Advancements in Personal Dosimetry for Industrial Radiography

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NDTMA Conference
February 14, 2019
Advancements in New Dosimetry

• Agenda

✓ History of Issue
✓ Review of Current Regulation
✓ Current Dosimetry – Disadvantages
✓ New Technology – Advantages
✓ Evidence New Technology Helps
✓ Change to Regulation
February 2011 - Requested authorization to use Electronic Dosimeter/Alarming Rate Meter Combination unit in lieu of Direct Reading Dosimeter and Alarming Ratemeter.

December 2011 – Additional information and clarification provided


October 2015 – NRC inspection of a crew at a temporary jobsite resulted in violation for use of unapproved dosimetry.

July 2016 – Petition for rulemaking submitted to NRC requesting change to 10 CFR 34.47 allowing the use of digital dosimetry,
Per Regulation

10 CFR 34.47: Personnel Monitoring

34.47(a)  The licensee may not permit any individual to act as a radiographer or a radiographer's assistant unless, at all times during radiographic operations, each individual wears, on the trunk of the body, a direct reading dosimeter, an operating alarm ratemeter, and a personnel dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor.
Issue:

- Based on interpretation received from NRC, current regulation requires three separate instruments and does not allow for use of multi-function devices (i.e. electronic dosimeter/alarming ratemeter combination units).

- Additionally, current regulation requires film badges to be exchanged monthly and all other personnel monitoring badges to be exchanged at least quarterly. (Digital monitoring badges do not require exchange).

- Industrial Radiography, under Part 34, only industry not permitted to wear new technology.

**REGULATION NEEDS TO CHANGE**
Current Dosimetry

(Examples)

Arrowtech W138
Direct Reading Dosimeter

NDS Products RA-500
Alarming Ratemeter
Current Dosimetry

Disadvantages

– No battery life indicator or alarm – Battery could be checked in morning but be bad by afternoon without knowing.

– No ability to track dose, dose rate or trends. Dose and dose rate received not recorded except manually by wearer.

– Durability questionable – direct reading dosimeter can discharge with hard bump or drop.

– Audible alarm on RA-500 difficult to hear in loud environments. No other physical alarm available.
New Technology

(Examples)

Sentinal RadEye G  Tracerco PED+  Mirion DMC-3000

Electronic Dosimeter/Alarming Ratemeter Combo Units
Advantages of New Technology

Advantages offered by new technology could help reduce employee exposure = ALARA.

• Battery life indicator and low battery alarm

• Programmable alarm thresholds for dose and dose rate.

• Multiple alarm indicators – audible, visible, vibrating

• Can be programmed by manufacturer and locked out to prevent user changes.
Advantages of New Technology

Advantages (cont.)

• Special software required to make changes/calibrate.

• Downloadable graphics displaying dose and dose rate alarm exceeded periods

• Combined with other new dosimetry options, investigation of high dose periods better defined.

• Items such as date exposure was received, length of time spent in high radiation area, etc. can be determined and used in ALARA investigations.

• Durable, Rugged and Reliable. Water resistant.
Other New Technology

Personal Monitoring Badges using Direct Ion Storage Technology

Advantages:

1) No exchange period – Data (readings) transmitted via internet to processor. Individual sees reads every time he or she logs in and reads device.

2) Ability of individual to read badge any time - multiple reads during each month

3) Immediate reads following emergency situations – No delay in reporting.
Evidence indicates use of new digital dosimetry can reduce overall exposure.

Average dose received per employee based on those employees receiving at least 1 mrem during the year.

- **CY2010** (last full year utilizing former dosimetry badge)
  - 811 employees badged – Average dose received 551 mrem

- **CY2015**
  - 1207 employees badged – Average dose received 473 mrem

- **CY2016**
  - 1210 employees badged – Average dose received 382 mrem

- **CY2017**
  - 1351 employees badged – Average dose received 369 mrem
One Additional Note:

• Most Industrial Radiographers are in their early 20’s to mid 30’s in age.

• They were born and raised in the digital age.

• They’re familiar with this type of technology and are more likely to wear and use it.
Regulation is Changing

Road to Regulation Change

• July 2016 – Petition for Rulemaking submitted to NRC requesting changes to 10 CFR 34.47 and parts of 10 CFR 20 to allow for the use of digital dosimetry and electronic dosimeter/alarming ratemeter combination units.

• August 2016 – Encouraged Organization of Agreement States to review current regulations for potential changes that will allow the use of digital dosimetry and combination units.
Regulation is Changing

• September 2017 – NRC issued Regulatory Issue Summary RIS 2018-06
  ✓ Provides clarification and approval for use of electronic dosimeter/alarming ratemeter combination dosimetry devices.

  ✓ Provides authorization and specifies Conditions for use.
Regulation is Changing

Conditions for use of Direct Ion Storage Dosimetry

1. The dosimetry is being provided and dose data evaluated and reported for the dose of record by an NVLAP-accredited processor

2. The licensee and NVLAP processor have a documented agreement specifying arrangements to identify and address the following areas (1) replacement of dosimeters (e.g., resulting from end-of-life deterioration of the dosimeter or quality assurance concerns) and (2) calibration checks or recalibration of each dosimeter performed at a frequency identified by the NVLAP-accredited processor.
Conditions for use of Direct Ion Storage Dosimetry

3. The licensee uses the NVLAP-accredited processor’s software to extract the data from the dosimeter and transmits it to the processor at a minimum frequency of every 3 months and documents the results to comply with applicable regulations.

4. The licensee maintains complete records to demonstrate that it has implemented the arrangements identified above.
Bottom Line

- Use of the new dosimetry devices available in today's market are now authorized for use.

- A change to the regulation is still needed but is at least in process.

- Licensees with use of the new technology have enhanced means of tracking personnel exposure and performing improved ALARA investigation.
Questions?
Thank you