

Fluid Flow Systems

Homework (1st. September, 2014)

Water distribution system

- Choose a pump based on the average consumption.
- Assuming the daily water consumption distribution detailed below, find the minimum reservoir surface that results in a water level variation between 1 and 3 m during the day (assuming 2 m water level at midnight).
- Find the $H(Q)$ curve of the hydraulic system. (Remove the pump and add a flow rate inlet at the pump node. Find the node at the same pressure while increasing the flow rate from 0 to 1000 m³/h regularly.) (OPTIONAL)

Data:

Homework code: system:..... pipe data:..... node data:.....

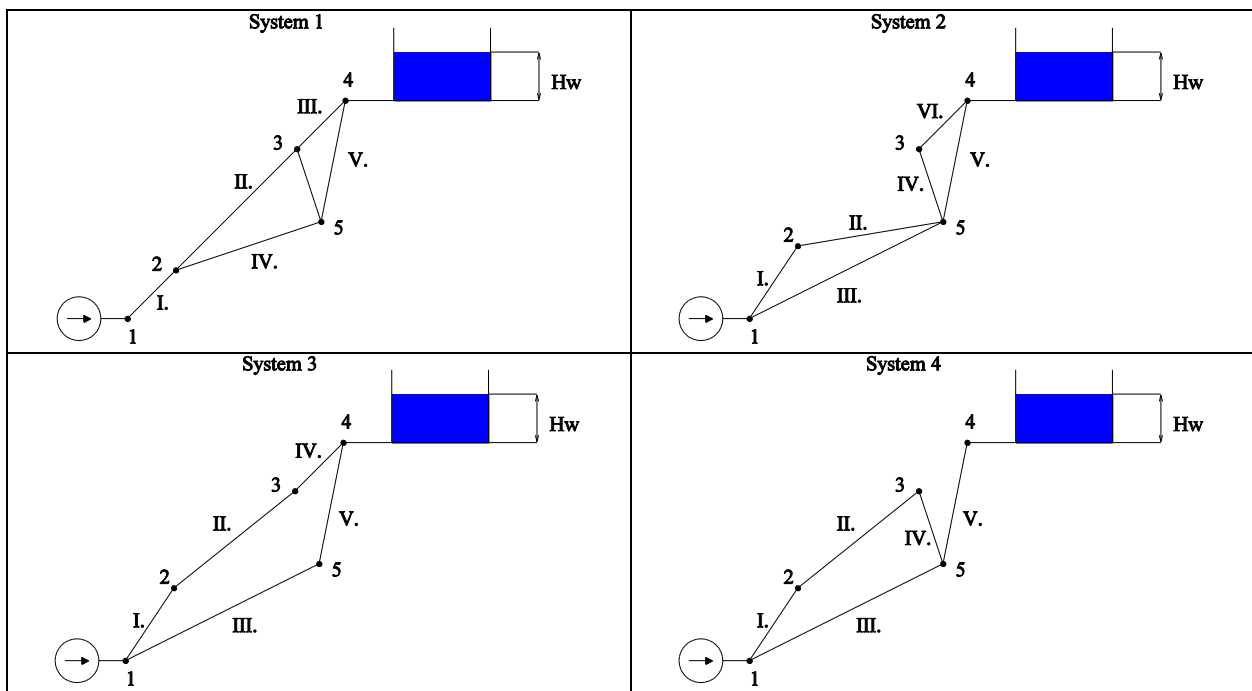


Figure 1. System codes. The reservoir bottom height and the water level is $H_b=60$ m and $H_w=2$ m, respectively.

pipe no	A	B	C
I	500/2000/0.02	400/2000/0.018	500/1000/0.02
II	400/2500/0.03	300/1000/0.02	200/1100/0.018
III	350/1000/0.02	300/3400/0.02	300/2400/0.02
IV	200/2200/0.02	200/2000/0.025	300/3000/0.02
V	200/2000/0.018	300/2200/0.02	100/1000/0.023
VI	300/2000/0.02	200/1000/0.02	300/3500/0.025

Table 1. Pipe data codes. D[mm] / L[m] / λ [-]

node no	A	B	C
1	0/50	0/50	0/50
2	20/430	10/300	20/150
3	30/50	20/150	20/320
4	60/0	55/0	60/0
5	50/20	45/10	50/0

Table 2. Node data codes. H[m] / Q[m³/h] (average consumption)

Notification: The total average consumption, for instance for node data code A, is $Q_A=50+430+50+0+20=550$ m³/h!

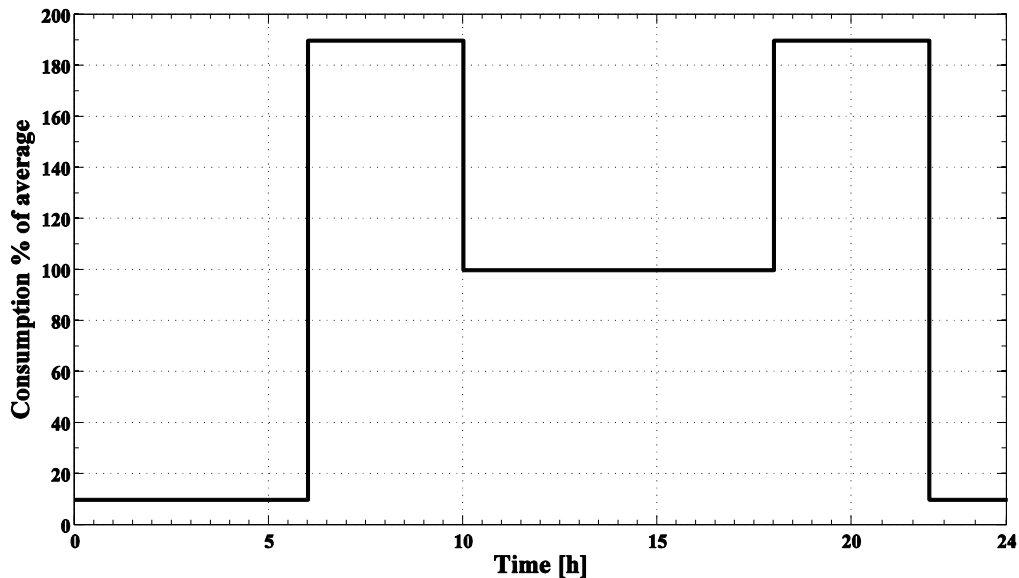


Figure 2. Daily consumption schedule based on the percentage of the average.