# SEALED SOURCES PRODUCTION FOR GAMMAGRAPHY AND INDUSTRIAL PROCESS CONTROL

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*Keywords: Radioisotope; sealed source; gamma writing; iridium-192 source; cobalt-60 source.*

The Gamma writing is an important non-destructive technique to analyze metallic components from small to large ones that need high performance and security in operation. The non-existence of internal failures is checked by gamma rays radiography, because of its great penetration characteristics that allows to obtain the photographic record of failures. This non-destructive analysis is used for quality control of welded components in chemical, nuclear and mechanical industries, such as pipelines, turbines, reservoirs and pressure vessels. Since 1983, IPEN supplies industrial gamma sealed sources to 21 customers. Annually, the laboratory produces 197 sealed sources, with activities ranging from 20Ci to 100Ci of 192Ir and from 10mCi to 500mCi of 60Co. It makes 194 inspections in irradiators, command cables and guide pipes and also selenium sources loading services. These supplies allow to take more then 100,000 radiography per year. In the last year, the principal customers were: Alstom, Arctest, ASND, Brasitest, CBC, Confab, Dyag Scan, End Test, Engisa, Gamatron, JLM, Metaltec, NDT, Qualitec, SBCQ, Synesis Tequaly, Topcheck, Usiminas, Unitec and Voith (FIG.1). The Gamma writing is an important non-destructive technique to analyze metallic components from small to large ones that need high performance and security in operation. The non-existence of internal failures is checked by gamma rays radiography, because of its great penetration characteristics that allows to obtain the photographic record of failures. This non-destructive analysis is used for quality control of welded components in chemical, nuclear and mechanical industries, such as pipelines, turbines, reservoirs and pressure vessels. Since 1983, IPEN supplies industrial gamma sealed sources to 21 customers. Annually, the laboratory produces 197 sealed sources, with activities ranging from 20Ci to 100Ci of 192Ir and from 10mCi to 500mCi of 60Co. It makes 194 inspections in irradiators, command cables and guide pipes and also selenium sources loading services. These supplies allow to take more then 100,000 radiography per year. In the last year, the principal customers were: Alston, Arctest, ASND, Brasitest, CBC, Confab, Dyag Scan, End Test, Engisa, Gamatron, JLM, Metaltec, NDT, Qualitec, SBCQ, Synesis Tequaly, Topcheck, Usiminas, Unitec and Voith.

FIGURE 1 - Hot cells used for sealed source production.

# ELECTRON BEAM ACCELERATORS AND GAMMA IRRADIATORS

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In the Radiation Technology Center (CTR) there are two Industrial Electron Beam Accelerators of 97.5 kW (1.5MeV-65mA) and 37.5 kW (1.5MeV-25mA), supplied by Radiation Dynamics Inc. and two Cobalto-60 Irradiators - Gammacell (11,000Ci) and Panoramic (5,000Ci) designs (FIG.1). The Electron Beam Accelerator and Cobalto-60 Irradiators are mainly applied for research, development and services of preservation and disinfestation of foods and agricultural products; radiosterilization of medical, pharmaceutical and biological products; Brazilian gemstones enhancement and polymer modification. The gamma rays (electromagnetic energy) and electron beams (EB) are very efficient agents for medical product sterilization due to high sensitivity of pathogenic bacteria to radiation. In 2004, 39,000 medical, pharmaceutical and biological products were sterilized in the radioactive facilities at CTR, increasing 95% the radiosterilization services. Annually, 470 km of wire and electric cables for chemical, automobile, aircraft and electro-electronic companies and 35 km of polyethylene foam for shoes industries have been irradiated in the Electron Beam Accelerators. The radiation process promotes crosslinking among the polymeric chains, increasing electrical, thermal, mechanical and chemical properties. The modernization and implantation of new EB irradiation systems in the Center have increased the processing velocity by radiation of wire and electric cables to 300 m/min and polyethylene foams to 15 m/min, becoming the products more competitive in the market.

FIGURE 1 - Gammacell Irradiator.