Automated Ultrasonic Inspection for the Steel Tube & Pipe Industry

Philip Dooms
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Imagination at work
MEASUREMENT & CONTROL

for the health of industry
MEASUREMENT & SENSING
- Sensors
- Nuclear instrumentation
- Flow (Panametrics)
- Gas and moisture
- Pressure (Druck)

INSPECTION TECHNOLOGIES
- Ultrasonic, eddy current
- Remote visual
- CR/DR, X-Ray, CT
- Software

FLOW & PROCESS TECHNOLOGIES
- Control valves and actuators
- Safety relief valves
- PII
- Inspection (ILI) services for oil & gas transmission pipelines
- Cracks / corrosion data analysis
- Integrity engineering
- Software tools
- Remote monitoring

CONTROL SOLUTIONS
- Control system
- Upgrade/retrofit projects
- Parts and services
- Cyber security
- Software and HMIs
- Mechanical solutions

BENTLY NEVADA
- Monitors
- Field devices
- Tech support
- System 1® software
- Machinery diagnostics

SOFTWARE & SERVICES
- Software platform
- Applications
- GE Predix technology
- Plant-wide machinery health services
- Repair & calibration services
Ultrasonic Testing Machines

- 4 Sites
  - Hürth, Germany
  - Alzenau, Germany
  - Shanghai, China
  - Lewistown, USA

- 5 Segments served
  - Oil&Gas
  - Aerospace
  - Rail
  - Automotive
  - PowerGen

- Turnkey Solutions
- Integrator packages
- ~400 employees
- Since 1960 (Krautkrämer)
Where are we in the tube manufacturing process?
Seamless tubes Process Stages

Starting material

- Steel billets of various dimensions
- Continuously cast or rolled

Piercing

- From billet to hollow
- Cross-roll piercer or piercing press

Elongating

- Hot pilger mill
- Mandrel/Konti Mill
- Assel Mill
- Push Bench mill
- Plug mill

Mill type defines later application of the tube!
Process Stages

Hot forming

Sizing Mill
- Stretch-reducing mill
- Rotary Expander
- NDT/Inspection?

Finishing Line
- Straightening
- Upsetting press
- Chamfering
- Threading
- Heat treatment
- Hydrostatic tester
- NDT/Inspection

Adjusting Line

Final Product
- Packaging
- Shipping

Cold forming
In line Inspection

- Compact, inline solution
- WT/LAM
- Full dimensional measurement (GEO: API5C2)
Batch Inspection

- High speed batch solution
- Portal or Tank (Helix)
- Full API5CT test functionality
- Up to ±45° gapless obliques capability

For adjusting lines with transverse transport
UT Inspection or Quality Control of O&G Tubes

Today’s drilling techniques drive tubular products towards their limits:

• Hydraulic fracturing
• Horizontal drilling
• Deep wells
• Cont. drilling torques up to 63,000 Nm (46,500 ft-lbs)

Higher demands for UT NDT of drill pipe, casing, risers, etc.
UT Inspection Standards – Seamless O&G Tubes

• API 5CT
  Base spec
• PSL2 & PSL3
  Product Spec Level add-ons to 5CT defining add’l criteria
• API 5C2
  Collapse & Burst requirements: ID/OD/OV/EX
• On top: Oil Company specific requirements
  Shell, Chevron, Total, BP, ExxonMobil
Inspection a cost or value creation...? Where does Inspection fit in the value chain...

Value

Requirements Level

End User
Oil&Gas
Automotive
PowerGen

GE

Tube Mill

Value

Shell, Chevron
...

API 5C2

PSL2 & 3

API 5CT

Value creation
Application expertise
**Open House tomorrow**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>9:00</td>
<td>Welcome, Introduction and Agenda</td>
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<tr>
<td>9:15</td>
<td>High speed testing for API 5CT using Rotary Head Testing Machines and Phased Array Technology</td>
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<tr>
<td>9:40</td>
<td>The Future of Seamless Tube Testing using 2D Arrays</td>
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<tr>
<td>10:05</td>
<td>Automated SAW Pipe Weld inspection using Phased Array Ultrasound</td>
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<td>10:30</td>
<td>Coffee Break</td>
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<tr>
<td>11:00</td>
<td>Latest product improvements to GE’s ROWA-B bar tester</td>
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<td>11:25</td>
<td>Guest presentation: BÖHLER Edelstahl GmbH &amp; Co KG</td>
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<td>15 Years Experience in Industrial Phased Array Testing of Rolled Bars with GE ROWA-B-PAT-Systems</td>
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<td>11:55</td>
<td>Wrap up and close of presentation segment</td>
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<tr>
<td>12:00</td>
<td>Bus transfer to GE Hürth facility</td>
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<td>13:00</td>
<td>Lunch Break</td>
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<tr>
<td>13:45</td>
<td>Live demonstrations</td>
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<td>- ROWA-B with Reference Standard Manipulator</td>
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<td>- GRP Portal</td>
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<td>- ROWA-WT</td>
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<td>- USIP</td>
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<tr>
<td>16:00</td>
<td>Expert Discussions &amp; Individual Meetings</td>
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<tr>
<td>17:00</td>
<td>End of Conference</td>
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Big Data & Asset Performance Management

- Secure Connected Assets
- Industrial Big Data
- Industrial Data Science
- Mobile & Cloud
ONE Platform to Bridge the “OT / IT Gap”
Industrial Internet and UT Inspection Solutions

From Testing Machines to “Intelligent Machines”
From Inspection to “Monitoring”

- Inspection data logging
- Process parameters logging...
- Monitoring & Feedback to process control
Industrial Internet and GE’s Inspection Solutions

- Harmonized NDT databases
- Worldwide access to data
- Global statistics and trends
- NDT data visualization and tracking
- Process control
Take aways...

• NDT Inspection can clearly add value...

• It open possibilities to differentiate your product...

• We (GE) are preparing it’s (Inspection’s) place in the Industrial internet or Industry 4.0...
Thank you

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WWW.LINKEDIN.COM/COMPANY/GE-INSPECTION-TECHNOLOGIES