

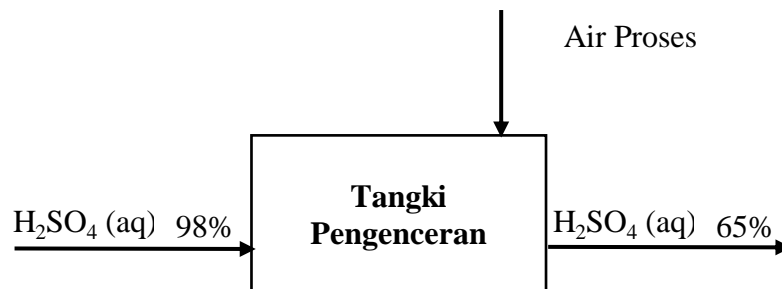


BAB III
NERACA MASSA

Kapasitas produksi = 606 ton/hari
= 200,000 ton/tahun
Waktu operasi = 1 hari = 24 jam
1 tahun = 330 hari

$$\begin{aligned} \text{Laju alir} &= \frac{200,000 \text{ ton}}{\text{tahun}} \times \frac{1,000 \text{ kg}}{\text{ton}} \\ &= \frac{200,000,000 \text{ kg}}{\text{tahun}} \times \frac{1 \text{ tahun}}{330 \text{ hari}} \times \frac{1 \text{ hari}}{24 \text{ jam}} \\ &= 25,253 \text{ kg/jam} \end{aligned}$$

1. TANGKI PENGECERAN ASAM SULFAT

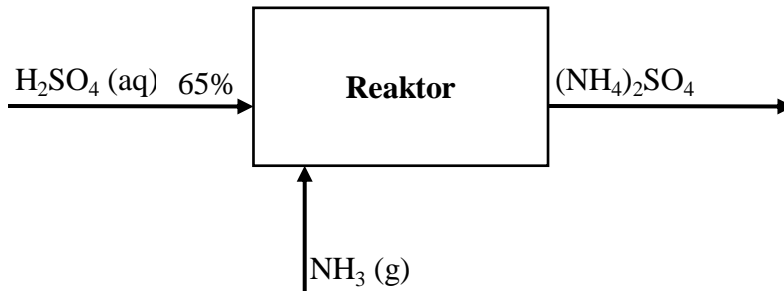


NERACA MASSA TANGKI PENGECERAN ASAM SULFAT

Massa Masuk (kg/jam)	Massa Keluar(kg/jam)
Dari tangki penyimpanan	Ke reaktor
H ₂ SO _{4(l)} = 18,817.4251	H ₂ SO _{4(aq)} = 18,817.4251
H ₂ O(l) = 384.0291	H ₂ O(l) = 10,132.4597
Air proses = 9,748.4306	
TOTAL = 28,949.8847	TOTAL = 28,949.8847

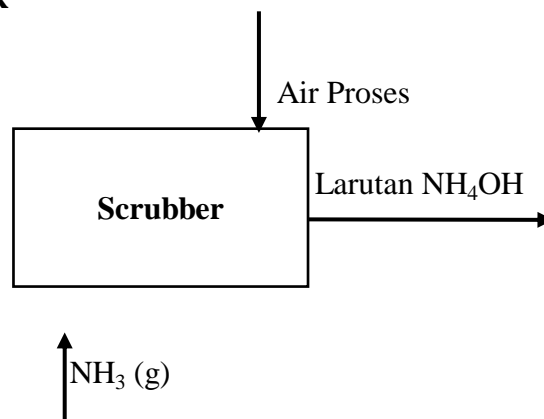


2. REAKTOR



Massa Masuk (kg/jam)	Massa Keluar (kg/jam)
Amonia dari penyimpanan	Amonia sisa ke scrubber
NH _{3(g)} = 6665.3745	NH _{3(g)} = 163.3670
H ₂ O _(l) = 33.3269	H ₂ O _(l) = 33.3269
Asam Sulfat dari tangki pengenceran	Asam Sulfat sisa ke evaporator
H ₂ SO _{4(aq)} = 18,817.4251	H ₂ SO _{4(aq)} = 94.0871
H ₂ O _(l) = 10,132.4597	H ₂ O _(l) = 10132.4597
	Amonium Sulfat ke evaporator
	(NH ₄) ₂ SO _{4(aq)} = 25,225.3454
TOTAL = 35,648.5861	TOTAL = 35,648.5861

3. SCRUBBER

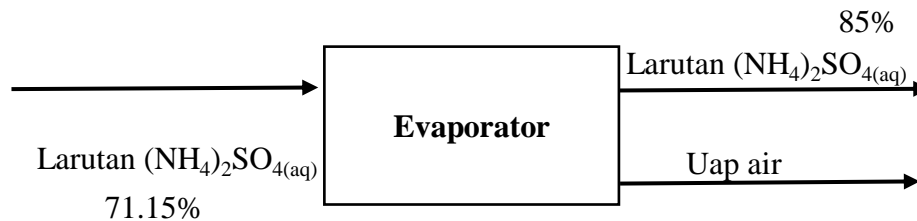




NERACA MASSA SCRUBBER

Massa Masuk		Massa Keluar	
Amonia dari reaktor ke scrubber		Amonium Hidroksida ke IPAL	
NH _{3(g)}	= 163.3670	NH _{4OH} (aq)	= 332.8307
H _{2O(g)}	= 33.3269	H _{2O(l)} sisa	= 256.6460
Air Proses	= 394.4165	NH _{3(g)} ke udara	= 1.6337
TOTAL	= 591.1104	TOTAL	= 591.1104

4. EVAPORATOR

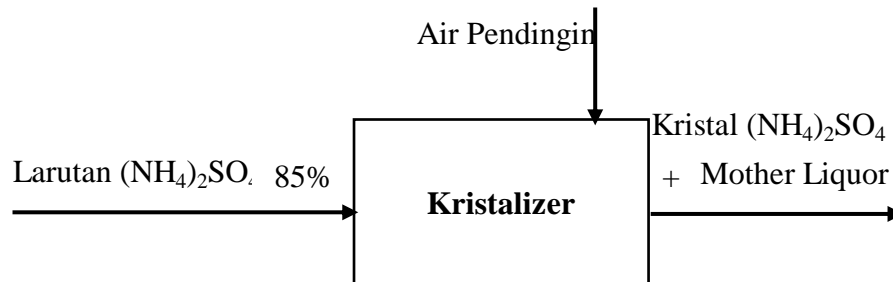


NERACA MASSA EVAPORATOR

Massa Masuk (kg/jam)	Massa Keluar (kg/jam)
Produk dari reaktor (NH ₄) ₂ SO _{4(aq)} = 25,225.3454	Produk ke kristalizer (NH ₄) ₂ SO _{4(aq)} = 25,225.3454
Sisa reaktan dari reaktor H ₂ SO _{4(aq)} = 94.0871 H _{2O(l)} = 10132.4597	Sisa reaktan ke kristalizer H ₂ SO _{4(aq)} = 94.0871 H _{2O(l)} = 4,357.4444 <hr/> 29,676.8769
	Uap Air Ke Kondensor H _{2O(g)} = 5,775.0152
TOTAL = 35,451.8922	TOTAL = 35,451.8922



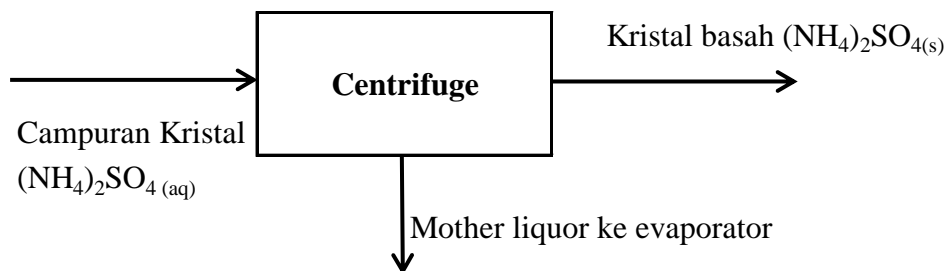
5. Kristalizer



NERACA MASSA CRYSTALLIZER

Massa Masuk (kg/jam)	Massa Keluar (kg/jam)
Produk larutan dari evaporator $(\text{NH}_4)_2\text{SO}_{4(\text{aq})} = 25,225.3454$	Campuran kristal ke centrifuge $(\text{NH}_4)_2\text{SO}_{4(\text{aq})} = 24,720.8385$
Sisa reaktan dari evaporator $\text{H}_2\text{SO}_{4(\text{aq})} = 94.0871$ $\text{H}_2\text{O}(\text{l}) = 4357.4444$	Sisa reaktan ke centrifuge $\text{H}_2\text{SO}_{4(\text{aq})} = 183.4699$ $\text{H}_2\text{O}(\text{l}) = 8497.0166$ 33,401.3250
Mother liquor dari crystallizer $\text{H}_2\text{SO}_{4(\text{aq})} = 89.3828$ $\text{H}_2\text{O}(\text{l}) = 4,139.5722$ $(\text{NH}_4)_2\text{SO}_{4(\text{aq})} = 9,585.6312$	Larutan sisa ke centrifuge $(\text{NH}_4)_2\text{SO}_{4(\text{aq})} = 10,090.1382$
TOTAL = 43,491.4631	TOTAL = 43,491.4631

6. Centrifuge (A)

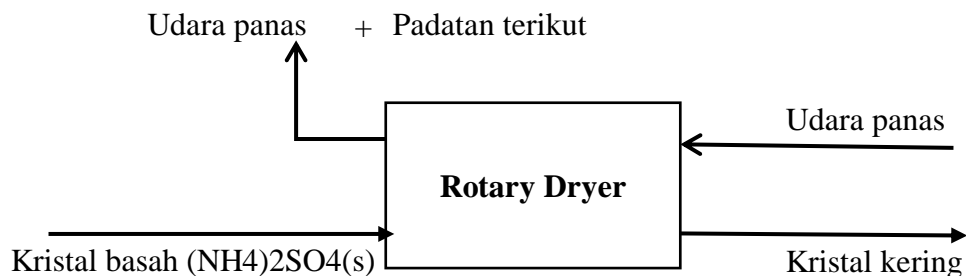




NERACA MASSA CENTRIFUGE

Massa Masuk (kg/jam)	Massa Keluar (kg/jam)
Campuran kristal dari kristalizer $(\text{NH}_4)_2\text{SO}_{4(s)} = 24,720.8385$	Produk kristal basah ke rotary dryer $(\text{NH}_4)_2\text{SO}_{4(s)} = 24,720.8385$
Sisa reaktan dari kristalizer $\text{H}_2\text{SO}_{4(aq)} = 94.0871$ $\text{H}_2\text{O(l)} = 4357.4444$	5% Liquid terikut $\text{H}_2\text{SO}_{4(aq)} = 4.7044$ $\text{H}_2\text{O(l)} = 217.8722$ $(\text{NH}_4)_2\text{SO}_{4(aq)} = 504.5069$ 25,447.9220
Produk larutan dari kristalizer $(\text{NH}_4)_2\text{SO}_{4(aq)} = 10,090.1382$	Mother liquor ke Kristalizer $\text{H}_2\text{SO}_{4(aq)} = 89.3828$ $\text{H}_2\text{O(l)} = 4,139.5722$ $(\text{NH}_4)_2\text{SO}_{4(aq)} = 9,585.6312$ 13,814.5862
TOTAL = 39,262.5082	TOTAL = 39,262.5082

7. Rotary Dryer

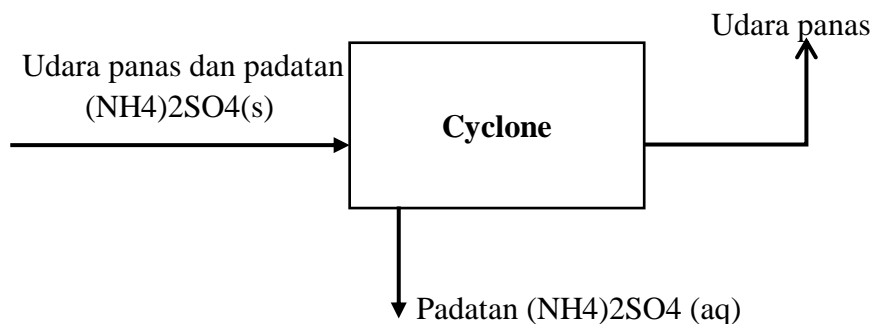




NERACA MASSA ROTARY DRYER

Massa Masuk(kg/jam)	Massa Keluar (kg/jam)
Produk solid dari centrifuge $(\text{NH}_4)_2\text{SO}_{4(s)} = 24,720.8385$	Produk kristal kering ke conveyor $(\text{NH}_4)_2\text{SO}_{4(s)} = 24,973.0919$
Sisa reaktan dari centrifuge $\text{H}_2\text{SO}_{4(aq)} = 4.7044$ $\text{H}_2\text{O(l)} = 217.8722$	Sisa $\text{H}_2\text{SO}_{4(s)} = 4.7044$ $\text{H}_2\text{O(l)} = 24.9981$ 25,002.7944
Produk liquid dari centrifuge $(\text{NH}_4)_2\text{SO}_{4(aq)} = 504.5069$	Campuran ke cyclone $(\text{NH}_4)_2\text{SO}_{4(s)} = 252.2535$ $\text{H}_2\text{O(l)} = 192.8741$
Udara kering = 10,238,233.8822	Udara panas = 10,238,233.8822 10,238,679.0098
TOTAL = 10,263,681.8042	TOTAL = 10,263,681.8042

8. Cyclone

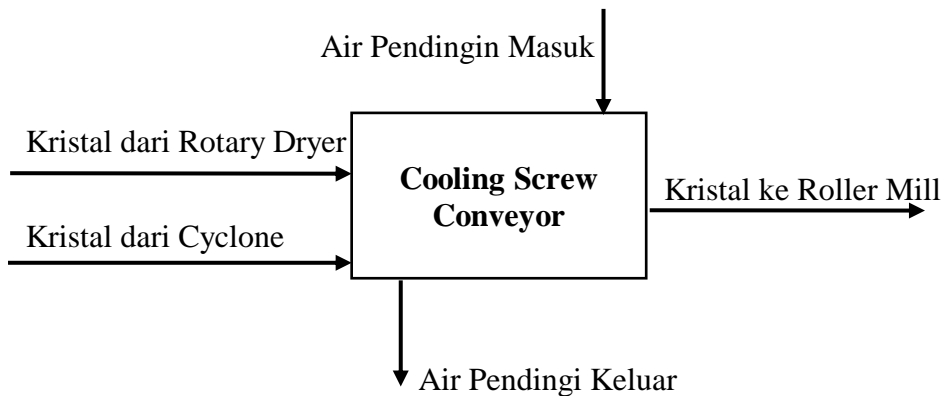




NERACA MASSA CYCLONE

Massa Masuk(kg/jam)	Massa Keluar (kg/jam)
Produk solid dari centrifuge	Produk kristal kering ke conveyor
(NH ₄) ₂ SO _{4(s)} = 252.2535	(NH ₄) ₂ SO _{4(s)} = 249.7309
H ₂ O _(g) uap = 192.8741	
Udara panas = 10,238,233.8822	Campuran ke udara
	(NH ₄) ₂ SO _{4(s)} = 2.5225
	H ₂ O _(g) uap = 192.8741
	Udara panas = 10,238,233.8822
TOTAL = 10,238,679.0098	TOTAL = 10,238,679.0098

9. Cooling Screw Conveyor



NERACA MASSA COOLING CONVEYOR

Massa Masuk (kg/jam)	Massa Keluar (kg/jam)
Produk solid dari Rotary Dryer	Produk kristal kering ke Ball Mill
(NH ₄) ₂ SO _{4(s)} = 24,973.0919	(NH ₄) ₂ SO _{4(s)} = 25,222.8229
Sisa H ₂ SO _{4(s)} = 4.7044	Sisa H ₂ SO _{4(s)} = 4.7044
H ₂ O(l) = 24.9981	H ₂ O(l) = 24.9981
25,002.7944	
Produk solid dari Cyclone	
(NH ₄) ₂ SO _{4(s)} = 249.7309	
TOTAL = 25,252.5253	TOTAL = 25,252.5253



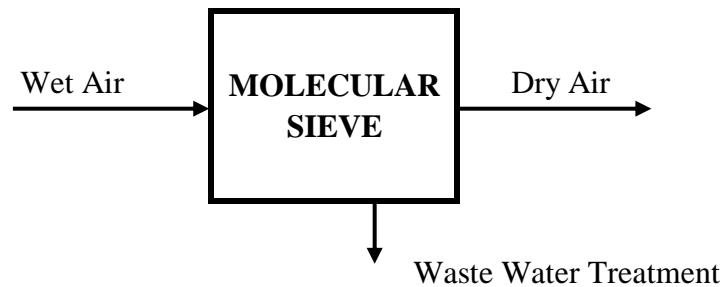
10 Ball Mill



NERACA MASSA BALL MILL

Massa Masuk (kg/jam)	Massa Keluar (kg/jam)
Produk solid dari cooling conveyor	Produk solid ke screen
(NH ₄) ₂ SO _{4(aq)} = 25,222.8229	(NH ₄) ₂ SO _{4(aq)} = 25,222.8229
Sisa H ₂ SO _{4 (aq)} = 4.7044	Sisa H ₂ SO _{4 (aq)} = 4.7044
H ₂ O(l) = 24.9981	H ₂ O(l) = 24.9981
25,252.5253	
TOTAL = 25,252.5253	TOTAL = 25,252.5253

11. MOLECULAR SIEVE



NERACA MASSA MOLECULAR SIEVE

Masuk (kg/jam)	Keluar (kg/jam)
Udara Basah masuk	Udara Kering ke Heater
Wet Air = 10,402,045.6244	Dry Air = 10,238,233.8822
	Kelembapan Air (Humidity) terserap Zeolit
	H ₂ O(l) = 163,811.7421
TOTAL = 10,402,045.6244	TOTAL = 10,402,045.6244