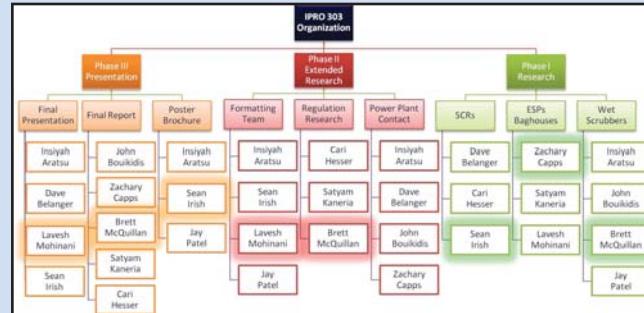


# Sponsor Information

SmartSignal of Lisle, Illinois is a prominent provider of equipment failure warning systems in a variety of industries. SmartSignal's unique solution contains intellectual property that models the behavior of major individual sub-components (assets) of complex facilities and equipment such as commercial airplanes, electric power generation plants, and petroleum refineries. SmartSignal delivers this information via its WatchList web application. The WatchList displays actual versus modeled behavior for each critical sensor on the key operational assets in these industries. This information leads to early warning of mechanical failures, performance problems, and an ongoing indication of the condition of the facility.



## Team Breakdown



**Brett McQuillan**  
Architecture Eng  
mcanart@lit.edu

A portrait of a woman with long, dark, straight hair. She is smiling broadly, showing her teeth. She is wearing a dark-colored top. The background is plain and light-colored.

A head-and-shoulders portrait of a man with short brown hair and a beard. He is wearing a green baseball cap and a green t-shirt. The background is plain and light-colored.



Insiyah Arastu  
Architecture  
iarastu@gmail.com

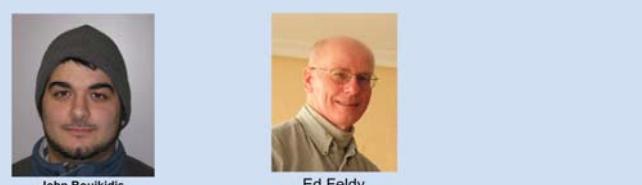
A head-and-shoulders portrait of a young man with dark, wavy hair. He is smiling slightly and looking directly at the camera. He is wearing a dark-colored zip-up jacket over a white t-shirt. The background is plain and light-colored.



Satyam Kaneria  
Electrical Eng  
kaneria@itd.edu

A portrait photograph of a man with dark, wavy hair and a light beard. He is wearing a grey zip-up jacket over a blue t-shirt. The photo is set against a plain, light-colored background.

A head-and-shoulders portrait of a young man with dark brown hair, smiling slightly. He is wearing a dark-colored zip-up hoodie or jacket over a red collared shirt. The background is plain and light-colored.



**John Bouikidis**  
Mechanical Eng  
jbouikidi@mit.edu

A small portrait photo of Ed Feldy, a man with glasses and a light-colored shirt.

# IPRO 303

# Failure Prediction Modeling for Power Plant Emission Control Systems



## Team Members

Sean Irish  
David Belanger  
Cari Hesser  
Lavesh Mohinani  
Zachary Capps  
Insiyah Arastu  
John Bouikidis  
Jay Patel  
Brett McQuillan  
Satyam Kaneria

# Faculty Advisor

## Edmund Feldy PE

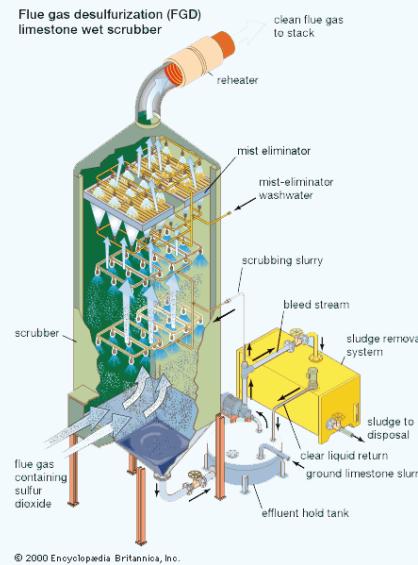
# Goals and Objectives

The main goal of IPRO 303 was to investigate how SmartSignal's modeling technology can provide value in detecting problems on environmental systems: The main objectives that SmartSignal would like for the team to investigate are:

1. What are the regulatory drivers and changes in laws/regulations occurring at various points in time? Are the regulations fleet-wide or regionally specific?
2. What types of systems are being deployed to remove what pollutants?
3. How much instrumentation is available on these systems, and what signals are measured (temperatures, pressures, chemistry analysis, etc.)?
4. What are the failure and performance degradation problems that occur? How common are they? What are the ramifications of these problems: outages, derates, having to burn more expensive fuel or turn on "peaking" generation units that are more expensive to run, just to name a few possibilities.
5. How can available instrumentation be used to remotely monitor and detect developing problems?

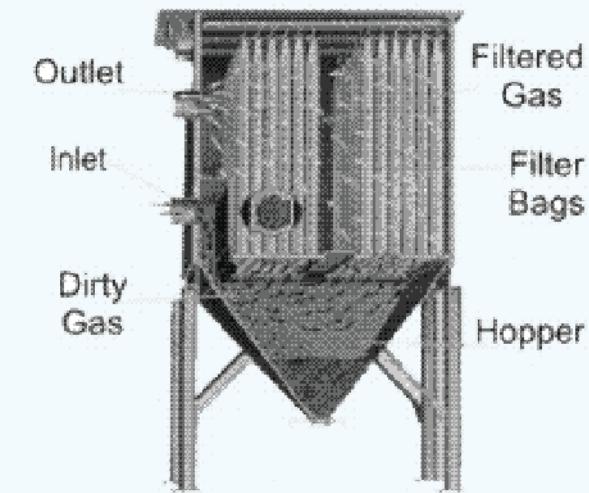
Students in this IPRO researched and answered the questions listed above. The research was gathered from literature, Internet, and experts in the field. Trips to two different coal powered power plants also helped students understand the different systems in question.

## Wet-Scrubbers



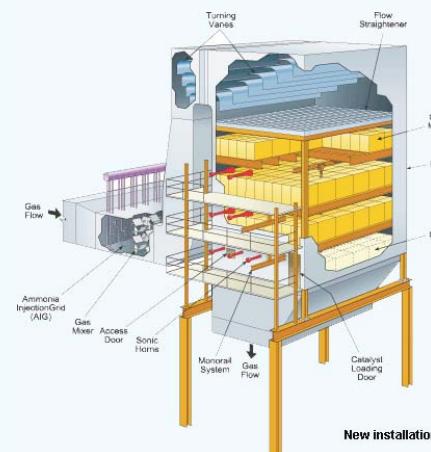
Wet-Scrubbers remove fly ash and sulfur dioxides from the flue-gas exiting the boiler

## Baghouses



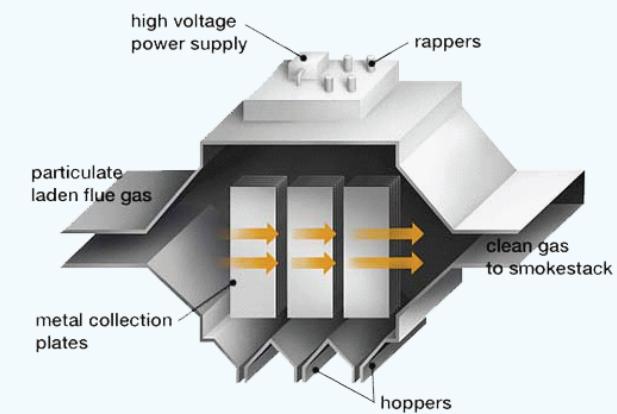
Baghouses remove flyash particulates from the flue-gas exiting the boiler

## Selective Catalytic Reducers



Selective Catalytic Reducers remove nitrous oxide gases from the flue gas exiting the boiler

## Electrostatic Precipitators



Side view of ESP Schematic Diagram [Source: [Powerspan Corp.](#)].

Electrostatic Precipitators remove fly ash particulates from the flue-gas exiting the boiler