

ME 333 Project: Fall_2014-15
Designing of a water system to meet a near-constant output need.

(Due: Monday 29th Dec 2014 before 10:35 AM)

Introduction

The supply of water is a variable function of time at a height of 20 m. It is required to submit this water flow at nearly steady flow at a distance of 30 m as illustrated by Fig. 1. The fluctuation of the output flow rate, q_{out} , should be less than 5% (i.e. $0.95 q_m < q_{out} < 1.05 q_m$)

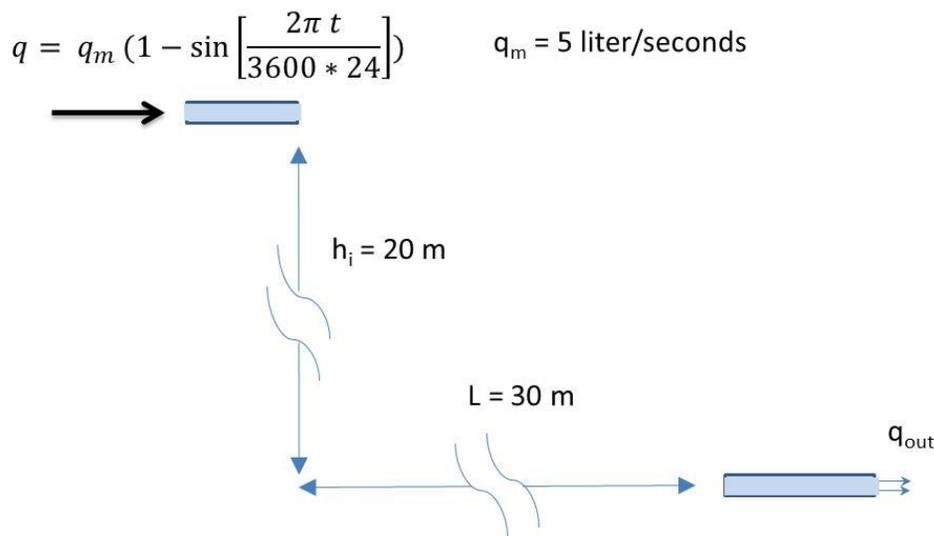


Figure 1. A schematic water supply and demand.

Model

It required to simulate the behavior of this system by a mathematical model. Model this system as a lumped system. Identify all system parameters, types of energy losses and limitations.

Design tasks

- (1) Choose the system parameters.
- (2) Build the system.
- (3) Consider the system with linear energy losses and non-linear one.
- (4) Solve the linear system analytically.
- (5) Build Simulink model that simulate the water flow.
- (6) Use the Simulink model to solve for linear and non-linear system.
- (7) Compare the linear system results with that of analytical solution.

- (8) Find the system parameters that lead to the minimum cost.
- (9) Work in groups that have a maximum of four students each.

Presentation of Results

Your written report should include

- (1) Cover page. (2 mark) (g)
- (2) Identify all system parameters, types of energy losses and limitations. (10 marks) (e)
- (3) Selection of the system parameters (5 marks) (c)
- (4) Use commercial catalogues that meet system parameters. (10 marks) (i)
- (5) Finding the parameters with the minimum cost. (5 marks) (c)
- (6) Build the mathematical models of the water storage system. (5 mark) (e)
- (7) Build the Simulink model that simulates this system. (8 marks) (k)

Your oral representation should include (on **Wednesday 31th Dec 2014**).

- a. Media use by Power-point files. (2 marks) (g)
- b. Group presentation by group leader. (3 marks) (g)

The submission of the final version of the written report is before 10:35AM Monday 29-DEC-2014. Late submission of project report (after 10:35 AM) means one day late. Each late day results into 25% mark reduction). No submission accepted after two days. Softcopies of project are submitted on **Wednesday 31th Dec 2014** by KFU_E-mail only to mmahdi@kfu.edu.sa . Please do not use non-KFU email. Oral presentation is on **Wednesday 31th Dec 2014** 10:30 AM)

Dr M Mahdi