

IMPACT FROM THE ~~POTENTIAL~~ SHORTAGE OF CS-137 SUPPLY

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CIRMS IAME Breakout Session – April 9, 2019

RADIATION SOURCE USE AND REPLACEMENT

- A 2008 National Academy of Sciences report
 - Recommended replacing CsCl blood irradiators with alternative technologies
 - The committee found that nonradionuclide replacements exists for nearly all applications of radioactive CsCl, but that they may not be economically viable or practical
 - There continues to be a lot of momentum and funding behind this: GAO Report

RADIATION SOURCE Use and Replacement

ABBREVIATED VERSION

Committee on Radiation Source Use and Replacement

Nuclear and Radiation Studies Board
Division on Earth and Life Studies

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

THE NATIONAL ACADEMIES PRESS
Washington, D.C.
www.nap.edu

BLOOD IRRADIATOR REPLACEMENT



MAYAK CESIUM PRODUCTION

- Source suppliers are seeing the marketplace for blood irradiators using cesium dry up and making business decisions that may lead to an end of production of the radioactive isotope.
 - Status of Production Association Mayak, in Russia
- What essential functions of cesium sources should be preserved?

WHAT OF THESE?

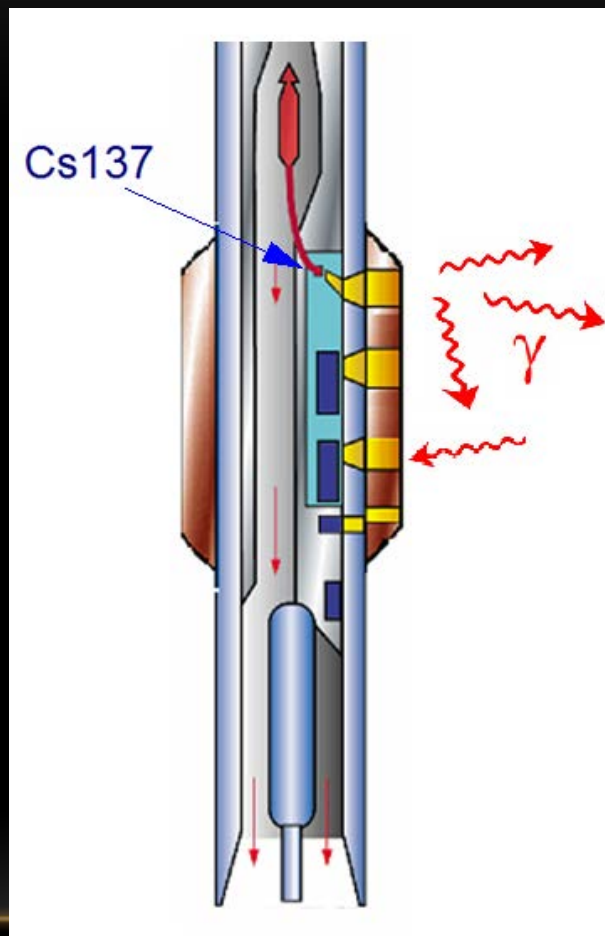


With every success,
it gets harder
to find the next one

RESEARCH



WELL LOGGING



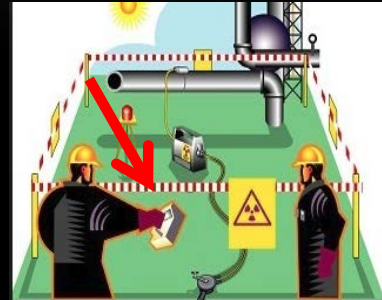
INDUSTRIAL RADIOGRAPHY



OTHERS

- Sterilization
 - Food, medical equipment, medical drugs, ...
- Radiotherapy
 - Medical therapy, Oncology, Cancer treatment
- Industrial gauges
 - Moisture-density gauges, leveling gauges, thickness gauges, monitoring weight and density of industrial products
- Geologic research
 - Soil measurements
- Other measurement techniques

WHAT DO ALL THESE HAVE IN COMMON?



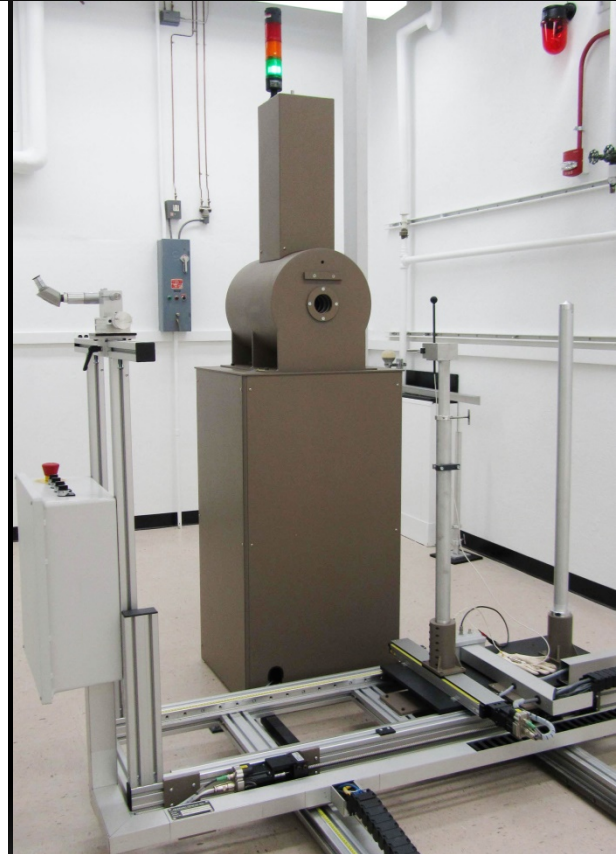
<https://fineartamerica.com/art/photographs/dosimeter>

<https://www.flir.com/threat-detection/radiation/>

https://www.reddit.com/r/whatisthisthing/comments/2r0zlj/hexagon_tag_the_doctors_wear_in_house/

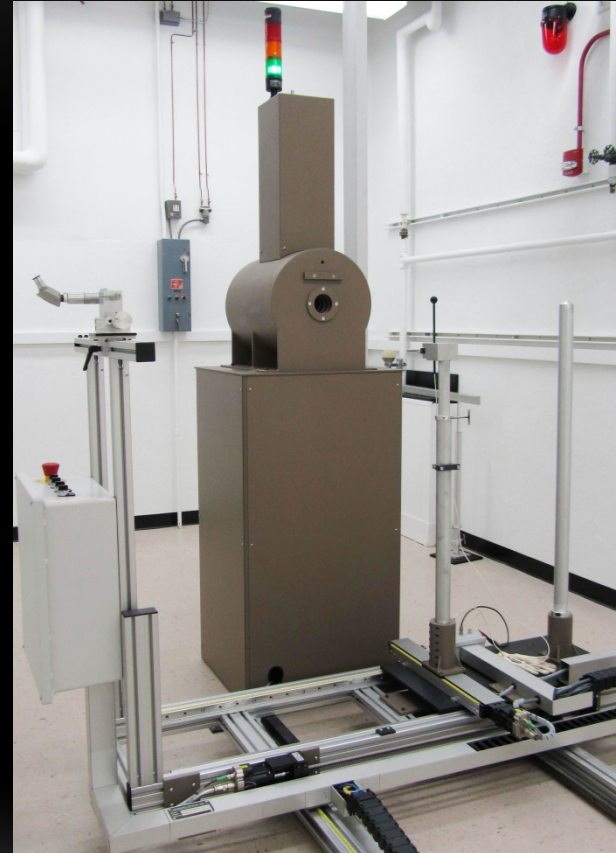
<https://www.indiamart.com/techno-engineering-services-vadodara/services.html#industrial-radiography>

CALIBRATION



CALIBRATION

- ANSI Standards rely on Cs-137
- NIST maintains Cs-137 standard
- Network of laboratories ensures that every radiation detection instrument that is used in the country measures correctly and is traceable to NIST
- U.S. Armed Forces performs annual calibration of >150,000 survey meters
 - must be traceable to NIST
- Dept. of Homeland Security require Cs-137 for calibration of first responder and emergency response equipment
- More than 250,000 radiation measuring instruments and millions of dosimeters are traceable to the spectrum of Cs-137



CALIBRATION

Application	Estimated Devices	% of Total Curies
Blood Irradiators	773	33.0
Research Irradiators	707	66.0
Calibrators	140	1.0

- Out of all CsCl domestic uses, **calibration takes up approximately only 1%**
- Blood and research irradiators making up the vast majority of CsCl applications
- Why would cesium producer continue production?

<https://www.nrc.gov/docs/ML0830/ML083040077.pdf>

DISCUSSION

- Cesium blood irradiators are being eliminated.
- Research irradiators are likely next.
- Will calibration irradiators follow?
- In medical, research, industrial settings, out in the field, at plants and laboratories, for mining and well-logging, etc. Calibration spans the gamut of radiation applications and it currently hinges on radioactive cesium as the standard for providing a safe effective means of telling users how safe they are in almost all radiation environments.
 - What is the impact on radiation protection?
 - Cesium-137 essential accessory in any radiation measurements
 - Difficult to reproduce the monoenergetic 662 keV
 - No replacements for cesium standards
 - Side by side comparisons needed

DISCUSSION

- Cesium is an internationally accepted standard.



- The primary standards laboratories provide the traceable calibration for all the handheld and personnel dosimeters used in all radiation industries.
- Are any Primary Standards Laboratories or Secondary Standard Dosimetry Laboratories looking into the calibration landscape as cesium is removed from the marketplace?
 - Preliminary discussions have shown they are not aware

DISCUSSION

- Cesium is an internationally accepted standard.

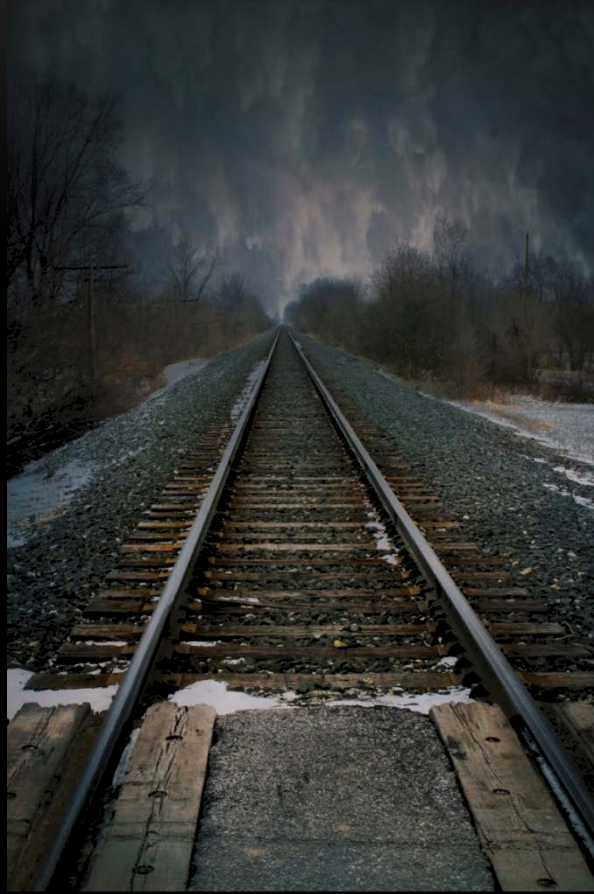


- What systems are in place to not eliminate it?
- Is BIPM aware or concerned?
- What studies have been done?



- This is a major issue the calibration community needs to be proactive about before preemptive action is taken via laws and legislations.

SO WHERE DO
WE GO FROM
HERE?



ALTERNATIVES

- Hopewell is here to support existing calibration applications using $^{137}\text{CsCl}$ while recognizing that moving forward will include a push to viable alternatives...

Down the Same Road:

- Existing supply
- Alternative chemical forms
- Strengthen security
- Cobalt-60



Branch Out:

- X-ray irradiators
- Accelerators
- Other radioisotopes
- Unknowns...



A NOTE ON END OF LIFE MANAGEMENT

- Shipping containers and the domestic bottleneck
- NNSA 435B
- INL 10-160B
- Neutron Products NPI-20WC-6 MkII
- NNSA 380B
- Alpha Omega 100A Type B



THE NEEDS REPORT

- The radiation protection community relies on cesium-137 as a reference standard for calibration.
- With the future supply of the radioisotope uncertain, the need exists for an economical and practical solution to replace cesium.



Needs Report

Page

Discussion

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Radiation Protection

B/C/E. Radiation Protection and Homeland Security [\[edit\]](#)

http://cirms.org/w/index.php?title=Radiation_Protection

- The Need: Targeted research funding to IDENTIFY and run conversion studies on a replacement reference standard for calibration

THANK YOU



QUESTIONS?

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