



# filtec NEWSLETTER

## Gamma vs X-Ray Q & A

### Cost of Ownership – Reliability – Safety - Energy Efficiency

We often receive inquiries concerning the pros and cons of our X-Ray source based inspection equipment as compared to our Gamma source based equipment. They are both excellent choices. Below we provide answers to the more commonly asked questions.

#### How X-Ray and Gamma Systems work

##### **What is the difference between X-Ray and Gamma radiation?**

X-Rays and Gamma Rays are identical. A Gamma photon looks exactly like an X-Ray photon. Gamma Rays are generated by the natural degeneration of a radioisotope. X-Rays are generated by an X-Ray tube containing a cathode that emits electrons, which are accelerated toward the anode by a high voltage electric charge.

##### **Where Do the Gamma sources come from?**

The Gamma sources that we use in our inspection equipment are Americium-241. Americium-241 is found in large quantities as a by-product of regular power reactors. Americium-241 results from the successive capture of neutrons by plutonium.

##### **Are there applications where one type of machine is preferable?**

For some thick glass inspection applications, machines using X-Ray generators may be preferable because of the requirement for a higher level of radiation to penetrate the thicker glass. In most other cases, the technologies are interchangeable.

#### Reliability

##### **What is the useful life of X-Ray generators and Gamma sources?**

X-Ray generators have an average useful life of three to six years. The constant application of a high voltage electric charge to accelerate electrons in the X Ray tube causes wear that usually results in failure within three to six years of usage. In some cases, use of a cooler can extend the life of the X-Ray generator, but generally not materially.

Gamma sources rely on the radiation caused by the natural degeneration of a very small Americium radioisotope. Currently, filtec sources are rated for 40 years of continuous use.



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#### **How do X-Ray and Gamma machines compare in terms of reliability?**

X-Ray generators must be replaced every 3 to 6 years. In most states, a licensed professional must install the X-Ray generator. The licensed professional who installs the new X Ray generator certifies that it is operating within NRC and state health and safety guidelines. This satisfies the company's compliance responsibilities with respect to the X-Ray generator.

Gamma sources rely on naturally generated radiation so that there are no failure parts. Filtec Gamma sources are now rated for 40 years of continuous use. The only requirement is that once every three years the source must be wipe tested. Different than the machines using X-Ray sources, the wipe testing can be conducted without shutting the line down.

#### **Cost of Ownership .**

#### **How do X-Ray and Gamma machines compare in terms of cost of Ownership?**

The initial cost of X-Ray and Gamma machines is very similar.

X-Ray generators must be replaced every three to six years at a cost of \$6,000 for a new unit and \$3,000 for a refurbished unit with return of the replacement. Over the 20 year life of a machine using an X-Ray generator, the cost can be in the range of \$25,000 to \$35,000. In addition, there is the cost of the electricity needed to produce the high voltage electrical charge to accelerate the electrons in the X-Ray tube. The electricity cost will vary depending on usage. Finally, there is down time resulting from the failure. Gamma sources require wipe testing every three years at a cost of \$50 per wipe test certificate. Over the 20 year life of a machine using a Gamma source, the cost of the wipe test is \$350. There is no electricity requirement for a Gamma source and there is no down time for periodic wipe tests.

#### **Do you provide any warranties with respect to X-Ray generators and Gamma sources?**

We provide a three year warranty on our X-Ray generators (special terms apply).

We provide a 40 year unconditional guarantee with respect to our Gamma sources.



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#### Regulatory matters .

##### **Does the NRC support the commercial applications of Americium?**

The NRC supports the use of Americium-241 in home smoke detectors and other commercial applications such as the filtec Gamma source inspection equipment because they are safe applications of by-products of regular power reactors.

##### **How do I register my new source?**

There is no need to worry about regulatory compliance related to sources. When you purchase a new or filtec certified pre-owned machine with a Gamma source from us, we will handle (or assist you in handling) the federal and state registration of the gamma source. We have registered thousands of Gamma sources during our 50 years in business and have trained people on staff that can guide you through the process effortlessly.

##### **How do I keep up with my source compliance responsibilities?**

We add each registered machine to our machine database, schedule wipe tests every three years and perform the wipe tests for a nominal charge of \$50 per wipe test certificate per machine. We maintain a copy of each certificate in our machine file and send the original to the customer for their machine file.

##### **Does the Environmental Protection Agency have any plans for regulating use of X-Ray or Gamma sources?**

The EPA is not responsible for regulating equipment that utilizes X-Ray generators or Gamma sources. The EPA has no official position with respect to regulation of sources.

#### Environmental Matters .

##### **Are Gamma sources green?**

The Gamma sources that we use in our products have the key attributes of a green product:

They are produced from a recycled material.

They use no energy to produce the source radiation.

Due to controls that we have put in place, with the cooperation of our customers, it is very unlikely that they will ever end up polluting the environment due to improper disposal.



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### **Is the use of Gamma sources in inspection equipment safe?**

The use of Gamma sources in inspection equipment is safe. We assure the safe deployment of our Gamma sources by design under NRC guidelines: we test all Gamma sources in the field every three years. We do this by wipe testing, a process that is designed to detect any abnormalities with respect to the sources. No abnormality has been detected in any of the wipe testing conducted on a filtec gamma source machine in our 50 years of business.

In addition to the wipe testing, we periodically retrieve sources from the field and have them tested for structural integrity. The tests are performed pursuant to international standards that are published and agreed to by the regulatory authorities throughout the world. After each testing, the certified lab that conducted the testing recommended that the useful life be extended; we started with 15 years, then were extended to 30 years and most recently in 2001 the useful life was extended to 40 years.

The above testing assures that our Gamma sources are safe while in operation and that our customers will not experience any unexpected downtime by reason of failure of a source.

### **What is the safety record of Gamma sources?**

Filtec gamma sources are safe. They have been certified for a working life of 40 years of continuous use by AEA Technology. Moreover, we are not aware of any failure of a Gamma source used in our industry.

### **Can a sealed Gamma source explode?**

In the opinion of the independent laboratory that has performed the testing on the filtec Gamma sources, the sources are safe for at least 40 years after they are commissioned. Periodic wipe testing is designed to detect abnormalities in the source. There has not been one indication of such an abnormality in the 50 year history of the company.

### **What do I do if I want to take a Gamma source out of service?**

IDC is a certified storage facility for Gamma sources. In addition, IDC has agreements with disposal facilities located throughout the world should disposal be necessary. Thus, we have the ability to take back equipment and sources upon decommission of machines. Our goal is to make our machines the most efficient in the industry and to provide low cost of ownership. This includes both during operation and upon decommissioning should a customer decide to close down a plant and decommission machines. Customers should never have to look anywhere else other than to us to handle their sources.