ENGINEERING SCIENCE ERRATA – JUNE 2012

Chapter 8 Example 8.9 the solution should read:

$$I=\int_{10}^{15}10\rho x^2dx=10\rho\left[\frac{x^3}{3}\right]_{10}^{15}=10\rho\left[\frac{15^3}{3}-\frac{10^3}{3}\right]=7916.67\rho kgcm^2$$ (i.e.: 15^3 and 10^3 in the fraction)

Chapter 18 Example 18.15 part (c) answer should be as shown:

If for the venturi meter shown in Figure 18.18, the *diameter* at point (1) is 30 *mm* and at point (2) is 20 *mm* and *water* flows steadily into the meter with a velocity of 4 *m/s* at point (1) find: a) the mass flow rate b) the velocity at the throat (point 2) and c) the loss in static pressure between (1) and (2) as an equivalent *head*.

a) From continuity $\dot{m}=\rho A_1v_1=(1000)\left(7.06\text{ x }10^{-4}\right)(4)=2.83kg/s$ where $A_1=\frac{\pi 0.03^2}{4}=7.06\text{ x }10^{-4}m^2$

b) $A_2=\frac{\pi(0.02)^2}{4}=3.14\text{ x }10^{-4}m^2$ and again from continuity $v_2=\frac{A_1v_1}{A_2}=\frac{(0.000706(4)}{(0.000314)}=9m/s$

c) From Bernoulli $p_1-p_2=\frac{1}{2}\rho(v_2{}^2-v_1{}^2)=500(9^2-4^2)=32.5\ kN/m^2$, this is loss in static pressure so

from $p_1-p_2=\rho gh$ then $h=\frac{p_1-p_2}{\rho g}=\frac{\left(\mathbf{32.5}\text{ x }10^3\right)}{(1000)(9.81)}=3.31m$, that is the *head of water* reading on the manometer of the venturi meter $h=3.31m$]

Chapter 18 Example 18.16 alterations as shown:

A 100 *mm* diameter orifice plate is fitted into a 180 *mm* diameter pipe, if the pressure drop across the orifice is equivalent to a 90 *mm* head of fluid, find the volumetric flow rate of the fluid in the pipeline.

Then using Equation18.30 $\dot{Q}=A_1\sqrt{\frac{2gh}{\left(\frac{A_1}{A_2}\right)^2-1}}$ where $A_2=\frac{\pi(0.1)^2}{4}=7.85\text{ x }10^{-3}m^2$ and

$A_1=\frac{\pi(0.18)^2}{4}=0.0254m^2$, we find that the *volumetric flow rate* $\dot{Q}=0.0254\sqrt{\frac{(2)(9.81)(90\text{ x }10^{-3})}{\left(\frac{0.0254}{7.85\text{ x }10^{-3}}\right)^2-1}}=0.0109m^3/s$