

**Recycling of Radioactive Sources
Eckert & Ziegler Isotope Products
Cesio Prague
WINS Paris 17th -18th September 2014
Ivan Simmer**

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- **Eckert & Ziegler AG (EZAG)** is a one of the largest manufacturers of small and medium sized sealed radioactive sources (max. activity ~ 4TBq) in the world
 - **Simple Goal** - to make a purchasing, usage, and end of life management of sealed radioactive sources as simple as possible for our customers – straightforward, easy processes, in full compliance with International and National Legislation
 - **Take-Over of Used Sources** is a very important and necessary part of our business. All Used Sources manufactured by Eckert & Ziegler can be returned through our subsidiaries to the relevant Eckert & Ziegler manufacturing facility
 - **Return of Other Manufacturer's Used Sources** is possible upon request and is subject of approval after checking

What we can do with Used Sources.

- **Re-use** – further use of Used Sources is possible but, sources which are older than recommended working life (RWL) are usually subject to special handling regulations, primarily they must be frequently tested, there is a higher risk of leakage, or unexpected output change, due to disintegration of encapsulation and/or active part. This risk increases with length of time used. Hence we do not Re-use Sources after RWL and we do not recommend their Re-use to our customers.
- **Conditioning** of Used Sources and subsequent disposal – this is costly, occupying space at waste disposal facility or interim storage, applicable only for sources manufactured by EZAG or owned by domestic holders in countries where Eckert & Ziegler has recycling facilities.
- **Recycling** – saving cost of disposal, applicable for sources from other manufacturers and last, but not least, it is nature friendly
- **Recycling is the preferable way** for us to handle Used Sources wherever possible!

Recycling Methods

(used at our facilities)

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- **Over Encapsulation** – Used Sources are loaded into a new outer capsule
Positives: relatively straight-forward
Negatives: over encapsulation increase source dimensions, usually lack of historical information/records about original sources.
 - **Re-encapsulation of Double Encapsulated Sources** – the source in inner capsule is extracted from outer capsule, and loaded into a new outer capsule.
Positives: sources dimensions could remain the same
Negatives: extraction of source from outer capsule could be difficult, risk of leakage of inner capsule, lack of historical information/records about original sources.
 - **Recycled Sources:** high energy gamma sources (Cs-137, Co-60)

Recycling Methods

(used at our facilities)

- **Re-processing of Sources** – the radioactive parts are extracted from Used Sources and they are used for the preparation of new active parts.

Positives: only activity is used from Used Sources, encapsulation is completely new, and activities of sources can vary from original activity

Negatives: radioactive waste is generated, occasional occurrence of pressurised capsules, and active parts are sometimes different than expected

Active inserts of Am-241/Be OIL WELL LOGGING source (~ 5 years old)



Active Part of Old Am-241/Be Source Activity 850 GBq ~ 30 Years Old

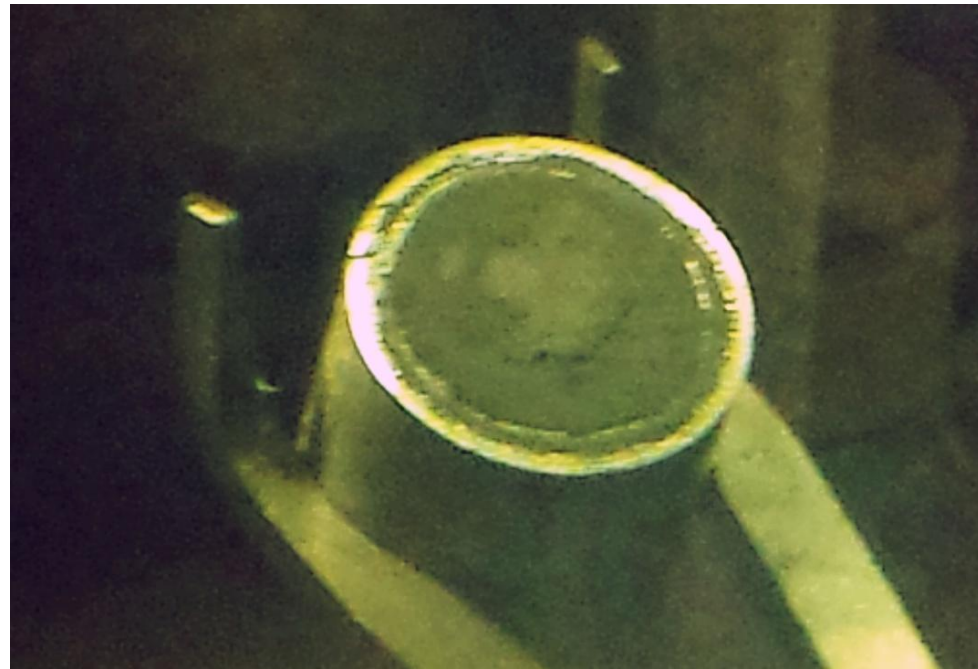


Active Parts of Used Sources

Am-241 Active Part of 30 year Old Used Sources



Cs-137 Active Part of 25 year Old Used Source



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- **Am-241** – Industrial Gamma Sources (activity range 1- 200 GBq)
 - Alpha Sources, Smoke Detectors foils (activity range 1-500 kBq)
 - **Am-241/Be** – Industrial Neutron Sources (activity range 1-200 GBq)
 - Oil Well Logging Neutron Sources (activity range 185-1000 GBq)
 - **Cs-137** – Industrial Gamma Sources (activity range 1- 200 GBq)
 - Medical (Blood Irradiators) Gamma Sources (activity range 1-60 TBq)
 - **Kr-85** – Industrial Beta Sources (activity range 1- 200 GBq)

Shipping of Used Sources to EZAG Recycling Facilities

- **Many holders of Used Sources have Problem to Organize Radioactive Shipments:** they do not have suitable shipping containers, they do not know International shipping regulation (ADR, IATA, etc.) and so they tend to use easiest way how to get rid the disused sources which is usually a disposal at local site or long term storage
- **Logistic Support of These Customers is Very Important** part of the recycling business. We can help them to decide how to ship, whether they need Type “A” or Type “B” Packages and usually we are able to provide them suitable packaging.
- **In Many Countries EZAG (or Our Contractors) Can Organize Collection** of Used Sources at customer’s premises and subsequent transport to EZAG recycling sites at Prague and Braunschweig.

Shipping containers

UK50S (DU shielding) Type "B" packaging



OS code110Av02m01

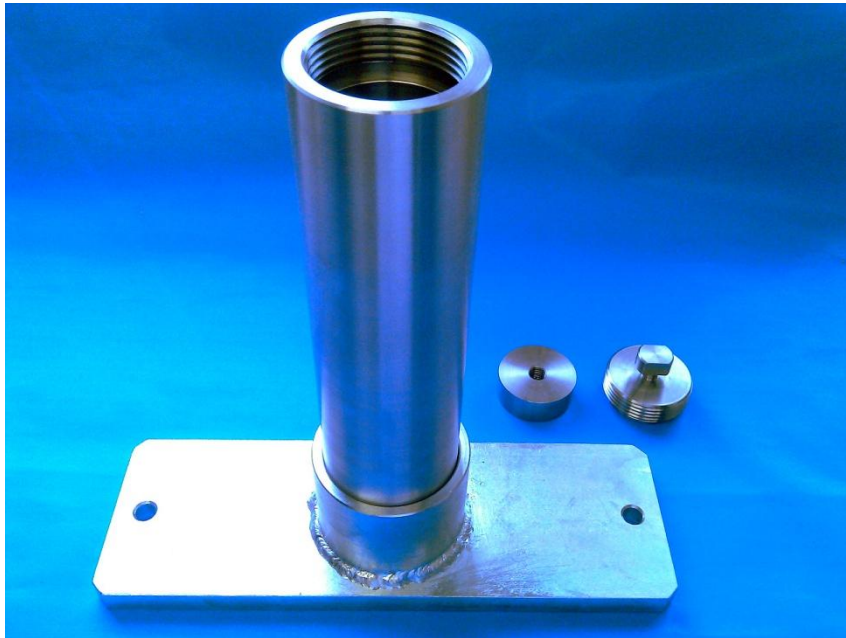
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CS80 (lead shielding), Type "A" Packaging

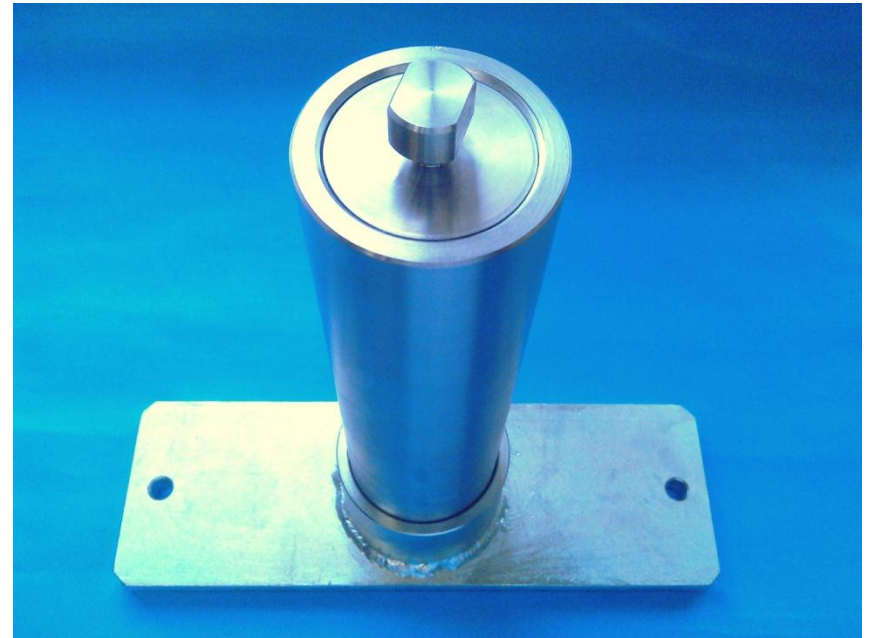


Special Form Capsule P60 Designed for Shipments of Used Sources in Type “A” Packaging

Ready to be Loaded.

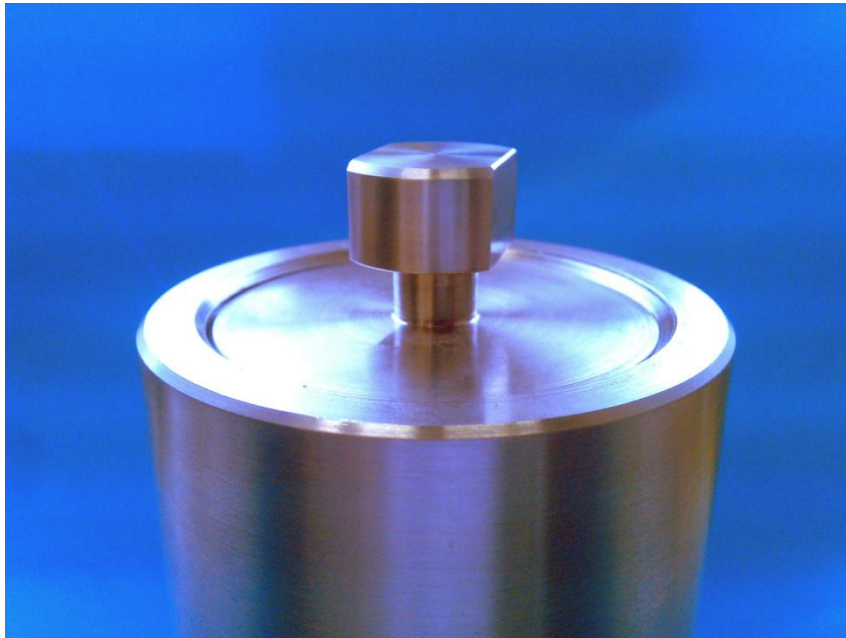


Sealed and Closed.



Special Form Capsule P60 - Details

Leaktight Closed.



Secured against Reopening.



The End.