



PROBLEM BASED LEARNING

Environmental Control Technology

(Heating, Ventilation,
Air Conditioning and Refrigeration)



ECT 24: Commercial HVAC Systems

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PROBLEM BASED LEARNING (PBL) SCENARIO

Instructor: Chuck Frost

Course: Commercial HVAC Systems

Course Number/Code: ECT 24

SCENARIO TITLE

“How to Keep the Chiller Running”

Key Course Concepts:

- Demonstrate the ability to understand the Heating, Ventilation, Air Conditioning (HVAC) system of buildings and the thermodynamics of heat transfer.

SCENARIO DURATION

- **2 partial class periods:** An introduction to the Problem Based Learning (PBL) process, presentation of sample projects, and class time to work on the project as a group

BUSINESS PARTNER

Laney College, Environmental Control Technology (ECT)

LEARNING OBJECTIVES

By the end of the semester, students will be able to demonstrate the ability to:

- Understand the HVAC system of buildings
- Calculate the amount of heat transfer
- Interpret and extract information from trend data and design documents

THE FOCUS OF THE PROBLEM

The focus of this Problem Based Learning (PBL) scenario is based around a real life scenario.

In various settings, the Problem Based Learning (PBL) scenario may be presented as a real time problem, hands-on scenario, or hypothetical problem. Using critical thinking and investigation, the students go through a process to solve a problem and provide recommendations for a solution.



PROBLEMATIC SITUATION

At the University of California, Berkeley, there is an 8 story building with a science laboratory in the basement. The building was undergoing a major infrastructure remodeling. In November, the nighttime outdoor temperature dropped into the high 30°F. This created problems for the chiller that was needed to supply water to keep the experiment running.

As a group, it your job to identify how to put enough BTUs on the chiller to keep it running in order to continue a long term Physics Department experiment and prevent critical data from being lost.

Questions to think about while investigating the Problem Based Learning (PBL) scenario:

***WHO** is involved?*

***WHAT** is not working?*

***WHEN** did the problem start?*

***WHERE** is this scenario taking place?*

***TIME** pressures or deadlines?*

STUDENT MATERIALS

The instructor will provide students with the following information:

- A copy of the Problem Based Learning (PBL) cycle and steps
- An explanation of the Problem Based Learning (PBL) approach
- A brief history of the building remodel
- Images and graphics of the building
- Tool: “Need to Know” to gather information
- Tool: Scoring rubric for final presentation
- Problem Based Learning (PBL) scenario evaluations: Team evaluation and online survey

Resources and Media:

- The internet
- Educational materials and books

INSTRUCTOR ROLE

The instructor will support the Problem Based Learning (PBL) experience by:

- Introducing the scenario and process
- Facilitating reflection and discussion
- Providing applicable resources and materials
- Answering any questions related to the scenario and coursework
- Providing class time to work on the scenario



STUDENT ROLE AND GUIDELINES

Individual

The intended outcome will be measured by having each student:

- Distribute project tasks between the team members
- Perform a specific individual role in their team
- Perform a specific individual role in the final presentation
- Complete a Problem Based Learning (PBL) scenario and team evaluation as a part of the final project

STUDENT ROLE AND GUIDELINES

Team

The intended team outcome will be measured by providing:

- A team presentation where each student will individually present a particular segment (1-2 minutes) of the recommendations to solve the problem at the University of California Berkeley Physics Department.
- Turn in an electronic version of your team Power Point Presentation to the instructor.
- A single document which describes recommendations on the problem and the solution(s).
- A class discussion where each student on the team will make an oral presentation of what they learned.

Group Size:

- 4 or 5 groups (Approximately 3-5 students per team)
- The Instructor will participate in the selection of members of each team

PRESENTATION DATE

The final presentation date: _____ (fill in date)

STUDENT FEEDBACK

As a team, and individually - students will review, assess and provide feedback regarding the Problem Based Learning (PBL) scenario experience.

Requirements of the final project: Before final presentation

- Completion of team member evaluation and online survey

TEAM LINK

The instructor will support the team learning process by allowing:

- Time to meet during class, outside of class and on the phone to work on the scenario

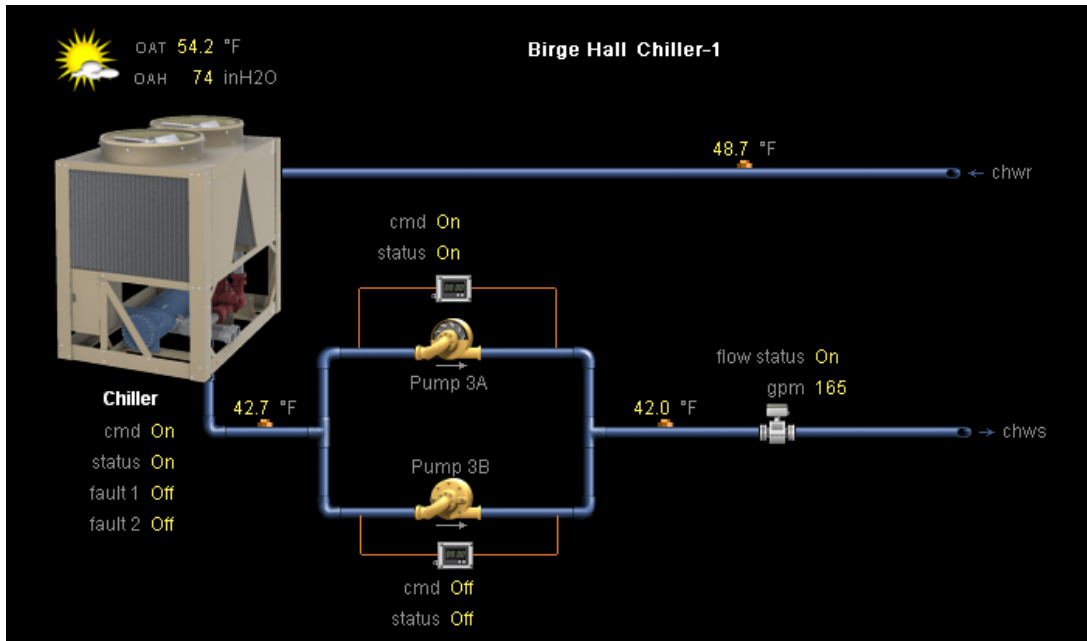


Photograph: The University of California Berkeley, roof top view of Birge Hall





Screen shot 1, Title: Graphic screen from control system of Birge Hall chiller



Screen shot 2, Title: Graphic screen from control system of air handling unit of Birge Hall

