



Rapid Response

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Rapid Response Research Service

Question: What are the environmental wastes and cost accounting considerations associated with switching from traditional x-rays to digital imaging?

Requestor: Cast metal part manufacturer

Date: December 2010

Request: A metal casting company has been asked by their customer to convert from traditional x-ray imaging of their parts, to digital, and they want to analyze all of the potential environmental cost savings prior to purchasing

Key Findings / Recommendations

The investment of converting to digital imaging is significant, however, it is a complex decision involving evaluation of available technology suitable for the application, the investment, and a thorough accounting for potential cost savings.

Costs will include system hardware, system software, application software, long-term system maintenance, staff training, vendor costs, and other expenses. And, because of the rapid pace of technological obsolescence, continuing investments in aspects of imaging applications are necessary. Benefits include higher office productivity, lower storage costs, and the option of using the web to make digitized information easily accessible (Srinivasan et al 2006).

A summary of some of the potential environmental, waste, and productivity savings to quantify are listed below:

- Reduced or eliminated purchase of consumable materials
 - Fixer
 - Developer
 - Film/tablets
 - Film jackets/sleeves
 - Personal protective equipment (PPE)
- Reduced hazardous and solid wastes
 - Silver bearing materials
 - Lead foil, lead-lined (radiation-proof) boxes (if used), aprons
 - Silver recovery services (including transport of materials)
 - PPE
 - Films no longer needed for storage
 - Containers and packaging associated with purchased consumables (above)
- Reduced inventory and material management (especially hazardous materials)
- Reduced physical space (onsite and/or offsite) and costs
 - Image development and related lab space
 - Consumable, material inventory storage
 - Offsite storage rental space
 - Maintenance and fire protection for onsite storage space
- Eliminate costs for physical delivery of images
 - Mailing images (postal) or courier service to customers

- Duplicate copies (for customer, one at point of manufacture)
- Reduced labor costs, such as:
 - Filing and retrieval activities (especially if images are stored at a remote location)
 - Labor spent developing images
 - Production delay or idle waiting time for new or retrieved images
 - Rework and time in queue for defective parts (due to more immediate access to image, measurement capabilities, and magnification)
 - Manual or computer logging and tracking of images and notes (which can be captured in the same file as the image)
 - Image retakes due to misplacement or poor quality
 - Managing solid and hazardous wastes, including hazardous waste documentation
 - Reduced chance of lost images, retakes, etc.
 - Potential for reduced downtime with digital vs. traditional equipment
- Revenue enhancement
 - Increased level of customer service
 - Additional space to convert to manufacturing or other use

Additional References and Resources (An Annotated Bibliography)

1. Washington State Department of Ecology (2010). Dangerous Wastes from X-Ray Operations in Medical and Dental Offices. Accessed at http://www.ecy.wa.gov/mercury/mercury_dental_xray.html
Discusses dangerous wastes associated with medical and dental x-ray.
2. McLachlan G. (2005). Looking Beyond Film. Accessed at <http://www.xrayllc.com/downloads/articles/NDTFeature2-Xray.pdf>
Discusses advantages of digital imaging for cast parts, especially the ability to use the capabilities and features of the imaging system to reduce rework and remelting. Provides suggestions on helpful features of imaging systems specific to cast parts.
3. Ziegler, M. (2002). Is PACS Worth the Trouble and Expense? A Case Study of the Landstuhl Regional Medical Center's Picture Archiving and Communications System (PACS) Implementation. Accessed at <http://faculty.ed.umuc.edu/~meinkej/inss690/ziegler.pdf>
This study looks deeper at the business case analysis and justification for a digital system. Some of the specific advantages that are also relevant to non-medical applications include:
 - Less downtime for maintenance, which in turn will increase availability of the equipment.
 - Elimination of delays in diagnostic interpretation and clinical review which were attributed to the courier services of the films will be eliminated (expect a decrease in processing time by as much as five days).
 - Instantaneous availability of images for clinical use as well as diagnostic interpretation as opposed to retrieving copies in a physical filing system.
 - Reductions in retakes due to lost or misplaced films and folders, or poor quality images (measured at 20-30% of past images, with the new system estimated at about 1%).
 - Recovering space by the elimination of film storage.
 - Avoidance of storing, handling, and process film and the related chemicals
 - Eliminates multiple handwritten logbooks to track the carried films between the facility and outlying clinics and errors that are introduced when handling large amounts of carried film files.
4. Srinivasan M, Liederman E, Baluyot N, and Jacoby R, (2006). Saving Time, Improving Satisfaction: The Impact of a Digital Radiology System on Physician Workflow and System Efficiency. Journal of Healthcare Information Management — Vol. 20, No. 2. Accessed at http://uwf.edu/sahls/medicalinformatics/docfiles/PACS_Saving%20Time.pdf
Discusses a study of cost and other savings associated with a new digital imaging system. Page 129 offers an explanation of cost savings.

5. Cost Benefit Calculator (By Kodak Dental Systems). Accessed at <http://www.carestreamdental.com/en/digital-imaging/intraoral-radiography/kodak-rvg-6100/roi-calculator.aspx>

Although intended for dental office use, the calculator offers a simple way to look at avoided costs of traditional x-rays, and provides an estimate of film cost per image.

6. State Archives Department, Minnesota Historical Society (2004). Accessed at http://www.mnhs.org/preserve/records/electronicrecords/docs_pdfs/erdigitalimaging.pdf

Although this statement is applicable to document archival, it provides sound recommendations when considering upgrading to digital imaging.

“Is digital right for you? A comprehensive cost-benefit analysis is a necessary step in determining the answer. Costs will include system hardware, system software, application software, long-term system maintenance, staff training, vendor costs, and other expenses. Benefits include higher [...] productivity, lower storage costs, and the option of using the Web to make digitized information easily accessible. Keep in mind that, because of the rapid pace of technological obsolescence, you will need to make continuing investments in all aspects of an imaging application on a routine and frequent basis”.