

## Design and Optimization of Low Carbon Emitting Combined Rankine Cycle

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A low carbon emitting combined Rankine cycle is proposed. In this cycle, the CO<sub>2</sub> generated from the coal combustion unit is captured through the post combustion capture process using mono-ethanol amine (MEA). This capture process consumes only 73% of the conventional capture plant operation energy by employing advanced process configuration. An organic Rankine cycle (ORC) utilizing both low-grade heat from a pulverized coal power plant and liquefied natural gas (LNG) cold exergy is also installed and optimized in order to minimize the power de-rate. The ORC uses R601-R23-R14 ternary mixture as its working fluid and is integrated with a steam cycle as a bottoming cycle. By utilizing the hot and cold exergy of low-pressure steam and LNG that were initially wasted, the ORC is able to generate additional power without consuming fossil fuel. The CO<sub>2</sub> captured from the capture process is liquefied by utilizing its latent heat as a heat source for the working fluid. 74.1 MW of additional electricity can be produced from ORC without consuming additional coal, thus both cycle efficiency and power de-rate resulted from CO<sub>2</sub> capture process installation are greatly improved.