



BAB IV

TUGAS KHUSUS

IV.1 Tugas Khusus

IV.1.1 Judul Tugas Khusus

Pembuatan raw mix desain dengan menggunakan material alternatif

IV.1.2 Latar Belakang Masalah dan Penyelesaian

1. Latar Belakang Masalah

Raw mix design digunakan untuk menentukan target-target kualitas dalam industri seperti LSF, SM, AIM, C₃S dan lainnya. Hal ini digunakan untuk memenuhi standart kualitas yang telah ditentukan dan permintaan masyarakat.

2. Perhitungan Raw Mix Desain

Tabel 7. Komposisi bahan

Target	Pile	RM
LSF	116	100
SIM	2.40	2.30
ALM	2.50	1.60

Komposisi	Faba	PS	SBE	DC
SiO ₂	39.94	5.18	51.01	24.62
Al ₂ O ₃	21.03	2.89	10.04	7.60
Fe ₂ O ₃	9.41	1.43	4.98	3.87
CaO	5.45	30.36	5.22	8.25
MgO	1.72	0.90	3.14	0.97
Jumlah	77.55	40.76	74.39	45.31

Target:

$$\text{LSF} = 100$$

$$\text{SIM} = 2.3$$

$$\text{ALM} = 1.6$$



$$LSF = \frac{100CaO}{2,8SiO_2 \times 1,18Al_2O_3 + 0,65Fe_2O_3}$$

$$= 100$$

$$SIM = \frac{SiO_2}{Al_2O_3 + Fe_2O_3}$$

$$= 2,3$$

$$ALM = \frac{Al_2O_3}{Fe_2O_3}$$

$$= 1,6$$

Penyelesaian:

- a = Faba Darat (Faba)
- b = Paper Sludge (PS)
- c = Spent Earth (SBE)
- 1 = Drilling Cutting (DC)

Komposisi	Faba (a)	PS (b)	SBE (c)	DC (1)
SiO ₂	Sf	Sp	Ss	Sd
Al ₂ O ₃	Af	Ap	As	Ad
Fe ₂ O ₃	Cf	Fp	Fs	Fd
CaO	Sf	Cp	Cs	Cd
MgO	Mf	Mp	Ms	Md
Jumlah	Tf	Tp	Ts	Td

Komposisi dalam raw meal yang terbentuk sebagai berikut :

$$SR = \frac{aS_f + bS_p + cS_s + S_d}{(a+b+c+1)}$$

$$FR = \frac{aF_f + bF_p + cF_s + F_d}{(a+b+c+1)}$$

$$AR = \frac{aA_f + bA_p + cA_s + A_d}{(a+b+c+1)}$$

$$CR = \frac{aC_f + bC_p + cC_s + C_d}{(a+b+c+1)}$$



Maka,

$$LSF = \frac{100Cr}{2,8xSr + 1,18xAr + 0,65xFr}$$

$$LSF = \frac{100 \left(\frac{aC_f + bC_p + cC_s + C_d}{(a+b+c+1)} \right)}{2,8 \left(\frac{aS_f + bS_p + cS_s + S_d}{(a+b+c+1)} \right) + 1,18 \left(\frac{aA_f + bA_p + cA_s + A_d}{(a+b+c+1)} \right) + 0,65 \left(\frac{aF_f + bF_p + cF_s + F_d}{(a+b+c+1)} \right)}$$

$$LSF = \frac{100(aC_f + bC_p + cC_s + C_d)}{2,8(aS_f + bS_p + cS_s + S_d) + 1,18(aA_f + bA_p + cA_s + A_d) + 0,65(aF_f + bF_p + cF_s + F_d)}$$

$$LSF[2,8(aS_f + bS_p + cS_s + S_d) + 1,18(aA_f + bA_p + cA_s + A_d) + 0,65(aF_f + bF_p + cF_s + F_d)] = 100(aC_f + bC_p + cC_s + C_d + C_k)$$

$$a [2,8 \times LSF \times S_f + 1,18 \times LSF \times A_f + 0,65 \times LSF \times F_f - 100 \times C_f] +$$

$$b [2,8 \times LSF \times S_p + 1,18 \times LSF \times A_p + 0,65 \times LSF \times F_p - 100 \times C_p] +$$

$$c [2,8 \times LSF \times S_s + 1,18 \times LSF \times A_s + 0,65 \times LSF \times F_s - 100 \times C_s]$$

$$= 100C_d - 2,8 \times LSF \times S_d - 1,18 \times LSF \times A_d - 0,65 \times LSF \times F_d$$

$$a [(2,8 \times S_f + 1,18 \times A_f + 0,65 \times F_f) \times LSF - 100 \times C_f] +$$

$$b [(2,8 \times S_p + 1,18 \times A_p + 0,65 \times F_p) \times LSF - 100 \times C_p] +$$

$$c [(2,8 \times S_s + 1,18 \times A_s + 0,65 \times F_s) \times LSF - 100 \times C_s]$$

$$= 100C_d - ((2,8 \times S_d + 1,18 \times A_d + 0,65 \times F_d) \times LSF)$$

$$a [(2,8 \times 39,94) + (1,18 \times 21,03) + (0,65 \times 9,41)] \times 100 - (100 \times 5,45) +$$

$$b [(2,8 \times 5,18) + (1,18 \times 2,89) + (0,65 \times 1,43)] \times 100 - (100 \times 30,36) +$$

$$c [(2,8 \times 51,01) + (1,18 \times 10,04) + (0,65 \times 4,98)] \times 100 - (100 \times 5,22)$$

$$= (100 \times 8,25) - 100 \times (2,8 \times 24,62 + 1,18 \times 7,60 + 0,65 \times 3,87)$$

Maka didapati persamaan kedua sebagai berikut:

$$13731,39 a + (-1151,63)b + 15269,22 c = -7216,95 \dots \dots \dots (Persamaan 1)$$

$$SM = \frac{SiO_2}{Al_2O_3 + Fe_2O_3}$$



$$SM = \frac{SR}{AR+FR}$$

$$SM = \frac{\left(\frac{aS_f+bS_p+cS_s+S_d}{(a+b+c+1)}\right)}{\left(\frac{aA_f+bA_p+cA_s+A_d}{(a+b+c+1)}\right) + \left(\frac{aF_f+bF_p+cF_s+F_d}{(a+b+c+1)}\right)}$$

$$SM = \frac{(aS_f+bS_p+cS_s+S_d)}{(aA_f+bA_p+cA_s+A_d) + (aF_f+bF_p+cF_s+F_d)}$$

$$SM[(aA_f + bA_p + cA_s + A_d) + (aF_f + bF_p + cF_s + F_d)] = (aS_f + bS_p + cS_s + S_d)$$

$$a((A_f + F_f)SM - S_f) + b((A_p + F_p)SM - S_p) + c((A_s + F_s)SM - S_s) = S_d - (A_d + F_d)SM$$

$$= a((21,03 + 9,41) \times 2,3 - 34,94) + b((2,89+1,43) \times 2,3 - 5,18) + c((10,04+4,98) \times 2,3 - 51,01) = 24,62 - ((7,60 + 3,87) \times 2,3)$$

Maka didapati persamaan kedua sebagai berikut:

$$30,072 a + 4,756 b + (-16,464) c = - 1,761 \dots\dots\dots(\text{Persamaan 2})$$

$$AM = \frac{Al_2O_3}{Fe_2O_3}$$

$$AM = \frac{AR}{FR}$$

$$AM = \frac{\left(\frac{aA_f+bA_p+cA_s+A_d}{(a+b+c+1)}\right)}{\left(\frac{aF_f+bF_p+cF_s+F_d}{(a+b+c+1)}\right)}$$

$$AM = \frac{(aA_f+bA_p+cA_s+A_d)}{(aF_f+bF_p+cF_s+F_d)}$$

$$AM(aF_f + bF_p + cF_s + F_d) = (aA_f + bA_p + cA_s + A_d)$$

$$a((F_f)AM - A_f) + b((F_p)AM - A_p) + c((F_s)AM - A_s) = A_d - (F_d)AM$$

$$a((9,41)1,6 - 21,03) + b((1,43)1,6 - 2,89) + c((4,98)1,6 - 10,04) = 7,60 - (3,87)1,6$$

Maka didapati persamaan ketiga sebagai berikut:

$$-5,974 a + (-0,602)b + (-2,072)c = 1,408\dots\dots\dots(\text{persamaan 3})$$



Schingga,

$$13731,39 a + (-1151,63)b + 15269,22 c = -7216,95 \dots\dots\dots(1)$$

$$30,072 a + 4,756 b + (-16,464) c = - 1,761 \dots\dots\dots(2)$$

$$-5,974 a + (-0,602)b + (-2,072)c = 1,408 \dots\dots\dots(3)$$

Dengan cara eliminasi pers (1) dan (2)

$$13731,39 a + (-1151,63)b + 15269,22 c = -7216,95$$

$$30,072 a + 4,756 b + (-16,464) c = - 1,761$$

Menjadi :

$$13731,39 a + (-1151,63) b + 15269,22 c = -7216,95$$

$$13731,39 a + 2171,67 b + (-7517,745) c = -804,102$$

$$-3323,3 b + 22786,965 c = -6412,848 \dots\dots\dots(4)$$

Eliminasi pers (2) dan (3)

$$30,072 a + 4,756 b + (-16,464) c = - 1,761$$

$$-5,974 a + (-0,602)b + (-2,072) c = 1,408$$

Menjadi :

$$30,072 a + 4,756 b + (-16,464) c = - 1,761$$

$$30,072 a + 3,0030 b + 10,430 c = -7,087$$

$$1,726 b + (-26,894) c = 5,326 \dots\dots\dots(5)$$

Eliminasi pers (4) dan (5)

$$-3323,3 b + 22786,965 c = -6412,848$$

$$1,726 b + (-26,894) c = 5,326$$

Menjadi :

$$-3323,3 b + 22786,965 c = -6412,848$$

$$-3323 b + 51782,648 c = -10254,866$$

$$-28995,683 c = 3842,018$$

$$c = -0,1325$$

Subtitusi nilai c ke pers (5)

$$1,726 b + (-26,894) x (-0,1325) = 5,326$$

$$b = 1,0212$$



Substitusi nilai b dan c ke pers (3)

$$-5,974 a + (-0,602) \times 1,0212 + (-2,072) \times (-0,1325) = 1,408$$

$$a = -0,2926$$

Sehingga,

$$a \text{ (Faba)} = -0,2926 \text{ bagian}$$

Komposisi Raw Mix Desain hasil perhitungan

$$\text{Faba} = \frac{-0,2926}{-0,2926+1,0212+(-0,1325)+1} \times 100\% = -18,33\%$$

$$\text{PS} = \frac{1,0212}{-0,2926+1,0212+(-0,1325)+1} \times 100\% = 63,98\%$$

$$\text{SBE} = \frac{-0,1325}{-0,2926+1,0212+(-0,1325)+1} \times 100\% = -8,30\%$$

$$\text{DC} = \frac{1}{-0,2926+1,0212+(-0,1325)+1} \times 100\% = 62,65\%$$

IV.1.3. Kesimpulan Tugas Khusus

Dari hasil perhitungan raw mix design dengan target LSF, SIM, ALM sebesar 100; 2,3; 1,6 diperoleh komposisi kimia seperti tabel berikut :

Tabel IV.1. Komposisi Kimia Hasil Perhitungan Raw Mix Design

Komposisi	Faba	PS	SBE	DC	Raw Meal
	-18,33%	63,98%	-8,30%	62,65%	
SiO ₂	39.94	5.18	51.01	24.62	7,183762
Al ₂ O ₃	21.03	2.89	10.04	7.60	1,922303
Fe ₂ O ₃	9.41	1.43	4.98	3.87	1,201276
CaO	5.45	30.36	5.22	8.25	23,16070
MgO	1.72	0.90	3.14	0.97	0,607629
Jumlah	77.55	40.76	74.39	45.31	34,07567

Dapat disimpulkan bahwa pada persentase komposisi faba (fly ash dan bottom ash) sebesar -18,33% dan komposisi SBE (Spen Bleaching Earth) sebesar -8,30% yang artinya tidak memungkinkan untuk memenuhi kebutuhan, maka harus memenuhi komposisi FABA, PS, DC, SBE terlebih dahulu, agar persentase komposisi tidak bernilai negatif sehingga data raw meal sesuai target yang diinginkan.



IV.2 Jadwal Kerja Praktek

**JADWAL PELAKSANAAN TEAM MEETING
PESERTA PKL PROGRAM STUDI TEKNIK KIMIA
BULAN NOVEMBER 2021**

No	Unit Kerja	Ka. Unit Kerja	Cp	Jadwal Teams
1	Perencanaan Bahan dan Produksi	M. AGUS PRAYITNO	08123414672	05/11/2021, 14.00
2	Quality Assurance -Material & Product	Teguh Widodo	081230322522	02/11/2021, 14.00
3	Perencanaan dan Pengawasan Tambang	Eko Purnomo, ST	081289020728	02/11/2021, 15.00
4	Operasi Tambang	M. Ardy Zailani, ST	085268418968	03/11/2021, 14.00
5	Operasi Crusher	Siswanto	081553116252	03/11/2021, 15.00
6	Operasi RKC 1	Yanu Pamungkas, ST	08123401954	
	Operasi RKC 2	Adam Wijatmiko	082333449190	
	Operasi RKC 3	Achmad Rusdiyanto	081553463753	04/11/2021, 15.00
	Operasi RKC 4	Ebin Setiawan	081553463691	
7	Operasi Finish Mill 1/2	Chalid Nurdin	08113641160	04/11/2021, 14.00
	Operasi Finish Mill 3/4	Gathot Suwarno	08113083491	
8	Operasi Packer	Susanto	08123407602	05/11/2021, 15.00
9	Operasi Utilitas	Abdul Cholik	081328192617	08/11/2021, 15.00
10	Material Ketiga dan Bahan Bakar Alternatif	Moch. Kholil	081553067767	08/11/2021, 14.00
11	Quality Control	Muyasaroh Effendi, ST	081133367280	09/11/2021, 14.00
12	Evaluasi Proses	Amelia Djafaar, ST	087851176886	10/11/2021, 14.00
13	Operasi WHRPG	M. Farid	081332399150	10/11/2021, 15.00
14	Electrostatic Precipitator & Dust Collector	Hasan Mujahid, ST	082234158393	11/11/2021, 14.00
15	Penyusunan Tugas khusus			
16	Penyusunan Laporan Kerja Praktek			