ABE 457
Spring 2018
Homework #9

Due: 4/27/18

1. A single screw food extruder consists of a metering zone and a die. The following dimensions are given : $D = 5$ cm , $H = 0.75$ cm in the metering zone, e = 0.452 cm, θ = 18 degrees, L = 40 cm and δ = 0.030 cm. . Cooked corn dough of 30 % moisture content is extruded. The apparent viscosity of the dough is given by,

$$\eta = 30(\dot{\gamma})^{-0.3} \exp(2500/T) \exp(-0.06M)$$

where T is the temperature in K and M is the percent moisture. The extruder is operated at 60 rpm. A cylindrical die of 1 mm dia and 1 cm long is at the end of the metering zone. The temperature in the metering zones is maintained at 70 ˚C. You need to account for correction for leakage flow in your calculations. The other correction factors can be assumed to be unity.

(i) Setup the equations for metering zone and die.
(ii) Calculate the volumetric flow rate through the extruder and pressure at different points.
(iii) Repeat (ii) for 100 rpm
(iv) Repeat (ii) for die diameter of 2 mm.
(v) Repeat (ii) for metering zone temperature of 90 ˚C.
(vi) Repeat (ii) for 20% moisture content of the dough.
(vii) Repeat (ii) for the case when you have 3 dies in the die assembly.