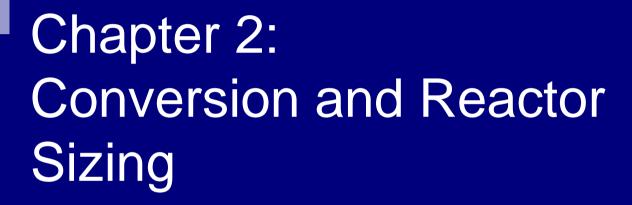
CHE 402 Kinetics & Reactor Design



Announcements

Electronic resources:

- 1. WebCT
- 2. www.al-mutairi.net

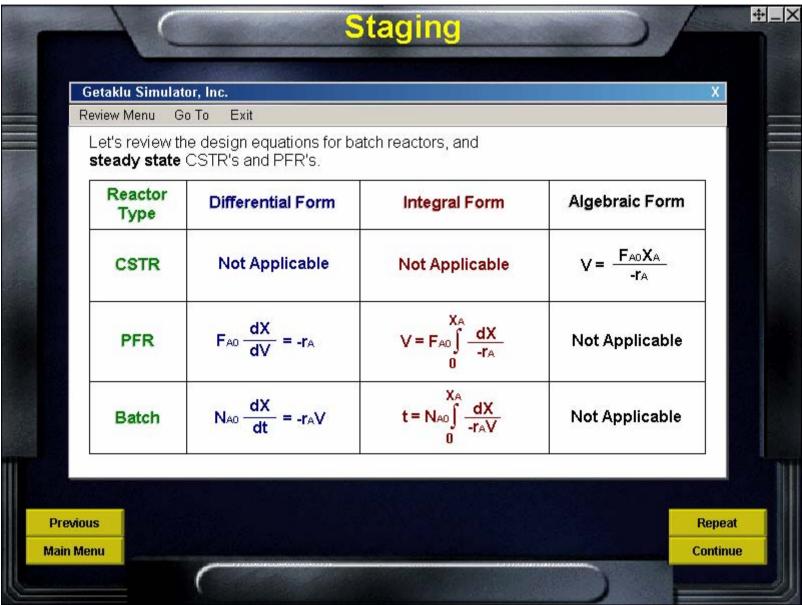




Objectives

- Define conversion and space time.
- Write the mole balances in terms of conversion for a batch reactor, CSTR, PFR, and PBR.
- Size reactors either alone or in series once given the molar flow rate of A, and the rate of reaction, - r_A, as a function of conversion, X.

Design Equations





Concentration

- For liquid phase $F_{A0} = C_{A0} v_0$
- For gas phase: $C_{A0}=P_{A0}/RT_0=y_{A0}P_0/RT_0$

$$F_{A0} = v_0 y_{A0} P_0 / RT_0$$

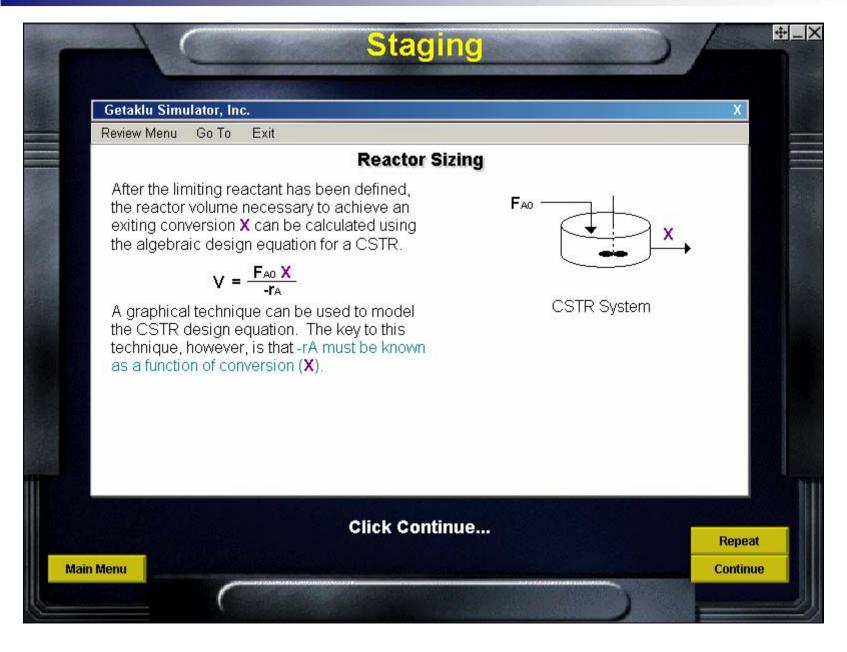


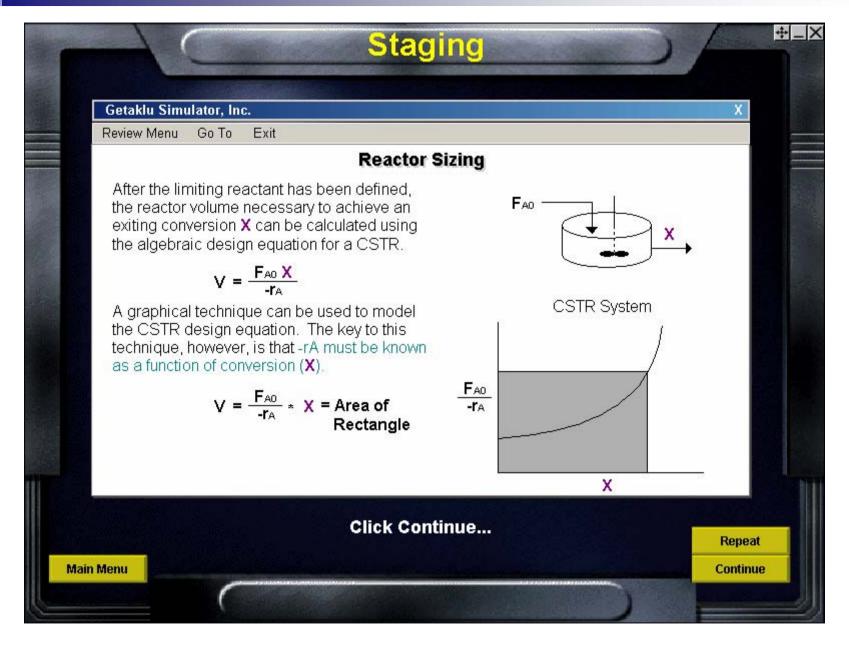
Example 2-1

A gas of pure A at 830 kPa (8.2 atm) enters a reactor with volumetric flow rate v₀ of 2 dm³/s at 500 K. Calculate the entering concentration of A, C_{A0}, and the entering molar flow rate, F_{A0}.



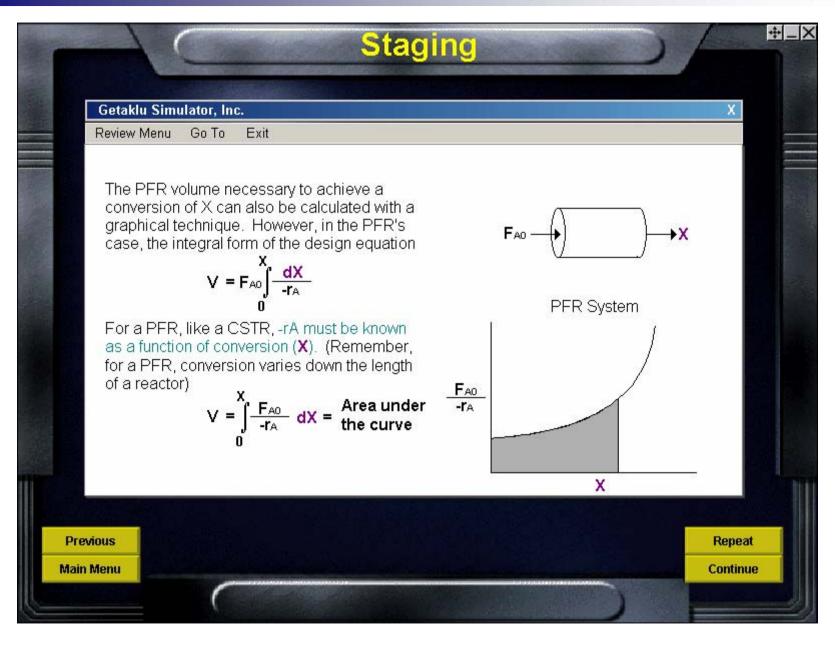
Reactor Sizing







Example 2-2 [CSTR]





Numerical Evaluation of Integrals

■ The integral to calculate the PFR volume can be evaluated using Simpson's One-Third Rule (see Appendix A.4 on p. 1013):

