In-Tank Solids Monitor

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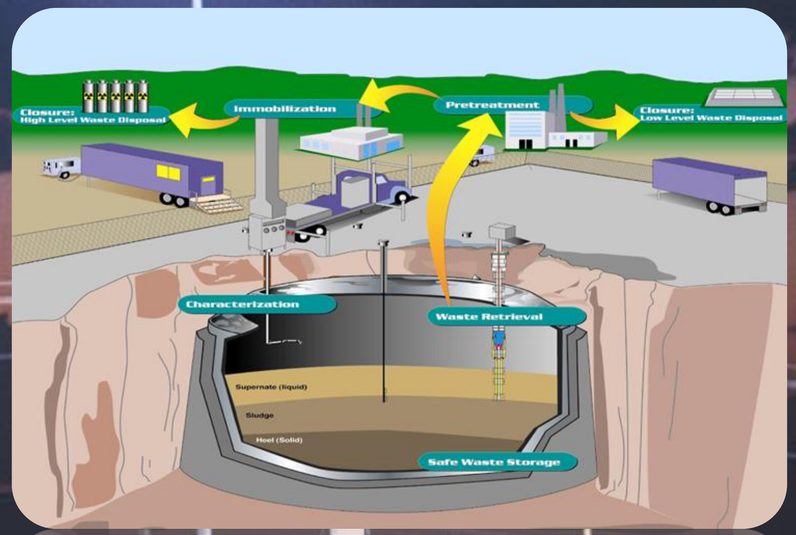
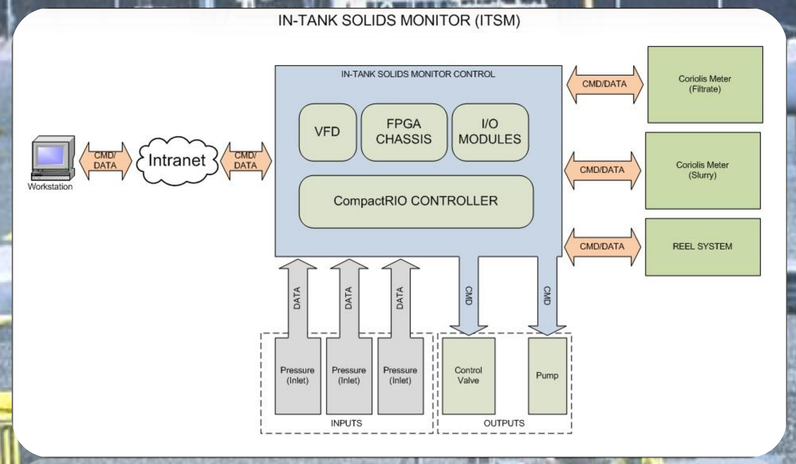
The Hanford Site

The U.S. DOE Hanford site has the largest number of High-Level Waste (HLW) storage tanks and the largest volume of HLW in the United States. The safe storage, retrieval, treatment, and disposal of approximately 53 million gallons of highly toxic, high-level radioactive waste stored in 177 underground tanks at the site are national priorities that pose a considerable technological challenge.

Problem

For proper HLW retrieval, a critical transfer velocity must be ensured. The transfer velocity is a function of the HLW slurry density. During retrieval of waste over the years, there have been several instances of pipeline plugging, which leads to schedule delays and excess costs. The ability to continuously monitor the slurry solids concentration during in-tank mixing will ensure the critical transfer velocity necessary for proper retrieval. This monitoring can mitigate the potential for pipeline plugging and down-time by providing the site with slurry density, viscosity and temperature data in an accurate, real time fashion.





Hardware

The system is controlled by a CompactRIO from National Instruments (NI) of Austin, TX. This unit consists of a controller running a Vxworks real-time operating system. The controller is coupled to a chassis that includes a Xilinx Virtex-5 FPGA and allows up to 8 I/O modules to be attached to the system. Control and data acquisition is done by this unit through the various sensors (pressure transducers and coriolis meters). Proper enclosures were selected that were National Electric Manufacturer Association (NEMA) compliant. They are NEMA 4X rated which includes protection against corrosion.

Software

To program the GUI for the system, NI LabVIEW is used. Communication to most of the components will be direct electrical control, while the flow meters will use Modbus protocol to communicate. A control system will be developed to ensure proper flow through the meters by control of the valve.

Pump | First Coriolis Meter | Crossflow Filter | Second Coriolis Meter

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