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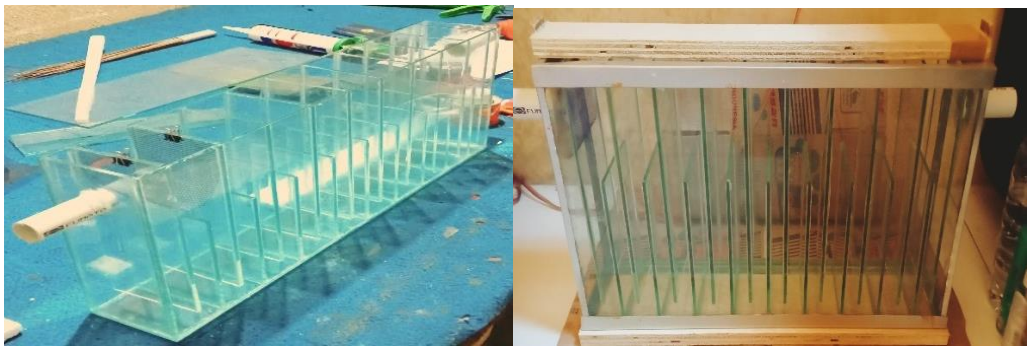
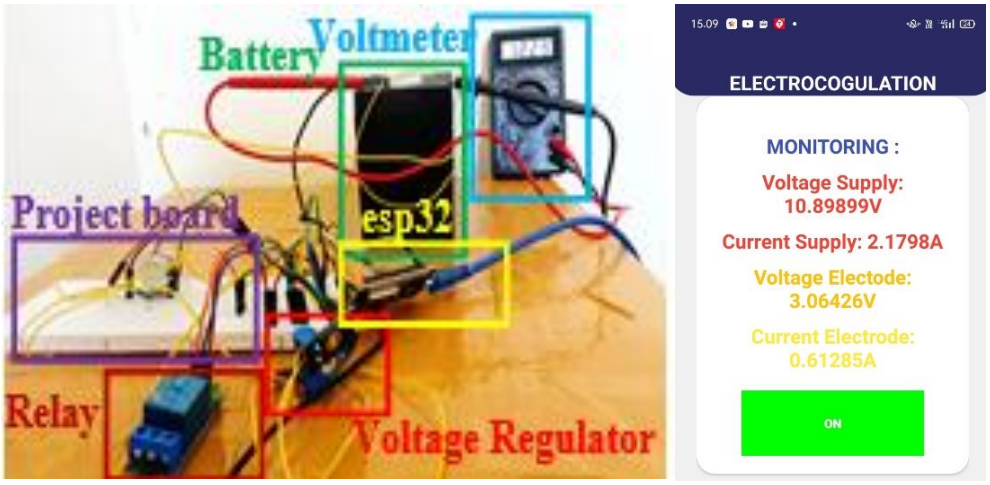
LAMPIRAN

Lampiran 1 Dokumentasi

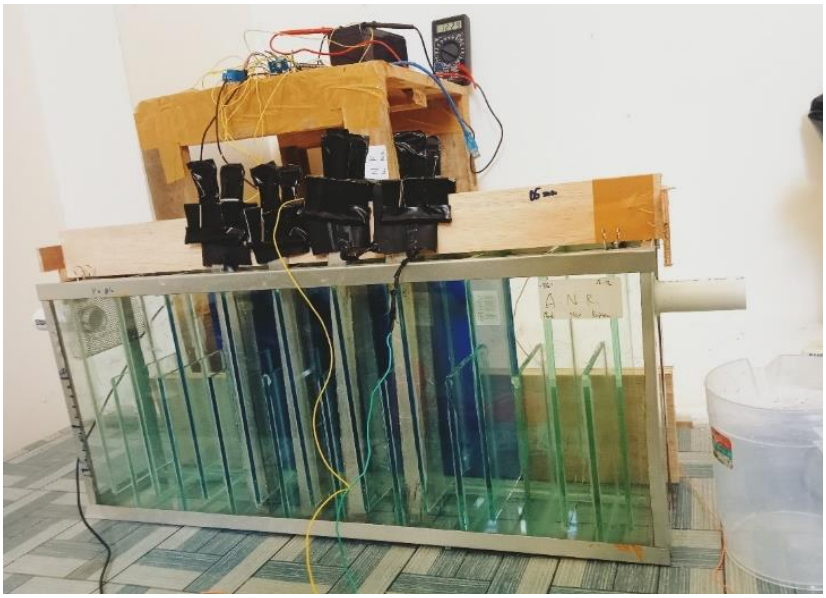


Desain dan pembuatan reaktor

Material elektrode (komersil), Nikel (atas) dan Aluminium (bawah)

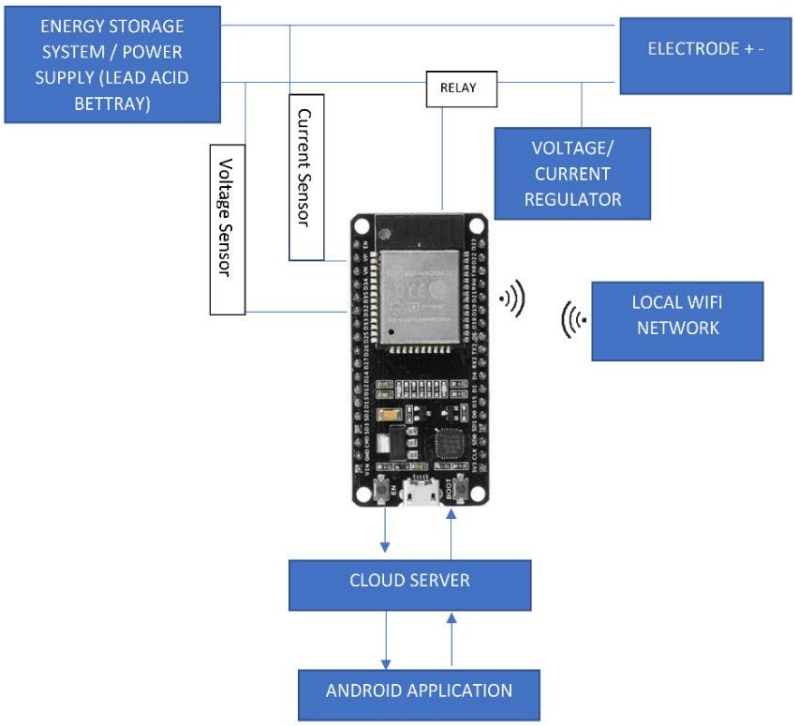


Sensor catu daya (kiri) dan tampilan aplikasi android untuk buka-tutup *power* dan pemantauannya (kanan)

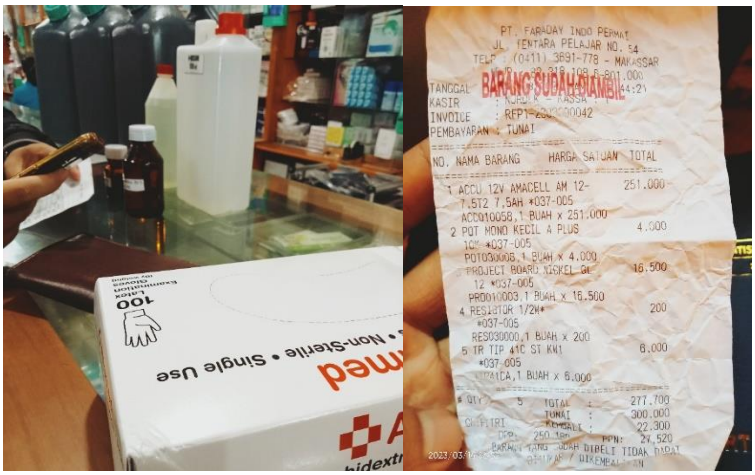


***Set-up* reaktor elektrokoagulasi aliran kontinu saluran tunggal dan sensor catu dayanya**

Proses pengambilan sampel air limbah rumah makan lokal di Kota Makassar, serta uji suhu, pH dan konduktivitasnya



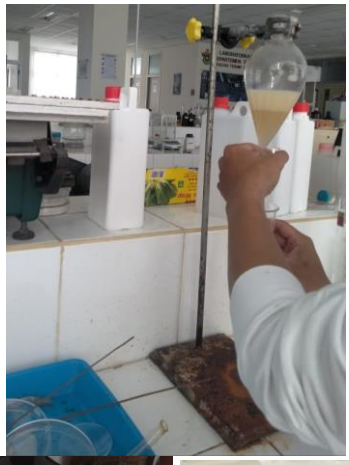
ESP32 dan pin koneksinya (atas), serta perangkat sensor lainnya (bawah)



Penyiapan alat dan bahan uji laboratorium

Uji BOD (atas) dan COD (bawah)

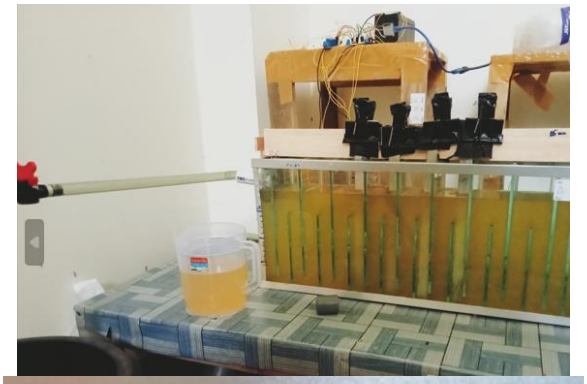
Uji Amonia



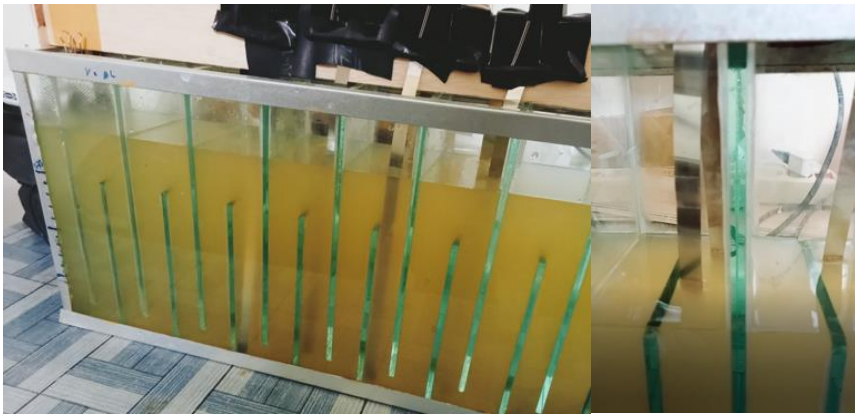
Uji minyak dan lemak

Uji TSS

Inlet (kiri), outlet dengan aluminium (tengah) dan outlet dengan nikel (kanan)



Proses pengolahan dengan elektrode berbahan aluminium



Proses pengolahan dengan elektrode berbahan nikel

Lampiran 2 Detail Analisis Data

Input data SPSS & Matlab:
Prediktor (*Independent Variables*):

Suplai Arus (A) (x1)	Suplai Tegangan (V) (x2)	Densitas Arus (mA/cm^2) (x3)	Muatan Listrik (C/L) (x4)	Konduktivitas (mS/cm) (x5)
0,61	2,81	10,11	3,03	19,28
0,55	2,77	9,22	2,77	19,30
0,56	2,81	9,37	2,81	19,30
0,33	1,65	5,50	1,65	19,30
0,35	1,76	5,88	1,76	19,35
0,32	1,62	5,39	1,62	19,35

Observasi (*Dependent Variables*):

pH	Suhu (^oC)	BOD (mg/L)	COD (mg/L)	TSS (mg/L)	Minyak-Lemak (mg/L)	Amonia (mg/L)
7,00	28,20	144	150	240	20	22,852
7,20	28,20	120	147	253	16	22,779
7,20	28,00	160	170	227	20	22,120
6,80	27,80	456	586	800	900	70,710
6,80	27,60	448	576	813	880	52,123
6,70	27,80	472	592	787	900	52,049

Variabel Input Persamaan dalam Analisis:

Variabel Perhitungan	Keterangan Nilai
***I* = Arus Elektrode (A)**	Aluminium (0,6 A) dan nikel (0,3 A)
***A* = Luas Permukaan Elektrode (cm^2)**	Aluminium dan Nikel (60 cm^2)
***U* = Tegangan Elektrode**	Aluminium (3V) dan Nikel (2V)
C_0	Konsentrasi Awal Parameter Air Limbah (*Inlet* atau Sebelum Pengolahan)
C_1	Konsentrasi Akhir Parameter Air Limbah (*Outlet* atau Setelah Pengolahan)
m_0 **(Massa Awal Elektrode)**	Aluminium (43 g), Nikel (4 g)
m_1 **(Massa Akhir Elektrode)**	Aluminium (41 g), Nikel (3 g)

Variabel Perhitungan	Keterangan Nilai
t_{EC} **(Waktu Elektrolisis)**	20 menit; 1.200 s
V **(Volume Elektrolisis)**	4 L
z **(Jumlah Elektron)**	Aluminium (3), Nikel (2)
F **(Konstanta *Faradaic*)**	96,487 C/mol
H **(Hidrogen per Elektron)**	½ (rata-rata logam)
M_w **(Berat Molekul Elektrode)**	Aluminium (27 g/mol), Nikel (59 g/mol)

Lampiran 3 Data Pendukung, Hasil Uji Laboratorium dan Izin Riset

Jumlah Rumah Makan di Kota Makassar				
No.	**Kecamatan**	**2017**	**2018**	**2019**
1.	Mariso	29	31	31
2.	Mamajang	48	50	50
3.	Tamalate	51	52	52
4.	Rappocini	51	52	52
5.	Makassar	42	43	43
6.	Ujung Pandang	146	151	153
7.	Wajo	73	74	74
8.	Bontoala	18	19	19
9.	Ujung Tanah	2	2	2
10.	Kep. Sangkarrang	-	-	-
11.	Tallo	7	7	7
12.	Panakkukang	136	145	145
13.	Manggala	4	4	4
14.	Biringkanaya	21	21	21
15.	Tamalanrea	61	62	62
Kota Makassar		689	713	715

Sumber: Badan Pusat Statistik (BPS) Kota Makassar, 2020

Jumlah Rumah Makan di Indonesia				
No	**Provinsi**	**2018**	**2019**	**2020**
1.	Aceh	21	21	20
2.	Sumatera Utara	191	235	125
3.	Sumatera Barat	68	91	91
4.	Riau	125	376	317
5.	Jambi	34	38	42
6.	Sumatera Selatan	132	180	227

Jumlah Rumah Makan di Indonesia				
No	**Provinsi**	**2018**	**2019**	**2020**
7.	Bengkulu	18	25	21
8.	Lampung	39	95	126
9.	Kep. Bangka Belitung	19	23	26
10.	Kepulauan Riau	114	114	107
11.	D.K.I. Jakarta	3.021	3.182	3.923
12.	Jawa Barat	1.231	1.201	1.038
13.	Jawa Tengah	289	297	241
14.	D.I. Yogyakarta	157	163	170
15.	Jawa Timur	640	681	488
16.	Banten	584	581	398
17.	Bali	408	397	141
18.	Nusa Tenggara Barat	29	29	21
19.	Nusa Tenggara Timur	25	25	22
20.	Kalimantan Barat	43	46	37
21.	Kalimantan Tengah	26	26	33
22.	Kalimantan Selatan	59	63	73
23.	Kalimantan Timur	109	103	92
24.	Kalimantan Utara	1	19	14
25.	Sulawesi Utara	47	47	27
26.	Sulawesi Tengah	4	4	5
27.	Sulawesi Selatan	150	144	132
28.	Sulawesi Tenggara	14	20	17
29.	Gorontalo	10	10	11
30.	Sulawesi Barat	2	2	1
31.	Maluku	20	20	15
32.	Maluku Utara	26	24	15
33.	Papua Barat	4	3	4
34.	Papua	20	19	22
Indonesia		**7.680**	**8.304**	**8.042**

Sumber: Badan Pusat Statistik (BPS) Indonesia, 2020

Jenis Makanan	Jumlah	Keterangan
Coto (Khas Makassar dan Sulawesi)	35	Terdata
Masakan Sari Laut	22	Terdata
Masakan Padang	7	Terdata
Lainnya (warung umum)	250	Terdata
Total	314	Terdata

Sumber: Dinas Pariwisata Kota Makassar, 2022s

Jenis Makanan	Jumlah	Keterangan
Coto (Khas Makassar dan Sulawesi)	1	Terdata (Usaha yang Mendaftar)
Masakan Sari Laut	2	Terdata (Usaha yang Mendaftar)
Masakan Padang	0	Terdata (Usaha yang Mendaftar)
Lainnya (Kafe dan Restoran)	348	Terdata (Usaha yang Mendaftar)
Total	351	Terdata (Usaha yang Mendaftar)

Sumber: Dinas Penanaman Modal dan Pelayanan Terpadu Satu Pintu Kota (DPMPTSP) Kota Makassar 2022 (*website*: oss.go.id)

Jenis Makanan	Jumlah	Keterangan
Coto (Khas Makassar dan Sulawesi)	19	Terdata
Masakan Sari Laut	18	Terdata
Masakan Padang	14	Terdata
Lainnya	-	-
Total	51	Terdata

Sumber: Google Earth Pro, 2023

LABORATORIUM KUALITAS AIR
DEPARTEMEN TEKNIK LINGKUNGAN
FAKULTAS TEKNIK UNIVERSITAS HASANUDDIN
Lantai 3 Gedung Sipil Fakultas Teknik Universitas Hasanuddin
Jln. Poros Malino KM.6, Bonto Marannu (92172) Gowa, Sulawesi Selatan
WATER QUALITY LABORATORY

LAPORAN HASIL UJI KARAKTERISTIK RUMAH MAKAN

Berdasarkan uji pendahuluan sampel air limbah rumah makan lokal di Kota Makassar yang dilakukan di Laboratorium Kualitas Air Departemen Teknik Lingkungan Fakultas Teknik Universitas Hasanuddin, Kabupaten Gowa Sulawesi Selatan, oleh:

Nama Praktikan	:	Abdi Nur Rajalau
NIM	:	D092211004
Program Studi	:	S2 (Magister)-Teknik Lingkungan
Lokasi Sampel	:	Rumah Makan Lokal, Kota Makassar, Sulawesi Selatan
Lokasi Uji	:	Laboratorium Kualitas Air, Departemen Teknik Lingkungan Fakultas Teknik Universitas Hasanuddin
Hari, Tanggal Sampel	:	Jum'at, 17 Februari 2023 – 28 Maret 2023
Hari, Tanggal Analisis	:	Jum'at, 17 Februari 2023 – 29 Maret 2023

Maka, dengan ini dilampirkan karakteristik air limbah sebagai berikut.

Rumah Makan	Parameter	Hari ke-1	Hari ke-2	Hari ke-3	*Mean*	*BM	**Ket.
Rumah Makan X	pH	7.22	4.05	6.88	6.05	6 -- 9	M-TM
	Suhu (°C)	28	28	28.2	28.1	N/A	N/A
	BOD (mg/L)	100	260	300	220	30	TM
	COD (mg/L)	360	976	768	701	100	TM
	TSS (mg/L)	3375	9640	1730	4915	30	TM
	M & L (mg/L)	3226	2705	3834	3255	5	TM
	Amonia (mg/L)	6.049	136.360	25.131	55.847	10	M-TM
	Konduktivitas (mS/cm)	12.05	81.4	9.38	34.28	N/A	N/A
Rumah Makan Y	pH	7.43	3.55	4.92	5.30	6 – 9	M-TM
	Suhu	26	28.4	28.2	27.5	N/A	N/A
	BOD (mg/L)	360	800	600	587	30	TM
	COD (mg/L)	480	1256	776	837	100	TM
	TSS (mg/L)	1190	8060	2260	3837	30	TM
	M & L (mg/L)	1606	31016	42714	25112	5	TM
	Amonia (mg/L)	6.778	49.828	75.989	44.198	10	M-TM
	Konduktivitas (mS/cm)	5.01	35.2	35.7	25.30	N/A	N/A
Rumah Makan Z	pH	5.75	5.03	3.43	4.74	6 – 9	TM
	Suhu	27	28.2	28	27.7	N/A	N/A
	BOD (mg/L)	360	1000	350	570	30	TM
	COD (mg/L)	520	2064	784	1123	100	TM
	TSS (mg/L)	2260	16890	2410	7187	30	TM
	M & L (mg/L)	941	7258	1937	3379	5	TM
	Amonia (mg/L)	4.769	12.874	12.691	10.111	10	M-TM
	Konduktivitas (mS/cm)	11.54	19.7	19.28	16.84	N/A	N/A

LABORATORIUM KUALITAS AIR
DEPARTEMEN TEKNIK LINGKUNGAN
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WATER QUALITY LABORATORY

(dengan pengenceran)

Parameter	Sebelum Pengenceran	Setelah Pengenceran	*BM	**Ket.
pH	4.67	6.13	6 -- 9	TM-M
Suhu (ºC)	27.9	26.6	N/A	TM
BOD (mg/L)	600	150	30	TM
COD (mg/L)	900	225	100	TM
TSS (mg/L)	1220	305	30	TM
M & L (mg/L)	1494	373	5	TM
Amonia (mg/L)	74.987	18.75	10	TM
Konduktivitas (mS/cm)	19.29	156.02	N/A	TM

*Baku mutu didasarkan pada PerMen LHK No. 68 Th. 2016, tentang Baku Mutu Air Limbah Domestik, khususnya **Rumah Makan.**
**Ket: M = Memenuhi, TM = Tidak Memenuhi, N/A = Tanpa Keterangan (Tidak Ada Data).

Demikian hasil laporan uji laboratorium ini agar dapat digunakan sebagaimana mestinya.

Mengetahui,
Laboran Laboratorium Kualitas Air
Departemen Teknik Lingkungan,

Syarifuddin, S.T.
NIP. 19660730 198903 1 003

Praktikan Laboratorium Kualitas Air
Departemen Teknik Lingkungan,

Abdi Nur Rajalau
NIM. D092211004

LABORATORIUM KUALITAS AIR
DEPARTEMEN TEKNIK LINGKUNGAN
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Jln. Poros Malino KM.6, Bonto Marannu (92172) Gowa, Sulawesi Selatan
WATER QUALITY LABORATORY

LAPORAN HASIL UJI PENGOLAHAN AIR LIMBAH RUMAH MAKAN

Berdasarkan uji olahan skala laboratorium terhadap sampel air limbah rumah makan lokal (Kota Makassar) yang dilakukan di Laboratorium Kualitas Air Departemen Teknik Lingkungan Fakultas Teknik Universitas Hasanuddin, Kab. Gowa Sulawesi Selatan, oleh:

Nama Praktikan	:	Abdi Nur Rajalau
NIM	:	D092211004
Program Studi	:	S2 (Magister)-Teknik Lingkungan
Lokasi Sampel	:	Rumah Makan Lokal, Kota Makassar, Sulawesi Selatan
Lokasi Uji	:	Laboratorium Kualitas Air Departemen Teknik Lingkungan Fakultas Teknik Universitas Hasanuddin
Hari, Tanggal Sampel	:	Kamis, 30 Maret 2023 – 7 Mei 2023
Hari, Tanggal Analisis	:	Kamis, 30 Maret 2023 – 7 Mei 2023

Maka, dengan ini dilampirkan hasil sebagai berikut.

Elektroda	Parameter	Influen 1	Influen 2	Influen 3	*Mean*	*BM	**Ket.
Aluminium (Al)	pH	4.70	4.60	4.70	4.67	6 -- 9	TM
	Suhu (°C)	28	27.8	28	27.9	N/A	N/A
	BOD (mg/L)	600	580	620	600	30	TM
	COD (mg/L)	900	880	920	900	100	TM
	TSS (mg/L)	1225	1230	1205	1220	30	TM
	M & L (mg/L)	1497	1487	1497	1494	5	TM
	Amonia (mg/L)	74.938	74.902	75.121	74.987	10	TM
	Konduktivitas (mS/cm)	19.28	19.30	19.30	19.29	N/A	N/A
Nikel (Ni)	pH	4.70	4.70	4.60	4.67	6 -- 9	TM
	Suhu (°C)	27.8	27.8	27.8	27.8	N/A	N/A
	BOD (mg/L)	600	580	620	600	30	TM
	COD (mg/L)	900	880	920	900	100	TM
	TSS (mg/L)	1225	1230	1205	1220	30	TM
	M & L (mg/L)	1497	1487	1497	1494	5	TM
	Amonia (mg/L)	74.938	74.902	75.121	74.987	10	TM
	Konduktivitas (mS/cm)	19.30	19.35	19.35	19.33	N/A	N/A

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(dikali faktor pengenceran = 4)

Elektroda	Parameter	Efluen 1	Efluen 2	Efluen 3	*Mean*	*BM	**Ket.
Aluminium (Al)	pH	7.00	7.20	7.20	7.13	6 -- 9	M
	Suhu (°C)	28.2	28.2	28	28.1	N/A	N/A
	BOD (mg/L)	144	120	160	141	30	TM
	COD (mg/L)	150	147	170	156	100	TM
	TSS (mg/L)	240	253	227	240	30	TM
	M & L (mg/L)	20	16	20	19	5	TM
	Amonia (mg/L)	22.852	22.779	22.120	22.584	10	TM
	Konduktivitas (mS/cm)	19.28	19.30	19.30	19.29	N/A	N/A
Nikel (Ni)	pH	6.80	6.80	6.70	6.77	6 -- 9	M
	Suhu (°C)	27.8	27.6	27.8	27.7	N/A	N/A
	BOD (mg/L)	456	448	472	459	30	TM
	COD (mg/L)	586	576	592	585	100	TM
	TSS (mg/L)	800	813	787	800	30	TM
	M & L (mg/L)	900	880	900	893	5	TM
	Amonia (mg/L)	70.71	52.12	52.05	58.294	10	TM
	Konduktivitas (mS/cm)	19.30	19.35	19.35	19.33	N/A	N/A

*Baku mutu didasarkan pada PerMen LHK No. 68 Th. 2016, tentang Baku Mutu Air Limbah Domestik, khususnya **Rumah Makan.**
**Ket: M = Memenuhi, TM = Tidak Memenuhi, N/A = Tanpa Keterangan (Tidak Ada Data).

(tanpa dikali faktor pengenceran/skala pengenceran dan ditambahkan dengan elektrolit)

Elektroda	Parameter	Influen 1	Influen 2	Influen 3	*Mean*	*BM	**Ket.
Aluminium (Al)	pH	6.00	6.20	6.20	6.13	6 -- 9	M
	Suhu (°C)	26.4	26.8	26.5	26.6	N/A	N/A
	BOD (mg/L)	150	145	155	150	30	TM
	COD (mg/L)	225	220	230	225	100	TM
	TSS (mg/L)	306	308	301	305	30	TM
	M & L (mg/L)	374	372	374	373	5	TM
	Amonia (mg/L)	18.735	18.725	18.780	18.75	10	TM
	Konduktivitas (mS/cm)	156.13	155.52	156.4	156.02	N/A	N/A
Nikel (Ni)	pH	6.20	6.00	6.20	6.13	6 -- 9	M
	Suhu (°C)	26.4	26.8	26.6	27	N/A	N/A
	BOD (mg/L)	150	145	155	150	30	TM
	COD (mg/L)	225	220	230	225	100	TM

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	Parameter	Influen 1	Influen 2	Influen 3	*Mean*	*BM	**Ket.
	TSS (mg/L)	306	308	301	305	30	TM
	M & L (mg/L)	374	372	374	373	5	TM
	Amonia (mg/L)	18.735	18.725	18.780	18.747	10	TM
	Konduktivitas (mS/cm)	156.13	155.52	156.4	156.02	N/A	N/A

Elektroda	Parameter	Efluen 1	Efluen 2	Efluen 3	*Mean*	*BM	**Ket.
Aluminium (Al)	pH	7.00	7.20	7.20	7.13	6 -- 9	M
	Suhu (°C)	27.2	27.4	27.2	27.3	N/A	N/A
	BOD (mg/L)	36	30	40	35	30	TM
	COD (mg/L)	38	37	42	39	100	TM
	TSS (mg/L)	60	63	57	60	30	TM
	M & L (mg/L)	5	4	5	5	5	TM
	Amonia (mg/L)	5.71	5.69	5.53	5.65	10	TM
	Konduktivitas (mS/cm)	156.13	155.52	156.4	156.02	N/A	N/A
Nikel (Ni)	pH	6.80	6.70	6.80	6.77	6 -- 9	M
	Suhu (°C)	26.6	26.8	26.8	26.7	N/A	N/A
	BOD (mg/L)	114	112	118	115	30	TM
	COD (mg/L)	146	144	148	146	100	TM
	TSS (mg/L)	200	203	197	200	30	TM
	M & L (mg/L)	225	220	225	223	5	TM
	Amonia (mg/L)	17.677	13.031	13.012	14.573	10	TM
	Konduktivitas (mS/cm)	156.13	155.52	156.4	156.02	N/A	N/A

*Baku mutu didasarkan pada PerMen LHK No. 68 Th. 2016, tentang Baku Mutu Air Limbah Domestik, khususnya **Rumah Makan**.
**Ket: M = Memenuhi, TM = Tidak Memenuhi, N/A = Tanpa Keterangan (Tidak Ada Data).

t > 20 menit (pembanding)

Elektroda	Parameter	Influen	Efluen	*BM	**Ket.
Aluminium (Al)	pH	6.00	7.20	6 -- 9	M
	Suhu (°C)	26.4	27.8	N/A	N/A
	BOD (mg/L)	600	220	30	TM
	COD (mg/L)	920	200	100	TM
	TSS (mg/L)	1230	290	30	TM
	M & L (mg/L)	1497	199	5	TM
	Amonia (mg/L)	74.938	32.605	10	TM
	Konduktivitas (mS/cm)	156.13	156.14	N/A	N/A
Nikel	pH	6.00	6.80	6 -- 9	M

(Ni)	Parameter	Influen	Efluen	BM	Ket.
	Suhu (°C)	26.4	27.0	N/A	N/A
	BOD (mg/L)	600	474	30	TM
	COD (mg/L)	920	632	100	TM
	TSS (mg/L)	1230	877	30	TM
	M & L (mg/L)	1497	989	5	TM
	Amonia (mg/L)	74.938	60.047	10	TM
	Konduktivitas (mS/cm)	156.13	156.14	N/A	N/A

t < 20 min (pembanding)

Elektroda	Parameter	Influen	Efluen	*BM	**Ket.
Aluminium (Al)	pH	6.00	6.80	6 -- 9	M
	Suhu (°C)	26.4	26.8	N/A	N/A
	BOD (mg/L)	600	314	30	TM
	COD (mg/L)	920	416	100	TM
	TSS (mg/L)	1230	597	30	TM
	M & L (mg/L)	1497	469	5	TM
	Amonia (mg/L)	74.938	45.393	10	TM
	Konduktivitas (mS/cm)	156.13	156.12	N/A	N/A
Nikel (Ni)	pH	6.00	6.40	6 -- 9	M
	Suhu (°C)	26.4	26.6	N/A	N/A
	BOD (mg/L)	600	490	30	TM
	COD (mg/L)	920	680	100	TM
	TSS (mg/L)	1230	950	30	TM
	M & L (mg/L)	1497	1079	5	TM
	Amonia (mg/L)	74.938	62.297	10	TM
	Konduktivitas (mS/cm)	156.13	156.12	N/A	N/A

*Baku mutu didasarkan pada PerMen LHK No. 68 Th. 2016, tentang Baku Mutu Air Limbah Domestik, khususnya **Rumah Makan.**

**Ket: M = Memenuhi, TM = Tidak Memenuhi, N/A = Tanpa Keterangan (Tidak Ada Data).

LABORATORIUM KUALITAS AIR
DEPARTEMEN TEKNIK LINGKUNGAN
FAKULTAS TEKNIK UNIVERSITAS HASANUDDIN
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Jln. Poros Malino KM.6, Bonto Marannu (92172) Gowa, Sulawesi Selatan
WATER QUALITY LABORATORY

Kombinasi elektroda (pembanding)

Elektroda	Parameter	Influen	Efluen	*BM	**Ket.
Ni-Al	pH	6.00	6.20	6 -- 9	M
	Suhu (^oC)	26.4	26.6	N/A	N/A
	BOD (mg/L)	600	452	30	TM
	COD (mg/L)	920	608	100	TM
	TSS (mg/L)	1230	887	30	TM
	M & L (mg/L)	1497	780	5	TM
	Amonia (mg/L)	74.938	58.565	10	TM
	Konduktivitas (mS/cm)	156.13	156.12	N/A	N/A

*Baku mutu didasarkan pada PerMen LHK No. 68 Th. 2016, tentang Baku Mutu Air Limbah Domestik, khususnya **Rumah Makan.**
**Ket: M = Memenuhi, TM = Tidak Memenuhi, N/A = Tanpa Keterangan (Tidak Ada Data).

Demikian hasil laporan uji laboratorium ini agar dapat digunakan sebagaimana mestinya.

Mengetahui,
Laboran Laboratorium Kualitas Air
Departemen Teknik Lingkungan,

Syarifuddin, S.T.
NIP. 19660730 198903 1 003

Praktikan Laboratorium Kualitas Air
Departemen Teknik Lingkungan,

Abdi Nur Rajalau
NIM. D092211004

KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN
UNIVERSITAS HASANUDDIN
FAKULTAS TEKNIK
Jalan Poros Malino Km. 6 Bontomarannu, 92171 Gowa Sulawesi Selatan
☎ (0411) 586015, 586262 Fax (0411) 586015.
http://eng.unhas.ac.id. E-mail:teknik@unhas.ac.id

Nomor : 29299/UN4.7.1/PT.01.04/2022 27 Desember 2022
Lamp. : --
H a l : Permohonan izin penelitian / Pengambilan Data

Kepada
Yth. : Kepala Laboratorium Kualitas Air
Departemen Teknik Lingkungan Fakultas Teknik
Di
Tempat

Dengan hormat, sehubungan dengan surat Ketua Program Studi S2 Teknik Lingkungan Fakultas Teknik Universitas Hasanuddin nomor : 29019/UN4.7.8/PT.01.04/2022 tanggal 23 Desember 2022 perihal sebagaimana pada pokok surat diatas, dengan ini kami sampaikan bahwa mahasiswa yang namanya tercantum dibawah ini :

Nama	: Abdi Nur Rajalau
Stambuk	: D092211004
Program Pendidikan	: S2 (Magister)
Program Studi	: Teknik Lingkungan
Konsentrasi	: Kualitas Air

Bermaksud melakukan penelitian/ pengambilan data dalam rangka penulisan tesis dengan judul : "Pengolahan Air Limbah Dapur Rumah Makan X di Kota Makassar Menggunakan Proses Elektrokoagulasi dengan Performa Reaktor Continuous Flow-SingleChannel."

Pembimbing : - Dr. Ir. Achmad Zubair, M.Sc.
- Dr. Roslinda Ibrahim, S.P., MT

Lokasi Penelitian : Laboratorium Kualitas Air Departemen Teknik Lingkungan

Atas perhatian dan kerjasama yang baik, kami sampaikan terima kasih.

a.n. Dekan
Wakil Dekan Bidang Akademik dan Kemahasiswaan

Dr. Amil Ahmad Ilham, ST., M.IT
NIP. 19731010 199802 1 001

Tembusan :
1. Dekan Fakultas Teknik UNHAS
2. Ketua Program Studi S2 Teknik Lingkungan
3. Mahasiswa yang bersangkutan

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN
FAKULTAS TEKNIK
Jalan Poros Malino Km. 6 Bontomarannu, 92171 Gowa Sulawesi Selatan
☎ (0411) 586015, 586262 Fax (0411) 586015.
http://eng.unhas.ac.id. E-mail:teknik@unhas.ac.id

Nomor : 28669/UN4.7.1/PT.01.04/2022 21 Desember 2022
Lamp. : --
H a l : Permohonan izin penelitian / Pengambilan Data

Kepada
Yth. : Rumah Makan
Di
Kota Makassar

Dengan hormat, sehubungan dengan surat Ketua Program Studi S2 Teknik Lingkungan Fakultas Teknik Universitas Hasanuddin nomor : 28499/UN4.7.8/PT.01.04/2022 tanggal 20 Desember 2022 perihal sebagaimana pada pokok surat diatas, dengan ini kami sampaikan bahwa mahasiswa yang namanya tercantum dibawah ini :

Nama	: Abdi Nur Rajalau
Stambuk	: D092211004
Program Pendidikan	: S2 (Magister)
Program Studi	: Teknik Lingkungan
Konsentrasi	: Kualitas Air

Bermaksud melakukan penelitian/ pengambilan data dalam rangka penulisan tesis dengan judul : "Pengolahan Air Limbah Dapur Rumah Makan X di Kota Makassar Menggunakan Proses Elektrokoagulasi dengan Performa Reaktor Continuous Flow-Single Channel."

Pembimbing : - Dr.Ir.Achmad Zubair,M.Sc.
- Dr.Roslinda Ibrahim, S.P., M.T

Tujuan Penelititan : Izin Pengambilan Sampel Air Limbah dapur

Atas perhatian dan kerjasama yang baik, kami sampaikan terima kasih.

a.n. Dekan
Wakil Dekan Bidang Akademik dan Kemahasiswaan

Dr. Ama Ahmad Ilham, ST., M.IT
NIP. 19731010 199802 1 001

Tembusan :
1. Dekan Fakultas Teknik UNHAS
2. Ketua Program Studi S2 Teknik Lingkungan
3. Mahasiswa yang bersangkutan

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI
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FAKULTAS TEKNIK
Jalan Poros Malino Km. 6 Bontomarannu, 92171 Gowa Sulawesi Selatan
☎ (0411) 586015, 586262 Fax (0411) 586015.
http://eng.unhas.ac.id. E-mail:teknik@unhas.ac.id

Nomor : 152/UN4.7.1/PT.01.04/2023 3 Januari 2023
Lamp. : --
H a l : Permohonan izin penelitian / Pengambilan Data

Kepada
Yth. : Kepala Badan Kesatuan Bangsa dan Politik
Di
Tempat

Dengan hormat, sehubungan dengan surat Ketua Program Studi S2 Teknik Lingkungan Fakultas Teknik Universitas Hasanuddin nomor : 010/UN4.7.8/PT.01.04/2023 tanggal 2 Januari 2023 perihal sebagaimana pada pokok surat diatas, dengan ini kami sampaikan bahwa mahasiswa yang namanya tercantum dibawah ini :

Nama	: Abdi Nur Rajalau
Stambuk	: D092211004
Program Pendidikan	: S2 (Magister)
Program Studi	: Teknik Lingkungan
Konsentrasi	: Kualitas Air

Bermaksud melakukan penelitian/ pengambilan data dalam rangka penulisan tesis dengan judul : "Pengolahan Air Limbah Dapur Rumah Makan X di Kota Makassar Menggunakan Proses Elektrokoagulasi dengan Performa Reaktor Continuous Flow-Single Channel."

Pembimbing : - Dr.Ir.Achmad Zubair,M.Sc.
- Dr.Roslinda Ibrahim, S.P., M.T

Tujuan Penelititan : Izin permintaan data rumah makan: alamat, jumlah/banyaknya dan ukuran bangunannya pada Tanggal 9 Januari - 3 Februari 2023

Atas perhatian dan kerjasama yang baik, kami sampaikan terima kasih.

a.n. Dekan
Wakil Dekan Bidang Akademik dan Kemahasiswaan

Dr. Amil Ahmad Ilham, ST., M.IT
NIP. 19731010 199802 1 001

Tembusan :
1. Dekan Fakultas Teknik UNHAS
2. Ketua Program Studi S2 Teknik Lingkungan
3. Mahasiswa yang bersangkutan

PEMERINTAH KOTA MAKASSAR
BADAN KESATUAN BANGSA DAN POLITIK
Jalan Ahmad Yani No 2 Makassar 90111
Telp +62411 – 3615867 Fax +62411 – 3615867
Email : Kesbang@makassar.go.id Home page : http.www.makassar.go.id

Makassar, 09 Januari 2023

Kepada

Yth. TERLAMPIR

Di –

MAKASSAR

SURAT IZIN PENELITIAN
Nomor : 070/49-II/BKBP/I/2023

Dasar :
1. Undang-Undang Nomor 11 Tahun 2019 tentang Sistem Nasional Ilmu Pengetahuan dan Teknologi.
2. Peraturan Menteri Dalam Negeri Nomor 17 Tahun 2016 tentang Pedoman Penelitian dan Pengembangan di Kementerian Dalam Negeri dan Pemerintahan Daerah.
3. Peraturan Daerah Kota Makassar Nomor 8 Tahun 2016 tentang Pembentukan dan Susunan Perangkat Daerah Kota Makassar (Lembaran Daerah Kota Makassar Tahun 2016 Nomor 8).

Memperhatikan : Surat Kepala Dinas Penanaman Modal dan Pelayanan Terpadu Satu Pintu Provinsi Sulawesi Selatan nomor **: 179/S.01/PTSP/2023** Tanggal 05 Januari 2023 perihal Izin Penelitian.

Setelah membaca maksud dan tujuan penelitian yang tercantum dalam proposal penelitian, maka pada prinsipnya Kami menyetujui dan memberikan Izin Penelitian kepada :

Nama	:	**ABDI NUR RAJALAU**
NIM / Jurusan	:	D092211004 / Teknik Lingkungan
Pekerjaan	:	Mahasiswa (S2) / Univ. Hasanuddin
Tanggal pelaksanaan	:	**09 Januari s/d 09 Februari 2023**
Jenis Penelitian	:	Tesis
Alamat	:	Jl. Poros Malino Km. 6 Bontomarannu-Gowa
Judul	:	**" PENGOLAHAN AIR LIMBAH DAPUR RUMAH MAKAN X DI KOTA MAKASSAR MENGGUNAKAN PROSES ELEKTROKOAGULASI DENGAN PERFORMA REAKTOR CONTINUSOUS FLOW-SINGLE CHANNEL"**

Demikian Surat Izin Penelitian ini diberikan agar digunakan sebagaimana mestinya dan selanjutnya yang bersangkutan melaporkan hasilnya kepada Walikota melalui Kepala Badan Kesatuan Bangsa dan Politik Kota Makassar Melalui *Email* Bidanghublabakesbangpolmks@gmail.com.

a.n. WALIKOTA MAKASSAR
KEPALA BADAN KESBANGPOL.
u.b.
SEKRETARIS,

DR. HARI, S.IP., S.H., M.H., M.Si., M.I.Kom
Pangkat : Pembina Tingkat I/IV.b
NIP : 19730607 199311 1 001

17/01/23 Malikel TIN

LAMPIRAN : Surat Izin Penelitian di Kota Makassar
Nomor : 070/49-II/BKBP/I/2023
Tanggal : 09 Januari 2023

NAMA LOKASI PENELITIAN DI KOTA MAKASSAR :

1. KEPALA DINAS PARIWISATA KOTA MAKASSAR; ✓
2. KEPALA DINAS LINGKUNGAN HIDUP KOTA MAKASSAR; ✓
3. KEPALA DINAS PERKERJAAN UMUM KOTA MAKASSAR; ✗
4. KEPALA DINAS PENANAMAN MODAL DAN PELAYANAN TERPADU SATU PINTU KOTA MAKASSAR; ✓
5. KEPALA DINAS PENATAAN RUANG KOTA MAKASSAR; ✗
6. KEPALA BADAN PENDAPATAN DAERAH KOTA MAKASSAR. ✓

PEMERINTAH KOTA MAKASSAR
DINAS PARIWISATA
Jl. Urip Sumoharjo No. 58, Makassar 90144. Phone/Fax : 0411 - 424 832
Email : pariwisata@makassarkota.go.id Website https://explore.makassarkota.go.id

REKOMENDASI

NOMOR : 289/ DISPAR/008/ I /2023

Menindaklanjuti Surat Dari UNIVERSITAS HASANUDDIN dengan nomor 179/S.01/PTSP/2023 Tanggal 05 Januari 2023, Perihal ***Izin Penelitian.***

Maka kami dari Dinas Pariwisata Makassar pada prinsipnya memberikan izin sekaligus memberi Data Survey Kepada :

Nama : **ABDI NUR RAJALAU**

NIM / Jurusan : D092211004 / Teknik Lingkungan

Pekerjaan : Mahasiswa (S2) / Univ. Hasanuddin

Judul : ***"PENGOLAHAN AIR LIMBAH DAPUR RUMAH MAKAN X DI KOTA MAKASSAR MENGGUNAKAN PROSES ELEKTROKOAGULASI DENGAN PERFORMA REAKTOR CONTINUSOUS FLOW-SINGLE CHANNEL"***

Demikian Rekomendasi ini diberikan kepada yang bersangkutan untuk di gunakan sebagaimana mestinya.

Makassar, 10 Januari 2023

KEPALA DINAS,

MUHAMMAD ROEM, S.STP., M.Si
Pangkat : Pembina
Nip : 19831110200212101