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Funding Source: U.S. Dept. of Energy Innovations in Nuclear Infrastructure and Education Summer MURR Undergraduate Research Scholarship; U.S. Department of Energy University Partnership (UP) Program

Design of an Automatic System for the University of Missouri Research Reactor's (MURR) Small Diameter Pneumatic-Tube (P-Tube) System

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The nuclear research facility at the University of Missouri-Columbia (MURR) has proposed a redesign of the process for irradiating the samples with INAA (Instrumental Neutron Activation Analysis) in order to increase efficiency (sample throughput), to lower the costs of experiments and to minimized dosage radiation exposure for workers. INAA was discovered in 1936 when Hevesy and Levi found that samples containing certain unusual earth elements became highly radioactive after been in contact to a source of neutrons. From this observation, they rapidly acknowledged the potential of employing nuclear neutron bombardment of samples followed by measurement of the induced radioactivity to smooth the progress of both quantitative and qualitative detection of the elements present in the samples. This new design includes a circular sample storage tray, a pneumatic gripper (for both sealing and for sending and returning of the sample from the reactor), a rotary table motor and two slider motors--one for the gripper and one for moving the sample closer to the counter machine. After the new design was conceived, the Research Reactor needed an automatic control system for the motors that were going to move the samples so they could be sent to the reactor and to the radiation detection room. My responsibility was to design the control system for the operation of the motors. The design (programming) software that I chose to use was LABVIEW programmi

EMAILED 7/26/07!!