

## BAB V

### KESIMPULAN DAN SARAN

#### A. Kesimpulan

Dari hasil penelitian pengolahan limbah cair RSUP. Dr. Sarjito dengan penggunaan lumpur aktif secara anaerob dapat diambil kesimpulan sebagai berikut :

1. Proses pengolahan limbah cair RSUP. Dr. Sardjito secara anaerob dengan pengenceran 50% menunjukkan hasil yang paling maksimal, karena pada konsentrasi ini menunjukkan penurunan parameter BOD terbesar yaitu sebesar 75,91%, COD sebesar 77,37%, dan penurunan bakteri patogen *Salmonella sp* dan *Vibrio sp*, dan sesuai dengan baku mutu lingkungan yang berlaku.
2. Produksi gas bio dari digester anaerobik yang paling tinggi terjadi pada konsentrasi limbah 100 %.

#### B. Saran

Proses pengolahan limbah cair Rumah Sakit secara anaerob dapat menurunkan kandungan bakteri pathogen tetapi untuk dapat mematikan bakteri patogen tersebut maka perlu diberikan zat disinfektan berupa kaporit pada akhir proses pengolahan sebelum limbah dibuang ke lingkungan.

Di dalam proses pengolahan limbah Rumah Sakit perlu dilakukan penelitian terhadap limbah radioaktif, apakah kandungan limbah radioaktif yang dihasilkan dapat mencemari lingkungan atau tidak, dan bagaimana cara mengelola limbah radioaktif tersebut agar tidak mencemari lingkungan.

## DAFTAR PUSTAKA

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# LAMPIRAN

LAMPIRAN B : KEPUTUSAN MENTERI NEGARA  
 LINGKUNGAN HIDUP  
 NOMOR : KEP- 58 /MENLH/12/1995  
 TENTANG : BAKU MUTU LIMBAH CAIR BAGI  
 KEGIATAN RUMAH SAKIT  
 TANGGAL : 21 DESEMBER 1995

BAKU MUTU LIMBAH CAIR BAGI KEGIATAN RUMAH SAKIT

PARAMETER	KADAR MAKSIMUM
<b>FISIKA</b>	
Suhu	≤ 30°C
<b>KIMIA</b>	
pH	6 - 9
BOD <sub>5</sub>	30 mg/L
COD	80 mg/L
TSS	30 mg/L
NH <sub>3</sub> Bebas	0,1 mg/L
PO <sub>4</sub>	2 mg/L
<b>MIKROBIOLOGIK</b>	
MPN - Kuman Golongan Koli/100 mL	10.000
<b>RADIOAKTIVITAS</b>	
<sup>137</sup> Cs	7 x 10 <sup>2</sup> Bq/L
<sup>137</sup> Sr	2 x 10 <sup>2</sup> Bq/L
<sup>137</sup> Co	3 x 10 <sup>2</sup> Bq/L
<sup>137</sup> Cr	7 x 10 <sup>2</sup> Bq/L
<sup>137</sup> Ce	1 x 10 <sup>2</sup> Bq/L
<sup>137</sup> Sr	4 x 10 <sup>2</sup> Bq/L
<sup>137</sup> Me	7 x 10 <sup>2</sup> Bq/L
<sup>137</sup> Sn	3 x 10 <sup>2</sup> Bq/L
<sup>137</sup> I	1 x 10 <sup>2</sup> Bq/L
<sup>137</sup> Bi	7 x 10 <sup>2</sup> Bq/L
<sup>137</sup> W	1 x 10 <sup>2</sup> Bq/L
<sup>137</sup> ...	...

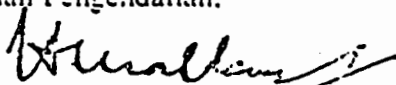
Menteri Negara  
 Lingkungan Hidup,

ttd.

Sarwono Kusumaatmadja

Salinan sesuai aslinya

Asisten IV Menteri Negara Lingkungan Hidup  
 Bidang Pengembangan, Pengawasan  
 dan Pengendalian.

  
 Hambar Martono

## PENGELOLAAN LIMBAH CAIR RUMAH SAKIT

Limbah Cair RS = Bahan buangan berbentuk cair yang berasal dari proses kegiatan di RS yang kemungkinan mengandung mikroorganisme patogen, bahan kimia beracun dan radioaktivitas.

Sumber Penghasil Limbah Cair :

### I. PELAYANAN MEDIS

1. Rawat Inap
2. Rawat Jalan/poliklinik
3. Rawat Intensif
4. Rawat Darurat
5. Haemodialisa
6. Kamar Jenazah
7. Bedah Sentral
8. ....

→ Kamar mandi, wastavel, closed, ruang cuci instrumen medik, buangan dialisat, excudat penderita DLL

### II. PENUNJANG MEDIS

1. Dapur Pusat
2. Binatu
3. Lab. Klinik
4. Lab. Patologi Anatomi
5. Radiologi
6. ....

→ Kamar mandi, wastavel, closed, tempat cuci peralatan masak, rendaman dan bilasan proses pencucian, pencucian preport, sisa reagensia, sisa spesi men-cair proses pencucian X Ray, dll

### III. PERKANTORAN & FASILITAS SOSIAL

1. Perkantoran & Administrasi
2. Asrama Pegawai
3. Rumah Dinas
4. Kafetaria
5. ....

→ Kamar mandi, closed, wastavel, pencucian peralatan makan, dll

OBS	PERL	HARI	UL	COD	BOD	VFA	MLSS	SALMNELA	VIBRIO	GAS_BIO	PH
1	A	0	1	306.970	173.33	518.88	3.1	1840000	171000	0.000	7.2
2	A	0	2	312.470	152.00	591.00	4.0	720000	85000	0.000	7.1
3	A	0	3	294.730	146.67	616.44	3.6	275000	65000	0.000	7.2
4	B	0	1	223.140	93.33	375.45	2.7	330000	62000	0.000	7.1
5	B	0	2	231.200	98.67	317.95	1.3	208000	54000	0.000	7.1
6	B	0	3	217.980	118.00	348.00	2.1	117000	69000	0.000	7.0
7	C	0	1	116.114	56.67	348.00	1.8	2020000	47000	0.000	7.2
8	C	0	2	114.840	47.34	267.69	1.2	104000	55000	0.000	7.1
9	C	0	3	112.210	53.67	301.44	1.8	125000	.	0.000	7.0
10	K	0	1	53.730	21.33	243.23	1.2	350000	.	0.000	7.1
11	K	0	2	52.730	20.00	227.52	2.3	.	.	0.000	7.0
12	K	0	3	56.930	25.34	188.00	1.5	.	.	0.000	7.0
13	A	05	1	237.020	106.67	893.50	3.4	255000	72000	144.117	7.0
14	A	05	2	214.380	117.33	820.00	5.5	271000	.	127.488	7.1
15	A	05	3	226.480	109.33	886.67	3.4	171000	42000	144.117	6.9
16	B	05	1	171.180	77.34	589.64	3.2	142000	100000	99.773	6.8
17	B	05	2	173.810	85.33	591.50	2.1	183000	37000	138.574	6.9
18	B	05	3	168.540	69.33	469.92	2.0	186000	.	67.624	7.0
19	C	05	1	112.490	53.33	435.56	2.2	79000	55000	68.733	6.9
20	C	05	2	102.700	42.67	312.00	2.0	88000	30000	103.099	6.9
21	C	05	3	97.440	40.00	335.08	1.8	71000	.	87.579	7.0
22	K	05	1	47.400	16.00	321.23	1.9	.	.	28.823	7.1
23	K	05	2	45.300	19.33	300.48	1.6	.	.	58.755	7.2
24	K	05	3	34.230	13.34	324.48	2.8	.	.	55.429	7.1
25	A	10	1	102.460	66.67	1198.00	1.7	94000	.	404.635	6.8
26	A	10	2	116.410	77.34	1014.00	2.7	69000	31000	413.504	6.6
27	A	10	3	113.770	74.67	1152.92	4.7	590000	32000	402.418	6.5
28	B	10	1	79.540	48.00	692.33	2.8	18000	.	327.034	6.7
29	B	10	2	88.590	53.33	827.54	1.1	66000	.	205.089	6.9
30	B	10	3	74.800	45.33	714.46	1.9	34000	61000	288.233	6.9
31	C	10	1	60.570	29.33	372.95	1.4	16000	34000	184.026	6.8
32	C	10	2	66.370	32.00	470.90	1.7	64000	.	228.924	6.8
33	C	10	3	53.980	26.67	499.62	1.1	37000	.	230.587	6.9
34	K	10	1	18.960	5.34	371.04	0.6	.	.	131.922	7.2
35	K	10	2	15.280	8.67	437.50	0.7	.	.	100.882	7.2
36	K	10	3	16.430	10.67	421.44	0.8	.	.	143.008	7.1
37	A	15	1	81.640	42.67	1099.47	1.8	61000	34000	598.639	6.4
38	A	15	2	73.730	45.33	1086.05	1.1	41000	28000	669.588	6.7
39	A	15	3	74.800	40.00	1108.85	2.9	.	.	607.507	6.6
40	B	15	1	46.890	29.33	734.19	1.7	.	.	496.648	6.6
41	B	15	2	55.720	21.34	999.70	1.2	41000	.	425.699	6.8
42	B	15	3	49.520	24.00	804.89	1.7	.	.	437.893	6.8
43	C	15	1	38.980	13.33	464.72	1.0	36000	.	292.668	6.7
44	C	15	2	23.700	16.00	593.03	0.6	.	.	390.778	6.6
45	C	15	3	26.330	18.67	570.93	0.9	.	.	425.699	6.9
46	K	15	1	5.260	6.34	359.47	0.7	.	.	260.519	7.1
47	K	15	2	9.280	6.67	383.95	0.7	.	.	187.352	7.1
48	K	15	3	10.530	7.33	415.45	0.4	.	.	247.770	7.0

----- HARI=0 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: COD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	112323.4993	37441.1664	1104.20	0.0001
Error	8	271.2647	33.9081		
Corrected Total	11	112594.7639			

R-Square	C.V.	Root MSE	COD Mean
0.997591	3.338524	5.823065	174.420333

Duncan's Multiple Range Test for variable: COD

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 33.90808

Number of Means	2	3	4
Critical Range	10.95	11.42	11.69

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	304.723	3	A
B	224.107	3	B
C	114.388	3	C
D	54.463	3	K



----- HARI=05 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1.2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: COD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	57355.77062	19118.59021	313.82	0.0001
Error	8	487.38287	60.92286		
Corrected Total	11	57843.15349			

R-Square	C.V.	Root MSE	COD Mean
0.991574	5.742823	7.805310	135.914167

Duncan's Multiple Range Test for variable: COD

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 60.92286

Number of Means	2	3	4
Critical Range	14.68	15.30	15.67

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	225.960	3	A
B	171.177	3	B
C	104.210	3	C
D	42.310	3	K

----- HARI=10 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: COD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	14029.01113	4676.33704	128.14	0.0001
Error	8	291.95613	36.49452		
Corrected Total	11	14320.96727			

R-Square	C.V.	Root MSE	COD Mean
0.979613	8.981222	6.041069	67.2633333

Duncan's Multiple Range Test for variable: COD

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 36.49452

Number of Means	2	3	4
Critical Range	11.36	11.84	12.13

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	110.880	3	A
B	80.977	3	B
C	60.307	3	C
D	16.890	3	K

----- HARI=15 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: COD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	7691.591567	2563.863856	90.52	0.0001
Error	8	226.579333	28.322417		
Corrected Total	11	7918.170900			

R-Square	C.V.	Root MSE	COD Mean
0.971385	12.86566	5.321881	41.3650000

Duncan's Multiple Range Test for variable: COD

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 28.32242

Number of Means	2	3	4
Critical Range	10.01	10.43	10.68

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	76.723	3	A
B	50.710	3	B
C	29.670	3	C
D	8.357	3	K

----- HARI=0 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: BOD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	31668.93022	10556.31007	106.12	0.0001
Error	8	795.79640	99.47455		
Corrected Total	11	32464.72663			

R-Square	C.V.	Root MSE	BOD Mean
0.975487	11.89291	9.973693	83.8625000

Duncan's Multiple Range Test for variable: BOD

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 99.47455

Number of Means      2      3      4  
Critical Range    18.75 19.56 20.02

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	157.333	3	A
B	103.333	3	B
C	52.560	3	C
D	22.223	3	K

----- HARI=05 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: BOD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	15057.55260	5019.18420	130.76	0.0001
Error	8	307.06980	38.38372		
Corrected Total	11	15364.62240			

R-Square	C.V.	Root MSE	BOD Mean
0.980014	9.912736	6.195460	62.500000

Duncan's Multiple Range Test for variable: BOD

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 38.38372

Number of Means	2	3	4
Critical Range	11.65	12.15	12.44

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	111.110	3	A
B	77.333	3	B
C	45.333	3	C
D	16.223	3	K

HARI=10

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: BOD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	6852.473433	2284.157811	147.91	0.0001
Error	8	123.542267	15.442783		
Corrected Total	11	6976.015700			

R-Square	C.V.	Root MSE	BOD Mean
0.982290	9.865020	3.929731	39.8350000

Duncan's Multiple Range Test for variable: BOD

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 15.44278

Number of Means	2	3	4
Critical Range	7.389	7.705	7.890

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	72.893	3	A
B	48.887	3	B
C	29.333	3	C
D	8.227	3	K

----- HARI=15 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: BOD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	2105.239825	701.746608	90.43	0.0001
Error	8	62.078667	7.759833		
Corrected Total	11	2167.318492			

R-Square	C.V.	Root MSE	BOD Mean
0.971357	12.33452	2.785648	22.5841667

Duncan's Multiple Range Test for variable: BOD

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 7.759833

Number of Means	2	3	4
Critical Range	5.238	5.462	5.593

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	42.667	3	A
B	24.890	3	B
C	16.000	3	C
D	6.780	3	K

----- HARI=0 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: VFA

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	207687.4290	69229.1430	47.55	0.0001
Error	8	11648.6011	1456.0751		
Corrected Total	11	219336.0301			

R-Square	C.V.	Root MSE	VFA Mean
0.946892	10.54198	38.15855	361.967750

Duncan's Multiple Range Test for variable: VFA

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 1456.075

Number of Means	2	3	4
Critical Range	71.75	74.82	76.61

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	575.44	3	A
B	347.14	3	B
B			
B	305.71	3	C
C	219.58	3	K





----- HARI=05 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: VFA

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	564826.8687	188275.6229	68.54	0.0001
Error	8	21974.1542	2746.7693		
Corrected Total	11	586801.0229			

R-Square	C.V.	Root MSE	VFA Mean
0.962553	10.01451	52.40963	523.337083

Duncan's Multiple Range Test for variable: VFA

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 2746.769

Number of Means	2	3	4
Critical Range	98.6	102.8	105.2

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	866.72	3	A
B	550.35	3	B
C	360.88	3	C
C			
C	315.40	3	K

----- HARI=10 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: VFA

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	978143.1410	326047.7137	64.98	0.0001
Error	8	40140.9875	5017.6234		
Corrected Total	11	1018284.1285			

R-Square	C.V.	Root MSE	VFA Mean
0.960580	10.40075	70.83519	681.058583

Duncan's Multiple Range Test for variable: VFA

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 5017.623

Number of Means      2      3      4  
Critical Range    133.2 138.9 142.2

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	1121.64	3	A
B	744.78	3	B
C	447.82	3	C
C			
C	409.99	3	K

----- HARI=15 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: VFA

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	904904.3914	301634.7971	49.18	0.0001
Error	8	49062.4022	6132.8003		
Corrected Total	11	953966.7936			

R-Square	C.V.	Root MSE	VFA Mean
0.948570	10.90107	78.31220	718.390333

Duncan's Multiple Range Test for variable: VFA

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 6132.8

Number of Means	2	3	4
Critical Range	147.3	153.5	157.2

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	1098.12	3	A
B	846.26	3	B
C	542.89	3	C
D	386.29	3	K

----- HARI=0 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: MLSS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	7.61666667	2.53888889	8.91	0.0063
Error	8	2.28000000	0.28500000		
Corrected Total	11	9.89666667			

R-Square	C.V.	Root MSE	MLSS Mean
0.769619	24.08364	0.533854	2.21666667

Duncan's Multiple Range Test for variable: MLSS

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 0.285

Number of Means	2	3	4
Critical Range	1.004	1.047	1.072

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	3.567	3	A
B	2.033	3	B
B	1.667	3	K
B	1.600	3	C

----- HARI=05 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: MLSS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	8.62250000	2.87416667	4.91	0.0320
Error	8	4.68666667	0.58583333		
Corrected Total	11	13.30916667			

R-Square	C.V.	Root MSE	MLSS Mean
0.647862	28.79238	0.765398	2.65833333

Duncan's Multiple Range Test for variable: MLSS

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 0.585833

Number of Means	2	3	4
Critical Range	1.439	1.501	1.537

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	4.100	3	A
B	2.433	3	B
B			
B	2.100	3	K
B			
B	2.000	3	C

----- HARI=10 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: MLSS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	8.71333333	2.90444444	3.68	0.0624
Error	8	6.31333333	0.78916667		
Corrected Total	11	15.02666667			

R-Square	C.V.	Root MSE	MLSS Mean
0.579858	50.28399	0.888351	1.76666667

Duncan's Multiple Range Test for variable: MLSS

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 0.789167

Number of Means	2	3	4
Critical Range	1.670	1.742	1.784

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	3.033	3	A
A			
B	1.933	3	B
B			
B	1.400	3	C
B			
B	0.700	3	K

----- HARI=15 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: MLSS

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	3.42250000	1.14083333	4.66	0.0364
Error	8	1.96000000	0.24500000		
Corrected Total	11	5.38250000			

R-Square	C.V.	Root MSE	MLSS Mean
0.635857	40.40610	0.494975	1.22500000

Duncan's Multiple Range Test for variable: MLSS

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 0.245

Number of Means	2	3	4
Critical Range	0.931	0.970	0.994

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	1.933	3	A
A			
B	1.533	3	B
B			
B	0.833	3	C
B			
B	0.600	3	K

----- HARI=0 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: PH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	0.02916667	0.00972222	1.94	0.2011
Error	8	0.04000000	0.00500000		
Corrected Total	11	0.06916667			

R-Square	C.V.	Root MSE	PH Mean
0.421687	0.997095	0.070711	7.09166667

Duncan's Multiple Range Test for variable: PH

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 0.005

Number of Means	2	3	4
Critical Range	0.133	0.139	0.142

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	7.1667	3	A
A			
A	7.1000	3	C
A			
A	7.0667	3	B
A			
A	7.0333	3	K



----- HARI=05 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: PH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	0.09583333	0.03194444	4.79	0.0340
Error	8	0.05333333	0.00666667		
Corrected Total	11	0.14916667			

R-Square	C.V.	Root MSE	PH Mean
0.642458	1.167814	0.081650	6.99166667

Duncan's Multiple Range Test for variable: PH

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 0.006667

Number of Means	2	3	4
Critical Range	0.154	0.160	0.164

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	7.1333	3	K
A			
B	7.0000	3	A
B			
B	6.9333	3	C
B			
B	6.9000	3	B

----- HARI=10 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: PH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	0.44000000	0.14666667	13.54	0.0017
Error	8	0.08666667	0.01083333		
Corrected Total	11	0.52666667			

R-Square	C.V.	Root MSE	PH Mean
0.835443	1.515776	0.104083	6.86666667

Duncan's Multiple Range Test for variable: PH

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 0.010833

Number of Means	2	3	4
Critical Range	0.196	0.204	0.209

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	7.1667	3	K
B	6.8333	3	C
B	6.8333	3	B
B	6.8333	3	B
B	6.6333	3	A

----- HARI=15 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: PH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	0.39583333	0.13194444	8.33	0.0076
Error	8	0.12666667	0.01583333		
Corrected Total	11	0.52250000			

R-Square	C.V.	Root MSE	PH Mean
0.757576	1.857278	0.125831	6.7750000

Duncan's Multiple Range Test for variable: PH

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 0.015833

Number of Means	2	3	4
Critical Range	0.237	0.247	0.253

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	7.067	3	K
B	6.733	3	C
B	6.733	3	B
B	6.567	3	A

----- HARI=05 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: GAS\_BIO

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	12760.41408	4253.47136	8.86	0.0064
Error	8	3839.30787	479.91348		
Corrected Total	11	16599.72194			

R-Square	C.V.	Root MSE	GAS_BIO Mean
0.768713	23.38589	21.90693	93.6758550

Duncan's Multiple Range Test for variable: GAS\_BIO

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 479.9135

Number of Means	2	3	4
Critical Range	41.19	42.95	43.98

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	138.57	3	A
A			
B	101.99	3	B
B			
B	86.47	3	C
C			
C	47.67	3	K

----- HARI=10 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: GAS\_BIO

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	125605.9094	41868.6365	32.90	0.0001
Error	8	10181.0071	1272.6259		
Corrected Total	11	135786.9166			

R-Square	C.V.	Root MSE	GAS_BIO Mean
0.925022	13.98856	35.67388	255.021891

Duncan's Multiple Range Test for variable: GAS\_BIO

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 1272.626

Number of Means	2	3	4
Critical Range	67.08	69.95	71.62

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	406.85	3	A
B	273.45	3	B
B	214.51	3	C
C	125.27	3	K

----- HARI=15 -----

Analysis of Variance Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12  
Analysis of Variance Procedure

Dependent Variable: GAS\_BIO

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	243478.6675	81159.5558	35.22	0.0001
Error	8	18436.6251	2304.5781		
Corrected Total	11	261915.2926			

R-Square	C.V.	Root MSE	GAS_BIO Mean
0.929608	11.42828	48.00602	420.063227

Duncan's Multiple Range Test for variable: GAS\_BIO

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 8 MSE= 2304.578

Number of Means	2	3	4
Critical Range	90.27	94.12	96.38

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	625.24	3	A
B	453.41	3	B
B			
B	369.71	3	C
C	231.88	3	K

----- HARI=0 -----

General Linear Models Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12

NOTE: Due to missing values, only 10 observations can be used in this analysis.

General Linear Models Procedure

Dependent Variable: SALMNELA

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	3	9.22992E+11	3.07664E+11	0.49	0.7001
Error	6	3.74424E+12	6.24039E+11		
Corrected Total	9	4.66723E+12			

R-Square	C.V.	Root MSE	SALMNELA Mean
0.197760	129.7358	789961.5	608900.000

Duncan's Multiple Range Test for variable: SALMNELA

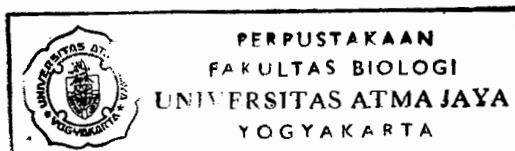
NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 6 MSE= 6.24E11  
WARNING: Cell sizes are not equal.  
Harmonic Mean of cell sizes= 2

Number of Means	2	3	4
Critical Range	1932994	2003471	2036171

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	945000	3	A
A			
A	749667	3	C
A			
A	350000	1	K
A			
A	218333	3	B



----- HARI=05 -----

General Linear Models Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12

NOTE: Due to missing values, only 9 observations can be used in this analysis.

General Linear Models Procedure

Dependent Variable: SALMNELA

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	2	35534000000	17767000000	14.96	0.0047
Error	6	7124000000	1187333333		
Corrected Total	8	42658000000			

R-Square	C.V.	Root MSE	SALMNELA Mean
0.832997	21.44670	34457.70	160666.667

Duncan's Multiple Range Test for variable: SALMNELA

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 6 MSE= 1.1873E9

Number of Means	2	3
Critical Range	68844	71354

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	232333	3	A
A			
A	170333	3	B
B	79333	3	C



----- HARI=10 -----

General Linear Models Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12

NOTE: Due to missing values, only 9 observations can be used in this analysis.

General Linear Models Procedure

Dependent Variable: SALMNELA

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	2	89746888889	44873444444	1.54	0.2889
Error	6	175046666667	29174444444		
Corrected Total	8	264793555556			

R-Square	C.V.	Root MSE	SALMNELA Mean
0.338932	155.5919	170805.3	109777.778

Duncan's Multiple Range Test for variable: SALMNELA

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 6 MSE= 2.917E10

Number of Means        2        3  
Critical Range    341256 353698

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	251000	3	A
A			
A	39333	3	B
A			
A	39000	3	C

----- HARI=15 -----

General Linear Models Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12

NOTE: Due to missing values, only 4 observations can be used in this analysis.

General Linear Models Procedure

Dependent Variable: SALMNELA

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	2	168750000.0	84375000.0	0.42	0.7365
Error	1	200000000.0	200000000.0		
Corrected Total	3	368750000.0			

R-Square	C.V.	Root MSE	SALMNELA Mean
0.457627	31.60254	14142.14	44750.0000

Duncan's Multiple Range Test for variable: SALMNELA

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 1 MSE= 2E8  
WARNING: Cell sizes are not equal.  
Harmonic Mean of cell sizes= 1.2

Number of Means 2 3  
Critical Range 231992 231992

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	51000	2	A
A			
A	41000	1	B
A			
A	36000	1	C

----- HARI=0 -----

General Linear Models Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12

NOTE: Due to missing values, only 8 observations can be used in this analysis.

General Linear Models Procedure

Dependent Variable: VIBRIO

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	2	4749333333	2374666667	1.83	0.2533
Error	5	6488666667	1297733333		
Corrected Total	7	11238000000			

R-Square	C.V.	Root MSE	VIBRIO Mean
0.422614	47.40009	36024.07	76000.0000

Duncan's Multiple Range Test for variable: VIBRIO

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 5 MSE= 1.2977E9  
WARNING: Cell sizes are not equal.  
Harmonic Mean of cell sizes= 2.571429

Number of Means      2      3  
Critical Range    81754 84265

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	107000	3	A
A			
A	61667	3	B
A			
A	51000	2	C

----- HARI=05 -----

General Linear Models Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12

NOTE: Due to missing values, only 6 observations can be used in this analysis.

General Linear Models Procedure

Dependent Variable: VIBRIO

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	2	679000000.0	339500000.0	0.37	0.7180
Error	3	2747000000.0	915666666.7		
Corrected Total	5	3426000000.0			

R-Square	C.V.	Root MSE	VIBRIO Mean
0.198190	54.03569	30259.98	56000.0000

Duncan's Multiple Range Test for variable: VIBRIO

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 3 MSE= 9.1567E8

Number of Means	2	3
Critical Range	96177	96549

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	68500	2	B
A			
A	57000	2	A
A			
A	42500	2	C

----- HARI=10 -----

General Linear Models Procedure  
Class Level Information

Class	Levels	Values
PERL	4	A B C K
UL	3	1 2 3

Number of observations in by group = 12

NOTE: Due to missing values, only 4 observations can be used in this analysis.

General Linear Models Procedure

Dependent Variable: VIBRIO

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
PERL	2	620500000.0	310250000.0	620.50	0.0284
Error	1	500000.0	500000.0		
Corrected Total	3	621000000.0			

R-Square	C.V.	Root MSE	VIBRIO Mean
0.999195	1.790144	707.1068	39500.0000

Duncan's Multiple Range Test for variable: VIBRIO

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 1 MSE= 500000  
WARNING: Cell sizes are not equal.  
Harmonic Mean of cell sizes= 1.2

Number of Means 2 3  
Critical Range 11600 11600

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	PERL
A	61000.0	1	B
B	34000.0	1	C
B			
B	31500.0	2	A

OBS	PERL	HARI	COD	VFA	MLSS	GAS_BIO
1	A	0	304.723	575.44	3.56667	0.000
2	A	05	225.960	866.72	4.10000	138.574
3	A	10	110.880	1121.64	3.03333	406.853
4	A	15	76.723	1098.12	1.93333	625.245
5	B	0	224.107	347.14	2.03333	0.000
6	B	05	171.177	550.35	2.43333	101.990
7	B	10	80.977	744.78	1.93333	273.452
8	B	15	50.710	846.26	1.53333	453.413
9	C	0	114.388	305.71	1.60000	0.000
10	C	05	104.210	360.88	2.00000	86.470
11	C	10	60.307	447.82	1.40000	214.512
12	C	15	29.670	542.89	0.83333	369.715
13	K	0	54.463	219.58	1.66667	0.000
14	K	05	42.310	315.40	2.10000	47.669
15	K	10	16.890	409.99	0.70000	125.271
16	K	15	8.357	386.29	0.60000	231.880

CORRELATION ANALYSIS

4 'VAR' Variables: COD VFA MLSS GAS\_BIO

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
COD	16	104.74071	85.16346	1676	8.35667	304.72333
VFA	16	571.18844	283.36065	9139	219.58333	1122
MLSS	16	1.96667	0.96548	31.46667	0.60000	4.10000
GAS_BIO	16	192.19024	189.26983	3075	0	625.24476

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 16

	COD	VFA	MLSS	GAS_BIO
COD	1.00000 .0.0	0.13526 0.6175	0.81541 0.0001	-0.39749 0.1274
VFA	0.13526 0.6175	1.00000 0.0	0.43322 0.0937	0.78817 0.0003
MLSS	0.81541 0.0001	0.43322 0.0937	1.00000 0.0	-0.16641 0.5379
GAS_BIO	-0.39749 0.1274	0.78817 0.0003	-0.16641 0.5379	1.00000 0.0

Model: MODEL1  
 Dependent Variable: MLSS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	9.29670	9.29670	27.778	0.0001
Error	14	4.68552	0.33468		
C Total	15	13.98222			
Root MSE		0.57852	R-square	0.6649	
Dep Mean		1.96667	Adj R-sq	0.6410	
C.V.		29.41603			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob >  T
INTERCEP	1	0.998431	0.23380897	4.270	0.0008
COD	1	0.009244	0.00175394	5.270	0.0001

Dependent Variable: VFA

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	22034.26622	22034.26622	0.261	0.6175
Error	14	1182364.5915	84454.61368		
C Total	15	1204398.8577			
Root MSE		290.61076	R-square	0.0183	
Dep Mean		571.18844	Adj R-sq	-0.0518	
C.V.		50.87826			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob >  T
INTERCEP	1	524.051012	117.45136120	4.462	0.0005
COD	1	0.450039	0.88107473	0.511	0.6175



Dependent Variable: GAS\_BIO

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	84898.82149	84898.82149	2.627	0.1274
Error	14	452447.19113	32317.65651		
C Total	15	537346.01262			
Root MSE	179.77112	R-square	0.1580		
Dep Mean	192.19024	Adj R-sq	0.0979		
C.V.	93.53811				

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob >  T
INTERCEP	1	284.717012	72.65513180	3.919	0.0015
COD	1	-0.883389	0.54503073	-1.621	0.1274

Dep Variable: GAS\_BIO

## Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Regression	1	28035.21077	28035.21077	0.771	0.3948
Error	14	509310.80185	36379.34299		
C Total	15	537346.01262			
Root MSE		190.73370	R-Square	0.0522	
Dep Mean		192.19024	Adj R-Sq	-0.0155	
C.V.		99.24213			

## Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob >  T
INTERCEP	1	280.253465	111.07206236	2.523	0.0244
MLSS	1	-44.777909	51.00812100	-0.878	0.3948

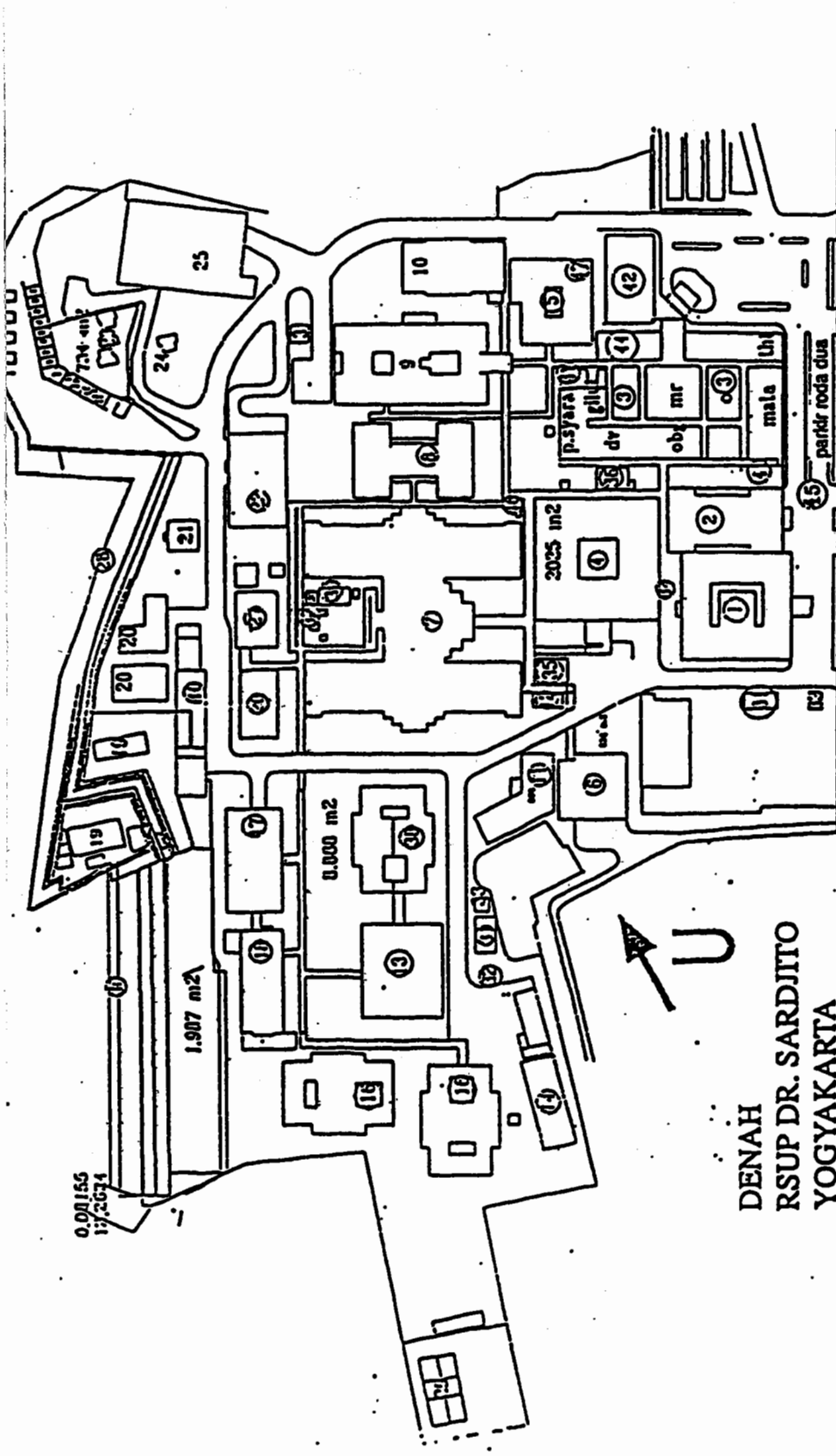
Model: MODEL1  
Dep Variable: VFA

## Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Regression	1	748180.88183	748180.88183	22.959	0.0003
Error	14	456217.97589	32586.99828		
C Total	15	1204398.8577			
Root MSE		180.51869	R-Square	0.6212	
Dep Mean		571.18844	Adj R-Sq	0.5942	
C.V.		31.60405			

## Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob >  T
INTERCEP	1	344.406937	65.39658318	5.266	0.0001
GAS_BIO	1	1.179984	0.24626073	4.792	0.0003



**DENAH  
RSUP DR. SARDJITO  
YOGYAKARTA**

- |                                     |                              |                               |                        |                              |
|-------------------------------------|------------------------------|-------------------------------|------------------------|------------------------------|
| 1. Instalasi Radiologi              | 11. Kedokteran Nuklir        | 19. Sentral Pengolahan Limbah | 29. Lapangan Tennis    | 39. Walet Treatment          |
| 2. Instalasi Rawat Darurat          | 12. Ruang Tunggu ICU         | 20. Instalasi Farmasi         | 30. Turap              | 40. Garasi                   |
| 3. Instalasi Rawat Jalan            | 13. Menza                    | 21. Masjid                    | 31. KK Daya Listrik    | 41. Laboratorium Klinik      |
| 4. Instalasi Bedah Sentral          | 14. Rumah Pembangkit Listrik | 22. Dapur / Pencucian         | 32. Pos Keamanan       | 42. Poli Bedah               |
| 5. Administrasi Lama                | 15. Gudang                   | 23. Perumahan Dinas           | 33. Gardu Trafo        | 43. Sungal Code              |
| 6. Kamar Masyal                     | 16. I. Asrama Putri          | 24. Guest House               | 34. Poliklinik Pegawai | 44. Pulmonologi / Cardiologi |
| 7. Bangsal Perawatan Dewasa WARD    | 16. II. Asrama Putra CEU     | 25. Administrasi Pusat        | 35. Kafetaria          | 45. Parkir Roda Dua          |
| 8. Baslanet                         | 16. III. Asrama Putra        | 26. IPSAP                     | 36. AC Sentral         | 46. Km/WC Umum               |
| 9. Bangsal Perawatan Anak (IRNA II) | 17. Pav. Kusuma              | 27. ISBFL                     | 37. Pompa              | 47. Apotek KF                |
| 10. P.R.M.                          | 18. Pav. Wijaya              | 28. Incenerator               | 38. Pompa Deep Well    |                              |