## SENSORS & ((...) CONTROLS

CROSSCUTTING RESEARCH





Sensors and Control research provides pivotal insights into optimizing plant performance and reliability while utilizing and furthering technological megatrends such as advanced manufacturing processes and Industry 4.0 principles.

Sensors and Control research is focused on developing costeffective technologies capable of monitoring key parameters while operating in harsh environments, and aligning with self-organizing information networks for process control and decision making. The research portfolio is categorized into two key technology platforms:

- ADVANCED SENSORS
- DISTRIBUTED INTELLIGENT CONTROLS

The diverse sensors and control research portfolio uses advanced manufacturing techniques that can embed sensors in a variety of plant components to monitor parameters such as temperature, pressure, fluid composition, and the state of materials. Advanced sensors can operate in extreme environments, and condition-based monitoring algorithms provide improved maintenance of plant operations.

Sensors and Controls serve as an essential technology that enable systems operations under conditions where optimal performance is balanced with reliability.

## **ADVANCED SENSORS**

Researchers are devoted to creating novel sensor concepts that include optical, micro, and wireless sensors that can be embedded into several plant components using advanced manufacturing techniques. Advanced manufacturing is used to design and produce these novel sensors cost-effectively that can be rapidly reproduced for wide distribution. The increased ability to monitor plant components and transmit the data to a distributed network increases plant efficiency and reliability. New approaches to sensing technologies and to manufacturing and utilization of sensor data have the potential to be transformative to the energy landscape, optimizing plant performance and increasing the expected life-cycle of materials.

## DISTRIBUTED INTELLIGENT CONTROLS

After Sensors collect data from the power plants, the distributed Controls network then processes the data to permit decision making. The controls research area develops systems with fast dynamics for non-steady-state and incorporates controls that are capable of handling systems that are inherently non-linear using real-time data. Using a dynamic process of highly integrated sensors allows for increased control of the power plant, and is more robust than linear model predictive control algorithms. The program area also examines sensor placement to improve performance, management and cost of the entire control system, and to further optimize cognitive capabilities.

## SENSORS AND CONTROLS RESEARCH UTILIZES ADVANCED TECHNOLOGICAL TRENDS TO IMPROVE POWER PLANT PERFORMANCE:

- Sensors and Control provide the basis for plant optimization and digitization strategies
- Advanced data analytics such as machine learning algorithms for optimization of plant control and operations
- Advanced manufacturing techniques enable a digital supply chain that can cost-effectively create and embed sensors at a power plant
- Advanced sensors require state-of-the-art cybersecurity systems as utilities deploy thousands of new smart parts, to enable a cognizant, resilient control system



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