

ENGR 3203 Project

Power Generation for a Remote Air Separation Plant

Background

You and one other design engineer have been charged with ensuring an air separation plant in desert has sufficient power – 20 MW average power and 30 MW max. power. Your design should consider the power requirements, but also the initial cost for the plant equipment, environmental impact, availability of fuel supply, health and safety issues, and any social considerations that may be involved.

Requirements

Design a Steam Power Plant to supply a nominal power of 2 MW and 4 MW peak.

1. Choose a fuel to supply to heat the steam – at a minimum consider cost, energy delivery rate, environmental factors, local community acceptance).
 1. Coal – traditional coal-fired plant (like http://en.wikipedia.org/wiki/Mohave_Power_Station)
 2. Solar – concentrated solar plant (like http://en.wikipedia.org/wiki/Nevada_Solar_One)
 3. Nuclear – (like http://en.wikipedia.org/wiki/Susquehanna_Steam_Electric_Station)
2. Choose components – at a minimum consider basic components required to run the steam cycle. Ideally consider additional components that will cause plant to run more efficiently.
 1. Evaporator/Boiler
 2. Turbine – consider a realistic *isentropic* efficiency
 3. Condenser – consider inlet/outlet temperatures of steam and inlet/outlet temps of cooling water (available from nearby reservoir at 10 degrees C).
 4. Pump – consider realistic *isentropic* efficiency
3. Analyze the components you have chosen
 1. Component analysis
 1. Mass flow rates, pressures, temperatures, heat exchange rates, power generation and consumption rates, entropy generation rates, etc...
 2. Overall Plant Analysis
 1. Overall thermal efficiency
 2. Overall plant effects on surroundings
 3. Overall ability to supply needed power
 4. Overall cost
 5. Overall public acceptance of plant and its effects (short term versus long

term)

4. Documentation - Each two person group will need to submit a group report. The report is due on Dec. 11, 2008 by 11:59 p.m. The report will need to be turned into a pdf and submitted by each group to Dr. Lemley via e-mail by the deadline.

(See http://evan.lemley.org/courses/engr4123_fall_2008/report_template.doc

for a report template, and

http://www.asme.org/Publications/ConfProceedings/Author/Formatting_Paper.cfm for paper formatting)

1. *Introduction* – the basics of the design problem and your basic objectives.
2. *Background* – this should include relevant background theory.
3. *Problem Description* – What problem are you tasked with solving (graphics are nice)
4. *Choice of Fuel and Components*
5. *Analysis of Plant*
 1. *Component Analysis*
 2. *Plant Overall Analysis*
6. *Results and Conclusions*
7. *Appendices*
8. *References*