

ENVIRONMENTAL STUDIES 73

Motors and Drives

HOMEWORK #2

Name: _____

For presentation to the class on March 11th.

Our class will divide into groups of three or four people. Work together to answer the following questions. Each member should take responsibility for some of the questions and present that portion to class. All group members will be expected to be involved with the presentation. Each group member will also be asked to grade the other members of their group to ensure equitable distribution of the work load. Here is the scenario:

Imagine that your group is chartered to convince a non-technical decision maker to reduce the energy used by the motors at his or her facility. To gain this decision maker's confidence, you will need to address the "big picture" including potential energy savings, maintenance savings, environmental benefits, reliability improvements and first cost issues. Each group will be allowed 15 minutes presentation time plus five minutes for questions from the class.

Ideally one person in your group will be able to download and use MotorMaster+ for the energy savings portion. Really be thinking about the Motor Action Plan information from the reading assignments.

1) Explain to this decision maker why your information about motors and motor controls is important.

2) Propose a motor plan your group would implement if hired by this decision maker (for example -- describe any surveys you may perform and what types of data you would collect).

3) Describe the types of situations you would install an energy efficient motor (at least three).

As a preamble to question 4, help the decision maker visualize your recommendations by setting the “scene” or making assumptions for your recommendations. Your group can use an example from the field trip or make up your own building. The remainder of your answers should make sense within the context of these assumptions. (In other words, a vent fan for a “snack shack” will only be on a few hours per year while a hospital would be 24 hours-per-day.) Look at the last question on the first homework assignment for some ideas.

4) To prove to the decision maker that your motor plan will save him or her money, calculate the energy savings for converting from a standard efficiency motor to a NEMA premium motor. Your group can decide how many hours-per-year the motors are used. (All new motors should be 4 pole, ODP)

Group A) Three 50 hp standard efficiency motors where the nominal efficiency is 89%

Group B) Two 60 hp standard efficiency motors where the nominal efficiency is 90%.

Group C) Two 75 hp standard efficiency motors where the nominal efficiency is 91%

Group D) Two 100 hp standard efficiency motors where the nominal efficiency is 91.5%

4a) After you have calculated the above savings, are there additional energy savings for reducing the hours-per-year that the motor runs? Please calculate. (Answer in kWh)

You may use Motormaster 3 or the simplified calculation shown in class. Please either show your work or print out the pages from Motormaster 3.

5) Since the decision maker is interested in his or her bottom line, what is the simple payback for installing energy efficient motors? (Answer in years.) Assume an energy cost of \$0.177/kWh. Prices for motors are as follows:

50 hp = \$2510

60 hp = \$3648

75 hp = \$4579

100 hp = \$5610

Remember that Simple Payback = Cost/Savings.

6) Describe to the decision maker a situation where motor controls would be appropriate. What kind of controls would your group recommend? What are the ballpark potential savings?

7) Explain why this decision maker should be concerned about oversized motors.

Information sources:

- 1) *Lecture notes*
- 2) *Handouts*
- 3) *Knowledge gained from earlier courses*
- 4) *Outside sources such as product literature, catalogs, web sites, etc. are also ok.*

Please list the other members of your group and grade their participation in the group effort.

Name Grade

- 1.
- 2.
- 3.
- 4.

Submitting Assignments: [copy and attach the cover sheet on the last page of the syllabus]:

- Turn in your paper at the Distance Learning Center, room LCW-102. During regular hours drop them into the Homework Drop Box inside the office and sign in your name on the "Student Coursework Sign-In-Sheet" so there is a record of your paper being turned in there. After hours, drop them into the Homework Drop Box located by the Distance Learning Center back door (facing the California History Center).
- Mail your paper to: Julie Phillips/Scott Gould, De Anza College Distance Learning Center, 21250 Stevens Creek Blvd., Cupertino, CA 95014. Include a self-addressed, **postage paid** envelope.
- FAX your assignment to either of the two Distance Learning Center FAX machines: (408) 864-5546, or (408) 864-8245.
- FAX your assignment to Scott Gould's office directly (650) 723-3191