Problem 12-6

A preliminary estimate of the total cost for a completely installed pumping system is required for a certain design project. In this system, 15.75 kg/s of cooling water at 15.5 ºC is to be provided using a 305-m pipeline. It has been estimated that the theoretical power requirements for the pump will be 7.5 kW. Using the following data, estimate the total cost of the pumping system:

Material of construction – carbon steel
Number of fittings (equivalent to tees) – 40
Number of valves (gate) – 4
Insulation (85% magnesia) – 0.038 m
Pump – centrifugal horizontal
Motor – AC, enclosed, 3-phase, 1800 r/min

Cadets are required to calculate purchased price in December of 2025.

Problem 12-13

What power will be required to mix an aqueous solution of 50% NaOH in a baffled tank, 2m in diameter? The mixing will be performed in the vertical tank filled to a height of 2 m by a disk turbine with six flat blades. The turbine is 0.67 m in diameter and is positioned 0.67 m above the bottom of the tank. The turbine blades are 0.134 m wide and turn at 90 r/min. The solution has a viscosity of 0.012 Pa·s and a density of 1500 kg/m^3.

Cadets are required to solve for power and mixing time using both methods 1 and 2.