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Title: Technical Case for Removal of Baseline Pressure Measurements

Author(s): Nelson, Benjamin E.

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Technical Case for Removal of Baseline Pressure Measurements

Ben Nelson
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Background Information

- Purpose: safe and effective packaging of actinide oxides for long-term storage
- DOE-STD-3013-2012
 - Three nested containers, (outer, inner and convenience)
 - 50 year storage
 - Impurities
 - Salts and moisture

Radiography

- X-rays to create a 2D image of all the structures super imposed on each other.
- The darker the image the denser the material.
- Required per DOE-STD-3013-2012 within 30 days of hermetically sealing package (welding)



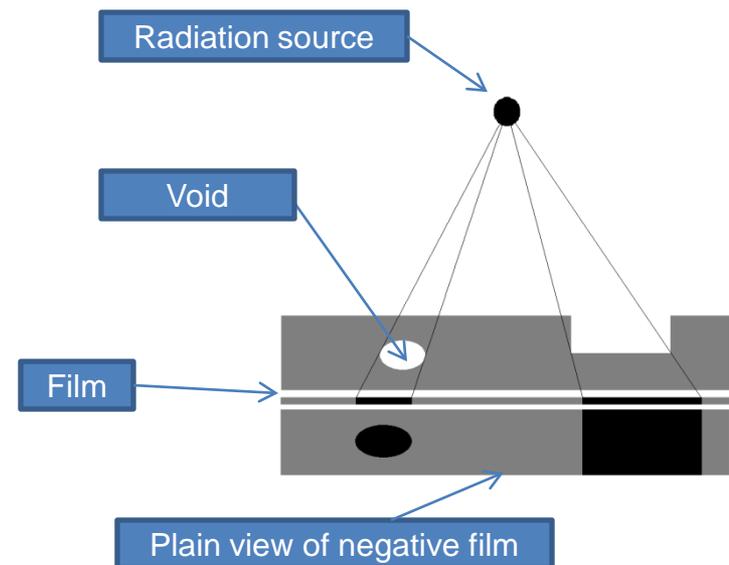
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Surveillance Drawbacks

- This digital radiography apparatus developed at Savannah River where 3013 package is rotated
- Radiography
 - Costly
 - Radiation dose to operators
 - Time Consuming
 - 30 day deadline for imaging
 - Monitoring every 4 years
 - Number of containers increasing

GOAL: To reduce the frequency of 3013 package monitoring

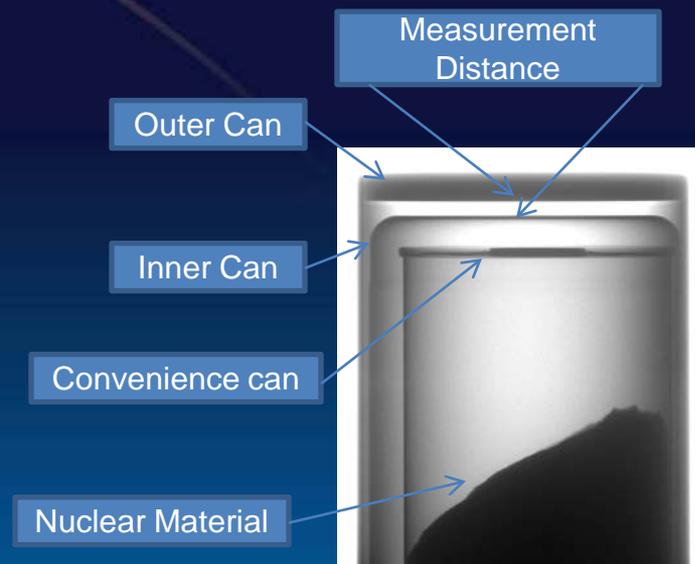


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Process

- Digital Radiographic Images
 - # of samples
 - 12 images per container, 30 degree increments
 - Free photo editing software
 - Measurement process
 - Outer can width / 2
 - conversion of pixels to inches
 - 0 degree measurements
 - $0.394\text{inches} / \# \text{ of pixels}$

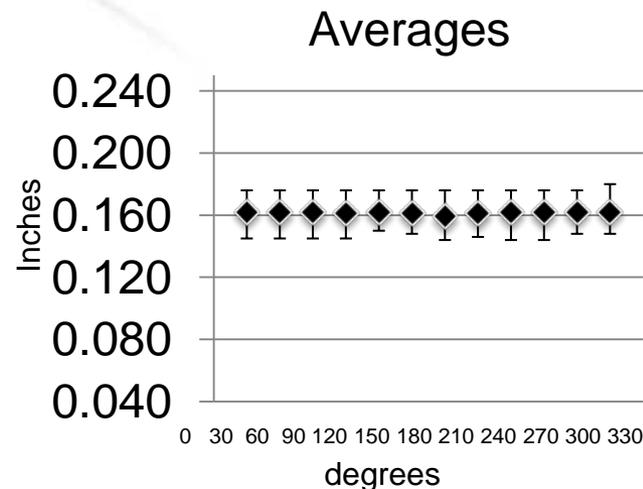


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Results

- Average Chart
- Error bars correspond to max/min for a given measurement
- Relatively consistent
- 180 degrees
 - .002 inches smaller than the rest
- 134 cans x 12 angles = 1608 measurements
- The max and minimum of the other degrees are about the same as 60 degrees.



60°

Standard Deviation:	0.005433
Mean:	0.161731
Min:	0.145
Max:	0.176
Standard error of the mean	0.000469
95% confidence limits	0.1622-0.1612

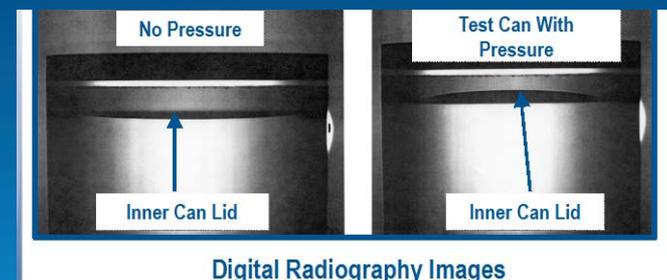
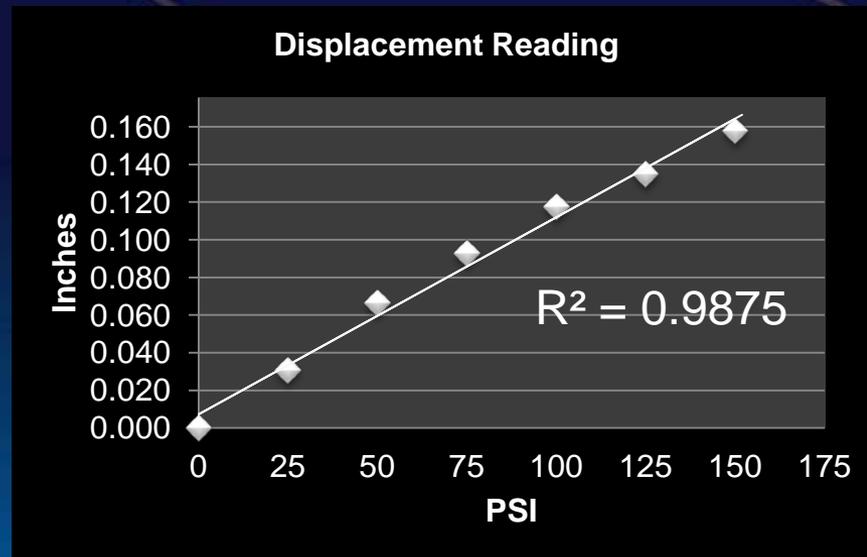
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Pressure Change

- 0.175-0.145 corresponds to approximately 25 psi based upon the displacement/pressurization measurements.
- Average Displacement Reading
- Concerned PSI level: 100
 - Displacement of about 0.120 inches



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Conclusions

- The measurement angle at 90 degrees was the most consistent. This is significant because we can then base our future measurements off this angle.
- Over 1608, 3013 inner to outer container distance measurements resulted in an average gap for the existing 3013 containers of 0.16153.
- There are serious concerns when PSI levels are 100+.
- Data will be presented to the Design Authority for relaxation digital radiography surveillance requirements.
- I would like to acknowledge the helpful guidance of my mentors Paul DeBurgomaster, Jane Lloyd, Nathan Rimkus, and Bill Santistevan.

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Questions?

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