Series 12 (23 May 2025)

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8.58 Water flows at a rate of 0.040 m^3/s in a 0.12-m-diameter pipe that contains a sudden contraction to a 0.06-m-diameter pipe. Determine the pressure drop across the contraction section. How much of this pressure difference is due to losses and how much is due to kinetic energy changes?

8.79 Water at 10°C is pumped from a lake as shown in Fig. P8.79. If the flowrate is 0.011m^3/s, what is the maximum length inlet pipe, l, that can be used without cavitation occurring?

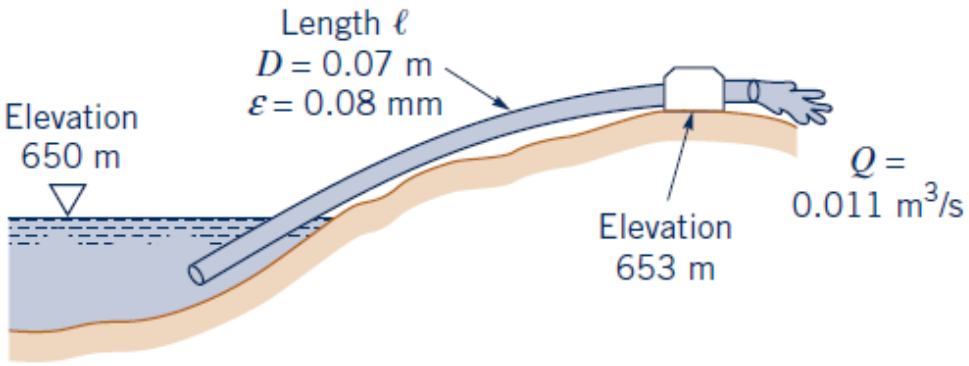

Figure P8.79

8.88 A fan is to produce a constant air speed of 40 m/s throughout the pipe loop shown in Fig. P8.88. The 3-m-diameter pipes are smooth, and each of the four 90° elbows has a loss coefficient of 0.30. Determine the power that the fan adds to the air.

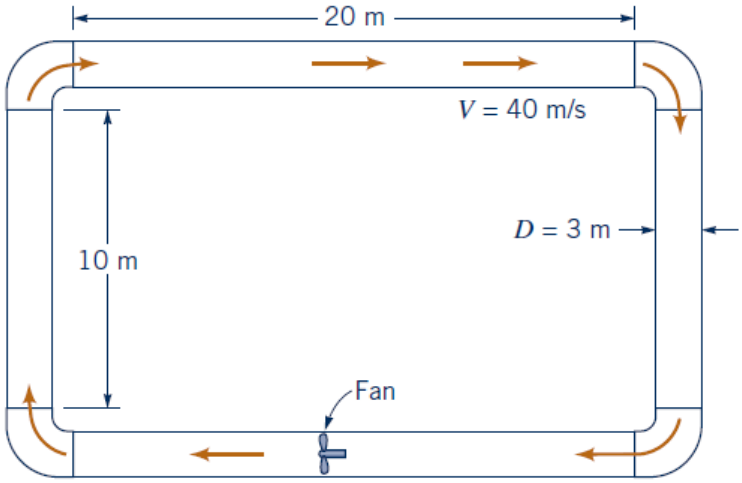

Figure P8.88

8.90 Water flows from the nozzle attached to the spray tank shown in Fig. P8.90. Determine the flowrate if the loss coefficient for the nozzle (based on upstream conditions) is 0.75 and the friction factor for the rough hose is 0.11.

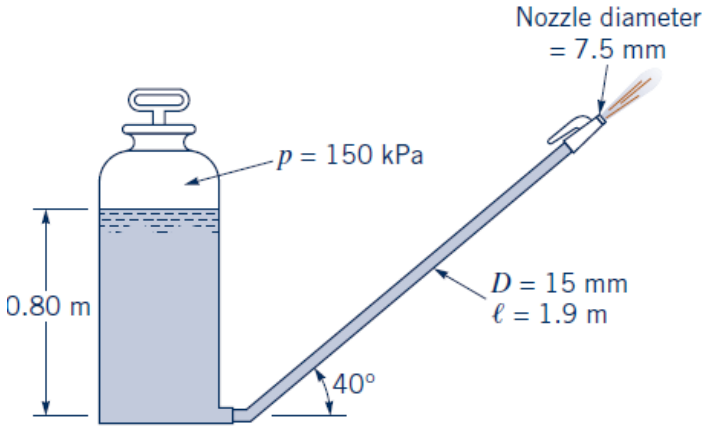

Figure P8.90

8.94 The pump shown in Fig. P8.94 adds 25kW to the water and causes a flowrate of $0.04\mathrm{m}^3/\mathrm{s}$. Determine the flowrate expected if the pump is removed from the system. Assume $f = 0.016$ for either case and neglect minor losses.

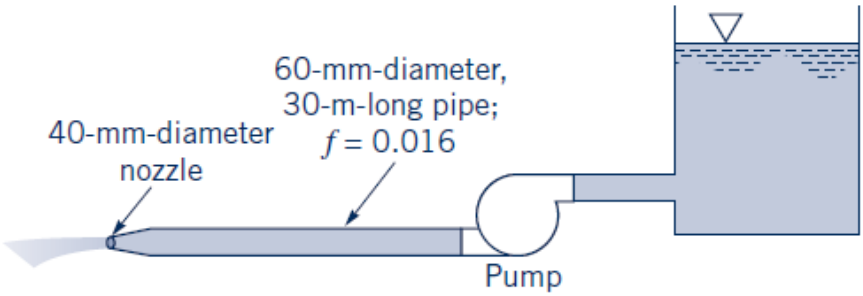

Figure P8.94

8.101 Water is pumped between two large open reservoirs through 1.5km of smooth pipe. The water surfaces in the two reservoirs are at the same elevation. When the pump adds 20kW to the water, the flowrate is $1\mathrm{m}^3/\mathrm{s}$. If minor losses are negligible, determine the pipe diameter.