MANUFACTURING OF GAMMA-DEFECTOSCOPE GAMMARID-192 ON THE BASIS OF IONIZING RADIATION SOURCE OF IRIDIUM-192

U.T.Ashrapov, S.S.Khujaev, S.A.Baytelesov
Institute of Nuclear Physics Academy of Sciences, Tashkent, Uzbekistan
ashrapov@inp.uz

In Uzbekistan a new objects on extraction, transportation and processing of gas and oil (Ustyurt Gas Chemical Complex, Talimarjan Thermal Power Plant, Mubarek Gas Processing Plant, etc.) are build and put into operation, where are used radiating nondestructive control of welded connections of pipelines, closed capacities, various installations and at present time sharp need for gamma-defectoscopes with encapsulated radioactive sources of Iridium-192 is observed.

Gamma-defectoscope of type «Gammarid-192» complete with radioactive ionizing radiation source of Iridium-192 with activity 100-120 Ci is portable universal hose device, intended for radiographic quality assurance of products with various manufacturing techniques (cast welded, forged, pressed, etc.) without their destruction [1].

Importation foreign analogues devices (gamma-radiografy SIGMA 880, DELTA 880) to Uzbekistan is connected with some difficulties on reception of licence for importation of radioactive sources Iridium-192, purchase of production for currency, it`s delivery from abroad, and also recycling and burial of waste sources of Iridium-192.

In the Institute of Nuclear Physics by scientists and experts have been performed works on creation of technological line of manufacture of Iridium-192 sources encapsulated and acquisition gamma-defectoscopes «Gammarid-192» by pilot models of Iridium-192 sources encapsulated with activity 120 Ci.

Radionuclide of Iridium-192 has been received by neutron irradiation of samples of natural iridium disks on WWR-SM nuclear research reactor by nuclear reaction Ir-191 (n, γ) Ir-192.

In table 1 are shown calculated values resulted of maximal specific activity of radionuclide of Iridium-192 and time of its achievement at irradiation of natural iridium in various streams of nuclear reactor neutrons [2].

Table 1.

Calculated values of maximal specific activity of radionuclide of Iridium-912 and time of its achievement at irradiation in neutrons various streams.

Neutrons stream, neutron/(sm^2 x sek)	10^{12}	10^{13}	10^{14}	10^{15}	10^{16}	10^{17}	∞
Maximal specific activity, Ci/g Ir-192	21	170	660	1010	1060	1060	1060
Maximal specific activity achievement time, days	507	270	87	13	1,4	0,14	0

Thermal neutrons stream density distribution along the irradiation channel of WWR-SM reactor active core by small-sized thermo-neutron gauge [3] has shown, that the thermal neutrons (E=0,025 eV) stream density maximal value is observed in distance 35-45 sm on down from the along the lines of the top point of the vertical channel.

Iridiun-192 ionizing radiation source manufacturing process consists of 4 stages:

1) Samples of disks of natural iridium (∅=3,0 mm, h=0,2 mm) pack into aluminium foil, which place in block container aluminium EK-22 and load into the hollow center of fuel

assemble type of IRT-4M in the vertical channel # 5-7 of reactor active core. 2) Samples of disks of natural iridium irradiate in current 1680 hours at stream of thermal neutrons $1,0x10^{14}$ neutron / (sm^2xsek); 3) In reactor «hot chamber» make pilot model of Iridium-192 source encapsulated, for this purpose samples of radioactive disks of natural iridium with radionuclide Iridium-192 wash out by alkali solution, than by water, after drying and than place in capsule (∅=5,5 mm, h=8,0 mm) from stainless steel, spent hermetic sealing of Iridium-192 source by argon-arc welding, check of tightness of Iridium-192 source capsule by immersion method [4] and measure Iridium-192 source activity. 4) In of Republican central isotope laboratory complete gamma-defectoscope «Gammarid-192» with radioactive source of Iridium-192, for this purpose in «hot chamber» Iridium-192 source capsule place in the holder with flexible shaft of gamma-defectoscope, roll lid holder and install the holder with Iridium-192 source in radiating head of gamma-defectoscope Gammarid-192.

Nondestructive control testing of metal pipe (coil) pieces (Ø=219 mm, h=8,0 mm) with a welded seam through two walls with grooving standards sensitivity №11 is lead by means of gamma-defectoscope «Gammarid-192» with Iridium-192 source pilot model has shown that received by radiography method x-ray pictures on sensitivity and quality, corresponding to request of State Standard GOST-7512-82 «Control not destroying. Connections welded. Radiographic method».

References

1. Gamma-degectoscope of «Gammarid-192». Description and Maintenance Instruction. 1988. P.51.
2. V.I. Levin Radioactive Isotopes Preparation.-M.: Atomizdat.1972. P.25.
3. P.G.Afanasev, T.B.Ashrapov, N.Abdusalamov, etc. Research of Spatial Distribution of Thermal Neutrons Stream in Active Zones of Research Nuclear Reactors by Means of Small-sized Thermo-neutrone Gauges. IV All-Union Meeting on Metrology of Neutron Radiation on Reactors and Accelerators.-M.: 1985. P.67-68.
4. U.T.Ashrapov, Kh.A Ergashev., Sh.M. Makhkamov. Method of Leak Tightness Control of Ionization Radiation Source. Patent of Republic Uzbekistan #4943.1997.