VENTILATION AIR SYSTEM ISSUE AT THE UNIVERSITY OF COSTA RICA'S CYCLOTRON FACILITY

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Background: The first Cyclotron in Costa Rica was installed in 2020 at the Atomic, Nuclear and Molecular Science Research Center (CICANUM), at the University of Costa Rica. The layout of the building was initially accepted by the CICANUM and it was approved by IBA. The layout considers all different areas and systems of the facility. During the first acceptance tests of the Cyclotron, 18F isotope was produced, sent to the hot-cells and eventually dumped through the building ventilation exhaust pipe, where were released outside the building but then detected by the environmental detectors into the production floor, therefore outside the hot-cells, which represents a radiation incident that needs to be corrected. The analysis of the incident showed an issue with the vial which received the activity produced from the cyclotron. After a building gas flow analysis, the CICANUM personnel concludes that there was a recirculation of the dumped gas from the hot-cells and it should be fixed by changing the configuration of exhaust pipe of the HVAC system of the building.

Aims: The goal of this work was to develop a proposal for the practical geometric change of that exhaust, to avoid recirculation events of potentially radioactive gaseous waste through the building ventilation system, which could trigger radiation incidents into the production floor.

Methods: An analysis of the geometric configuration of the inlet and outlet of the HVAC system was faced with a geographic air trajectory study using mainly HYSPLIT model by the NOAA Air resources laboratory. An anemometer was placed between the main HVAC inlet and outlet of the building to evaluate the wind direction at that point in order to sustain the wind direction arguments based on the analysis with the modelers and propose a practical option to reconfigure the exhaust pipe. Along with that study, hot-cell intermediate artefacts were proposed to contain its dumped gases enough time to reduce its activity before being released to the main exhaust pipe.

Results: As a result of the analysis and discussion of possibilities, one rotation of nearly 100° at the elbow of the exhaust pipe along with an extension of its length of 20 meters, was performed over the roof of the building beside with a "delay line" system to reduce the evacuation speed of the hot-cell dumped gases.

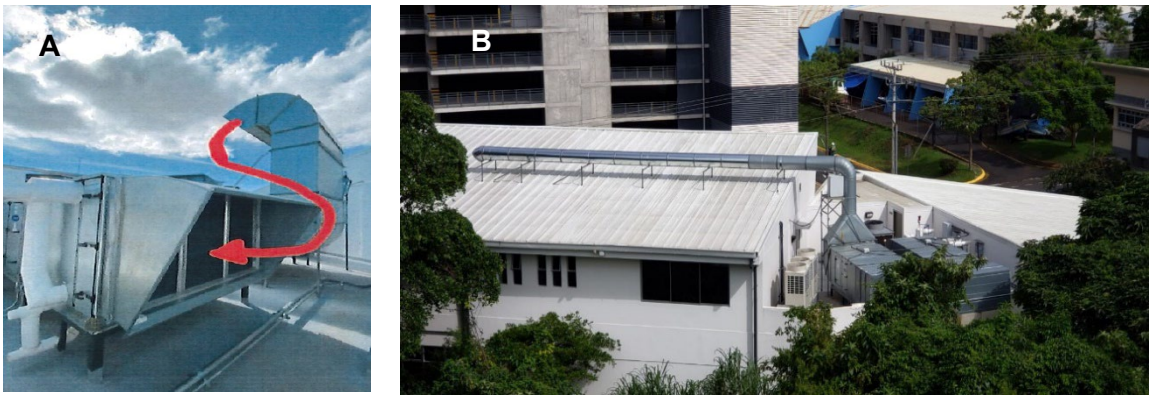

FIG. 1. A. Inlet and outlet pipe HVAC system initial arrangement installed in the building and radioactive gas trajectory entering production main floor. B. Final placement of the outlet pipe.

Conclusion: The incident analysis gave us the opportunity to understand where the problem was and solve it. HVAC system configuration requires a meticulous analysis for these types of installations to prevent recirculation of radioactive gases. Our solution considered wind speed and direction using HYSPLIT model. Incident analysis gave a solution to prevent this type of events within our hot – cells.