

TECHNICAL RESULTS

Cost Comparison for Direct Contact and Indirect Contact

Direct Contact	Cost (US \$)	Indirect Contact
218,000	Capital Cost	836,939
3,273,400	Operational Cost	3,064,959
3,299,500	Annualized Cost	3,165,392
5.28	Cost Per 1000 Gallons H ₂ O Recovered	5.10

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I PRO497-302

ANALYSIS OF WATER
 RECOVERY FOR RECYCLING



Sponsor:



PROJECT STATEMENT

The Main purpose of this project is to increase the sustainability of a coal burning power plant. Several processes in power plants require various amounts of water, which has to be purchased from outside sources. As water becomes more scarce, the price for make-up water can build up.

When **Coal** is burned, H₂O is formed, this water, including the small water content naturally found in coal, is normally just released into the atmosphere. Recovering this water, would reduce costs and help limit plant emissions.

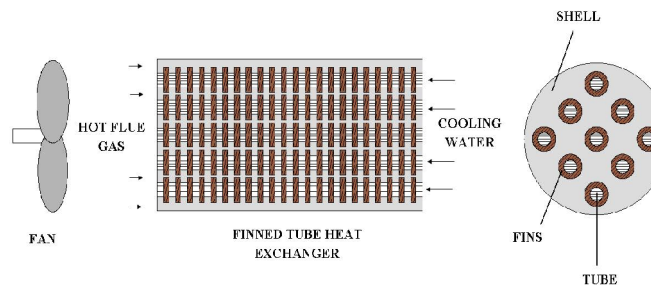
One of these pollution reducing systems is the **Flue Gas Desulfurization (FGD)** process. This process requires water to form a slurry to be sprayed into the gas in order to remove most sulfur emissions., responsible for acid rain. How is water lost in the **FGD**?

- The gas is cooled below its **dew point** and some water condenses out.
- The exiting vapor is saturated with water vapor.
- The slurry reaction leaves the base of the **FGD** Tower with a large quantity of water.

OBJECTIVES

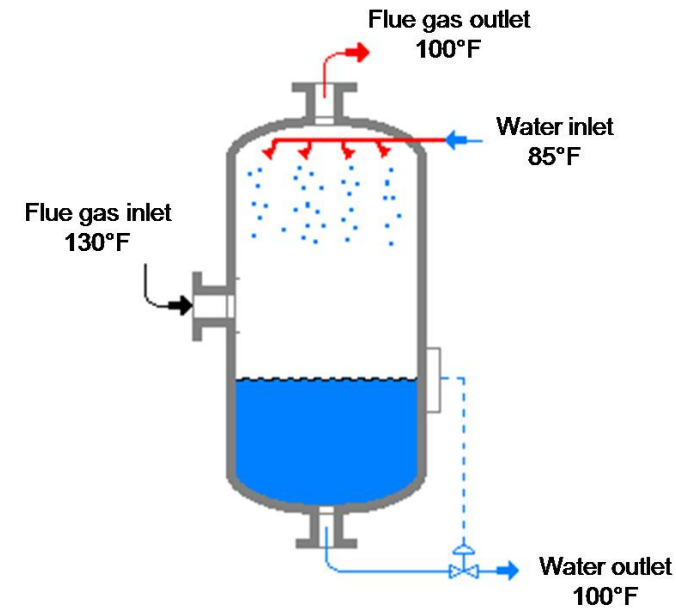
- Analyze Several Methods of extracting water from Flue Gas
- Determine the Cost per 1000gal Water Produced
- Compare Results vs Cost to purchase water and compare.

INDIRECT CONTACT



- Large surface-to-volume ratio for effective heat transfer
- Staggered finned-tube arrangement increases contact with flue gas
- Counter-flow arrangement provides a more uniform temperature difference, minimizing thermal stress.
- Generally saves substantial cost, weight, and volume compared to conventional shell-and-tube heat exchanger.

DIRECT CONTACT



Direct Contact: Mixes Coolant and Flue Gas

- A Spray Tower design allows the gas to flow continuously through, while water is sprayed into that gas where energy transfer can occur.
- Mixing Warmer Flue Gas (Saturated with Water Vapor) with cool water causes the gas to cool.
- The cooler gas can hold less water, causing part of the water vapor to condense.

Specs

- Pressure: Atmospheric
- Minimal Pressure Drop in Tower
- Height: 7meters
- Diameter: 2meters