9.30.1 A nozzle with a steady flow of air entering at 2.21 kg/m^3 and 40 m/s and is exiting at 180 m/s and 0.752 kg/m^3. 90 cm^2 is the area of the inlet; determine (a) the mass flow rate, and (b) the exit area.

Ans: (a) 0.796 kg/s, (b) 58 cm^2

9.30.2 Steam is flowing at 200 lbm/s through a pipe at 200 psia and 600°F. if velocity is not to exceed 50 ft/s, what is minimum diameter the pipe.

Ans: 3.63 ft

9.30.3 Initially 35°C air at 120 kPa fills a spherical balloon with a diameter of 3 m. Air enters through a 1-m diameter opening of the balloon with a velocity of 2 m/s at 35°C and 120 kPa . How long will it take to for the balloon to reach a diameter of 15-m assuming the temperature and pressure of the air in the balloon is the same as the air going into the balloon?

Ans: 18.6 min

Assigned 10/4/13

10.4.1
The inlet water of an adiabatic turbine inlet is at 2.5 MPa and is saturated vapor. At the outlet the pressures is 0.15 MPa with a quality of 98%. What is the turbine output power if the mass flow rate is 72 kg/s?
Ans 1.10×10^4 IW

10.4.2
A turbine takes in steam 3 lbm/sec with the inlet at 300 psia, 800°F and a velocity of 180 ft/s. At the outlet the conditions are 14.7 psia, quality of 98% and velocity of 450 ft/s. Knowing the changed in elevation between the inlet and outlet is 3 ft and that the turbine losses heat at the rate of 1.7×10^5 Btu/h what is a) the power output of the turbine. b) the power output if the kinetic and potential energy is neglected c) the diameters of the inlet and outlet pipes?
Ans: a) 813 Btu/s, b) 823 Btu/s, c) 2.73 in and 5.66 in.

10.4.3 Steam is expanded in an adiabatic nozzle. Determine the exit velocity if the inlet is a 2 MPa, 450°C and the velocity is almost zero. The exit pressure is 0.15 MPa and temperature is 150°C.
Ans 1080 m/s