Digital Conversion

“Successful conversion from film to Computed Radiography”

GE Inspection Technologies
Content:

- Digital Conversion
- Digital Conversion Benefits
Digital Conversion
Radiographic Examination

- Film
- Traditional Film
- Film Processing (Processors & Chemistry)
- X-Ray / Isotope
- Radiation Source
- Object
- Phosphor Plates
- Plates Read Out Digitally (CR)
- Direct Digital Read Out (DR)

- Digital

- Object
Why converting to Digital Radiography..?

For the same reasons as why commercial and private photographers are going for digital imaging:

- Speed – Instant Imaging – No consumables - No Film Development Process
- Digital Image Enhancement – Imaging Tools
- Easy Data managing – Fast Data Sharing with others
- No Environmental issues
- Easy, Trendy, etc..
Digital conversion…Why now?

- Technology is available
- International Standards released
- Required quality can be achieved
- Recently developed Computer hard- & software adds tremendous value to digital solutions
- New applications are conceivable
Go digital…improve efficiency & accuracy

Create Digital Images

- Film Digitizers scan film into digital images
- Computed Radiography scanners read CR plates to create digital images
- Direct Radiography provides ‘instant’ digital images
- DR & Automation create additional efficiencies

Manage Digital Images

- Receives digital images from the Image Acquisition Station
- Allows location of defect indications
- Adds inspection results to images
- Saves results on archive media
- Connects to customer network for information storage or transmission

Automated Solutions
Conventional Film Radiography

- Film “With or without Pb intensifying screens”
Conventional Film Radiography

Set Up

Exposure - X-ray or Isotope

Film

Processing

Interpretation
Computed Radiography

Set Up

Exposure - X-ray or Isotope

Shorter exposure time

Scanning

Rhythm Software WS

CRx Flex

CR50P

CR50XP
Phosphor screen captures the image…

- Dedicated Phosphor screens/cassettes
- Same exposure process as film
- Highly portable & flexible
- Reusable
CR versus Film

Feature & Benefits

• **Lower Doses**
  - Smaller Safety perimeters
  - Shorter plant shut-downs
  - Smaller isotopes / longer lifetime

• **Easily availability digital images and data**
  - Data and images together on network
  - Easier and faster analysis of defects
  - Lower risk of lost data

• **Light and robust Phosphor plates & Cassettes**
  - Can keep same workflow the customer is used to

• **Flexible Imaging Plates**
  - Plates can be bent
CR versus Film

Feature & Benefits

• Shorter exposure times (10-50% D7)
  – Time efficiency for resources, plant shut down, higher throughput

• Higher Dynamic Range
  – Less retakes by bad exposure, different thicknesses in one shot

• Reusable Phosphor plates
  - No film needed: consumable cost saving

• No energy limitations
  – Wide range of applications

• No chemicals, no darkroom
  – Less expensive infrastructure (No EHS issues)
Data Sharing Scenarios

Scenario 1: Share data from Rhythm™ Review workstation to any other PC

- Utilize CD/DVD viewer
- Full fidelity image
- Some analysis tools
  - Window level / Zoom
  - Line measurement
  - Angle measurement
Data Sharing Scenarios

Scenario 2: Share data between Rhythm™ Review workstations

Site 1

- Production Dept.
- Quality Dept.

Site 2

- LAN/WAN

- Full Review and analysis capabilities
- “Push” (send) studies to other workstations
- “Pull” (query) studies from other workstations
- Utilize “workflow rules” to automatically route images (e.g., send all “rejected” images to engineering)
Data Sharing Scenarios

Scenario 3: Share data using Rhythm™ Archive

- All studies are stored centrally
  - no need to “query” individual Rhythm Review stations to find the right study
- Larger, long-term storage
  - Without central archive, at some point studies are removed from individual review stations (archived to CD/DVD)
  - Therefore, they are not easily accessible by remote location
- Workflow rules may be used to automatically route, archive, and delete images (from local review stations)
- Full Review and analysis capabilities
Key advantages

• **Ease of Use**
  Streamlined user interface, customizable toolbars, short cut keys.

• **Multi-modality**
  One application for multiple modalities RT, VT, UT, ET,..

• **DICONDE**….really DICONDE, which allows the image to be a complete report in itself – DICONDE is an international standard that provides a common platform for users when dealing with NDE images

• **Leverage GEHC technology** developed over the past 11 years

• **Scalable architecture**, customer can add components when the need is there..

• **Application specific tools**, e.g. defect dept measurement, area measurement tools, ..
Digital Conversion Benefits
How can digital technology benefit your operation?

Two major classes of efficiency improvement:

• Operational
• Financial

All improvements provide value by enhancing ultimate mission of “flying more at reduced costs”!
Value from Operational Benefits

Time and Productivity:
• Additional Throughput
• Reduced Cycle Time (e.g.,)
  – Process Simplification …
    Eliminating Steps in the Process
• Reducing Time to Perform Tasks

Expected Benefits:
• >50% Additional Throughput
• 50% reduction in process steps
• 10x improvement in exposure time

Quality:
• Probability of Detection …
  Equivalent to Film in Targeted Applications

• 100% equivalence in defect indication detectability

Improved speed/quality trade-off allows realization of benefits
### Value Analysis – Financial Benefits

#### Customer's Income Statement

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Sales</td>
<td>1,000</td>
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<tr>
<td>Variable Costs</td>
<td>600</td>
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<tr>
<td>Contribution Margin</td>
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<td>Depreciation/Amort</td>
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<tr>
<td>Fixed Costs</td>
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<tr>
<td>Operating Margin</td>
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<tr>
<td>Other Inc/(Exp)</td>
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<tr>
<td>Interest Inc/(Exp) (21)</td>
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<tr>
<td>Taxes</td>
<td>26</td>
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<tr>
<td><strong>Net Income</strong></td>
<td><strong>38</strong></td>
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</tbody>
</table>

#### Customer's Balance Sheet

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Cash</td>
<td>20</td>
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<tr>
<td>Receivables</td>
<td>250</td>
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<tr>
<td>Inventories</td>
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<tr>
<td>Other Assets</td>
<td>500</td>
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<tr>
<td><strong>Total Assets</strong></td>
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<tr>
<td>Trade Payables</td>
<td>280</td>
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<tr>
<td>Other Liabilities</td>
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<tr>
<td>Borrowings/Debt</td>
<td>300</td>
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<tr>
<td><strong>Equity</strong></td>
<td><strong>300</strong></td>
</tr>
</tbody>
</table>

1. **Reduced Inspection Labor**
2. **Reduced Rework Labor**
3. **Reduced Variable Manufacturing Overhead – Film and Chemicals Procurement, Handling & Storage**

### Financial Metrics: Representative Customer Experiences

1. **Net Present Value (NPV)** – 2 Times Initial Investment
2. **Internal Rate of Return (IRR)** - 30% IRR
3. **< 1 to 2 Year Payback Period**

*Every Customer is unique…requires value analysis*
GE imagination at work