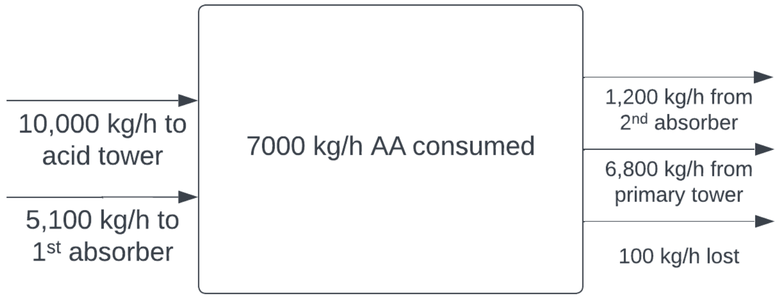
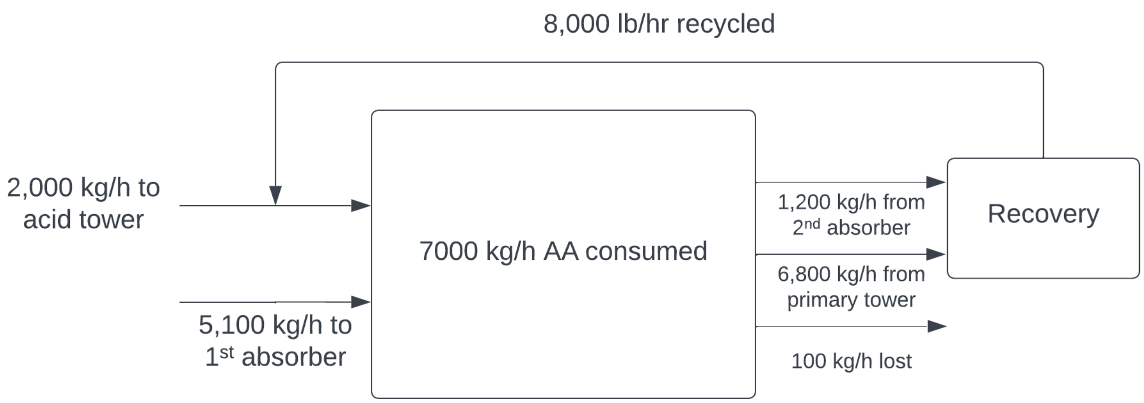
1. Problem 3.15

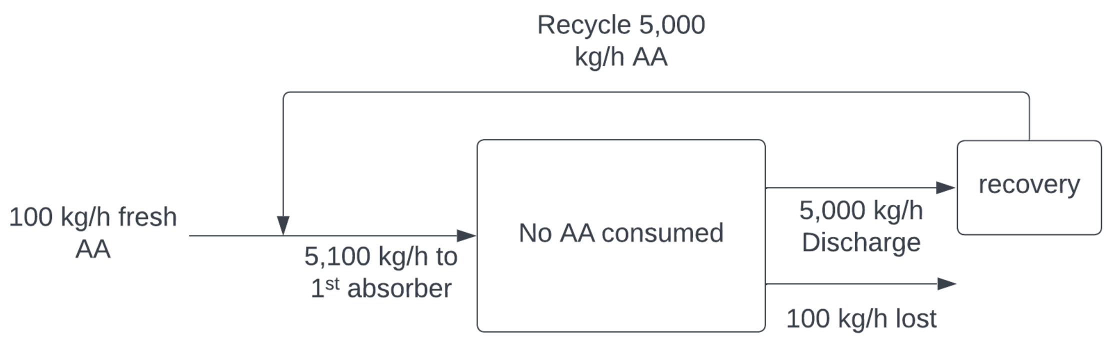


The acetic acid from the 2^{nd} absorber and the primary column can be recovered and recylced back to the process, decreasing the necessary fresh feed by 8,000 kg/h.



The total required fresh feed is 7,100 kg/h, and the losses are 100 kg/h.

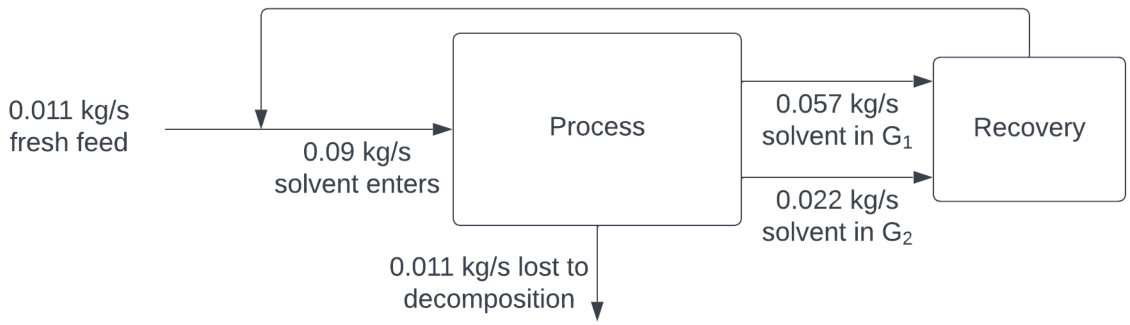
2. Problem 3.16



10,000 kg/h of acetic acid is no longer necessary to feed to the reactor. 100 kg/h is lost. The remaining 5,000 kg/h of acetic acid discharge can be recovered back to the process.

The total required frech feed is 100 kg/h, the same as the total losses.

3. Problem 3.17



0.09 kg/s of solvent is fed to the process. 0.011 kg/s of solvent is lost to decomposition. 0.079 kg/s comes from G_1 and G_2. This solvent can be recovered and recycled to the feed.

The total required frech feed then becomes 0.011 kg/s of solvent to make up for 0.011 kg/s in losses.

4. Problem 3.18

(a)

$$\text{A in S1} = 200$$
$$\text{P production} = 0.8 \cdot 200 - 2 \cdot (375 - 370)^2 = 110$$
$$\text{Total fresh input} = 200 + 100 = 300$$
$$\text{ME} = \frac{0.8 \cdot 110}{300}$$
$$\boxed{\text{ME} = 29.3\%}$$

(b)

Find the maximum of this equation:

$$\text{P production} = 0.8 \cdot 200 - 2 \cdot (375 - T)^2$$
$$\boxed{T = 375 \text{ K}}$$

(c)

From maximum solver in the last part

$$\text{P production} = 160 \text{ kg/h}$$
$$\text{P in S7} = 160 \cdot 0.8$$
$$\boxed{\text{P in S7} = 128 \text{ kg/h}}$$

(d)

Recover all P in S2

$$\boxed{\text{P in S7} = 160 \text{ kg/h}}$$

(e)

Recover A in S3 and B in S6

$$\text{Recovered A} = 40 \text{ kg/h}$$
$$\text{Recovered B} = 95 \text{ kg/h}$$
$$\text{Total recovered inputs} = 135 \text{ kg/h}$$

Decrease input by 135 kg/hr

$$\text{Required input} = 300 - 135 = 165 \text{ kg/h}$$
$$\text{P in S7} = 160 \text{ kg/h}$$
$$\text{ME} = \frac{160}{165}$$
$$\boxed{\text{ME} = 97.7\%}$$