Radiation detectors for the masses

In the United States there are more than 20,000 radioactive materials licensees. In addition, there are countless facilities that use x-ray machines, linear accelerators, and other radiation-generating devices as well as generally licensed radioactive sources (these are sources that can be purchased without having a license, such as the sources in gas chromatographs and explosive trace detection units). The Health Physics Society has about 3000 members, most of whom are not Radiation Protection Officers. There are perhaps an additional 10,000 or so radiation safety technicians around the country; most of them are not RPOs either. And let's not forget to add the radiation detectors used by police, firefighters, and military users – that's another few hundred thousand people. From these numbers it's clear that the majority of radiation protection in the US is being performed by people who are not radiation safety professionals – and the number of radiation detectors are in the hands of people who have only a little training in radiation protection, much of which is likely relatively low-level.

So here's an interesting question

If the great majority of people involved in radiation protection are non-technical, non-scientific, and are not radiation protection professionals ... why are virtually all radiation detectors designed for users who **are** scientists, engineers, and radiation protection professionals?

Can you imagine an automobile manufacturer who refused to build cars with automatic transmissions, high fuel efficiency, and air conditioning because that's not what professional drivers use – who insist that their cars should only be used by drivers who were willing to take the time to learn to drive a stick shift and who were willing to put up with a few drawbacks in return for optimum performance?

Instruments for people who are actually using them

But isn't that what instrument manufacturers are doing when they design instruments designed for radiation protection professionals, engineers, and scientists instead of for the people who are actually using them?

Consider, if you will, an industrial radiographer.

In the US the only required training to be RPO for an industrial radiography company is a 3-day course to cover radiation safety practices, regulatory requirements, and some of the basic science behind both radiation safety and industrial radiography.

When they're working, radiographers need to do their radiation surveys:

- They also need to set up their shot,
- calculate the exposure time for the source they decide to use,
- establish their radiation boundaries,
- do their paperwork,
- crank the source out,
- time the shot,
- retract the source,
- survey to make sure the source is shielded,
- take down their equipment,
- and a dozen other tasks before they go to do the next shot, and the one after that, and a few more.

In the US they're also required to have a copy of their radioactive materials license, documents on their source, and other paperwork (I can't remember if they're required to have copies of the relevant regulations as well). Radiography sources are potentially dangerous – but look how little of a radiographer's job involves using radiation instruments.

Instruments that are easier to use?

So why can't we make instruments that are easier to use, easier to interpret, and that make the radiologist's job easier and more foolproof?

The radiographer's dream

Wouldn't it be nice if the radiographer had a detector that connected wirelessly to a tablet computer, and on the tablet computer was a checklist of all the tasks the radiographer had to do:

- Software to plan the shot exposure time,
- PDF files of the license, regulations, source paperwork, and other necessary documents?

That would log the radiation readings, and help remind the radiographer of everything else that needed to be done, documenting everything for future regulatory scrutiny and flagging anything that required attention.

What if, instead of purchasing a radiation detector, the radiographer could purchase a radiation detector that was part of a regulatory compliance and safety system?

And wouldn't this have the potential to make industrial radiography safer?

Then think beyond that – if the radiographer goes out of business or decides to sell a few instruments, the new owner could download a nuclear medicine app or a science teacher app or an app to help them manage whatever radiation safety program the purchaser is required to have.

Why not develop personalized instruments?

Beyond the administrative and regulatory bits, displaying radiological information on a tablet computer or smart phone also makes it possible to display the information in a manner that makes the most sense to the **user**:

- Some people prefer numeric displays,
- some prefer analog;
- some react to color changes (e. g. red when a dose rate or limit is exceeded) while some are color-blind,
- some prefer a short or long meter constant, and so forth.

Decoupling data collection with data display gives the user the opportunity to personalize the instrument, showing the information in the manner best-suited to how they take in this information. This is the sort of instrument that puts the user first – not the engineers who designed it.

Instrument that puts the user first

Development of measuring devices for robust use is in demand.

Consider, too, that instruments tend to be designed in laboratories that are kept brightly lit, at room temperature, and they're usually tested by people dressed for temperatures in the low 20s.

But I wonder how much time the designers spend trying to push the correct button with numb fingers encased in heavy gloves. How much time they spend trying to read the display in dim light, through steam or smoke, or while wearing a full-face respirator?

It's one thing to ask cops, firefighters, well loggers, and so forth how well they can use their instrument – it's something else entirely to have the designers try operating and reading it themselves.

How well can they use their instrument?

I remember once when I was in a helicopter doing radiation surveys with a detector made of 9 2-liter-sodium-iodide-crystals with the data displayed on the screen of a small laptop computer. The detectors were great – but the touch screen didn't work when I had gloves on (it was a cold February day), the dark gray numbers on a light gray background were almost impossible to read at dusk and later, the small font was equally hard to read, and it was hard to tap on the correct buttons and controls on the screen in a vibrating helicopter. I'd like to think that all of this might have been better-designed had those developing the system actually used it in the field under less-than-optimal conditions.

New radiation detectors could make radiation protection even safer.

Let's face it – there are far too many radiation instruments made today that are essentially the same as the first radiation instruments I used in the Navy in the 1980s, and those were largely unchanged from instruments made in the 1960s and even earlier. Sure, the instruments can do more – the pancake GM hooked up to a meter body that I used in 1983 couldn't keep track of the integrated dose I'd received. But I had a TLD and a pocket ionization chamber that could do that for me. My new meter has a digital display with an LCD screen – but I'm still reading numbers off the meter face and deciding what they mean and when they're significant. The bottom line is that radiation detectors are still, by and large, simply detectors – and they could be so much more, and they could make radiation safety so much better.

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