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UPGRADING OF A GAMMA RADIATION FACILITY

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ABSTRACT

A gamma radiation facility installed with the support of the International Atomic Energy Agency (IAEA) is operating at Sacavém *campus* of the National Institute for Industrial Technology and Engineering (INETI) under the administration of the Institute of Technology and Innovation for Entrepreneurial Modernization (ITIME).

In order to upgrade the safety of the plant and running operation, following national regulations as well as the CEN standards, several improvements have been introduced in the last couple of years. Hence, a new radiation monitoring system, a physical barrier at the entrance of the labyrinth and an electro-pneumatic loading/unloading station were installed interlocked to the source. All the previous systems remaining and the new ones are controlled by a PC. The facility can work continuously in automatic mode.

KEYWORDS

Irradiation facility; cobalt-60; upgrade; interlock safety systems; loading/unloading station; process control.

INTRODUCTION

A cobalt-60 irradiation facility , Radiation Technology Unit (UTR), fully described elsewhere (C. M. Mendes; Cavaco, M. C. *et al.*), is running since 1988 at INETI *campus* of Sacavém. This plant from russian origin (Techsnabexport/Moscow) was installed with the support of IAEA. In January 1994 UTR was integrated in ITIME which is a private association without lucrative objectives, founding by INETI in cooperation with several portuguese companies.

UTR is a multipurpose plant dedicated to the radiation sterilization of medical devices, pharmaceuticals or decontamination of aromatic herbs, corks, packaging and raw materials. For the time being is the unique gamma facility in the country. Therefore is also involved in the development of new radiation applications, like the evaluation of compatibility of products to gamma radiation or the preparation of reference materials.

After almost six years of operation several modifications have been introduced with the objectives of upgrading the radiological safety of the plant on one hand and on the other hand to increase the effciency of running operation converting it into a fully automatic mode controlled by a PC. These improvements allow the facility run overnight unattended in safe conditions with considerable economy savings.

UPGRADING OF THE IRRADIATION FACILITY

To increase the radiological safety and the efficiency of the facility a few systems were installed: a new radiation monitoring system simple and reliable software-controlled; a physical barrier at the entrance of the labyrinth; an electrico-pneumatic loading/unloading station and a process control system looking at all the systems. The facility is automatically controlled by 2 PLC connected to a central PC.

INTERLOCK SAFETY SYSTEMS

Radiation Monitoring System. The system includes: ionizing chambers (2) fixed inside of the irradiation cell, detectors type Geiger Müller (4), two fixed inside of the labyrinth and the other two fixed at the entrance of the labyrinth. All these detectors are connected to gamma monitors, measuring the dose or dose rate, installed at the operating room (Figs. 1.,4.). These gamma monitors are software-programmed so they could either storage the date either make the transmission of these date to a PC .

Physical Barrier at the Entrance of the Labyrinth. At the entrance of the labyrinth a sliding door which opens each time the carriers are passing to or from the irradiation cell is installed (Fig. 3.).This sliding door is interlocked to the source and is actuated by the same key which normaly operates the sources at the control panel.

LOADING AND TRANSPORT

Loading/Unloading Station. An electrico-pneumatic system has been developed to load, transfer and reload the boxes. This station follows the same steps previously programmed but can deal with two kinds of boxes: standard boxes dimensions 40x40x40 cm^3 and boxes dimensions 40x40x85 cm^3 . The station is controlled by P.L.C. interlocked to the source and connected to the central PC, if any faulty appears all the system is stopped and the irradiator takes the storage position (Fig. 2.).

Carrier Modification . All carriers have been submited to a simple modification to carry two different sizes of boxes. Sensors has been installed in each carrier in such a way that a signal can be received in the process control system indicating the position of each carrier at any moment.

PROCESS CONTROL SYSTEM

A very simple control panel has been developed. At the control panel it can be seen the master switch, the emergency switch to shut down the irradiator, the master key of the facility and the switch to operate the conveyor. The panel is controlled by a P.L.C. and connected to the central PC. To prevent eventually a failure of the power an U.P.S. has been integrated in the process control system. A software tailor-made has been developed to comand the interlock safety systems, set all irradiation process parameters wihich can be visualized in a colour monitor at any moment and be corrected by the operator or by the PC in automatic mode, (Fig. 1.).

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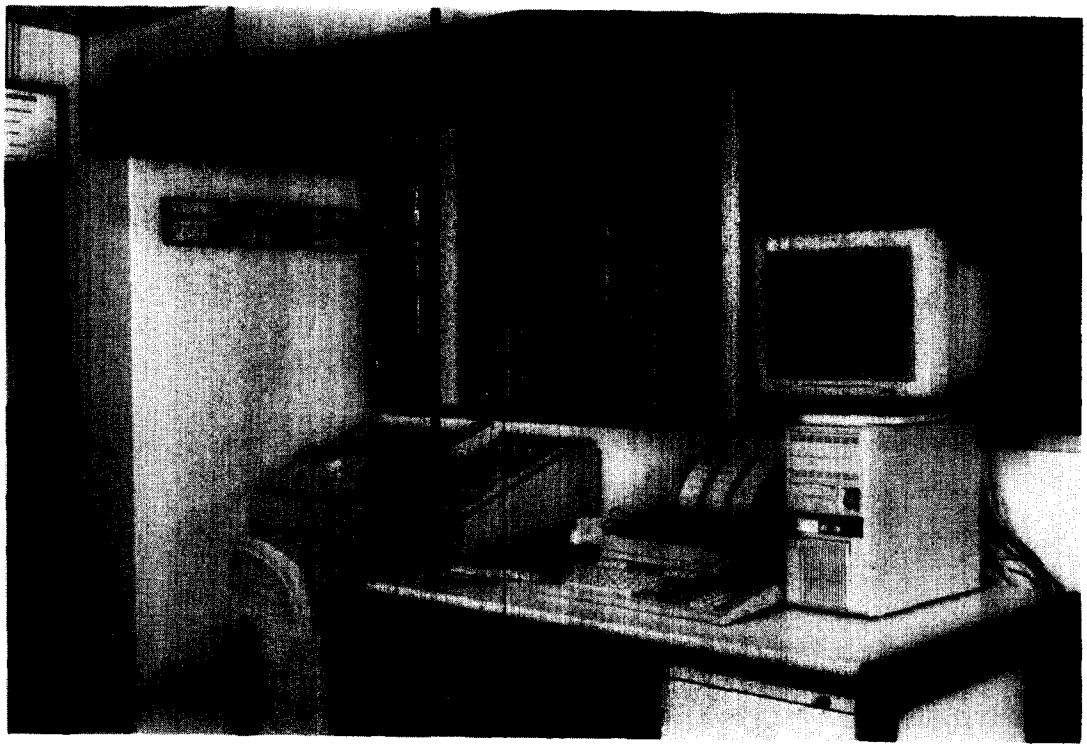

Fig. 1 View of process control system at the control room.

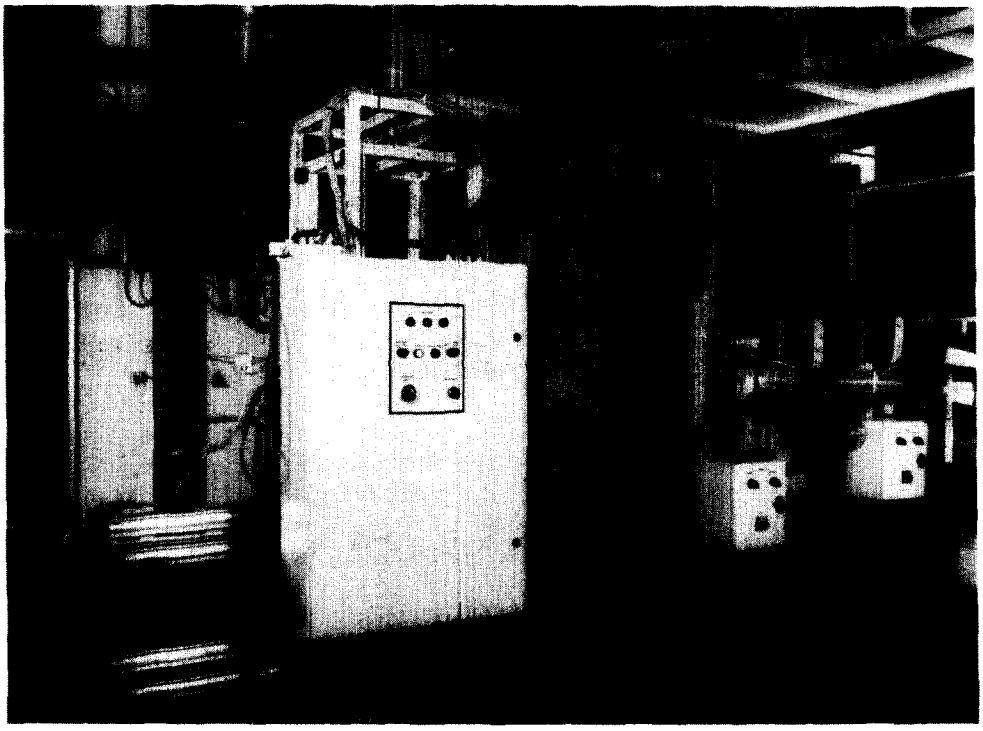

Fig. 2 View of loading/unloading station.

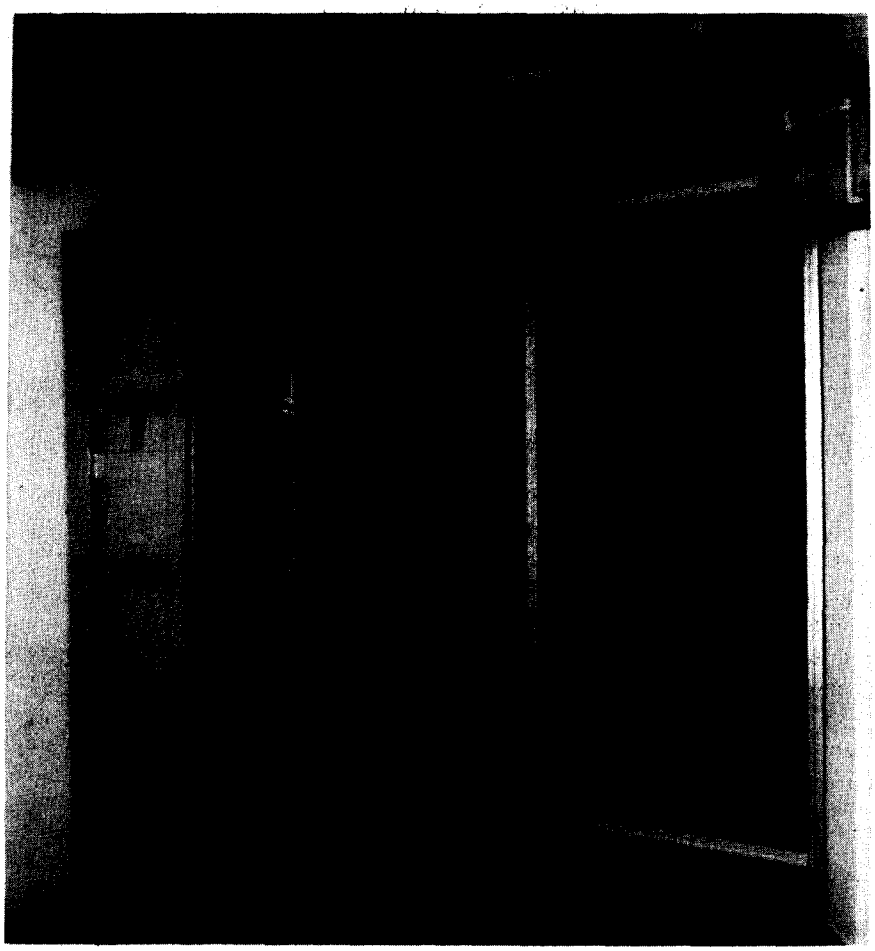

Fig. 3 Physical barrier (sliding door) at the entrance of labyrinth.

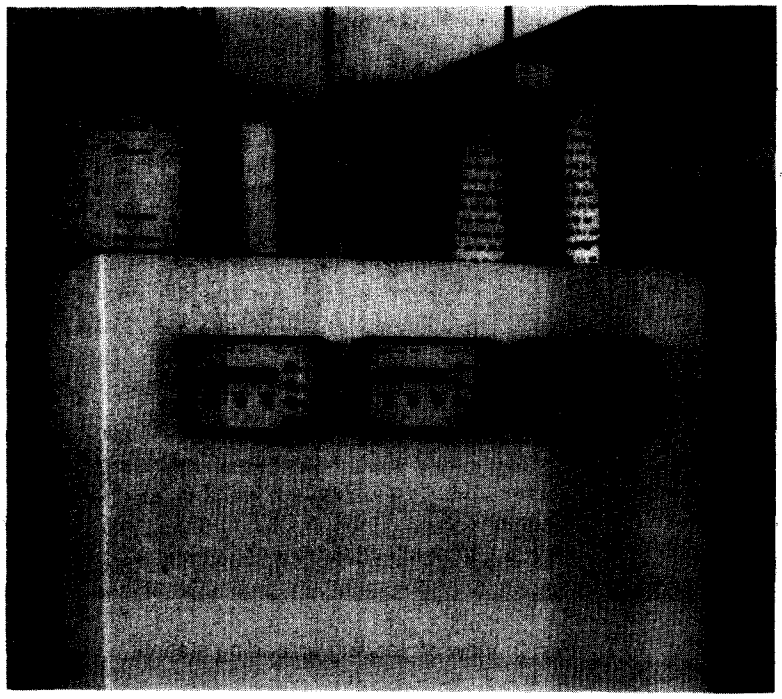

Fig. 4 A detail of gamma monitors installed at room control.