What Does Eichrom's Quality Control System Do For You?

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Eichrom Technologies, LLC

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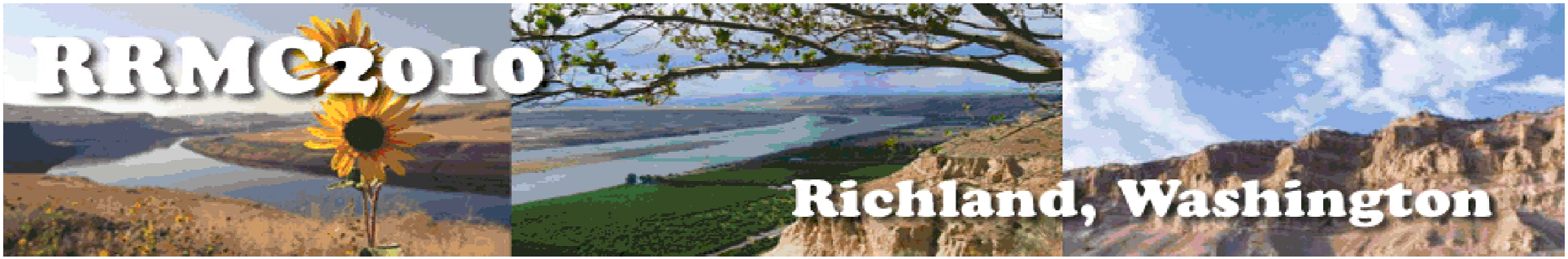

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Outline

- QC Goals
- Standard Testing
  - Finished Product Testing
  - Individual Constituent Testing
- QC Progression of a New Resin
- System Improvements
- Upcoming QC Upgrades

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Eichrom's
Key QC Goals

1. Ship at least 98% of line items by the customer's required delivery date.

- 97% (To Date)

2. Implement one or more improvements in product quality, measurement systems of product quality, or efficiency quarterly.

(2010 highlights)

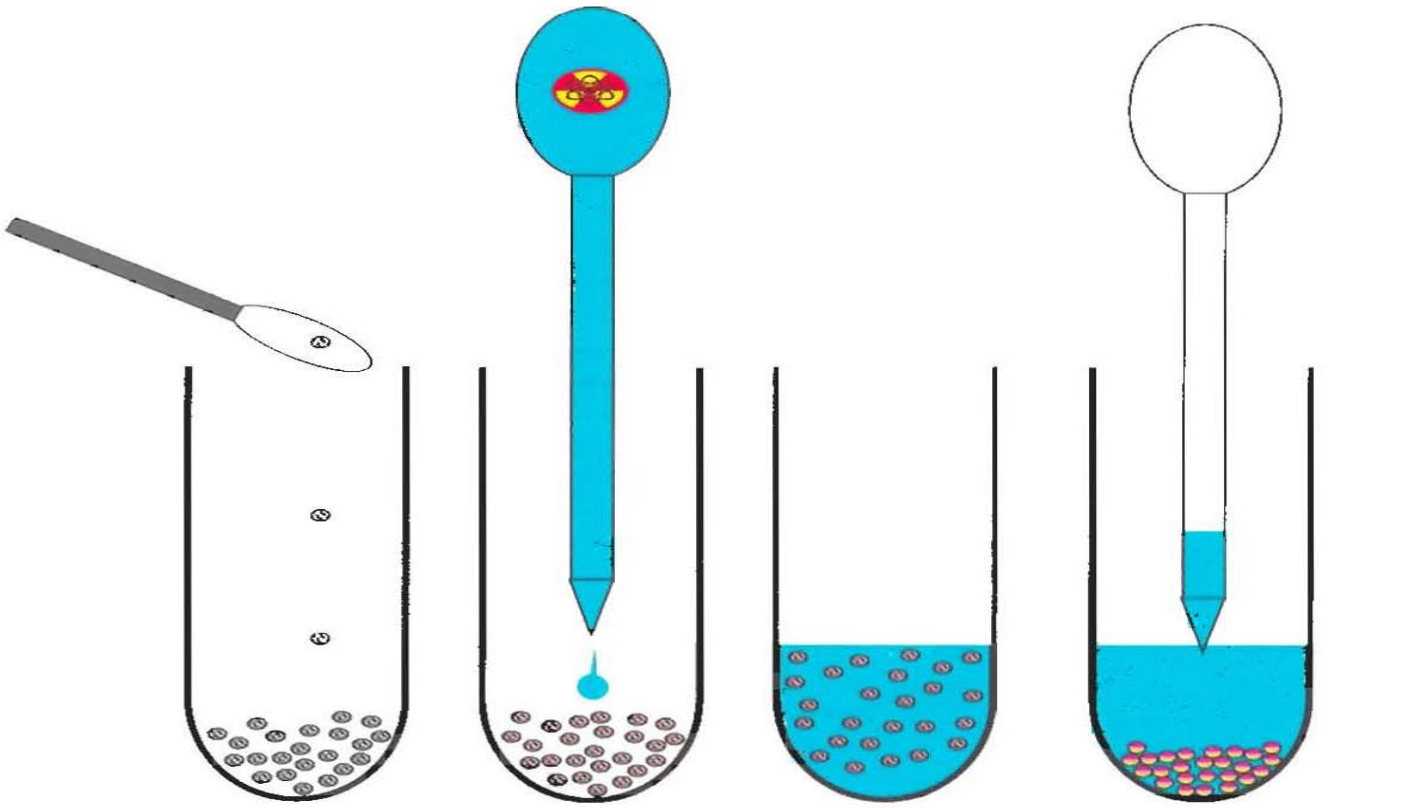
- Shelf Life Study Completed for DGA, Sr, TRU, TEVA, & UTEVA

- Reformulation of Tritium Columns

Finished Product Testing

- Dry Weight Distribution Ratio (D_W)
  - Since the formation of Eichrom, an essential feature of our quality control system was the measurement of D_w for each batch of new resin manufactured.
  - Radioactive or Stable Elements

Dry Weight Distribution Ratio

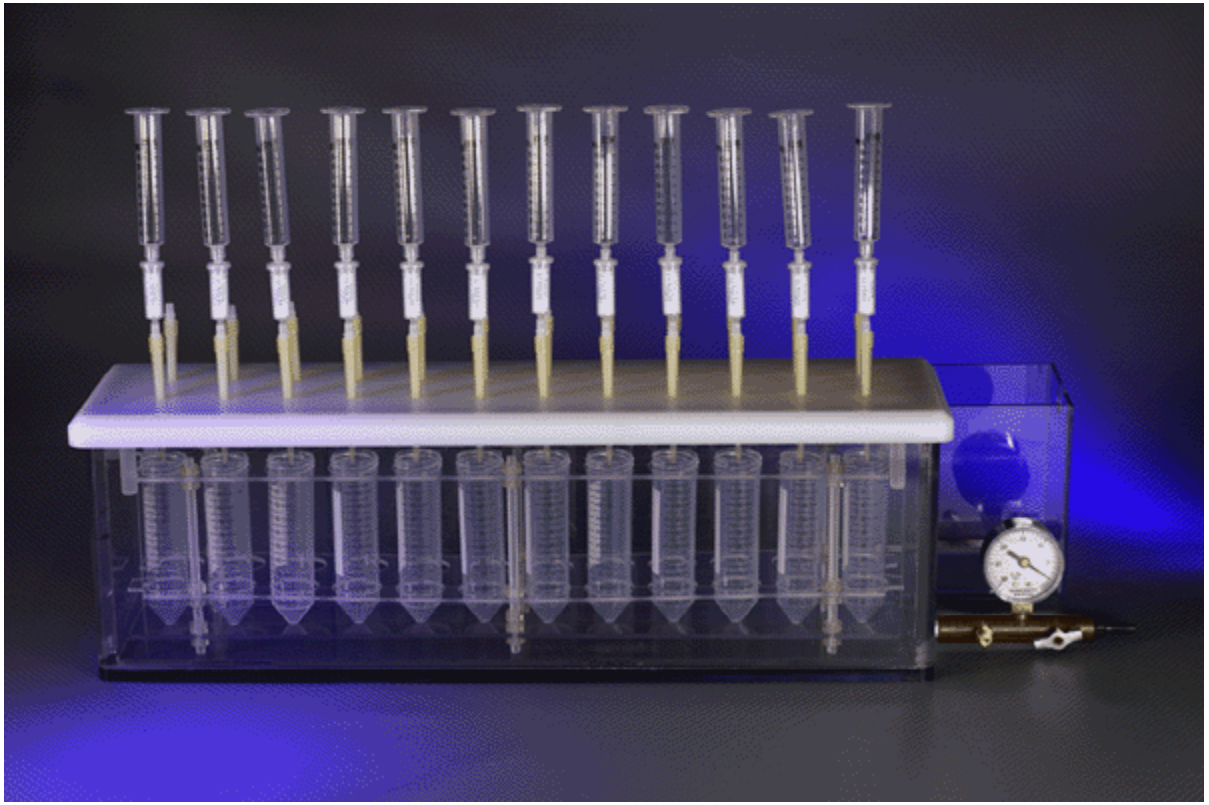


$$D_w = \frac{A_0 - A_s}{w(g)} \Big/ \frac{A_s}{v(mL)}$$

Finished Product Testing (cont.)

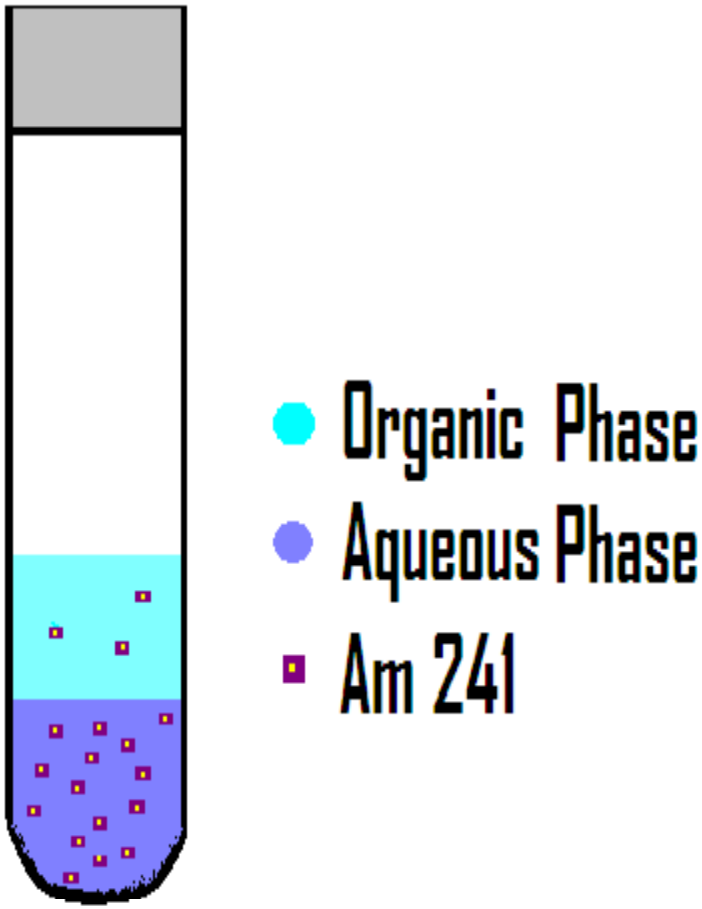
Column Elutions

- DGA
  - Am & U
- Sr
  - Ba, Ca, Sr, & Y
- TEVA
  - Pu & Th
- TRU
  - Am & Pu
- UTEVA
  - Th & U



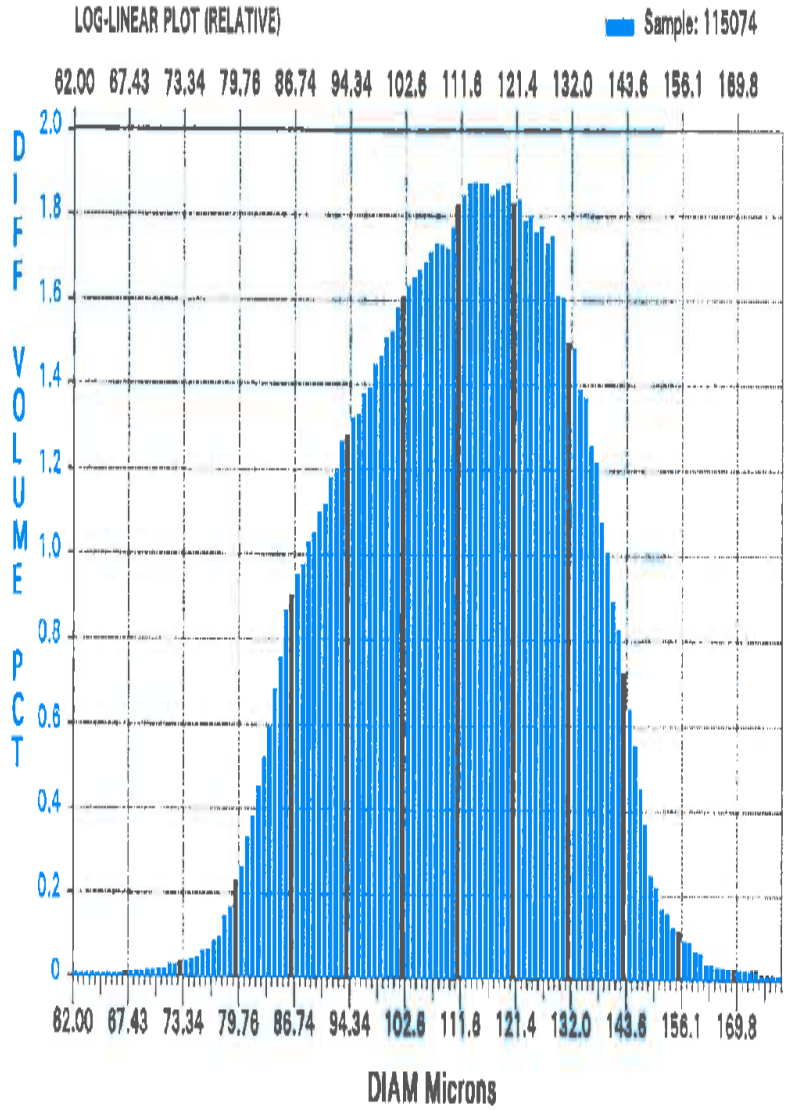
Individual Constituent Testing

- Extractants & Diluents
  - Solvent Extraction
    - CMPO/TBP (TRU Resin)
    - Aliquat-336 (TEVA Resin)
    - DAAP (UTEVA Resin)



Individual Constituent Testing (cont.)

- Support Resin
  - Flow Rate
    - A-Grade Specs (0.6-0.8mL/min.)
  - Particle Characterization
    - New Lot



QC Progression of a New Resin

- Development of the Resin
- QC Testing Based on Application of Resin
- Collaborating w/ Input from Client
  - Ensuring the resin will meet their needs.
- Development of a Standard QC
- Setting of Performance Specifications

QC Improvements

- Constantly Striving to Deliver the Best Product
- New Material
- Change of Material Supplier
- Inconsistent Data

New Material

- Resolve Filters
  - Supplier Changed Manufacturing Process
  - Did Not Meet Needs
  - Designed a rugged enough QC to differentiate between materials.
  - Finally found a material that was comparable.

New Material

- Tritium Columns
  - Supply of 100-200 mesh Diphonix was low, almost non-existent.
  - Batch Uptakes
  - Performance Directly Related to Flow Rate
  - 50-100 mesh Diphonix Did Not Perform Well
  - Mixed Particle Diphonix + S-Grade Pre-Filter
  - Reformulation/Collaborations with Clients => Better Product (Better Results/Faster)

Supplier Change

- CMPO (TRU Resin)
  - New Supplier After 15+ Years
  - Ensure Quality/Purity
  - Th-227 Column Elution
    - Extremely High Specific Activity

Inconsistent Data

- Sample From Larry's Trunk
- Matt O'Hara Collaboration
  - Inconsistent Results Using DGA
- Original QC: Column Elution w/Eu-152
- New QC: Column Elution w/ Am-241 & U-233
- Inconsistency Observed w/ U-233=> Purifying Extractant
  - Consistent Resin

Load: 3M HNO_3 U Strip: 0.5M HNO_3 Am Strip: 0.5M HCl

Upcoming QC Upgrades

- LN QC Procedure
- Anion Procedure
  - Increase Ruggedness
  - New Needs
    - Client
    - Field Changes
  - Interferences

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Conclusions

- Standard testing is done to ensure the consistency of a product before the end user receives it.
- Eichrom always has open ears. If there is a comment or concern, please share.
- Specifications associated with the QC performed on the major resins are in the handout.
- CoAs Online

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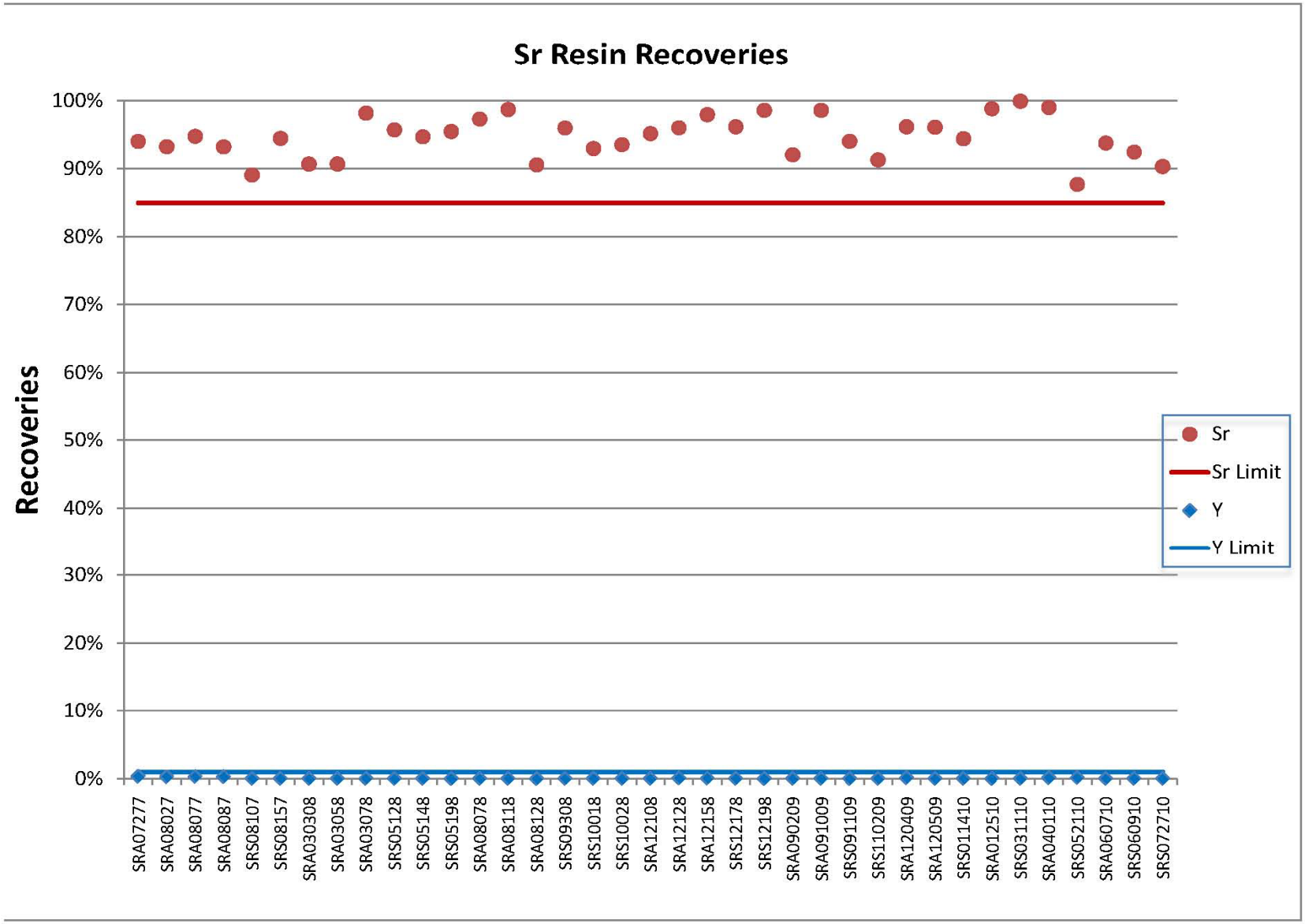
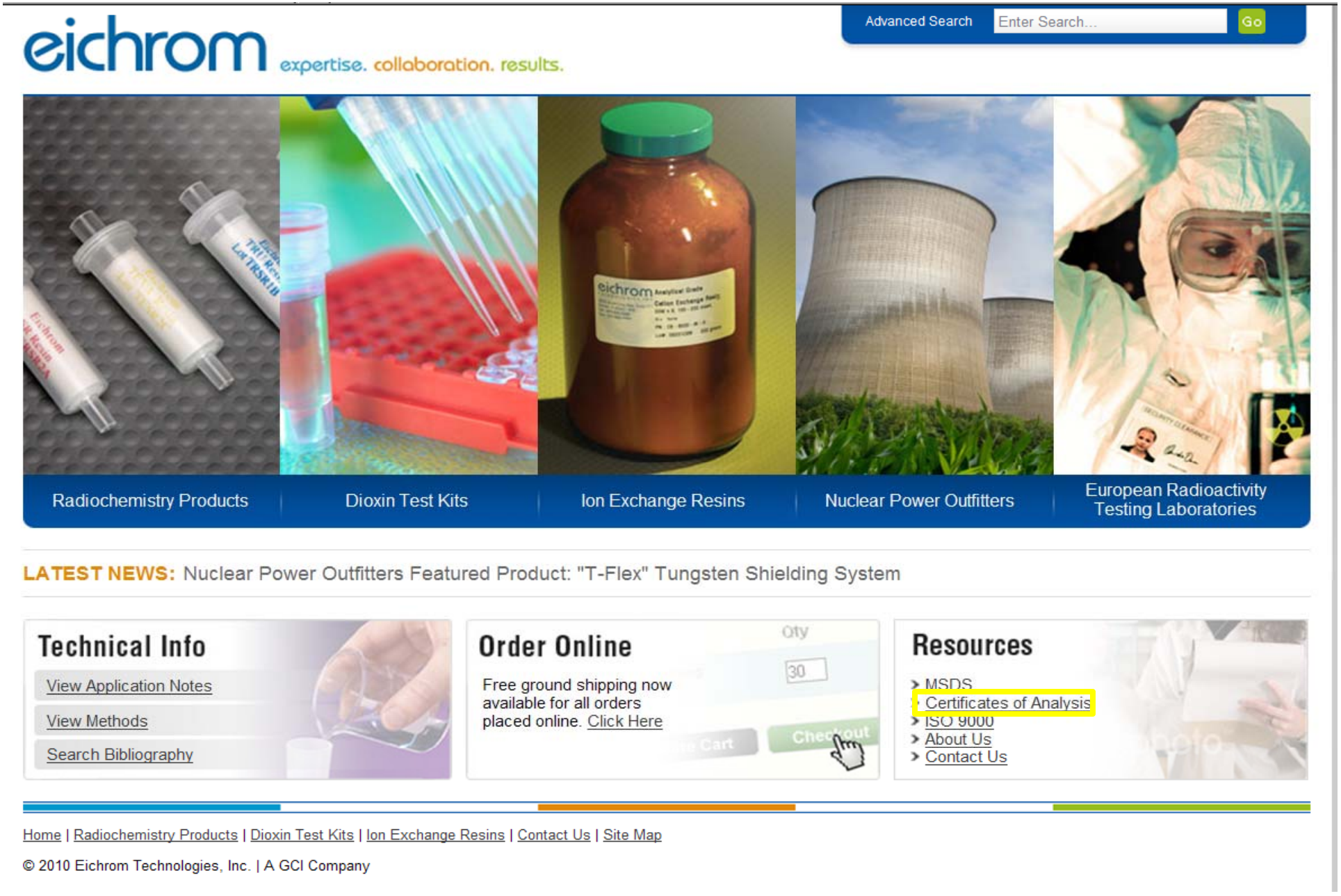
Standard QC Specifications

DGA-Normal Resin	^{241}Am Strip	^{241}Am Breakthrough	^{233}U Strip	^{233}U Breakthrough
Mean (%)	97	1	97	1
Minimum (%)	95		95	
Maximum (%)		2		2
MnO_2 Resin	^{133}Ba Strip	^{133}Ba Breakthrough		
Mean (%)	95	1		
Minimum (%)	90			
Maximum (%)		2		
Sr Resin	Ba Breakthrough	Ca Breakthrough	Sr Strip	Y Breakthough
Mean (A-Grade%/S-Grade%)	0.5/0.25	0.25/0.15	85/85	0.25/0.15
Minimum (A-Grade%/S-Grade%)			80/80	
Maximum (A-Grade%/S-Grade%)	1.5/0.5	0.75/0.25		0.75/0.25
TEVA Resin	^{239}Pu Strip	^{239}Pu Breakthrough	^{230}Th Strip	^{230}Th Breakthrough
Mean (%)	90	1	93	2
Minimum (%)	85		88	
Maximum (%)		2		5
TRU Resin	^{241}Am Strip	^{241}Am Breakthrough	^{239}Pu Strip	^{239}Pu Breakthrough
Mean (%)	95	1	95	1
Minimum (%)	90		90	
Maximum (%)		2		2
UTEVA Resin	^{230}Th Strip	^{230}Th Breakthrough	^{233}U Strip	^{233}U Breakthrough
Mean (%)	90	0.5	90	1
Minimum (%)	85		85	
Maximum (%)		0.7		2


Sr Resin Recoveries
Recoveries
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Sr
Sr Limit
Y
Y Limit
SRA07277
SRA08027
SRA08077
SRA08087
SRS08107
SRS08157
SRA030308
SRA03058
SRA03078
SRS05128
SRS05148
SRS05198
SRA08078
SRA08118
SRA08128
SRS09308
SRS10018
SRS10028
SRA12108
SRA12128
SRA12158
SRS12178
SRS12198
SRA090209
SRA091009
SRS091109
SRS110209
SRA120409
SRA120509
SRS011410
SRA012510
SRS031110
SRA040110
SRS052110
SRA060710
SRS060910
SRS072710

Online: Certificate of Analysis



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WARNING:

BE CAREFUL WHAT YOU GET OUT OF LARRY'S TRUNK!

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