

PRODUCTION OF COBALT-60 SOURCES

GIPA FACT SHEET

INTRODUCTION

In the United States over 50 large scale cobalt-60 irradiators annually sterilize approximately 200 million cubic feet of medical items composed of thousands of different devices including disposable or single-use and implantable healthcare products -- representing 45 to 50% of all sterile medical devices produced in the US. Cobalt-60 sources provide the ionizing energy used primarily to gamma sterilize these many different types of single-use medical products, as well as a vast array of consumer products, spices and certain foods.

There are more than 160 irradiators around the world processing over 260 million cubic meters of product every year. During the 50-year history of the industry, over 800 million curies of cobalt-60 has been safely and securely shipped to gamma processing sites in more than 50 countries.

TRANSFORMING COBALT-59 TO COBALT-60

Placing inactive metallic cobalt-59 sources into a nuclear reactor, like a CANDU™ power reactor, creates the deliberately produced radioactive isotope cobalt-60. The cobalt-59 either slugs, discs, wafers, or pellets are encapsulated into stainless steel or zircaloy capsules and seal welded so that the cobalt-59 is completely contained within the capsule. Then assembly of the target capsules into a holder suitable for the reactor type takes place. Next step is the insertion of the cobalt-59 capsules into the reactor core. After a pre-determined period of time, normally between 12 to 36 months, removal of these capsules from the reactor happens.

While in the reactor the cobalt-59 atom absorbs one neutron to become cobalt-60 and over time the ratio of cobalt-60 to cobalt-59 increases. The Cobalt-60 atom is naturally unstable because of the extra neutron and therefore, will eventually emit one electron and two gamma rays at energies of 1.17 MeV and 1.33 MeV. This decay is a well understood natural phenomena and the cobalt-60 will, in time will decay to inactive nickel-60. The rate of decay is such that the cobalt-60 loses half of its remaining activity every 5.3 years, referred to as the "half life". The amount radioactivity or "energy level" is measured in curies or Becquerel's per gram.

COBALT-60 SOURCE PRODUCTION

Production of the cobalt-60 sealed sources occurs in high-technology processing facilities and under strict quality control systems. After removal from the reactor the cobalt-60 is loaded into containers for shipment to a source manufacturing facility. Upon receipt measuring the cobalt-60 radioactivity happens, then the product sorted and inventoried.

Manufacturing the finished sources involves high-density concrete and lead shielded hot cells, which have remote manipulators and specialized equipment to handle the radioactive cobalt-60. The finished products are normally double-encapsulated, welded stainless steel sources. Identified with a unique serial number, each source is leak tested, inspected and measured for the total cobalt-60 activity. Under strict regulations, only licensed companies with personnel trained in safety and security requirements will then transport the finished cobalt-60 sources to the customer site.

QUALITY ASSURANCE

Sealed sources are manufactured in accordance with strict quality assurance systems such as ISO-9001. The sealed sources meet or exceed various standards and regulatory requirements. Some of these requirements are:

- * US Nuclear Regulatory Commission, 10 CFR Part 36
- * ISO-2919-1999 (E) and ANSI/HPS N43.6 - 1997
- * American National Standard Institute (ANSI), N43.10-1984 Class 5
- * Special Form Radioactive Material as per IAEA TS-R-1

Sealed sources can be manufactured in various sizes and strengths. The typical source used in industrial irradiation facilities is approximately 18 inches long by 0.5 inch diameter (450 mm long by 11 mm diameter) and can hold up to 14,250 curies (527 TBq). These sources weigh approximately 0.5 pound (0.24 kg).

The industry has consistently regarded security and safety as a top priority throughout its 50-year history and is proud of its outstanding track record.

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