Final Report on the
Fabrication and Testing of a Centrifugal Pump
ME 120 Winter 2016
Due Date: Thursday, 10 March 6pm

The final report for the pump project should be a brief document that includes the content described in the following sections. The entire report should consist of no more than three pages of text, which does *not* include diagrams, photographs, plots, and sample calculations. However, figures, tables, etc. that are a part of the report must be cited in the text and discussed in a manner that clarifies or condenses your report. The objective of using graphics is to speed, deepen, or otherwise improve the uptake of your work by the reader.

Title Page

The cover sheet should be plain paper with the title of project, team members, team name, course, date, and location (Portland State University). Please do not use a plastic report cover.

Pump Design

Provide Solidworks drawings of your pump body, face plate and impeller. You can choose to assemble these components in an assembly or leave them as separate parts. Photographs of your pump would be helpful, though not required. For each drawing or picture, make sure to label as figures (more detail on the next page).

Pump Fabrication

Discuss the two or three steps that you think were most important. This should be brief: one paragraph per important step. Discuss any particular difficulties that you encountered and how you overcame those difficulties.

Pump Performance

Describe the experimental setup. Schematics and photographs would be very helpful. Provide the equations used to quantify the performance of your pump. Show plots of head (meters) versus flow rate (L/min) and pump efficiency (%) versus flow rate (L/min). Include an appropriate curve fit on each plot. Make sure your plot axes are labeled. Briefly discuss the trends in the data. Note any irregular data that do not follow the expected trends and provide a plausible reason for the irregularities.

In an appendix, show a sample calculations for one operating condition, i.e. pump head and flow rate. In a second appendix, provide a printout of the spreadsheet used for analyzing all of the data. With the exception of the plots, this spreadsheet should fit (neatly!) on a single side of a single sheet of paper.

Suggestions for Improvement

Provide suggestions for how you think the pump could be improved. What should be changed to eliminate the problems you encountered? What would you do if you had a week to re-do the entire design, fabrication and testing?

Additional Instructions for the Pump Report

Figures and Tables

All Figures and Tables should have a number and caption. The caption provides a concise description of the content of the Figure or Table. Think of the caption as the essential documentation that allows the Figure or Table to stand on its own. The caption is located above a table and below a figure, as illustrated in Table 1 below and Figure 1, on the following page.

Table 1 Raw data collected in the pump experiment.

h (inch)	V (Volts)	I (mA)	Δm (g)	Δt (s)
55	12.09	287	0	20
34	12.09	302	148	20
20	12.09	310	203	20
40	12.09	297	107	20
16	12.09	307	218	20
12	12.09	306	235	20
28	12.1	301	174	20
46	12.1	295	86	20
6	12.1	307	263	20
50	12.1	290	53	20
30	12.1	300	171	20
36	12.1	305	147	20
10	12.09	320	250	20
24	12.1	310	202	20
48	12.08	306	83	20
20	12.12	313	226	20
52	12.12	297	56	20
55	12.11	294	24	20
55	12.09	287	0	20

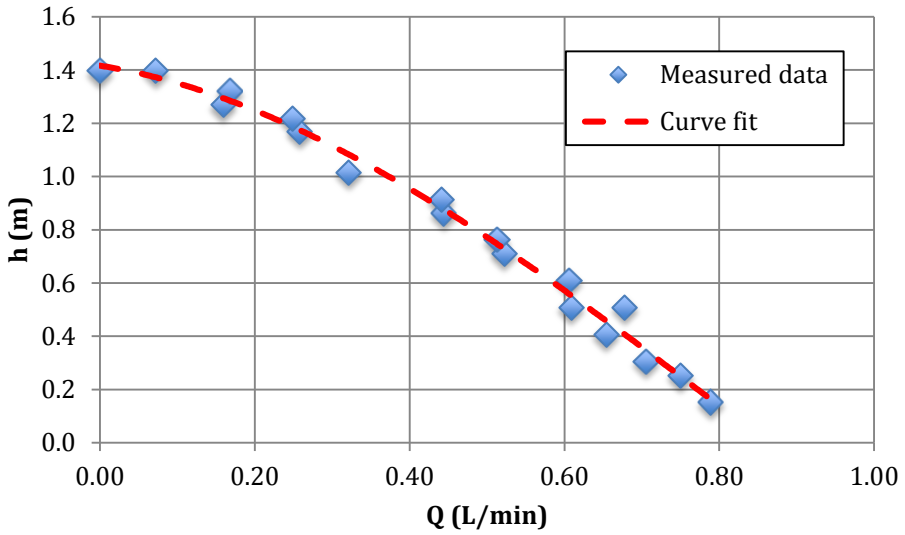

Figure 1 Measured head versus flow rate data from the pump experiment.

Sample Calculations

A sample calculation should show all steps in the data analysis for one operating point. Starting with the raw measurements (mass collected, time duration of mass collection, height of outlet above the inlet, voltage applied to pump motor, current through pump motor), show the computations necessary to obtain one (Q,h) data pair and one (Q,η) data pair. These computations can be hand-written and must be neat and legible. Hand-written analysis should be on green engineering paper.

The data analysis should be carried out with equations using standard engineering notation. Include units for each step of the calculation and follow the rules of algebra. Final results should have an appropriate number of significant digits. Intermediate results can carry extra digits to prevent unnecessary rounding errors in the calculations.