

Extended Homework Project, Part 3
due December 9, 2008

The third part of the project involves applying energy balances to some of the units for which mass balances were solved in the first two parts of the project. All previous conditions given in the problem still apply, in addition to the new information given below.

(**k**) The air enters the dryer at 40°C and 0% relative humidity (i.e all water vapor has been removed from it, to prevent water absorption into the drug). The drug and held-up solvent enter the dryer at the crystallizer outlet temperature (given in part 2 by email). If the vapor phase exits the dryer at 30°C , calculate the amount of additional heat that must be added in the dryer.

(**l**) The combustion gases enter the flare at 30°C and exit the process at 120°C . Calculate the heat transferred out of the combustion gases and thus into the process. As in earlier parts of the project, assume that properties of solvents F and G can be represented using those of diethyl ether and dodecane, respectively.

(**m**) Write a Matlab program that calculates the amount of heat available from the combustion in the flare at different exit temperatures. Test your program using your answer to part *l*, and then use it to calculate the temperature at which all of the heat generated in the combustion process goes to raising the temperature of the product gases. (This is called the *adiabatic flame temperature*.)

For parts *k*, *l*, and *m*, show your work in the answers that you submit. For part *m*, also submit a printout of your program and send it by email to Prof. Greenfield.