APPENDIX TUGAS KHUSUS

Component Feed In Departemen Produksi IIA NPK

Phonska

KapasitasProduksi : 100 Ton/h

Data kadar bahan komponen masuk furnace:

ZA : 67 % = 10

SO_2 : 17 % = 2.56

SO_3 : 16 % = 2.44

Merupakan data bahan baku dan komposisi pupuk NPK 15-15-15 PT. Petrokimia Gresik (Teknologi INCRO, 2002)

Bahan Baku	Masic Flow (kg/h)	%N	$\%P_2O_5$	$\%H_2SO_4$	$\%K_2O$	$\%H_2O$	%Solid	ρ (kg/m3)
NH_3	10480	82	0	0	0	0.5	0	678
H_3PO_4	18879	0	48	2.88	0	23.2	3	1610
H_2SO_4	18768	0	0	98	0	2	0	1840
Urea	900	46	0	0	0	0.5	99.5	800
KCl	15003	0	0	0	60	1	99	1300
Filler	0	0	0	0	0	0	0	1000-1300
ZA	27500	21	0	0	0	1	78	1770

A. MASSA BAHAN BAKU

Asumsi = 14782.6 kg/h

Maka, diperoleh ;

1. ZA = Berat asumsi × (Berat Persentase / Kadar Bahan ZA)
   = 14782.6 kg/h × (67% / 0.21%)
   = 46928.88889 kg/h
2. Urea = Berat Asumsi × (Berat Persentase / Kadar Bahan Urea)
   = 14782.6 kg/h × (17% / 0.46%)
   = 5484.558841 kg/h

3. NH_3 = Berat asumsi × (Berat Persentase / Kadar Bahan Urea)
   = 14782.6 kg/h × (16% / 0.82%)
   = 2932.483252 kg/h

4. H_2SO_4 = (Feed In <aliran 1> + Feed In <aliran 7> + Feed In <aliran 6>) × 100 / 98
   = (2684.388595 + 353.4534463 + 3.5345345) × 100 / 98
   = 3103.445485 kg/h

5. H_3PO_4 = Feed In <aliran 1> × 1 / 0.48
   = 5368.77719 × 1 / 0.48
   = 11184.95248 kg/h

6. KCl = 15 kg/h

B. KEBUTUHAN NH_3

➢ Reaksi Ammonium Sulfat

$H_2SO_4 + {}_2NH_3 \rightarrow (NH_4)_2SO_4$

M	5	18	-
R	5	10	5
S	0	8	5

➢ Reaksi Di-Ammonium Phosphat

$H_3PO_4 + NH_3 \rightarrow NH_4H_2PO_4$

M	10	8	-
R	8	8	8
S	2*	0	8

*Dikarenakan tidak habis bereaksi dikarenakan mol NH_3 yang tidak mencukupi, sehingga dilakukan penyempurnaan reaksi yang berlangsung di Granulator.

➢ Reaksi di Granulator

NH_3 ditambahkan di granulator untuk mereaksikan sisa H_3PO_4 dan $NH_4H_2PO_4$ di Pre-Neutralizer Tank

➢ Reaksi Pembentukan Monoammonium Phosphate (MAP)

$H_3PO_4 + NH_3 \rightarrow NH_4H_2PO_4$

M	2	X	-
R	2	2	2
S	0	X-2	2

➢ Reaksi Di-Ammonium Phosphate (DAP)

$NH_4H_2PO_4 + NH_3 \rightarrow (NH_4)_2HPO_4$

M	8	X-2	-
R	8	8	8
S	0	X-10	8

Dimana, dimisalkan ;

X = NH_3 yang masuk granulator

X = 10% x + 10 mol NH_3 dibutuhkan pada Granulator

X = 10 / 0.9

X = 13.33 mol NH_3 Granulator

Sehingga, diperoleh total NH_3 pada system yang dapat ditunjukkan pada tabel, sebagai berikut :

Unit	Mol	Fraksi Mol	Massa (kg/h)
PN	18	0.5745	1684.8
Granulator	13.33	0.4255	1247.7
	31.33	1	2932.5

➢ Reaksi pada Pre-Neuralizer Tank Untuk Mengetahui Kebutuhan H_2SO_4

❖ Pembentukan Ammonium Sulfat

$H_2SO_4 + 2NH_3 \rightarrow (NH_4)_2 SO_4$

M	5	18	-
R	5	10	5
S	0	8	5

➢ Reaksi pada Granulator Scrubber

Granulator menguapkan 10%, NH_3 maka diperlukan granulator scrubber untuk menangkap NH_3 denan reaksi sebagai berikut ;

❖ Pembentukan Ammonium Sulfat

$H_2SO_4 + 2NH_3 \rightarrow (NH_4)_2SO_4$

M	X	1.11	-
R	0.55	1.1	0.55
S	0	0.01	0.55*

*Sehingga perlu diinjeksikan sebanyak 0.55 mol H2SO4ke Granulator Scrubber

➢ Reaksi pada Tail Gas Scrubber

❖ Pembentukan Ammonium Sulfat

$H_2SO_4 + 2NH_3 \rightarrow (NH_4)_2SO_4$

M	X	0.01	-
R	0.005	0.01	0.005
S	0	0	0.005*

*Maka, diperlukan 0.005 mol H_2SO_4 untuk dilakukan injeksi pada Tail Gas Scrubber

C. MOL RASIO

N/P	0.8	mol NH_3	9	mol H_3PO_4	10
N/S	1.8	mol NH_3	9	Mol H_2SO_4	5

D. NERACA MASSA PRE-NEUTRALIZER TANK

Diketahui Kadar Bahan

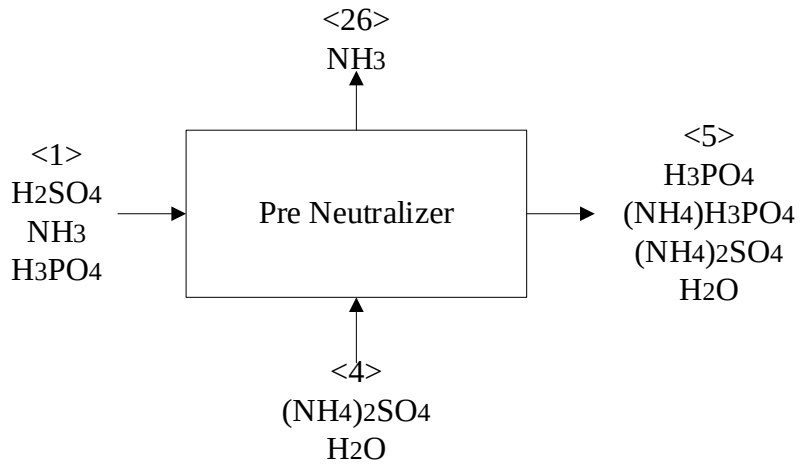
ZA	0.21
Urea	0.46
NH_3	0.82

A	+	B	=	F
A	+	C	=	D
A	+	D	=	E

2A	+	B	=	F
98.6101933	+	27.392	=	27.39172036
54.7834407	+	27.392	=	27.39172036
43.8267526	+	0	=	27.39172036

A	+	C	=	D
43.8267526	+	54.783	=	
43.8267526	+	43.827	=	43.82675257
0	+	10.957	=	43.82675257

Feed IN			Feed Out	
1			5	
H2SO4	2684.388595		H3404	1073.755438
NH3	1676.373286		MAP	5040.076546
H3PO4	5368.77719		H2O	2635.746497
H20	2635.746497		ZA	3615.707087
4			26	
(NH4)2SO4		kg	NH3	0
H20		kg/h		



☆ Aliran 1

Massa NH_3 = 1676.373286

Massa NH_3 Murni = 98.6101933 × 17

= 1676.373286

Massa H_2O = Massa NH_3 Murni × 0.005 / 0.995
= 1676.373286 × 0.005 / 0.995
= 8.423986361

Massa H_2SO_4 Murni = 27.392 × 98
= 2684.388595

Massa H_2O = Massa H_2SO_4 Murni × 0.02 / 0.98
= 2684.388595 × 0.02 / 0.98
= 54.78344071

Massa H3PO4 Murni = 54.783 × 98
= 5368.77719

Massa H2O = 5368.77719 × 0.23 / 0.48
= 2572.53907

☆ Aliran <4>

Mol $(NH_4)_2SO_4$ yang terbentuk di granulator scrubber sama dengan mol H_2SO_4 yang masuk karena didalam granulator scrubber, H_2SO_4 habis Bereaksi (Operation Manual PT. Petrokimia Gresik, 2012)

Mol $(NH_4)_2SO_4$ $= \frac{Massa\ H2SO4}{98} \ x\ Fraksi\ (NH4)2SO4\ Murni$

$= \frac{18588.22}{98} \ x\ 0.98$

= 18.58 kmol/h

Massa $(NH_4)_2SO_4$ Murni = 2452,85 kg

Massa H_2O = (2 / 98) × 2452.85
= 50.06 kg/h

☆ Reaksi pada Pre-Neutralizer Tank

❖ Pembentukan Ammonium Sulfat (ZA)

	H_2SO_4	+ $2NH_3$	→ $(NH_4)_2SO_4$
M	168.93	379.27	-
R	168.93	37.86	168.93
S	0	41.41	168.93

❖ Pembentukan Monoammonium Phospate (MAP)

	H_3PO_4	+ NH_3	→ $(NH_4)_2H_2PO_4$
M	61.65	41.41	-
R	41.41	41.41	41.41
S	20.24	0	41.41

☆ Aliran <5>

Massa H_3PO_4 = 10.957 × 98

=1073.755438

Massa MAP = 43.82675257 × 115

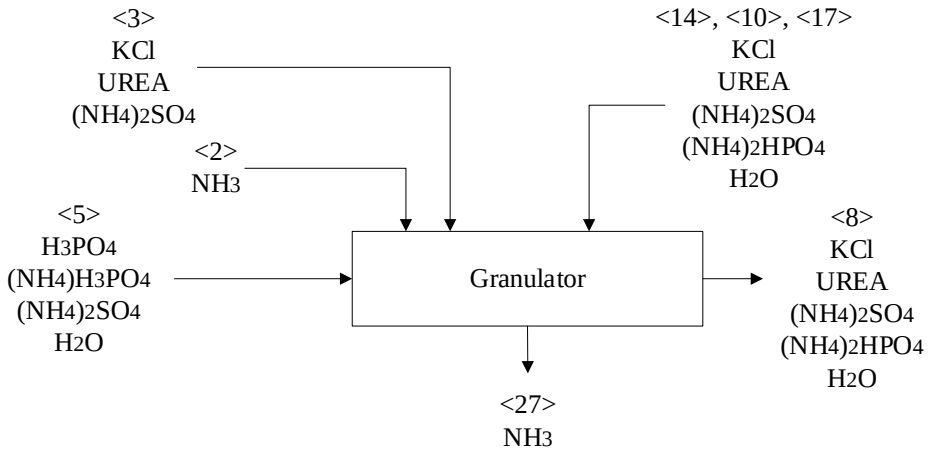
= 5040.076546

Massa H_2O = 2635.746497

Massa ZA = 27.39172036 × 132

= 3615.707087

E. NERACA MASSA GRANULATOR



Feed IN	
5	
H3404	1073.755438
MAP	5040.076546
H2O	2635.746497
ZA	3615.707087
2	
NH3	1241.4475
H20	6.20723775
3	
ZA	46459.6000
UREA	5457.136046
KCL	14.850
H2O	496.8616831
14	
DAP	1357.40550
ZA	9395.34273
UREA	1023.89114
KCL	2.78622
H2O	179.02741
10	
ZA	53.29356904
DAP	7.699664151
UREA	5.807857676
KCL	0.015804386
H2O	1.015504141
17	
ZA	3174.37313
DAP	458.6220708
UREA	345.938688
KCL	0.941370982
H2O	60.48739

A	+	C	=	D
73.026326	+	10.96	=	
10.956688	+	10.96	=	10.95668814
62.069638	+	0	=	10.95668814

A	+	D	=	E
62.069638	+	54.78	=	
54.783441	+	54.78	=	54.78344071
7.2861976	+	0	=	54.78344071

Feed Out	
8	
DAP	9058.4284
ZA	62698.3165
UREA	6832.7737
KCL	18597.1144
H2O	3586.18614
27	
NH3	123.8653595

☆ Aliran<5>

Massa H_3PO_4 = 1073.755438

Massa MAP = 5040.076546

Massa H_2O = 2635.746497

Massa ZA = 3615.707087

☆ Aliran<2>

Massa NH_3 = 73.026326 × 17

= 1241.4475

Massa H_2O = 1241.4475 × 0.005

= 6.20723775

☆ Aliran<3>

Massa ZA = 46928.88889 × 0.99

= 46459.6000

Massa Urea = 5484.558841 × 0.995

= 5457.136046

Massa KCl = 15 × 0.99
= 14.850

Massa H_2O = 46928.88889× 0.01 + 5484.558841 × 0.005 + 15 × 0.01
= 496.8616831

☆ Aliran<14>

Massa DAP = 11756.13302 × 1823.727233
= 1357.40550

Massa ZA =0.744302916 × 15794.82327
= 9395.34273

Massa Urea = 0.744302916 × 1375.63769
= 1023.89114

Massa KCl =0.744302916 × 3.743395716
= 2.78622

Massa H_2O = 0.744302916 × 240.5303037
= 179.02741

☆ Aliran<10>

Massa ZA = 0.004221938 × 12623.00943
= 53.29356904

Massa DAP = 0.004221938 × 1823.727233
= 7.699664151

Massa Urea = 0.004221938 × 1375.63769
= 5.807857676

Massa KCl = 0.004221938 × 3.743395716
= 0.015804386

Massa H_2O = 0.004221938 × 240.5303037
= 1.015504141

☆ Aliran <17>

Massa ZA = 0.251475145 × 12623.0094
= 3174.37313

Massa DAP = 0.251475145 × 1823.727233
= 458.6220708

Massa Urea = 0.251475145 × 1375.63769
= 345.938688

Massa KCl = 0.251475145 × 3.743395716
= 0.941370982

Massa H_2O = 0.251475145 × 240.5303037
= 60.48739

☆ Aliran <8>

Massa ZA = 54.78344071 × 132.06+ 1357.40550 +
7.70 + 458.6220708
= 9058.4284

Massa DAP = 3615.707087 +46459.6000
+9395.34273 +53.29356904+3174.37313
= 7231.4142

Massa Urea = 5457.136046 + 1023.89114 + 5.807857676 +345.938688
= 345.938688

Massa KCl = 14.850 +2.78622 +0.015804386 + 0.941370982
= 0.941370982

Massa H_2O = 496.8616831 + 179.02741 + 1.015504141 + 60.48739 + 2635.746497 + 6.20723775 + 60.48739
= 3379.34572

☆ Aliran <27>

Massa NH_3 = 7.28619761 × 17
= 123.8653595

F. ALIRAN RECYCLE

Pemisalan Neraca Massa Overall di Aliran Recycle dan Granulator

$$A + B = C \quad \ldots(1)$$

Dimana ;

A	Massa bahan masuk Granulator tanpa H_2O dan recycle
B	Produk recycle yang masuk ke Granulator
C	Produk keluar dari Granulator

☆ Mencari A

A =	Massa masuk Granulator tanpa H_2O dan recycle - 10% NH_3
A =	62657.8496

☆ Mencari B

B=	Aliran 14 : oversize aliran <11> dari crusher (85% dari 99,9% massa input screen)
	Aliran 10 : Dari produk onsize (85% dari 0,1% aliran input screen)

	Aliran 17 : Dari produk undersize aliran <13> dari screen (5% dari 99,9% input screen)
	& dari polishing screen (85% dari 0,1% output cooler)
B=	(15%)(99,9%)(C) + (85%)(0,1%)(C) + ((5%)(99,9%)(C) + (85%)(0,1%)(80%)(99,9%)(C))
B=	0.20132932 C (Pers 2)

☆ Mencari C

Substitusi nilai A dan Pers 2 ke Pers 1, maka nilai C dan B	
C =	78452.67283
B =	15794.8233

Diasumsikan Komposisi Massa di Recycle = Massa di Granulator, sehingga

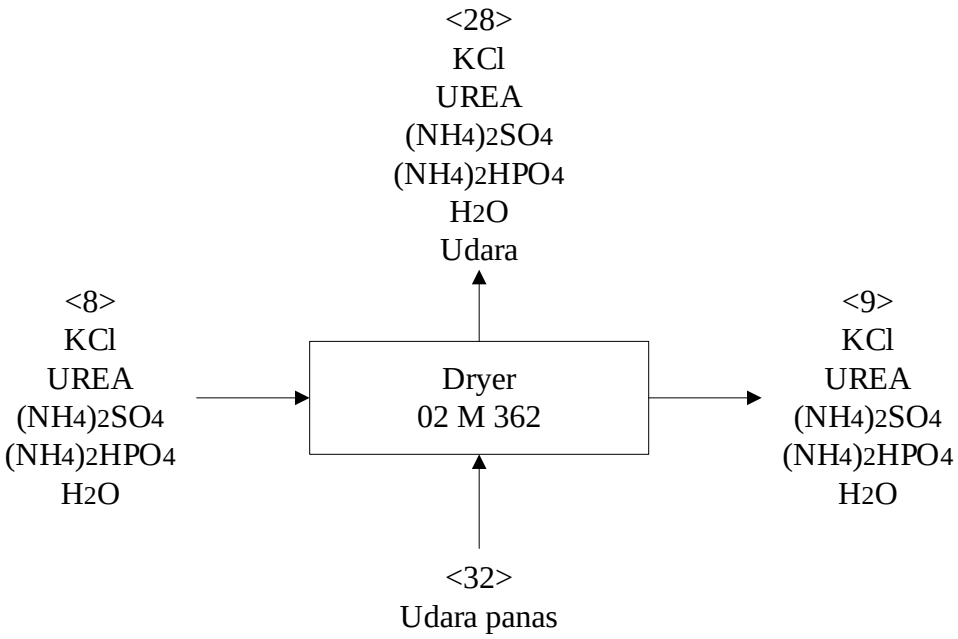
Komponen	A	Komponen	B
DAP	7234.70118	DAP	1823.727233
ZA	50075.30709	ZA	12623.00943
UREA	5457.136046	UREA	1375.63769
KCL	14.85	KCL	3.743395716

Karena produk recycle juga telah melewati dryer dimana produk diharapkan dari dryer memilikimoisture content 1,5%, maka massa H2O pada recycle dapat diketahui:

Massa H_2O = 240.530303037

Aliran	Massa	Fraksi
14	11756.13302	0.744302916
10	66.68477191	0.004221938
17	3972.005478	0.251475145
tottal	15794.82327	1

G. NERACA MASSA DRYING



Asumsi = 0,1% massa menuju cyclone, dan produk dikeringkan hingga kadar air sisa 1,5%'

Massa produk kering total = 23141.2097

Kadar air dalam produk = 1,5% (99% produk kering + X) = X
= 350.6243897

Massa Udara Panas = 5000 kg/h

Feed IN	
8	
DAP	9058.4284
ZA	7231.4142
UREA	6832.7737
KCL	18.5934
H2O	3379.3457
32	
Udara panas	5000

Feed Out	
9	
DAP	9049.369985
ZA	7224.18276
UREA	6825.940963
KCL	18.57480232
H2O	350.6243897
28	
DAP	9.0584
ZA	7.2314
UREA	6.8328

KCL	0.0186
H2O	3028.7213
Udara panas	5000.0000
	31520.55544

☆ Aliran <8>

Massa DAP = 9058.4284

Massa ZA = 7231.4142

Massa Urea = 6832.7737

Massa KCl = 18.5934

Massa H_2O = 3379.3457

☆ Aliran <32>

Udara Panas = 5000

☆ Aliran <9>

Massa DAP = 9049.369985

Massa ZA = 7224.18276

Massa Urea = 6825.940963

Massa KCl = 18.57480232

Massa H_2O = 350.6243897

☆ Aliran <28>

Massa DAP = 9058.4284 - 9049.369985
= 9.0584

Massa ZA = 7231.4142 - 7224.18276
= 7.2314

Massa Urea = 6832.7737 - 6.8328
= 6.8328

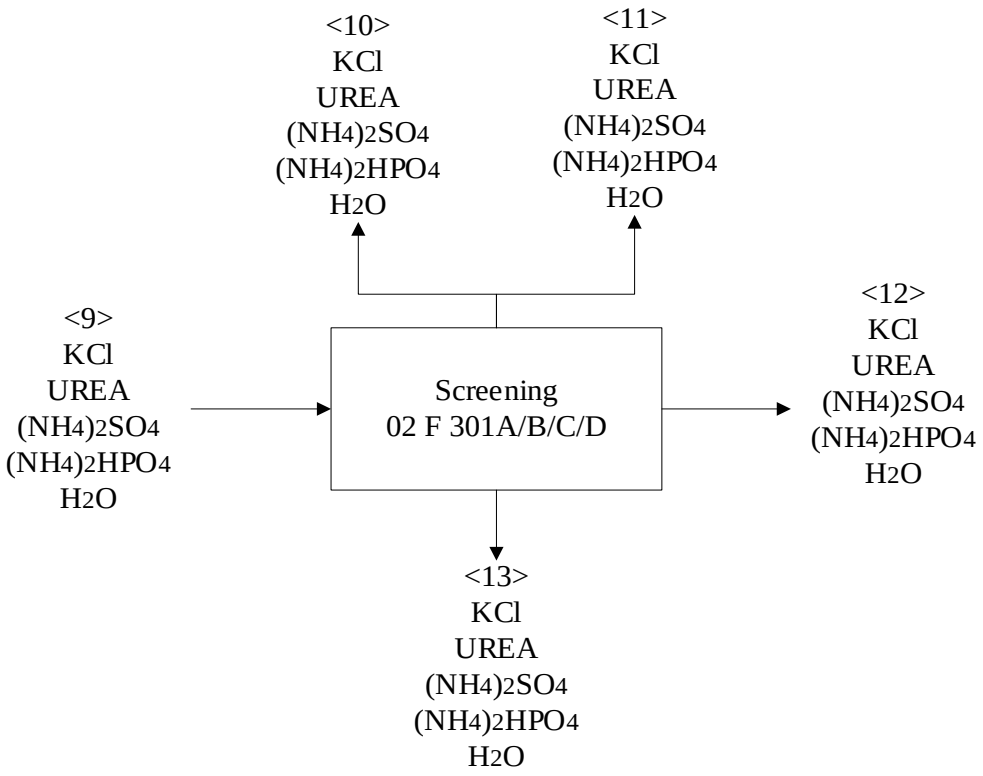
Massa KCl = 18.5934 - 18.57480232
= 0.0186

Massa H_2O = 3379.3457 - 350.6243897
= 3028.7213

Udara Panas = 5000.0000

TOTAL = 31520.55544

H. NERACA MASSA SCREENING



Diketahui

Mesh Undersize -10	8%
Mesh Onsize +4	22%
Mesh Oversize -4 sd 10	70%

Feed IN		Feed Out	
9		10	
DAP	9049.369985	DAP	7.691964487
ZA	7224.18276	ZA	6.140555346
UREA	6825.940963	UREA	5.802049818
KCL	18.57480232	KCL	0.015788582
H2O	350.6243897	H2O	0.298030731
		11	
		DAP	1356.048092
		ZA	1082.543787
		UREA	1022.867253
		KCL	2.783434128
		H2O	52.54106479

		12	
		DAP	7233.613897
		ZA	5774.650489
		UREA	5456.315909
		KCL	14.84776823
		H2O	280.2716059
		13	
		DAP	452.0160307
		ZA	360.8479289
		UREA	340.9557511
		KCL	0.927811376
		H2O	17.51368826
TOTAL	23468.6929	TOTAL	23468.6929

☆ Aliran <9>

Massa DAP = 9049,369985

Massa ZA = 7224,18276

Massa Urea = 6825,940963

Massa KCl = 18,57480232

Massa H_2O = 350,6243897

☆ TOTAL = 23468.6929

☆ Aliran <10>

Massa DAP = 0.1 × 9049,369985 × 0.85

= 7.691964487

Massa ZA = 0.1 × 7224,18276 × 0.85

= 6.140555346

Massa Urea = 0.1 × 6825,940963 × 0.85

= 5.802049818

Massa KCl = 0.1 × 18,57480232 × 0.85

= 0.015788582

Massa H_2O = 0.1 × 350,6243897 × 0.85

= 0,298030731

☆ Aliran <11>

Massa DAP = 99.9% × 9049,369985 × 15%

= 1356,048092

Massa ZA = 99.9% × 7224,18276 × 15%
= 1082,543787

Massa Urea = 99.9% × 6825,940963 × 15%
= 1022,867253

Massa KCl = 99.9% × 18,57480232 × 15%
= 2,783434128

Massa H_2O = 99.9% × 350,6243897 × 15%
= 52,54106479

☆ Aliran <12>

Massa DAP = (99,9% × 9049,369985 × 80%) + (9049,369985 × 0,1% × 0,15)
= 7233,613897

Massa ZA = (99,9% × 7224,18276 × 80%) + (7224,18276× 0,1% × 0,15)
= 5774,650489

Massa Urea = (99.9% × 6825,940963 × 80%) + (6825,940963 × 0,1% × 0,15)
= 5456,315909

Massa KCl = (99.9% × 18,57480232 × 80%) + (18,57480232 × 0,1% × 0,15)
= 14,84776823

Massa H_2O = (99.9% × 350,6243897 × 80%) + (18,57480232 × 0,1% × 0,15)
= 280,2716059

☆ Aliran <13>

Massa DAP = 99,9% × 9049,369985 × 5%
= 452,0160307

Massa ZA = 99,9% × 7224,18276 × 5%
= 360,8479289

Massa Urea = 99.9% × 6825,940963 × 5%
= 340,9557511

Massa KCl = 99.9% × 18,57480232 × 5%

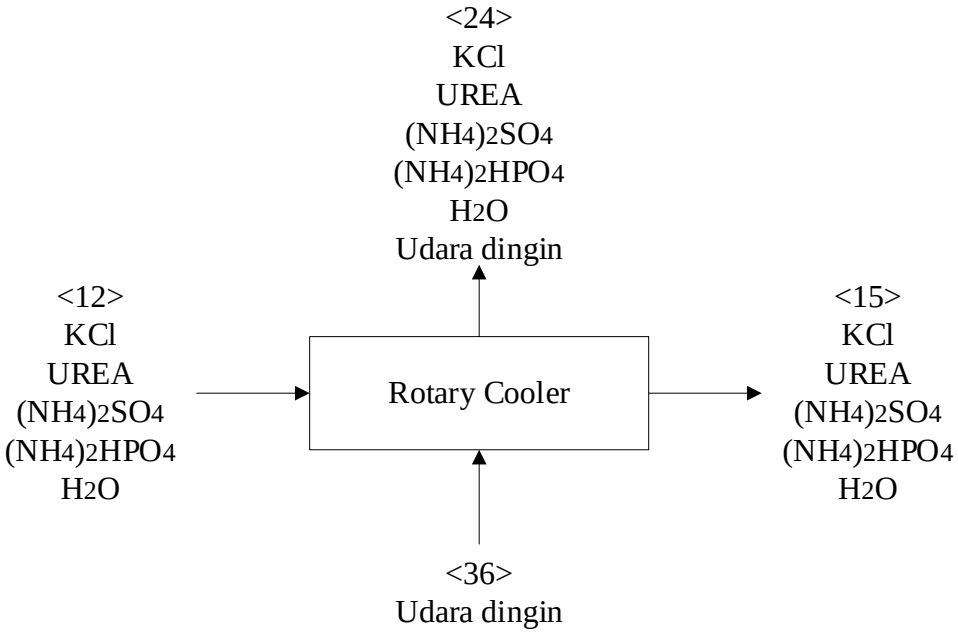
= 0,927811376

Massa H_2O = 99.9% × 350,6243897 × 5%

= 17,51368826

☆ TOTAL = 23468.6929

I. NERACA MASSA COOLER



Feed IN		Feed Out	
12		15	
DAP	7233,613897	DAP	7227,465325
ZA	5774,650489	ZA	5769,742036
UREA	5456,315909	UREA	5451,67804
KCL	14,84776823	KCL	14,83514763
H2O	280,2716059	H2O	280,033375
36		24	
Udara dingin	79000	DAP	6,148571813
		ZA	4,908452916
		UREA	4,637868522
		KCL	0,012620603
		H2O	0,238230865
		Udara dingin	79000

Asumsi 0,1% massa menuju cyclone dan 0,99% massa menjadi produk cooler

☆ Aliran <12>

Massa DAP = 7233,613897

Massa ZA = 5774,650489

Massa Urea = 5456,315909

Massa KCl = 14,84776823

Massa H_2O = 280,2716059

☆ Aliran <36>

Udara Dingin = 79000

☆ TOTAL = 97759.69967

☆ Aliran <15>

Massa DAP = (7233,613897 × 99,9%) + (7233,613897 × 0,1% × 0,15)

= 7227,465325

Massa ZA = (5774,650489 × 99,9%) + (5774,650489 × 0,1% × 0,15)

= 5769,742036

Massa Urea = (5456,315909 × 99,9%) + (5456,315909 × 0,1% × 0,15)

= 5451,67804

Massa KCl = (14,84776823 × 99,9%) + (14,84776823 × 0,1% × 0,15)

= 14,83514763

Massa H_2O = (280,2716059 × 99,9%) + (280,2716059 × 0,1% × 0,15)

= 280,033375

☆ Aliran <24>

Massa DAP = 7233,613897 × 0,1% × 0,85

= 6,148571813

Massa ZA = 7233,613897 × 0,1% × 0,85

= 4,908452916

Massa Urea = 5456,315909 × 0,1% × 0,85

= 4,637868522

Massa KCl = 14,84776823 × 0,1% × 0,85

= 0,012620603

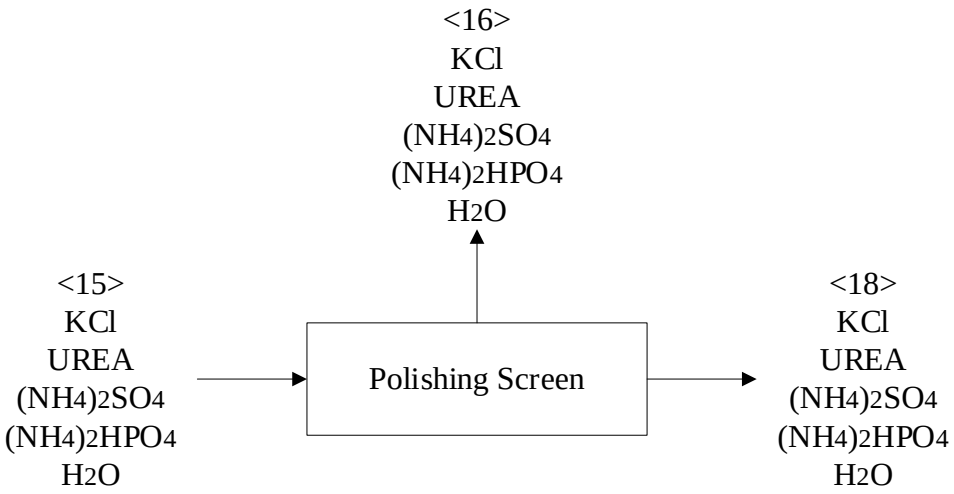
Massa H_2O = 280,2716059 × 0,1% × 0,85

= 0,238230865

Massa Udara Dingin = 79000

☆ TOTAL = 97759.69967

J. NERACA MASSA POLISHING SCREEN



Dengan ketentuan 85% dari 0,1% produk masuk Polishing Screen menuju stream

Feed IN		Feed Out	
15		16	
DAP	7227,465325	DAP	6,143345527
ZA	5769,742036	ZA	4,904280731
UREA	5451,67804	UREA	4,633926334
KCL	14,83514763	KCL	0,012609875
H2O	280,033375	H2O	0,238028369
		18	
		DAP	7221,32198
		ZA	5764,837755
		UREA	5447,044114
		KCL	14,82253776

		H2O	279,7953467

☆ Aliran <15>

Massa DAP = 7227,465325

Massa ZA = 5769,742036

Massa Urea = 5451,67804

Massa KCl = 14,83514763

Massa H_2O = 280,033375

☆ TOTAL = 18743,75392

☆ Aliran <16>

Massa DAP = 7227,465325 × 0,1% × 85%
= 6,148571813

Massa ZA = 5769,742036 × 0,1% × 85%
= 4,908452916

Massa Urea = 5451,67804 × 0,1% × 85%
= 4,637868522

Massa KCl = 14,83514763 × 0,1% × 85%
= 0,012620603

Massa H_2O = 280,033375 × 0,1% × 85%
= 0,238230865

☆ Aliran <18>

Massa DAP = 7233,613897 × 0,1% × 0,85
= 7221,32198

Massa ZA = 7233,613897 × 0,1% × 0,85
= 5764,837755

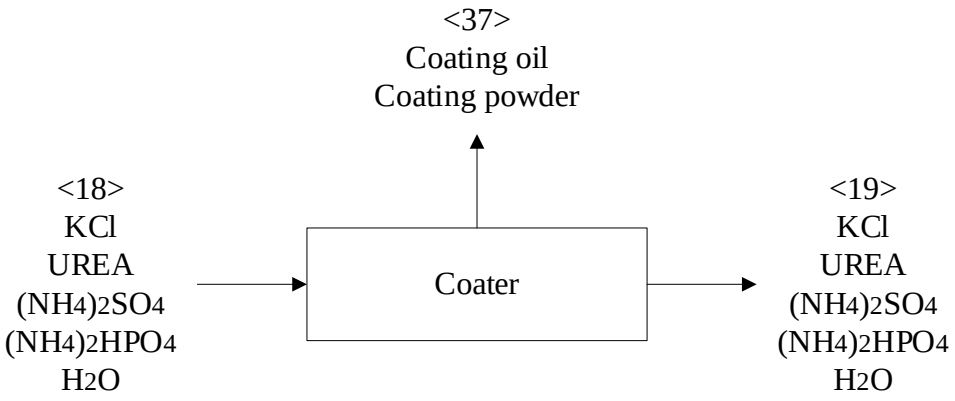
Massa Urea = 5456,315909 × 0,1% × 0,85
= 5447,044114

Massa KCl = 14,84776823 × 0,1% × 0,85
= 14,82253776

Massa H_2O = 280,2716059 × 0,1% × 0,85
= 279,7953467

☆ TOTAL = 18743.75392

K. NERACA MASSA COATER



Massa coating oil	60
Massa coating agent	240

(Operation Manual PT. Petrokimia Gresik)

Feed IN		Feed Out	
15		19	0
DAP	7221,32198	DAP	7221,32198
ZA	5764,837755	ZA	5764,837755
UREA	5447,044114	UREA	5447,044114
KCL	14,82253776	KCL	14,82253776
H2O	279,7953467	H2O	279,7953467
		Coating oil	60
37		Coating agent	240
Coating oil	60		
Coating agent	240		
TOTAL	19027,82173	TOTAL	19027,82173

☆ Aliran <15>

Massa DAP = 7221,32198

Massa ZA = 5764,837755

Massa Urea = 5447,044114

Massa KCl = 14,82253776

Massa H_2O = 279,7953467

- ☆ Aliran <37>

  Coating Agent = 60

  Coating Agent = 240

- ☆ TOTAL = 19027,82173

- ☆ Aliran <19>

  Massa DAP = 7221,32198

  Massa ZA = 5764,837755

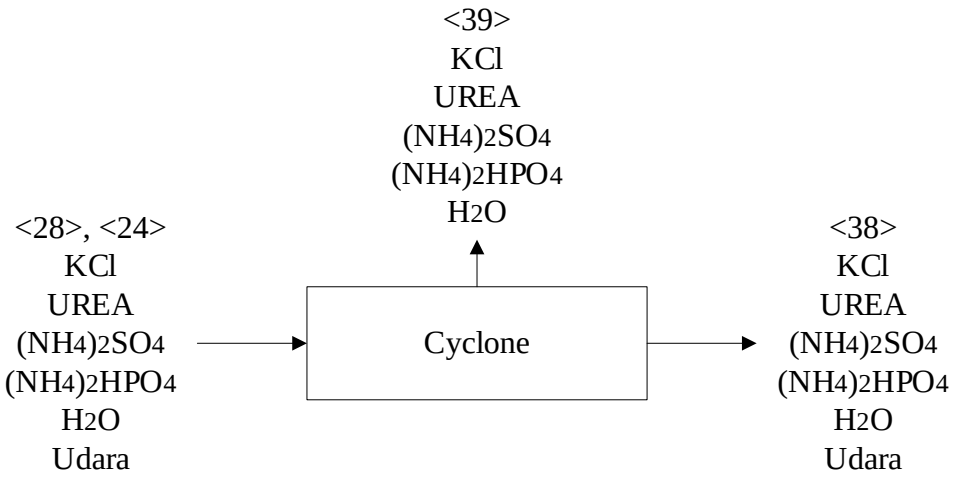
  Massa Urea = 5447,044114

  Massa KCl = 14,82253776

  Massa H_2O = 279,7953467

- ☆ TOTAL = 19027,82173

L. NERACA MASSA CYCLONE



Diasumsikan debu yang lolos ke dryer scrubber adalah 15% dan sisanya (85%) dibuang ke blower.

Feed IN		Feed Out	
24		38	
DAP	6,14857	DAP	2,281050034
ZA	4,90845	ZA	1,820980063
UREA	4,63787	UREA	1,720596339
KCL	0,01262	KCL	0,0046821
H2O	0,23823	H2O	454,3439344
Udara dingin	79000,00	Udara	12600
28		39	
DAP	9,0584	DAP	12,92595019
ZA	7,2314	ZA	10,31888703

UREA	6,8328	UREA	9,75004592
KCL	0,0186	KCL	0,026531899
H2O	3028,7213	H2O	2574,615628
Udara Panas	5000,0000	Udara	71400

☆ Aliran <24>

Massa DAP = 6,14857

Massa ZA = 4,90845

Massa Urea = 4,63787

Massa KCl = 0,01262

Massa H_2O = 0,23823

Udara Dingin = 790000

☆ Aliran <28>

Massa DAP = 9,0584

Massa ZA = 7,2314

Massa Urea = 6,8328

Massa KCl = 0,0186

Massa H_2O = 3028,7213

Udara Panas = 5000,0000

☆ Aliran <38>

Massa DAP = (6,14857 + 9,0584) × 0,15

= 2,281050034

Massa ZA = (4,90845 + 7,2314) × 0,15

= 1,820980063

Massa Urea = (4,63787 + 6,8328) × 0,15

= 1,720596339

Massa KCl = (0,01262 + 0,0186) × 0,15

= 0,0046821

Massa H_2O = (0,23823 + 3028,7213) × 0,15

= 454,3439344

Udara = (79000 + 50000) × 0,15

= 12600

☆ Aliran <39>

Massa DAP = (6,14857 + 9,0584) × 0,85
= 12,92595019

Massa ZA = (4,90845 + 7,2314) × 0,85
= 10,31888703

Massa Urea = (4,63787 + 6,8328) × 0,85
= 9,75004592

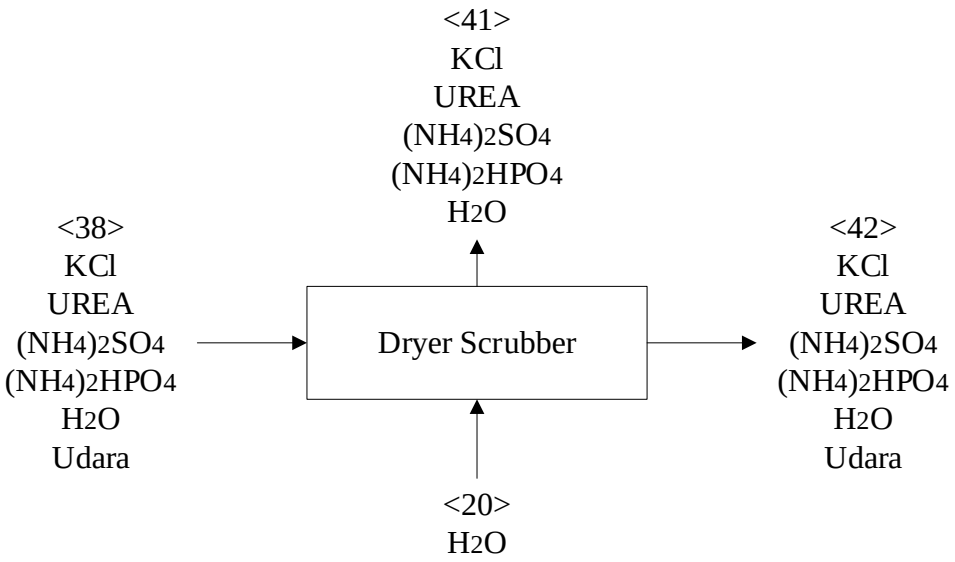
Massa KCl = (0,01262 + 0,0186) × 0,85
= 0,026531899

Massa H_2O = (0,23823 + 3028,7213) × 0,85
= 2574,615628

Udara = (79000 + 50000) × 0,85
= 71400

☆ TOTAL = 87067,80829

M. NERACA MASSA DRYER SCRUBBER



Diasumsikan debu yang lolos ke tail gas scrubber adalah 1% dan sisanya (99%) dibuang ke blower

Feed IN		Feed Out	
38		42	
DAP	2,28105	DAP	0,0228105

ZA	1,82098	ZA	0,018209801
UREA	1,72060	UREA	0,017205963
KCL	0,00468	KCL	4,6821E-05
H2O	454,34393	H2O	6,051009344
Udara	12600,00	Udara	126
20		41	
H2O	150,757	DAP	2,258239534
		ZA	1,802770263
		UREA	1,703390375
		KCL	0,004635279
		H2O	599,0499251
		Udara	12474
TOTAL	13210,92824	TOTAL	13210,92824

☆ Aliran <38>

Massa DAP = 2,28105

Massa ZA = 1,82098

Massa Urea = 1,72060

Massa KCl = 0,00468

Massa H_2O = 454,34393

Udara = 12600,00

☆ Aliran 20

Massa H2O = 150,757

☆ TOTAL = 13210,92824

☆ Aliran <42>

Massa DAP = 2,28105 × 1%

= 0,0228105

Massa ZA = 1,82098 × 1%

= 0,018209801

Massa Urea = 1,72060 × 1%

= 0,017205963

Massa KCl = 0,00468 × 1%

= 0,000047

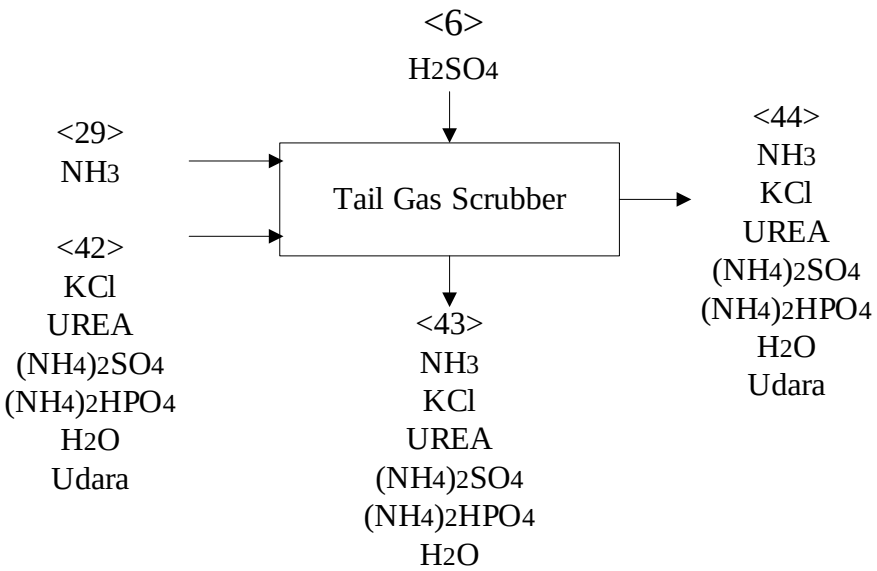
Massa H_2O	= 454,34393 × 1%
	= 6,051009344
Udara	= 12600,00 × 1%
	= 126

☆ Aliran <42>

Massa DAP	= 2,28105 × 99%
	= 2,258239534
Massa ZA	= 1,82098 × 99%
	= 1,802770263
Massa Urea	= 1,72060 × 99%
	= 1,703390375
Massa KCl	= 0,00468 × 99%
	= 0,004635279
Massa H_2O	= 454,34393 × 99%
	= 599,0499251
Udara	= 12600,00 × 99%
	= 12474

☆ TOTAL = 13210,92824

N. NERACA MASSA TAIL GASS SCRUBBER



Asumsi debu lolos udara 1%

2A	+	B	=	F
0,072861976		0,036066678		
0,072133356		0,036066678		0,036066678
0,00072862		0		0,036066678

Feed IN		Feed Out	
42		44	
DAP	0,022811	DAP	0,000228105
ZA	0,018210	ZA	0,047790113
UREA	0,017206	UREA	0,00017206
KCL	0,000047	KCL	4,6821E-07
H2O	6,051009	H2O	0,061231427
Udara	126	Udara	1,26
29		NH3	0,000123865
NH3	1,238654	43	
		DAP	0,022582395
6		ZA	4,731221209
H2SO4	3,5345345	UREA	0,017033904
H2O	0,0721334	KCL	4,63528E-05
		H2O	6,061911274
		Udara	124,74
		NH3	0,012262671
TOTAL	136,9546038	TOTAL	136,9546038

☆ Aliran <42>

Massa DAP = 0,022811

Massa ZA = 0,018210

Massa Urea = 0,017206

Massa KCl = 0,000047

Massa H_2O = 6,051009

Udara = 126

☆ Aliran <29>

Massa NH3 = 1,238654

Aliran <6>

Massa H2SO4 = 3,5345345

Massa H2O = 0,0721334

☆ TOTAL = 136,9546038

☆ Aliran <44>

Massa DAP = 0,022811 × 1%
= 0,0228105

Massa ZA = 0,018210 × 1%
= 0,047790113

Massa Urea = 0,017206 × 1%
= 0,00017206

Massa KCl = 0,00468 × 1%
= 0,000047

Massa H_2O = (6,051009 + 0,0721334) × 1%
= 0,061231427

Udara = 12600,00 × 1%
= 126

NH_3 = 0,00072862 × 17 × 1%
= 0,000123865

☆ Aliran <43>

Massa DAP = 0,022811 × 99%
= 0,022582395

Massa ZA = 0,018210 × 99%
= 4,731221209

Massa Urea = 0,017206 × 99%
= 0,017033904

Massa KCl = 0,000047 × 99%
= 0,000046

Massa H_2O = (6,051009 + 0.0721334) × 99%
= 6,061911274

Udara = 6,051009 × 99%
= 124,74

	NH_3	= 0,00072862 × 17 × 99%
		= 0,012262671
☆	TOTAL	= 136.9546038