LAMPIRAN A
DATA PENELITIAN

1. Tabel analisa limbah sebelum diolah

Limbah	DHL(umhos/cm)	TSS(mg/L)	COD(mg/L)	BOD(mg/L)
Asam	43600	20	20384	3483
Basa	6080	194	15680	2630

Sumber: Analisa Laboratorium Dinas Pertambangan Propinsi Sumsel,2014.

2. Tabel Hasil analisa limbah asam setelah pengolahan

Laju alir	DHL(umhos/cm)	TSS(mg/L)	COD(mg/L)	BOD(mg/L)
1L/menit	20400	8	9212	1527
2L/menit	18600	4	9212	1552
3L/menit	23500	4	11172	1911
4L/menit	23800	10	12348	2091
5L/menit	24700	10	11172	1861

Sumber:Analisa Laboratorium Dinas Pertambangan Propinsi Sumsel,2014.

3. Tabel Hasil analisa limbah basa setelah pengolahan

Laju alir	DHL(umhos/cm)	TSS(mg/L)	COD(mg/L)	BOD(mg/L)
1L/menit	3800	42	12348	2106
2L/menit	3800	42	8036	1332
3L/menit	4160	34	8820	1552
4L/menit	4750	66	12348	1766
5L/menit	4820	76	13524	2320

Sumber:Analisa Laboratorium Dinas Pertambangan Propinsi Sumsel,2014

LAMPIRAN B
PERHITUNGAN

1. Perhitungan Kadar COD

KODE	V	A	B	N	fp	Kadar
sblm diolah (Asam)	2	2,9	5,5	0,0392	50	20384
sblm diolah (Basa)	2	3,5	5,5	0,0392	50	15680
1 L/m (Asam)	2	3,15	5,5	0,0392	25	9212
1 L/m (Basa)	2	2,35	5,5	0,0392	25	12348
2 L/m (Asam)	2	3,15	5,5	0,0392	25	9212
2L/m (Basa)	2	3,45	5,5	0,0392	25	**8036**
3 L/m (Asam)	2	2,65	5,5	0,0392	25	11172
3 L/m (Basa)	2	3,25	5,5	0,0392	25	8820
4 L/m (Asam)	2	2,35	5,5	0,0392	25	12348
4 L/m (Basa)	2	2,85	5,5	0,0392	25	10388
5 L/m (Asam)	2	2,65	5,5	0,0392	25	11172
5 L/m (Basa)	2	2,05	5,5	0,0392	25	13524

a. Limbah Asam

- Kadar COD limbah sebelum diolah

$$COD = \frac{(B-A)\text{x BE Oksigen } \left(\frac{16}{2}\right)\text{x N X } 1000}{V}$$

$$COD = \frac{(5{,}5-2{,}9)\text{x } \left(\frac{16}{2}\right)\text{x } 0{,}0392 \text{ X } 1000}{2}$$

COD = 20384 mg/L

- Kadar COD limbah pada laju alir 1 L/menit

$$COD = \frac{(B-A)\text{x BE Oksigen } \left(\frac{16}{2}\right)\text{x N X } 1000}{V}$$

$$COD = \frac{(5{,}5-3{,}15)\text{x } \left(\frac{16}{2}\right)\text{x } 0{,}0392 \text{ X } 1000}{2}$$

COD = 1912 mg/L

- Kadar COD limbah pada laju alir 2 L/menit

$$COD = \frac{(B-A)x\ BE\ Oksigen\ \left(\frac{16}{2}\right)x\ N\ X\ 1000}{V}$$

$$COD = \frac{(5{,}5-3{,}15)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 1912 mg/L

- Kadar COD limbah pada laju alir 3 L/menit

$$COD = \frac{(B-A)x\ BE\ Oksigen\ \left(\frac{16}{2}\right)x\ N\ X\ 1000}{V}$$

$$COD = \frac{(5{,}5-2{,}65)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 11172 mg/L

- Kadar COD limbah pada laju alir 4 L/menit

$$COD = \frac{(B-A)x\ BE\ Oksigen\ \left(\frac{16}{2}\right)x\ N\ X\ 1000}{V}$$

$$COD = \frac{(5{,}5-2{,}35)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 12348 mg/L

- Kadar COD limbah pada laju alir 5 L/menit

$$COD = \frac{(B-A)x\ BE\ Oksigen\ \left(\frac{16}{2}\right)x\ N\ X\ 1000}{V}$$

$$COD = \frac{(5{,}5-2{,}65)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 11172 mg/L

b. Limbah Basa

- Kadar COD limbah sebelum diolah

$$COD = \frac{(B-A)x\,BE\ Oksigen\left(\frac{16}{2}\right)x\,N\,X\,1000}{V}$$

$$COD = \frac{(5{,}5-3{,}5)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 15680 mg/L

- Kadar COD limbah pada laju 1 L/menit

$$COD = \frac{(B-A)x\,BE\ Oksigen\left(\frac{16}{2}\right)x\,N\,X\,1000}{V}$$

$$COD = \frac{(5{,}5-2{,}35)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 12348 mg/L

- Kadar COD limbah pada laju alir 2 L/menit

$$COD = \frac{(B-A)x\,BE\ Oksigen\left(\frac{16}{2}\right)x\,N\,X\,1000}{V}$$

$$COD = \frac{(5{,}5-3{,}45)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 8036 mg/L

- Kadar COD limbah pada laju alir 3 L/menit

$$COD = \frac{(B-A)x\,BE\ Oksigen\left(\frac{16}{2}\right)x\,N\,X\,1000}{V}$$

$$COD = \frac{(5{,}5-3{,}25)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 8820 mg/L

- Kadar COD limbah pada laju alir 4 L/menit

$$COD = \frac{(B-A)x\ BE\ Oksigen\ \left(\frac{16}{2}\right)x\ N\ X\ 1000}{V}$$

$$COD = \frac{(5{,}5-2{,}85)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 10388 mg/L

- Kadar COD limbah pada laju alir 5 L/menit

$$COD = \frac{(B-A)x\ BE\ Oksigen\ \left(\frac{16}{2}\right)x\ N\ X\ 1000}{V}$$

$$COD = \frac{(5{,}5-2{,}05)x\left(\frac{16}{2}\right)x\ 0{,}0392\ X\ 1000}{2}$$

COD = 13524 mg/L

2. Perhitungan Kadar BOD

BOD 5 Hari

KODE	Xo	X5	Bo	B5	P	Kadar
sblm diolah (Asam)	11,63	0,62	13,34	9,31	0,002	3483
sblm diolah (Basa)	12,25	2,95	13,34	9,31	0,002	2630
1 L/m (Asam)	10,06	2,97	13,34	9,31	0,002	1527
1 L/m (Basa)	11,48	3,23	13,34	9,31	0,002	2106
2 L/m (Asam)	12,72	5,58	13,34	9,31	0,002	1552
2L/m (Basa)	10,18	3,48	13,34	9,31	0,002	**1332**
3 L/m (Asam)	10,44	2,58	13,34	9,31	0,002	1911
3 L/m (Basa)	13,34	6,20	13,34	9,31	0,002	1552
4 L/m (Asam)	13,03	4,81	13,34	9,31	0,002	2091
4 L/m (Basa)	12,41	4,84	13,34	9,31	0,002	1766
5 L/m (Asam)	12,41	4,65	13,34	9,31	0,002	1861
5 L/m (Basa)	12,25	3,57	13,34	9,31	0,002	2320

a. Limbah asam

- Kadar BOD limbah sebelum diolah

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((11{,}63-0{,}65)-(13{,}34-9{,}31))(1-0{,}002)}{0{,}002}$$

BOD = 3483 mg/L

- Kadar BOD limbah pada laju alir 1 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((10{,}06-2{,}97)-(13{,}34-9{,}31))(1-0{,}002)}{0{,}002}$$

BOD = 1527 mg/L

- Kadar BOD limbah pada laju alir 2 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((10{,}18-3{,}23)-(13{,}34-9{,}31))(1-0{,}002)}{0{,}002}$$

BOD = 1552 mg/L

- Kadar BOD limbah pada laju alir 3 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((10{,}44-2{,}58)-(13{,}34-9{,}31))(1-0{,}002)}{0{,}002}$$

BOD = 1911 mg/L

- Kadar BOD limbah pada laju alir 4 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((13,03-4,81)-(13,34-9,31))(1-0,002)}{0,002}$$

BOD = 2091 mg/L

- Kadar BOD limbah pada laju alir 5 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((12,41-4,65)-(13,34-9,31))(1-0,002)}{0,002}$$

BOD = 1861 mg/L

b. Limbah Basa

- Kadar BOD limbah sebelum diolah

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((12,25-2,95)-(13,34-9,31))(1-0,002)}{0,002}$$

BOD = 2630 mg/L

- Kadar BOD limbah pada laju alir 1 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((11,48-3,32)-(13,34-9,31))(1-0,002)}{0,002}$$

BOD = 2106 mg/L

- Kadar BOD limbah pada laju alir 2 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((10{,}18-3{,}48)-(13{,}34-9{,}31))(1-0{,}002)}{0{,}002}$$

BOD = 1332 mg/L

- Kadar BOD limbah pada laju alir 3 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((13{,}34-6{,}20)-(13{,}34-9{,}31))(1-0{,}002)}{0{,}002}$$

BOD = 1552 mg/L

- Kadar BOD limbah pada laju alir 4 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((12{,}41-4{,}48)-(13{,}34-9{,}31))(1-0{,}002)}{0{,}002}$$

BOD = 1766 mg/L

- Kadar BOD limbah pada laju alir 5 L/menit

$$BOD = \frac{((Xo-X5)-(B0-B5))(1-P)}{P}$$

$$BOD = \frac{((12{,}25-3{,}57)-(13{,}34-9{,}31))(1-0{,}002)}{0{,}002}$$

BOD = 2320 mg/L

3. Perhitungan Kadar TSS

KODE	A	B	V	Kadar
sblm diolah (Asam)	0,2112	0,2122	50	20
sblm diolah (Basa)	0,1971	0,2068	50	194
1 L/m (Asam)	0,1849	0,1853	50	8
1 L/m (Basa)	0,1986	0,2007	50	42
2 L/m (Asam)	0,2088	0,209	50	**4**
2L/m (Basa)	0,1933	0,195	50	34
3 L/m (Asam)	0,1952	0,1954	50	**4**
3 L/m (Basa)	0,1999	0,2016	50	34
4 L/m (Asam)	0,2082	0,2087	50	10
4 L/m (Basa)	0,2023	0,2056	50	66
5 L/m (Asam)	0,208	0,2085	50	10
5 L/m (Basa)	0,208	0,2118	50	76

a. Limbah Asam

- Kadar TSS limbah sebelum diolah

$$TSS = \frac{(B-A)x\ 1000\ x\ 1000}{V}$$

$$TSS = \frac{(0{,}2122-0{,}2112)x\ 1000\ x\ 1000}{50}$$

TSS = 20 mg/L

- Kadar TSS limbah pada laju alir 1 L/menit

$$TSS = \frac{(B-A)x\ 1000\ x\ 1000}{V}$$

$$TSS = \frac{(0{,}1853-0{,}1849)x\ 1000\ x\ 1000}{50}$$

TSS = 8 mg/L

- Kadar TSS limbah pada laju alir 2 L/menit

$$TSS = \frac{(B-A)x\ 1000\ x\ 1000}{V}$$

$$TSS = \frac{(0{,}1952 - 0{,}1954)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 4 mg/L

- Kadar TSS limbah pada laju alir 3 L/menit

$$TSS = \frac{(B - A)\text{x } 1000 \text{ x } 1000}{V}$$

$$TSS = \frac{(0{,}1952 - 0{,}1954)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 4 mg/L

- Kadar TSS limbah pada laju alir 4 L/menit

$$TSS = \frac{(B - A)\text{x } 1000 \text{ x } 1000}{V}$$

$$TSS = \frac{(0{,}2023 - 0{,}2056)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 10 mg/L

- Kadar TSS limbah pada laju alir 5 L/menit

$$TSS = \frac{(B - A)\text{x } 1000 \text{ x } 1000}{V}$$

$$TSS = \frac{(0{,}2085 - 0{,}208)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 10 mg/L

b. Limbah Basa

- Kadar TSS limbah sebelum diolah

$$TSS = \frac{(B - A)\text{x } 1000 \text{ x } 1000}{V}$$

$$TSS = \frac{(0{,}2068 - 0{,}1971)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 194 mg/L

- Kadar TSS limbah pada laju alir 1 L/menit

$$TSS = \frac{(B - A)\text{x } 1000 \text{ x } 1000}{V}$$

$$TSS = \frac{(0{,}2007 - 0{,}1986)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 42 mg/L

- Kadar TSS limbah pada laju alir 2 L/menit

$$TSS = \frac{(B - A)\text{x } 1000 \text{ x } 1000}{V}$$

$$TSS = \frac{(0{,}195 - 0{,}1933)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 34 mg/L

- Kadar TSS limbah pada laju alir 3 L/menit

$$TSS = \frac{(B - A)\text{x } 1000 \text{ x } 1000}{V}$$

$$TSS = \frac{(0{,}2016 - 0{,}1999)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 34 mg/L

- Kadar TSS limbah pada laju alir 4 L/menit

$$TSS = \frac{(B - A)\text{x } 1000 \text{ x } 1000}{V}$$

$$TSS = \frac{(0{,}2056-0{,}2023)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 66 mg/L

- Kadar TSS limbah pada laju alir 5 L/menit

$$TSS = \frac{(B-A)\text{x } 1000 \text{ x } 1000}{V}$$

$$TSS = \frac{(0{,}2118-0{,}208)\text{x } 1000 \text{ x } 1000}{50}$$

TSS = 76 mg/L

LAMPIRAN C
DOKUMENTASI

Gambar 1. Rangkaian alat pengolahan limbah cair laboratorium

Gambar 2. Sampel Limbah Asam

Gambar 3. Sampel limbah basa

Gambar 4. Sampel Limbah Cair Laboratorium

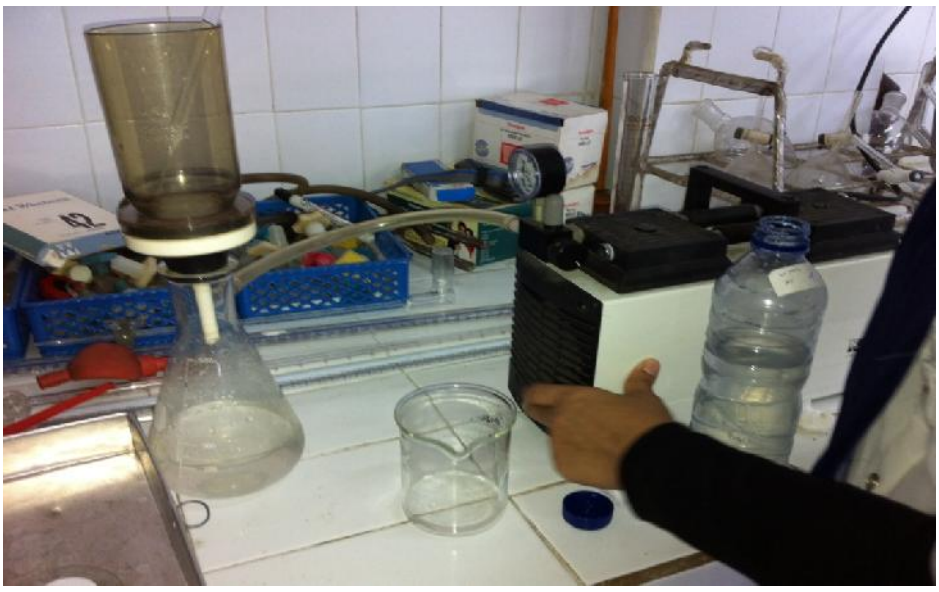
Gambar 5. Proses Pengolahan Limbah

Gambar 6. penampungan Limbah hasil Pengolahan

Gambar 7. Analisa COD

Gambar 8. Proses Analisa Sampel

Gambar 9. Reaktor COD



Gambar 10. Proses penyaringan vacum