


Digital Conversion

"Successful conversion from film to Computed Radiography"

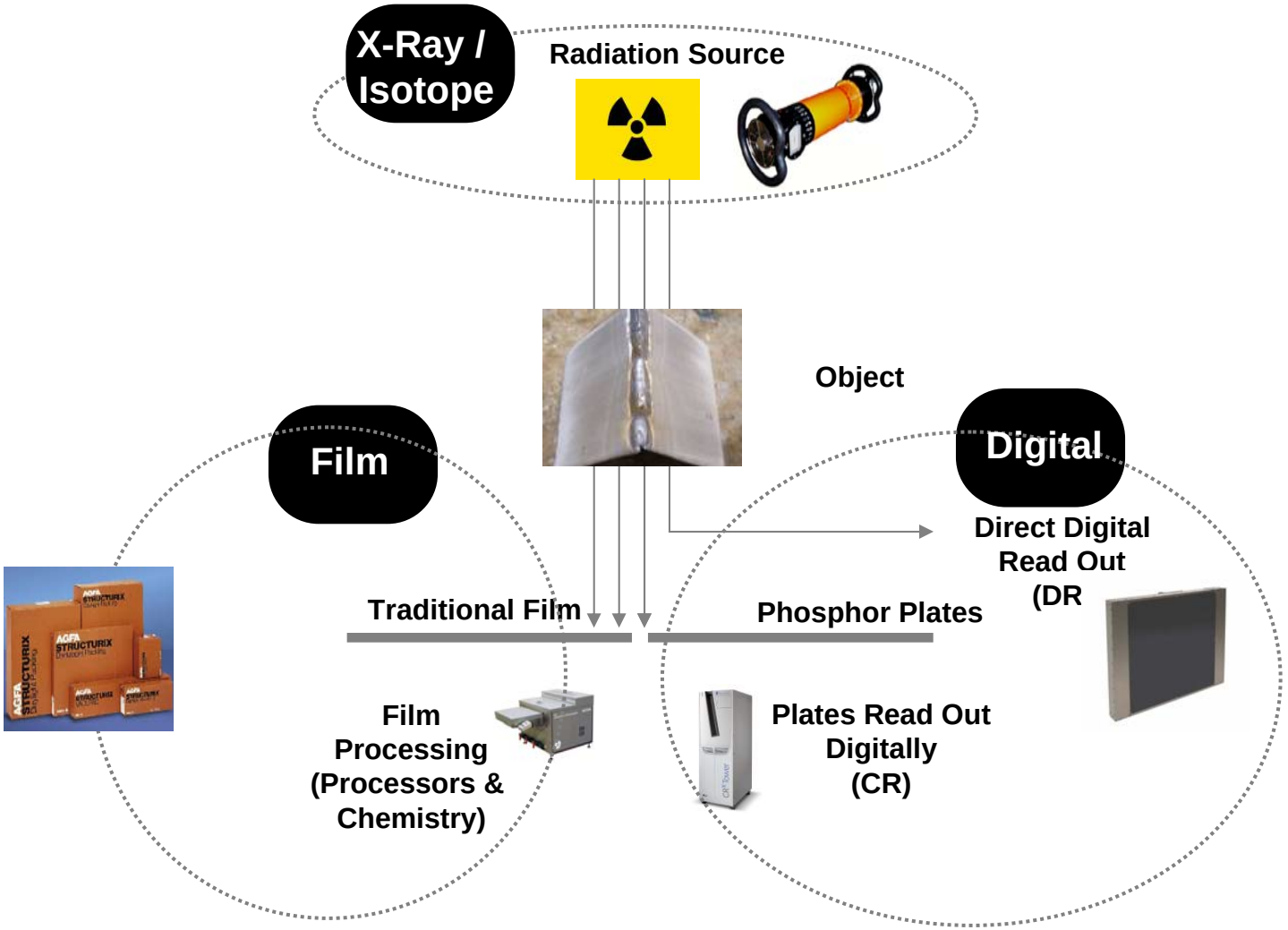
GE Inspection Technologies

Content:

- Digital Conversion
- Digital Conversion Benefits

Digital Conversion

Radiographic Examination



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 Digitizer

Film Digitizers scan film into digital images

CR Scanners

Computed Radiography scanners read CR plates to create digital images

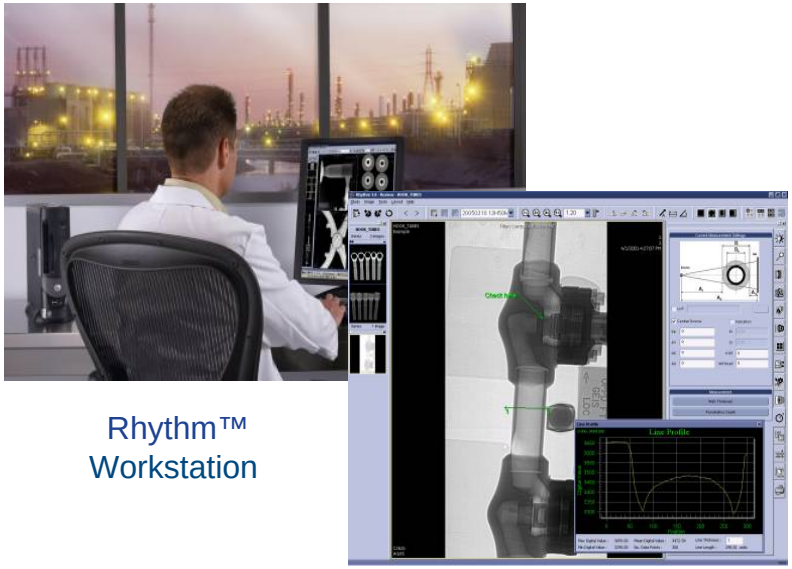
DR Detectors

Direct Radiography provides ‘instant’ digital images

DR & Automation create additional efficiencies

Automated Solutions

Manage Digital Images

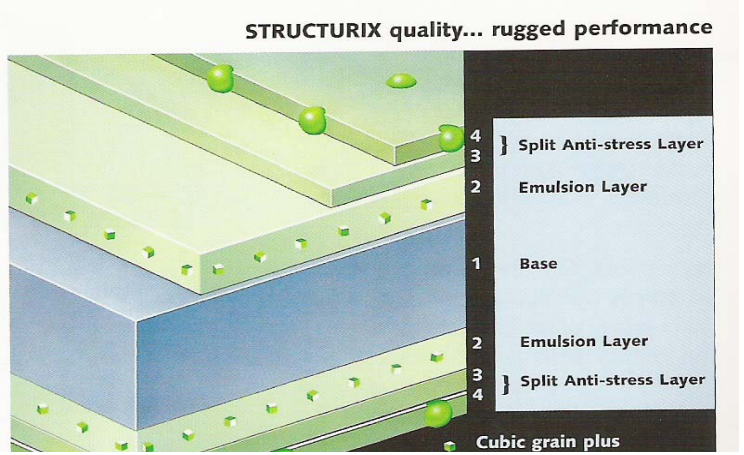


Rhythm™ Workstation

- 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

Conventional Film Radiography

- Film “With or without Pb intensifying screens”

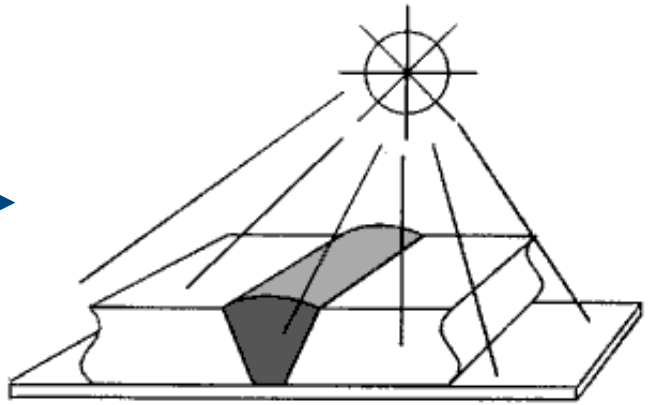


Film	Characteristics	Applications
D2	extremely fine grain film with high contrast, ideal for exposures requiring finest possible detail renderni	electronic components, composite materials castings (light metals and alloys) multiple film techniques
D3 s.c.	Single coated film with high image quality, high contrast and pleasant image tint	electronic components, composite materials neutron radiography inspections, whereby optical enlarg
D3	Ultra fine grain film with high contrast.	electronic components, composite materials castings very high quality welds
D4	Extra fine grain film with very high contrast, suitable for wide variety of x-ray applications	electronic components, composite materials castings very high quality welds
D5	very fine grain film with high contrast, excellent for visualisation of discontinuities	weldings castings shipbuilding aerospace and aircraft indus
D7	Fine grain film with high contrast and speed, designed for direct exposure with lead screens	weldings castings defence industry composite materia
D8	Medium grain film with high contrast and very high speed	concrete and heavy construction work castings multiple film techniques

Conventional Film Radiography

Set Up

Exposure - X-ray or Isotope



Film Processing

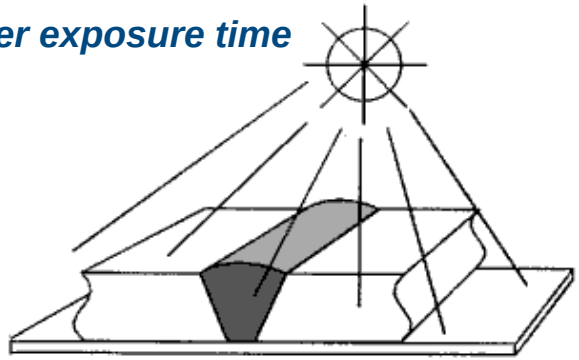
Interpretation

Computed Radiography

Set Up

Exposure - X-ray or Isotope

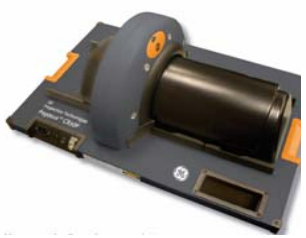
Shorter exposure time



Scanning

CRx Flex

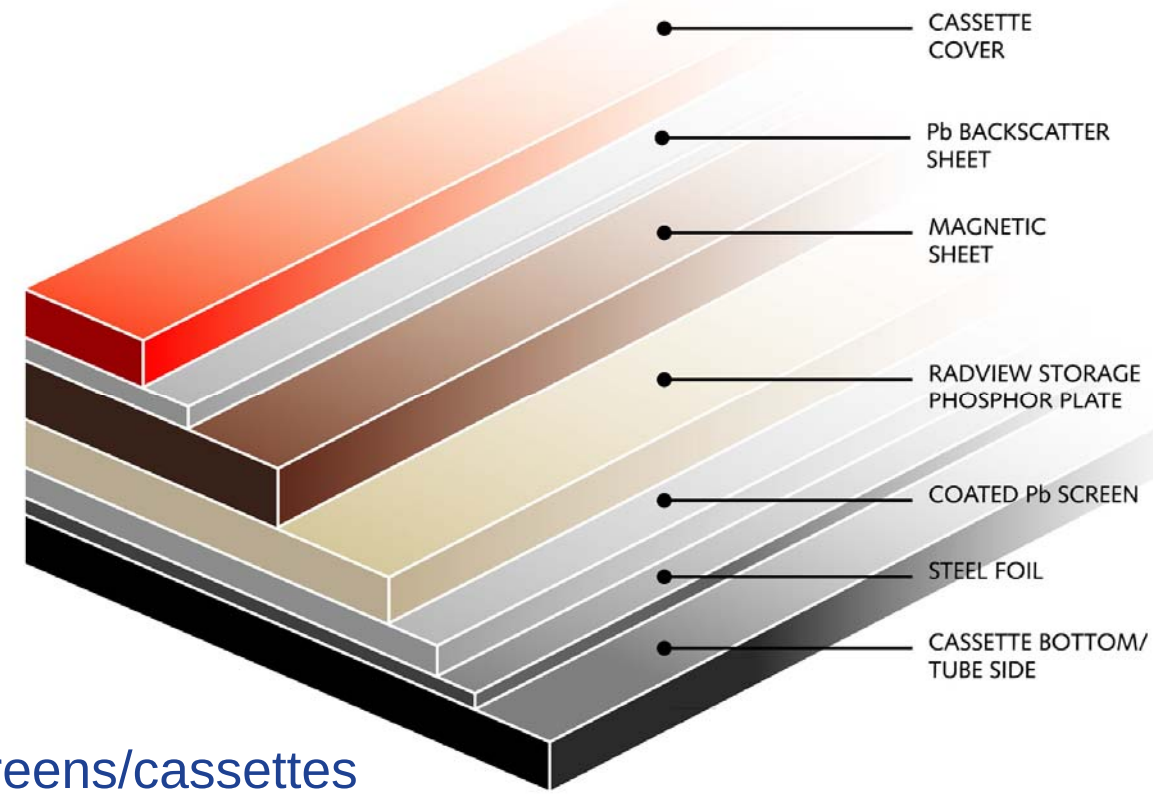
CR50P



CR50XP

Rhythm Software WS

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

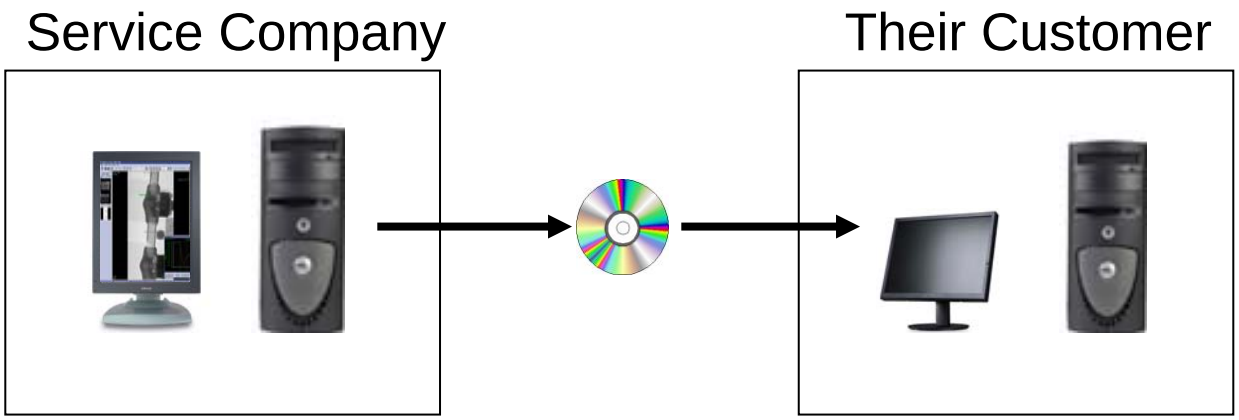
CR versus Film

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

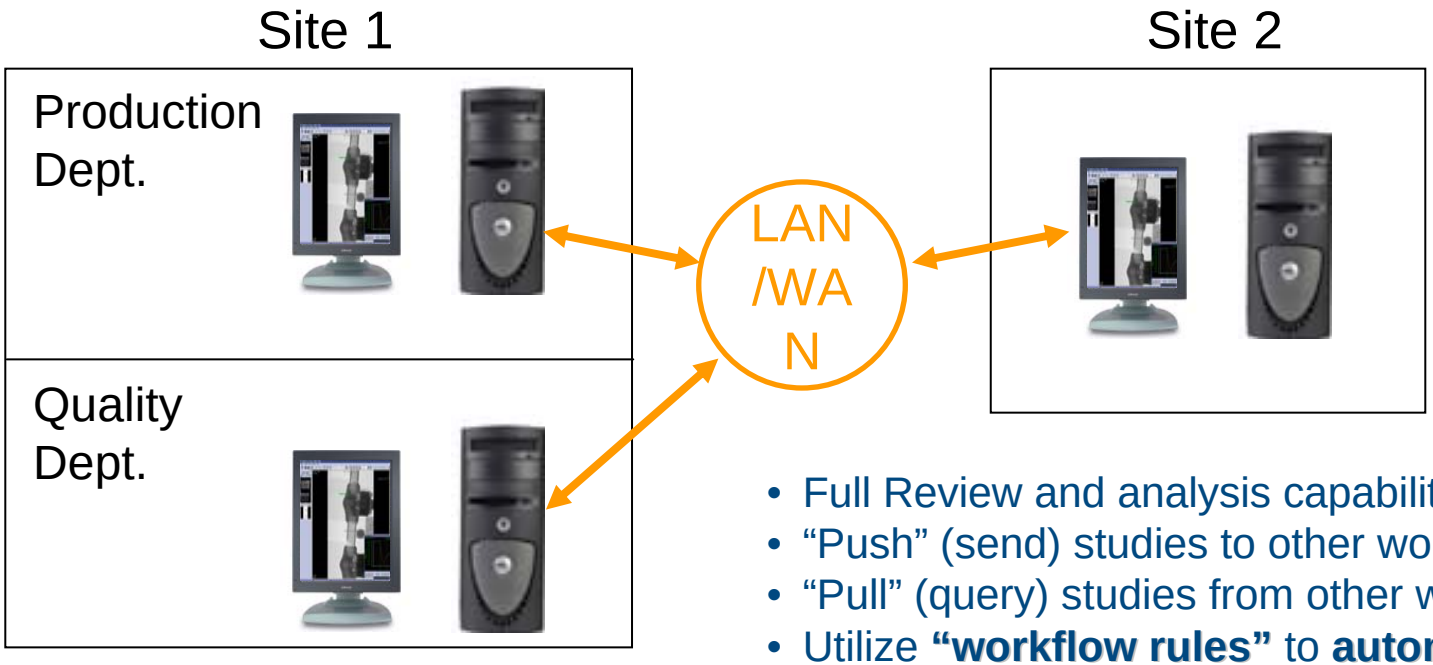
Scenario 1: Share data from Rhythm™ Review workstation to any other PC



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

Data Sharing Scenarios

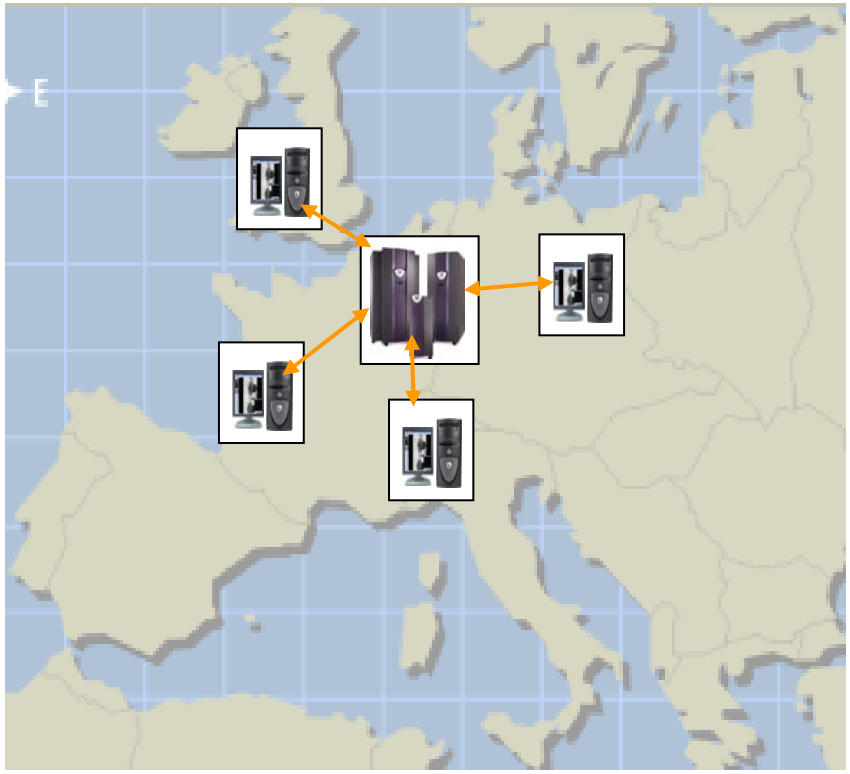
Scenario 2: Share data between Rhythm™ Review workstations



- 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

Expected Benefits:

- >50% Additional Throughput

- Reduced Cycle Time (e.g.,)
  - Process Simplification … Eliminating Steps in the Process

- 50% reduction in process steps

- Reducing Time to Perform Tasks

- 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

Sales	1,000
Variable Costs	600
Contribution Margin	400
Depreciation/Amort	20
Fixed Costs	300
Operating Margin	80
Other Inc/(Exp)	5
Interest Inc/(Exp)	(21)
Taxes	26
Net Income	38

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

1. Reduced Dark Room Maintenance

Customer's Balance Sheet

Cash	20
Receivables	250
Inventories	300
Other Assets	500
Total Assets	1,070
Trade Payables	280
Other Liabilities	190
Borrowings/Debt	300
Equity	300

1. Faster Cycle Time…Less WIP Inventory and Carrying Costs
2. Reduced Film and Chemical Inventory

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