IPRO 302 –
Analysis of Water Recovery from Power Plants for Recycling

Midterm Presentation
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Presented by:
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IPRO 302 - Purpose

- Analyze different methods of removing water from flue gas after coal combustion. (750 MW plant)
- Why? Limited water resources in various locations around the country that require water for FGD Systems.
- Cooling Flue Gas in order to condense out water. (which can be used elsewhere in the plant)
FGD (Flue Gas Desulfurization) System requires a Limestone and Water slurry to mix with the flue gas to remove SO2 emissions.
IPRO 302 - Organization

Leader: Don Dornbusch (CHE)

**Group1: Direct Contact**
- Group Leader: Alex (MMAE)
- Members: Sithhambara Kuhan (CHE)
  - Jesse Reinhardt (BIOCHEM)
  - Don Dornbusch (CHE)
  - Sajid Ali Khan (MMAE)

**Group2: Indirect Contact**
- Group Leader: Dave (CHE)
- Members: McLain Hubbard (MMAE)
  - Kwong Hann Tan (MMAE)
  - Wai Kit Ong (CHE)

Faculty: Don Chmielewski
- Myron Gottlieb

Sponsor Contacts: Ajay Jayaprakash
- Dave Stopek
Goals of the Project

- Determine the quantity and quality of moisture in the flue gas.
- Estimate the capital and operating cost for water recovery.
- Estimate the cost per 1000 gallons of water recovered.
- Analyze and study which different technologies used in water recovery is most cost effective.
Indirect Cooling Example

Heat Exchangers

- Shell and Tube

Courtesy: Washington University
Direct Cooling Example

- Spray Tower

Courtesy of epa.gov
Progress Towards Goals

**Total Team Progress**
- The flow rate of the flue gas.
- Molar compositions of gas.

**Indirect Cooling**
- Heat exchanger types and requirements.
- Initial Estimate - roughly 71% water can be recovered.

**Direct Cooling**
- Spray tower.
- Sizing of the tower.
- Cost (Estimated 70-150$/kW 1990)
Obstacles & Anticipated Challenges

Obstacles

- Upstream components alter characteristics of flue gas stream.
- Direct Contact: Utilizing recovered water through the spray tower.

Anticipated Challenges

- Attempting to size emerging technologies to our scale.
- Indirect removal of water pre FGD. (containing SO$_2$)
- Determining potential working fluids for Indirect Contact on the scale of our power plant.
Emerging Technologies

To be analyzed:

1) Desiccants:
   Absorb specific types of particles.

2) Membranes:
   Allows specific types of particles to pass through it.
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Questions/Comments?