**Project II - “Rochester Needs More Power!”**

**MCET 530 – Thermal Fluids Sciences II**

**Dr. J. O’Neil**

**INTRODUCTION**

A power plant, also known as a vapor power cycle, is an industrial facility for the generation of electric power. In order to analyze a complete power plant, it is first necessary to analyze the elements which make up such cycles. The four basic elements in power cycles are: (1) turbine, (2) pump, (3) boiler, and (4) condenser. Associated with each of these elements is a characteristic change in the properties of the working fluid. It is possible to calculate the cycle efficiency knowing the temperature of the heat source and heat sink. It is also possible to calculate the efficiencies of the individual components by comparing the actual and isentropic works.

At the center of nearly all power plants is a [generator](http://en.wikipedia.org/wiki/Electric_generator), a rotating machine that converts mechanical power into [electrical power](http://en.wikipedia.org/wiki/Power_%28physics%29#Electrical_power). The energy source harnessed to turn the generator varies widely. It depends chiefly on which cost effective fuels are easily available, and on the types of technology that the power company has access to. Most power stations in the world burn [fossil fuels](http://en.wikipedia.org/wiki/Fossil_fuel) such as [coal](http://en.wikipedia.org/wiki/Coal), [oil](http://en.wikipedia.org/wiki/Petroleum), and [natural gas](http://en.wikipedia.org/wiki/Natural_gas) to generate electricity, and some use [nuclear power](http://en.wikipedia.org/wiki/Nuclear_power). However, there is an increasing use of cleaner renewable sources such as [solar](http://en.wikipedia.org/wiki/Solar_power), [wind](http://en.wikipedia.org/wiki/Wind_power), [wave](http://en.wikipedia.org/wiki/Wave_Power), and [hydroelectric](http://en.wikipedia.org/wiki/Hydroelectric).

**BACKGROUND AND RULES**

You will work in teams to gain a better understanding of the thermal and economic analyses required of electric-generating power plant technology, going beyond the basic thermodynamic analysis of a vapor power cycle covered in class.

Each team is a start-up company charged with the task of designing and analyzing a power plant to be built here in Rochester, NY. Each company, using different fuel types (fossil fuel, nuclear, alternative energy), will start with a basic vapor power plant cycle analysis comparing cost and efficiencies. Dr. O’Neil will act as your local government and peer students as your customer. Throughout the remainder of the project each company will be required to turn in periodic project reports with their latest analysis. Each company should be prepared for imposed legislation that could affect their design!

Since we are adopting a company model, each team member will adopt a role within their company. The project proposal is due by **Wednesday, February 6th**. Each team must submit their company information, along with their individual roles, and have it approved by the professor.

**DEFINED GROUP ROLES:**

1. Project manager: responsible for providing and maintaining design requirements, acting as a liaison with the government/customer, maintaining the project’s timeline, responsible for reviewing and approving all designs and documents before submission by the Public Relations person, and managing the project group (“company”).
2. Financial Analyst: responsible for managing team finances (keeps track of team’s budget), researching operating costs (source of Qin), and analyzing cost/benefit of advanced or non-standard components.
3. Public Relations: responsible for submitting the final report to the customer, responsible for compiling a presentation from the company to the customer, and responsible for submitting bi-weekly progress memos to the customer.
4. System Integrator: evaluate how advanced and non-standard components or modifications affect system performance (device, cycle, and plant efficiencies).

**GENERAL TIMELINE:**

*Weeks 3 to 6* (02/01): Project introduction, project proposal plan/roles due **Wed. 02/06** from PR.

Simple cycle analysis report due **Wed. 02/20** from project manager.

*Week 7* (02/25): Cycle modification report due **Wed. 02/27** from project manager.

Rumor around town is there will be new legislation passed….

*Week 8* (03/04): Work work work!

*Week 10* (03/18): Submit a printed copy of your final report by **Wednesday, 03/20.**

Town hall meeting to be held **Friday, 03/22,** to present your company’s power

plant to local residents. Residents will vote on the plant to be built in their town.

**REPORT REQUIREMENTS:**

*Deliverables*: engineering analysis, plant/device performance, purchase costs, operational costs, and power output. More details to come!

**Your grade for this project will be based on:**

* (60 %) Quality of analyses (2 or 3 rounds)
* (30 %) Poster Presentation – 20% prof eval + 10% peer eval
* (10 %) Peer evaluation of project contributions

**MCET 530 – THERMAL FLUIDS SCIENCES II**

**PROJECT PLAN PROPOSAL**

**DUE: Wednesday, February 6, 2019**

**COMPANY NAME:**

**COMPANY EMPLOYEES/ROLE:**

|  |  |
| --- | --- |
| **EMPLOYEE** | **ROLE** |
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**APPROVAL SIGNATURES:**

Project Manager \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_

Customer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_

**ASSIGNED POWER PLANT TYPE:**