extra requirement put on operator
The cost of gaging is less than a wired system with integrated wireless
- No interface boxes, cables, special computers
- The gaging software can reside on the existing workstation computer
- Collection just becomes part of the measuring process
INEXPENSIVE AND GOOD DATA FOR INDUSTRIAL REVOLUTION 4.0

- Industry 4.0 – A Networked Factory
  - Includes manufacturing data within the plant
  - Takes into account changes outside the plant as well
    - Intelligent machines and products
    - Storage systems/resources interlinked including logistics, production, marketing and service
REDUCING COSTS THROUGH INDUSTRY 4.0

Objective of Industry 4.0

- Automation of manufacturing
- Automation of the measuring process
- Unlimited communication through “Cloud Monitoring”.
- Look into the machine for preventive status monitoring.
- Integrated systems are networked for self-monitoring
INTEGRATED WIRELESS GAGES IS A STEP CLOSER TO INDUSTRY 4.0

- Makes data collection easy and transparent
- Provides the benefits of a personal network – less rework and more productivity
- Opportunities for taking the personal network and make it a cloud-based network
- Allows intra company access to data to monitor processes from any supervisory position
SUMMARY

- Industrial Revolutions
- Data Collection – Why?
- Traditional Data Collection Methods
- Data Collection with Integrated Wireless
- The idea of setting up personal data collection networks
- Expanding these networks to allow data sharing
- Integrated wireless gaging is a step closer to the next industrial revolution
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