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Development of Artificial Intelligence through PLC & SCADA to predict process related failure and abnormality in a Reprocessing Plant

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Programmable Logic Controllers offer complete automation solution and flexibility to control in a plant like the nuclear fuel reprocessing plant. To ensure the safety of both the plant and personnel, continuous monitoring and diagnostics of plant parameters are implemented through various means. Audible and visual alarms are provided to alert the operator in case of process abnormality. But all the mechanisms are available only to report to the operator after an abnormal event, so that corrective action can be taken by the maintenance personnel. This increases the plant down time and involves tedious investigation of all related data in the operator's log and historical trend of the data.

The current work aims to develop an artificial intelligence (AI) based diagnostic tool within the existing HMI application, which can continuously monitor the plant data, review all associated process conditions and then predict the possibility of occurrence of any abnormal event. This AI based tool doesn't limit to event prediction, but also alerts the operator and suggests suitable corrective action that can be taken to avoid the event. An AI algorithm has been developed within the existing PLC/SCADA, thus requires no additional diagnostics tool and ensures smooth operation of plant.

Methods and materials: The system comprises PLC modules and SCADA servers & clients. The PLC modules continuously communicate with the field instruments to read inputs, execute logics and send control outputs to perform various liquid transfers, damper operations in ventilation/offgas systems and other utilities management. The SCADA server communicates with PLC to monitor and control various process, ventilation and radiation data. An AI based application/utility is developed which continuously monitors data in a plant scale to predict the next failure of a particular process or a system, so that predictive maintenance can be taken up by maintenance personnel. The tool predicts any unintended process events like process parameter deviation (tank level or tank pressure) due to impulse tubing leaks /failure of compressed air supply, unintended transfer of radioactive liquid, volume imbalance between source tank and destination tank, reduction in area/containment box vacuum due to exhaust system failures, temperature sensor failures and so on.

Country/Int. organization

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