RaPToRS

Rapid Pneumatic Transportation of Radioactive Samples System

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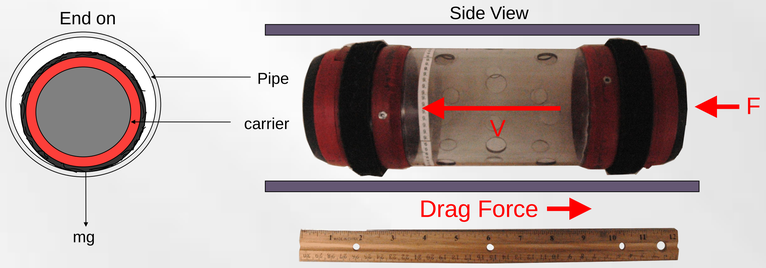
Abstract

This system is designed to quickly and safely move radioactive materials at the Mercury facility of the NRL. A radioactive sample carrier travels from the reaction chamber to the end station by airflow where it pneumatically brakes prior to the gate. The airflow, optical carrier-monitoring devices, and end gate are controlled manually or automatically with LabVIEW software. The installation and testing of the RaPToRS system at NRL was successfully completed. Prospective facilities for similar systems include the Laboratory for Laser Energetics and the National Ignition Facility.

RaPToRS

- It is a flow system, thus it has minimal friction and minimal driving force
- Average speed: 16.0 m/s ≈ 35.8 mph
- Over 300 successful trials were run
- Overbore in 90° and 45° pipes to prevent jamming

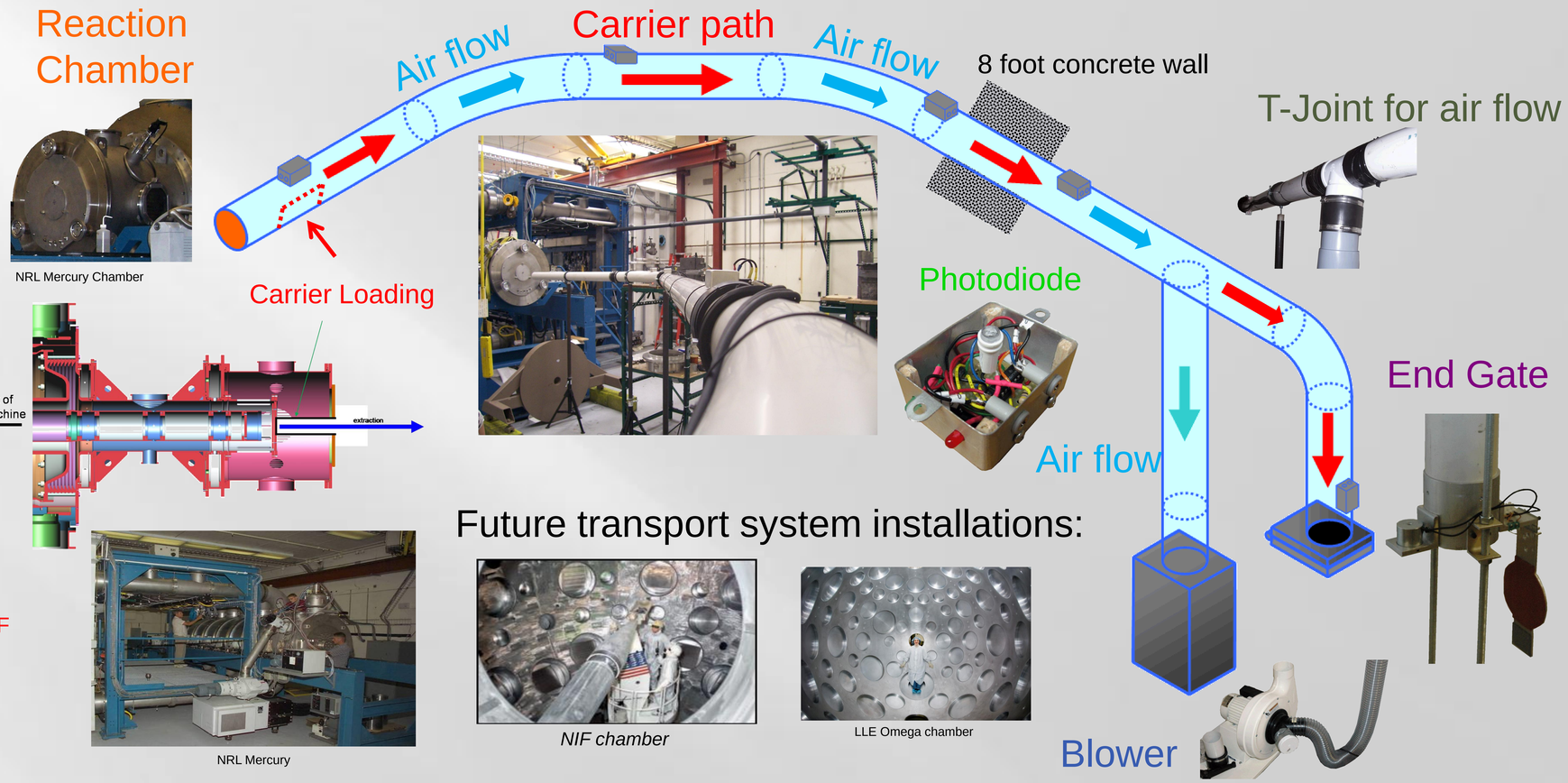


- Used to transport radioactive samples from the reaction chamber to the counting station

System Components

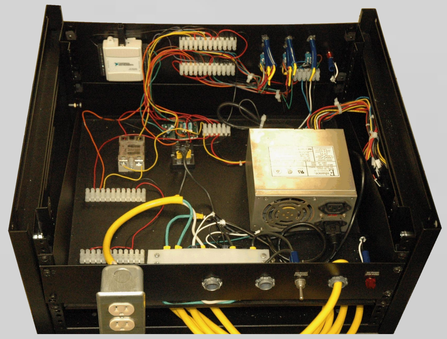
- Electronic switches on the control box allow user to manually control the blower and end gate or give all control to the LabVIEW program
- Blower air flow controls the carrier speed
- Carrier pneumatically brakes at the counting station
- Photodiode and LED pairs act as photo-gates to detect when the carrier has reached the designated locations
- NAND gate latching circuit enables the photodiode signal to stay on until the LabVIEW program resets it

RaPToRS Schematic



Control Panel

LabVIEW front panel



Manual control box

- LabVIEW front panel mimics the control switches of the manual control box
- One button starts the run, which is controlled by a basic programming language to command the blower and end-gate
- The carrier is detected by the photo-gates which are displayed on the LabVIEW front panel

The LabVIEW program is configurable to any number of independent gates, blowers, and photosensors. Program scripting enables sequential control of these components with commands such as “photosensor true” → “turn blower on” → “close gate”

Future applications of this system include a VELoCiRaPToRs system with the addition of several gates and blowers for ventilation and exhaustion of activated air in the carrier.

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