

Class 14

Multiple Reactions, Multiple Units

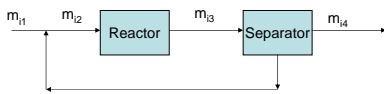
- Recommendations & Cautions (repeat)
- Definitions
 - Recycle
 - Purge
- Examples

Cautions

- If no reactions occur in the subunit, use the DOF for non-reacting systems
- If reactions occur in the block, you must use the DOF for reacting systems

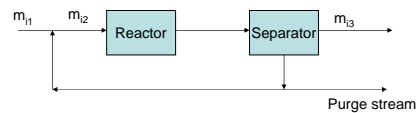
Definitions - Recycle

- Overall Conversion = $(m_{i1} - m_{i4}) / m_{i1}$
- Single Pass Conversion = $(m_{i2} - m_{i3}) / m_{i2}$



Definitions - Purge

- Recycle can result in buildup of unwanted species
- Purge streams are used to release a small portion of the recycle stream
- Unwanted species therefore have a path for release



Examples

- A. Multiple Species, Elements
- B. Multiple Units

Problem 4-52 (Multiple Reactions, Elements)

Ore

Basis: $m_1 = 100$ kg dissolved ore

$x_{CaF_2} = 0.96$

$x_{SiO_2} = 0.04$

m_{CaF_2}

m_{SiO_2}

$m_{H_2SO_4}$

m_{H_2O}

m_{HF}

$m_{H_2SiF_6}$

Aq. Sulfuric Acid

$m_2 = ?$

$x_{H_2SO_4} = 0.93$

$x_{H_2O} = 0.07$

Wanted

$CaF_2(s) + H_2SO_4(l) \Rightarrow CaSO_4(diss) + 2HF(l)$

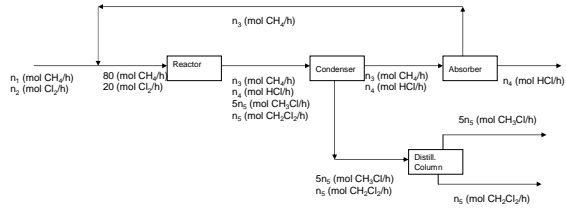
$4HF(l) + SiO_2(aq) \Rightarrow H_2SiF_6(s) + 2H_2O(l)$

15% excess Aq. Sulfuric Acid

100% of dissolved ore reacts

Find all unknowns, and check

DOF Practice (Problem 4-58)



Do the DOF on each subunit