

National Program on Technology Enhanced Learning (NPTEL)

Design and Optimization of Energy Systems

Assignment No: 1

- (a) An overhead tank of a big apartment complex has a capacity of 16000 liters. It is desired to select a pump and piping system to transport water from the sump to the tank. The distance between the two is 300m and the tank is at a level 25 m above the sump. For operational convenience, the time to fill the tank shall be 90 min. Losses in the expansions, contractions, bends and elbows have to be calculated appropriately. Design a workable system for the above and sketch the layout.
- (b) Using data for PVC pipes from local market sources or from Google, assign realistic values for pump efficiency, cost of the PVC pipe, and pump and running cost including maintenance costs. With the help of any method known to you, obtain the value of ΔP developed by the pump at which the total cost will be a minimum. The pump is expected to work everyday and the average daily consumption of water is 30000 liters. The cost of electricity may be assumed to be Rs.5 per unit (1 USD = 49 Indian Rupees) and increases by 5.5% every year. The life of the system may be assumed to be 20 years.