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SCIENTIFIC & RESEARCH PROJECTS

Project No.: 06 **Year:** 2017

Project Field: GHG Emission Reduction

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Project Title:

Optimization of Pre-Combustion Capture for Thermal Power Plants using Pinch Analysis

Abstract:

Carbon dioxide emissions from the chimneys of thermal power plants create major environmental risks. Therefore, an important step toward reducing the emissions in these power plants can be the carbon dioxide pre-combustion capture process. In this paper, a 150MW thermal steam cycle power plant fueled by bagasse was studied. The power plant has an efficiency of 32.74%, and emits 246.52 t/h carbon dioxide. First, the design and simulation of a suggested pre-combustion carbon dioxide capture process was outperformed. In this process, the amount of carbon dioxide separation and capture using mono ethanol amine (MEA) 30 wt% as solvent is 90%. In this condition, the mass flow of bagasse was increased about 60% to keep the plant efficiency constant. At the same time, the energy loss as a result of the addition of the carbon dioxide recovery unit was around 11%. The process was optimized through Pinch Analysis to reduce energy waste and fuel flow. Moreover, it was indicated that power plant efficiency could be increased around 8% by integrating the hot exhaust gases from the gasification unit with power plant boiler using a heat recovery steam generation (HRSG) unit. With this modification, bagasse consumption was decreased by 23%.