DAFTAR PUSTAKA

Anggraini et al., I. N. 2015. Analisa Tegangan Tembus Minyak Nabati Dengan Perlakuan Pemanasan Berulang. *Jurnal Amplifier*, Vol. 5 No. 2, Nopember, ISSN: 2089-2020.

Anonim. 2018. *Transformer Oil Density And Viscosity*. Globe Core .(Online). https://oilregeneration.globecore.com/transformer-oil-density-and-viscosity diakses tanggal 26 November 2019

Ansari. 2014. *Aluminium Oksida: Fungsi Dan Aplikasi*. (Online). https://wawasanilmukimia.wordpress.com/2014/02/26/aluminium-oksida-fungsi-dan-aplikasi/. diakses 27 Oktober 2020.

Arismunandar. 1983. *Teknik Tegangan Tinggi.* Jakarta Timur: Ghalia Indonesia.

ASTM_D1217-93. 2003. Standard Test Method for Density and Relative Density (Specific Gravity) of Liquids by Bingham Pycnometer. *ASTM International USA: American Society for Testing and Material) West Conshohocken*.

ASTM_D2196-18e1. 2018. Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer. *(USA: American Society for Testing and Material) West Conshohocken*.

ASTM_D3487. 2016. Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus. *USA: American Society for Testing and Material International, West Conshohocken*.

ASTM_D4928. 2000. Standard Test Methods for Water in Crude Oils by Coulometric Karl Fischer Titration. *(USA: American Society for Testing and Material) West Conshohocken*.

ASTM_D6871. 2008. Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus . *(USA: American Society for Testing and Material ASTM International), West Conshohocken*.

ASTM_D974-02e1. 2002. Standard Test Method for Acid and Base Number by Color-Indicator Titration. *(USA: American Society for Testing and Material) West Conshohocken*.

Aulia et al. 2018. Pengaruh Penuaan Elektrik terhadap Karakteristik Tegangan Tembus dan PDIV Minyak NanoNynas. *Jurnal Nasional Tek. Elektro*, 18-23.

Bartley, W. H. 2013. An Analysis of International Transformer Failure Part-1.

Cash dan Habetler. 1998. Insulation Failure Prediction in AC Machines Using Line-Neutral Volteges. *IEEE, vol. 34, Dec.*

Chandrasekar. 2018. Investigations On Partial Discharge, Dielectric And Thermal Characteristics Of Nano SiO2 Modified Sunflower Oil For Power Transformer Applications. *IEEE Electrical Eng Technology*, 13(3):1337–1345.

Chen et al. 2019. A Promising Nano-Insulating-Oil for Industrial Application: Electrical Properties and Modification Mechanism. *MDPI nanomaterials*.

Choi and Eastman. 1995. Enhancing thermal conductivity of fluids with nanoparticles. *ASME International Mechanical Engineering Congress and Exposition*, vol. 66, pp. 99–105, Washington, DC, USA.

Dean, G. A. 2005. Nanotechnology - an introduction for the standards. *Journal of ASTM International*, vol. 2, no. 6,.

Dhofir et al. 2017. Minyak Kelapa Beraditif Minyak Zaitun sebagai Isolasi Peralatan Tegangan Tinggi. *Jurnal EECCIS Vol. 11*.

IEC_60156. 2003. Insulating Liquids Determination of the Breakdown Voltage at Power Frequency Test Method. *Geneva: International Electrotechnical Commission, Switzerland*.

IEC_60270. 2000. High-voltage test techniques-partial discharge measurements. *Geneva: International Electrotechnical Commission, Switzerland*.

IEC_62539. 2007. Guide For The Statistical Analysis Of Electrical Insulation Breakdown Data. *Geneva: International Electrotechnical Commission, Switzerland*.

IEC-TR_61294. 1993. Insulating liquids - Determination of the partial discharge inception voltage (PDIV) - Test procedure. *Geneva: International Electrotechnical Commission, Switzerland*.

Jauhari. 2017. *Analisis Karakteristik Fisik dan Elektrik untuk Estimasi Umur Minyak Transformator Menggunakan Hukum Arrhenius*. Institut Teknolosi Sepuluh November, Surabaya.

Jumari et al, A. A. 2015. Fraksinasi Kompleksasi Urea Pada Minyak Dedak Padi Dalam Peningkatan Konsentrasi Asam Lemak Tak Jenuh. *EKUILIBRIUM*, Vol. 14.

Khaled, U. d. 2019. Statistical Investigation of AC Dielectric Strength of Natural Ester Oil-Based Fe_3O_4, Al_2O_3, and SiO_2 Nano-Fluids. *International Scientific Partnership Program (ISPP) IEEE Access, King Saud University, Riyadh*.

Kind, D. 1993. *Pengantar teknik eksperimental tegangan tinggi.* Bandung: ITB.

Kumar et al., W. I. 2016. Investigations on the Suitability of Rice Bran Oil and Corn Oil as Insulation Oil. *IEEJ Trans*.

Kunju et al. 2019. Dielectric Properties of Eco-friendly Nanofluids. *Journal of Physics: Conference Series. 1355. 012034.*

Maneerot et al. 2018. Studies of electrical and thermal characteristics of Natural ester immersed transformer compared with mineral oil immersed and Palm oil Immersed transformer. *IEEE*.

Manjang S., Kitta, I. & Ikhlas, A. 2019. Voltage Breakdown Characteristics of Transformer Mineral Oil with Varies the Composition of Corn Oil. *2nd International Conference on High Voltage Engineering and Power Systems (ICHVEPS*.

Marlia, F. 2017. Effect of Surfactant on Breakdown Strength and Thermal. *Universiti Teknologi Malaysia*.

Maurya dan Kushwaha, N. R. 2018. Pharmacognosy of rice bran oil - A review. *International Journal of Green Pharmacy*.

McNeese. 2011. Anderson-Darling Test for Normality (Online). https://www.spcforexcel.com/knowledge/basic-statistics/anderson-darling-test-for-normality. Diakses tanggal 14 Maret 2021.

Mohamed et al. 2017. Partial Discharge Inception Voltage Measurements of Ester Dielectric Fluid for Insulation Diagnosis. *6th International Youth Conference on Energy (IYCE)*.

Muangpratoom, P. & Pattanadech, N. 2018. Breakdown and Partial discharge characteristics of Mineral oil-based nanofluids. *IET Science Measurements Technology, Vol. 12.*

Muangpratoom, P. & Pattanadech, N.. 2016. Dielectric Breakdown Strength of Mineral Oil Based NanofluidsDielectric Breakdown Strength of

Mineral Oil Based Nanofluids. *International Conference on Condition Monitoring and Diagnosis*. China

Muladi. 2009. Analisis Pola Dan Tingkat Partial Discharge Dalam Menilai Kondisi Transformator Daya. *Program Magister Teknik Elektro Universitas Indonesia Kekhususan Tenaga Listrik Dan Energi, Depok*.

Musdalifa, A. 2013. *Estimasi Parameter Distribusi Weibull Dengan Transformasi Model Regresi Menggunakan Metode Kuadrat Terkecil Linier*. MIPA, Universitas Hasanuddin.

Nasir, F. d. et al. 2009. Ekstraksi Dedak Padi Menjadi Minyak Mentah Dedak Padi (Rice-Bran Oil) dengan Menggunakan Pelarut n-Hexane dan Ethanol. *Jurnal Rekayasa*, 18 (1). pp. 37-44. ISSN 0852-5366.

Olmo et al. 2019. Maghemite Nanofluid Based On Natural Ester: Cooling And Insulation Properties Assessment. *IEEE, 7, 145851– 145860*.

Potivejkul, S. et al. 2017. Electrical Characteristics of Natural Ester Based Nanofluid. *5th International Electrical Engineering Congress. Pattaya, Thailand*.

Pattanadech, N. 2013. Partial Discharge Inception Voltage Characteristics Of Mineral Oil. *Institute of High Voltage Engineering and System Management, Graz University of Technology, Austria.*

Peppas et al. 2016. Statistical investigation of AC breakdown voltage of nanofluids compared with mineral and natural ester oil. *IET Sci. Meas. Technol*, vol. 10, no. 6, pp. 644–652.

Prasad dan Chandrasekar. 2017. Effect Nano SiO_2 Particles on Partial Discharge Signal Characteristics Of FR3 Transformer Oil. *Advance in Chemistry*.

Primo. 2018. Improvement Of Transformer Liquid Insulation Using Nano dielectric Fluids: A Review. *IEEE Electr. Insul. Mag. 34*.

Rajeswari et al. 2019. Statistical Analysis of Partial Discharge Lightning Impulse and BDV Characteristics of Nano SiO_2-Corn Oil for HV Insulation Applications. *Journal of Electrical Engineering & Technology vol 14*, pp 877-888.

Rinne, H. 2009. The Weibull Distribution (A Handbook). *Jerman: Justus-Liebig-University Giessen*.

Riskayanti. 2016. *Sintesis Etil Ester Dari Minyak Dedak Padi (Oryza Sativa) Menggunakan Metode Ultrasonokimia*. Makassar: UIN Alauddin Makassar.

Rofiatun. 2016. *Pengaruh Penambahan Margarin Terhadap Konstanta Dielektrik Minyak Goreng*. Universitas Jember.

Romadhoni, A. 2018. *Pakan Ternak*. Perbedaan Dedak Padi dan Bekatul (Online).(https://pakanternak.fapet.ugm.ac.id/2018/03/13/4-perbedaan-dedak-padi-dan-bekatul/

Rubiyanto, A. S. 2019. *Pengaruh Penambahan Fenol Pada Minyak Kelapa Murni Terhadap Kekuatan Dielektrik Dalam Medan Homogen Dan Non Homogen*. , Malang: Universitas Brawijaya.

Saragih, R. 2008. *Sintesis Etil Ester Asam Lemak Dari Minyak Dedak Padi Ir64 Dan Dedak Padi Lokal Melalui Etanolisis Secara Langsung (In-Situ)*. Medan: Departemen Kimia Fakultas Matematika Dan Ilmu Pengetahuan Alam Universitas Sumatera Utara.

Shahbandeh. 2020. Top countries based on production of milled rice 2018/2019. *Statista*.

SPLN_49-1. 1982. *Specification for New Insulating Oils for Transformers and Switchgear*, Perusahaan Umum Listrik Negara.

Suhaimi et al. 2020. A Review on Oil-Based Nanofluid as Next-Generation. *Hindawi Journal of Nanomaterials*, 17.

Suhaimi et al., ,. N. 2018. Statistical Analysis on AC Breakdown Voltage of CNT Nanofluid with Mineral Oil and Palm Oil. *7th International Conference on Power and Energy (PECon)*.

Sujatha, M. a. 2017. Investigation on effects of different types of nanoparticles on critical parameters of nano-liquid insulation systems. *Journal of molecular*, 437-444.

Suwarno. 2011. Diagnosis Peralatan Tegangan Tinggi Dan Smart Grid. *Pidato Ilmiah Guru Besar Institut Teknologi Bandung*.

Suwarno. 2016. Partial Discharge in High Voltage Insulating Materials. *Electrical Engineering and Informatics Institut Teknologi Bandung*.

V. Segal, A. R. 2000. Experimental study of magnetic colloidal fluids behavior in power transformers. *Journal of Magnetism and Magnetic Materials*, vol. 215-216, pp. 513–515.

Voukelatos, J. a. 2017. Natural ester oil application in liquid filled transformers. *Electric Energy publisher (Energize)*.

Yangzhou, X. 2012. *Digital Partial Discharge Detector.* China. Electric Co, LTD.

Yusuf, M. 2009. *Studi Partial Discharge Pada Kabel Cross-Linked Polyethylene (XLPE).* Makassar: Universitas Hasanuddin.

Zakaria et al. 2017. Characteristics of mineral oil-based nanofluids for power transformer application. *International Journal of Electrical and Computer Engineering*, 1530-1537.

Zubaida. 2018. *Efek Penambahan Nano-Filler Silica Treated By Silane Pada Minyak RBDPO Olein*. Universitas Airlangga.

LAMPIRAN

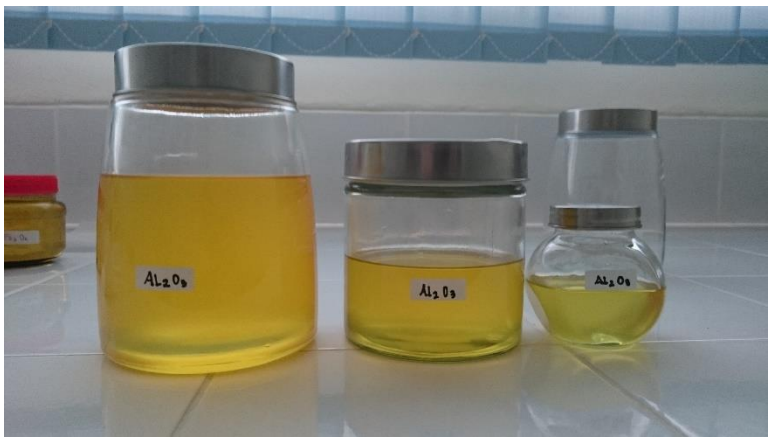
Lampiran 1 Alat dan Bahan Persiapan Minyak Dedak Padi dan Nanofluida

- Magnetic stirer

- Timbangan analitik digital

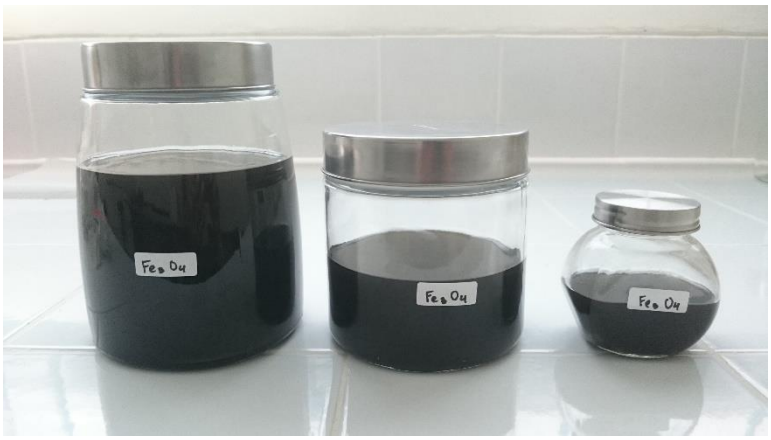
- Ultrasonicator Bath Minyak dedak padi dan Nanofluid

- Minyak Dedak Padi yang telah dimodifikasi Nanofluid Al_2O_3



- Minyak Dedak Padi yang telah dimodifikasi Nanofluid TiO_2

- Minyak Dedak Padi yang telah dimodifikasi Nanofluid Fe_3O_4



- Minyak dedak padi murni

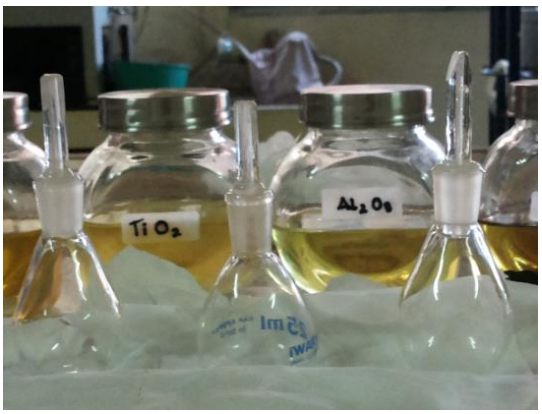
- Minyak Mineral transformator

Lampiran 2 Alat Pengujian Sifat Fisik dan Kimia Minyak Dedak Padi dan Nanofluida

- Viskometer *Brokfield*

- Hotplate

- Piknometer



- Oven Uap

- Batang pengaduk gelas

- Pipet tetes dan ukur kimia

- Desikator

- TAN Content Meter

- Termometer digital

.

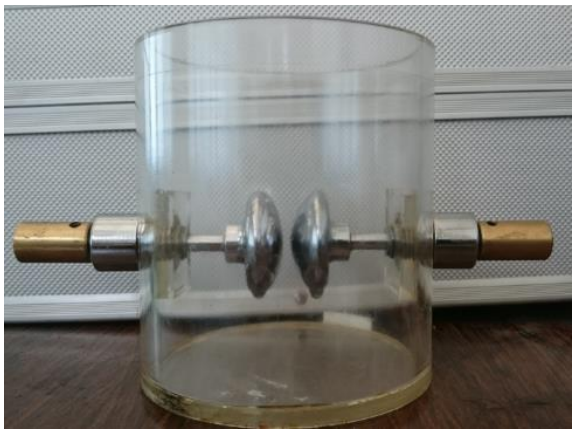
Lampiran 3 Alat Pengujian Sifat Elektrik Minyak Dedak Padi dan Nanofluida

- *Control Desk*

- Transformator

- High preassured limiting resistor

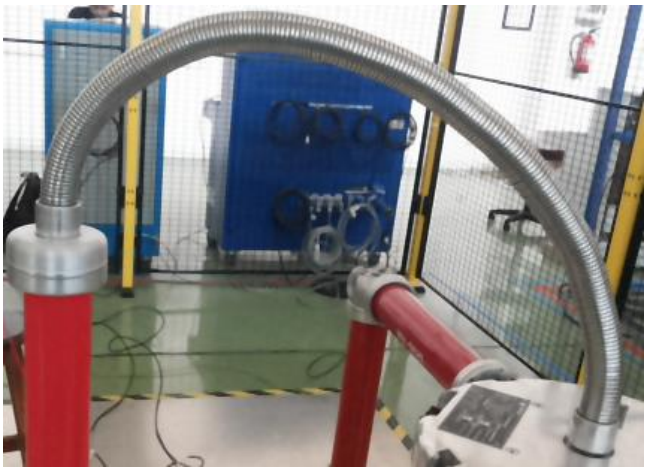
- Chamber Elektroda Tembereng



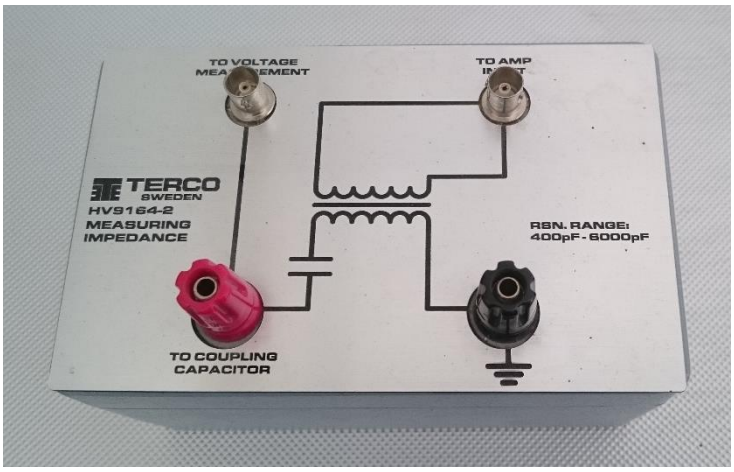
- Komputer dan Partial Discharge Meter (DPD HV9160)

- Coupling Capacitor

- HV Flexible Cable

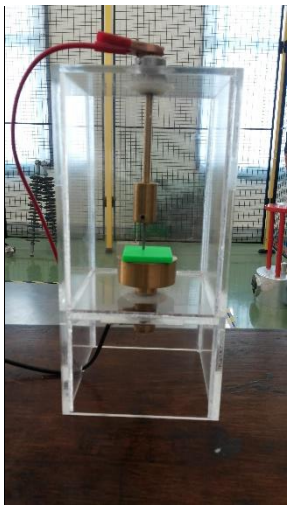


- Measuring impedance (opto-coupling quadripole capacitor)

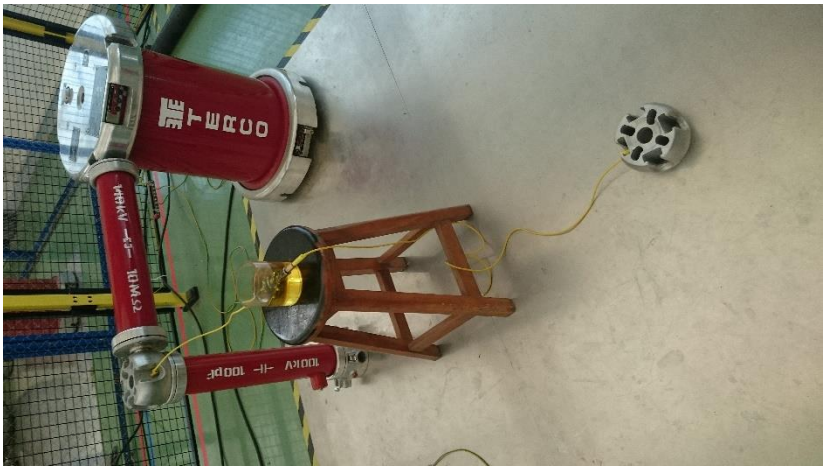


- Pulse Generator

- Kotak uji *Partial Discharge* elektroda jarum - bidang



- Rangkaian uji tegangan tembus minyak dedak padi



- Rangkaian pengukuran *Partial Discharge* Minyak dedak padi

Lampiran 4 Hasil Pengujian Sifat Fisik dan Kimia Minyak Dedak Padi dan Nanofluida

- Massa jenis

Sampel minyak	RBO	Al_2O_3	TiO_2	Fe_3O_4	MT
Berat Pikno kosong (g)	23.8006	25.263	21.2039	23.8006	21.2039
Berat Pikno kosong + Air (g)	47.9998	51.4713	46.3671	47.9998	46.3671
Berat Pikno kosong + Sampel (g)	45.9566	49.2622	44.24	45.9962	43.1459
Berat Jenis Air (29°C)			0.996		
Volume Air	24.29638554	26.31355	25.26426	24.29639	25.26426
Massa Jenis (g/cm^3)	0.911905187	0.912047	0.911806	0.913535	0.8685

- Viskositas

Sampel minyak	RBO	Al_2O_3	TiO_2	Fe_3O_4	MT
Massa Jenis (g/cm^3)	0.911905	0.912047	0.911806	0.913535	0.8685
A			100		
Viskositas (cP) 30°C	102.5	107.3	103.5	111.1	22.2
Viskositas (cP) 40°C	86	61	92	81	35
Viskositas (cSt) 30°C	112.4	117.65	113.51	121.62	25.56
Viskositas (cSt) 40°C	94.31	66.88	100.9	88.67	40.3
Viskositas (cSt) = A (Viskositas (cP)/Massa Jenis (g/cm^3)					

- Kadar air

Sampel Minyak	RBO	Al_2O_3	TiO_2	Fe_3O_4	MT
W1	55.104	55.021	55.82	57.473	56.762
W2	37.52582	49.2438	42.67439	-51.7257	-10.7848
Kadar air (mg/kg)	3.19	1.05	2.355	19	11.9
Kadar air (mg/kg)=(W1-W2)/W1					

- Kadar asam

Sampel Minyak	RBO	Al_2O_3	TiO_2	Fe_3O_4	MT
Kadar asam (mg KOH/g)	0.016689	0.018793	0.016829	0.015427	0.014305

Lampiran 5 Hasil Pengujian Sifat Elektrik Minyak Dedak Padi dan Nanofluida

- Hasil pengujian tegangan tembus minyak

Sampel Minyak	Breakdown Voltage (kV)			
	Suhu 30°C	Suhu 40°C	Suhu 50°C	Suhu 60°C
RBO	23.52	36.55	40.17	43.81
Al_2O_3	30.59	34.73	44.94	49.77
TiO_2	17.19	24.05	26.64	28.38
Fe_3O_4	13.57	31.58	39.05	41.23
MT	33.2	32.64	34.54	35.79

Sampel Minyak	RBO	Al_2O_3	TiO_2	Fe_3O_4	MT
Breakdown Voltage (kV)	22.39	31.79	15.56	14.7	33.26
	21.86	29.17	16.87	13.04	33.27
	22.92	31.4	16.29	13.45	32.98
	22.62	30.73	18.26	13.61	34.63
	26.87	29.84	18.96	13.05	32.15

Oil Samples	RBO	Al_2O_3	TiO_2	Fe_3O_4	MT
Mean	23.332	30.586	17.188	13.57	33.258
Median	22.62	30.73	16.87	13.45	33.26
Std. Deviasi	2.015	1.083	1.401	0.679	0.892
Maximum BDV	26.87	31.79	18.96	14.7	34.63
Lowest BDV	21.86	29.17	15.56	13.04	32.15

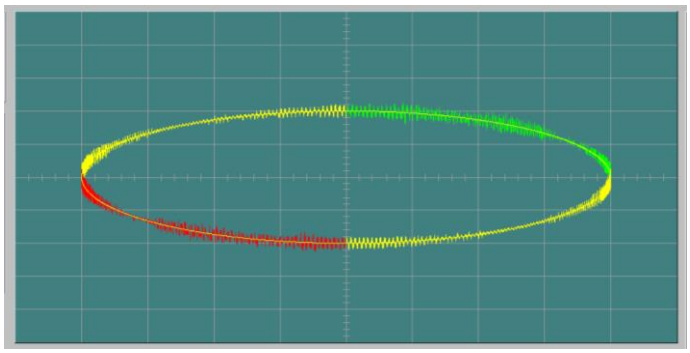
- Hasil Pengujian Partial Discharge

Sampel Minyak	Partial Discharge (pC)					
RBO	12.6	15.87	12.85	13.05	13.87	15.06
Al_2O_3	12.82	8.47	10.16	9.95	9.09	10.98

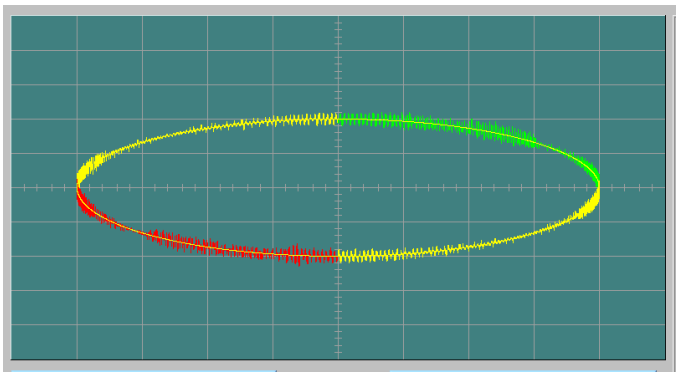
Sampel Minyak	RBO	Al_2O_3
Average	13.88333	10.245
Median	13.46	10.055
Std. Deviasi	1.322175	1.532955
Maximum PD (pC)	15.87	12.82
Lowest PD (pC)	12.6	8.47
PD Number	332	174

- Hasil sinyal *Partial Discharge Meter* berupa pola diagram elips RBO

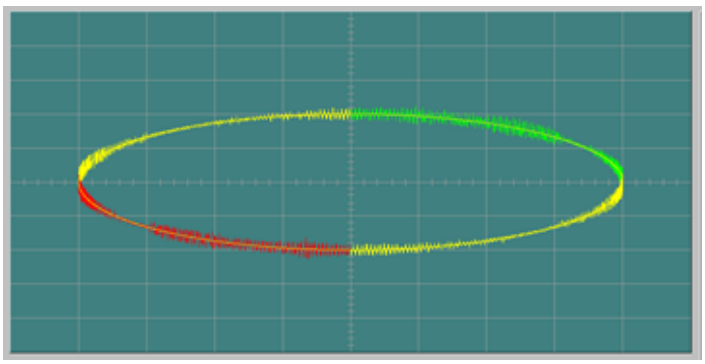
Pola diagram elips Minyak dedak padi murni (RBO) dengan hasil *PD value* 12.6 pC.



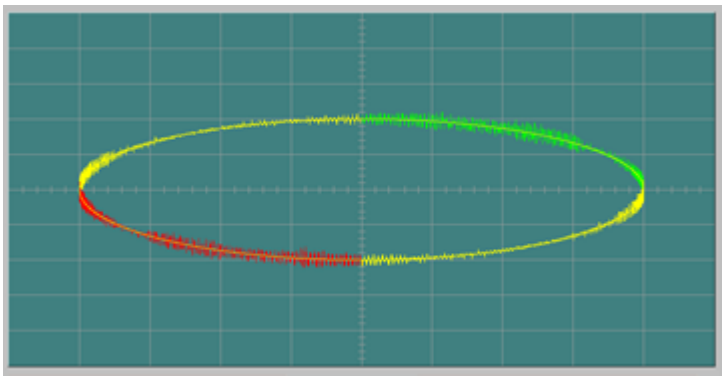
Pola diagram elips Minyak dedak padi murni (RBO) dengan hasil *PD value* 15.87 pC.



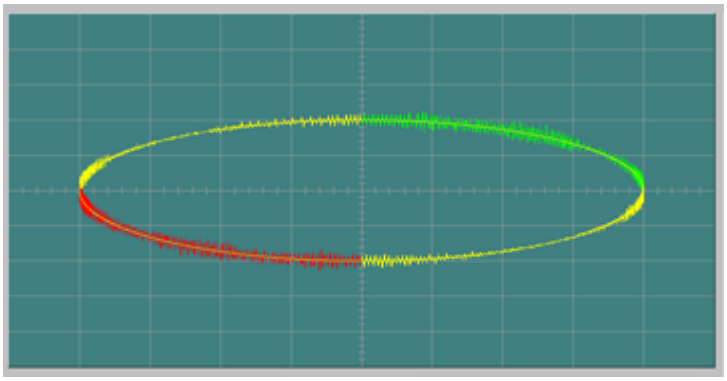
Pola diagram elips Minyak dedak padi murni (RBO) dengan hasil *PD value* 12.85 pC.



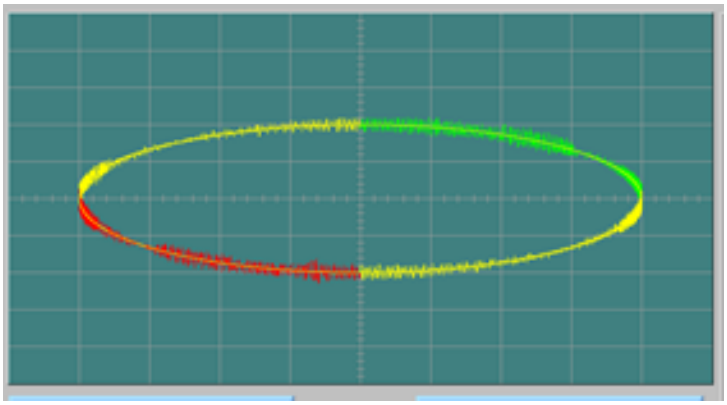
Pola diagram elips Minyak dedak padi murni (RBO) dengan hasil *PD value* 13.05 pC.



Pola diagram elips Minyak dedak padi murni (RBO) dengan hasil *PD value* 13.87 pC.

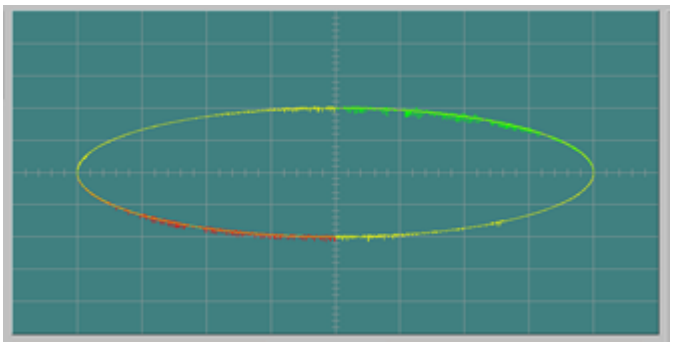


Pola diagram elips Minyak dedak padi murni (RBO) dengan hasil *PD value* 15.06 pC.

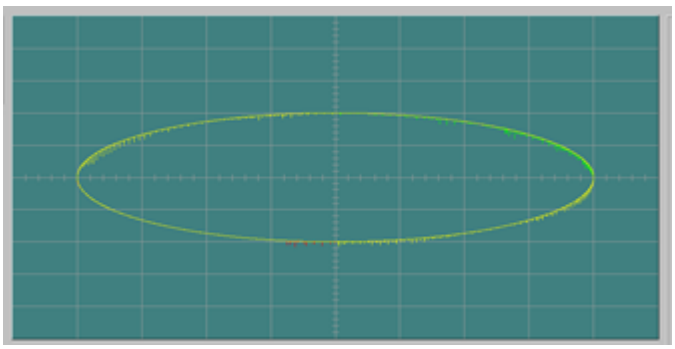


- Hasil sinyal *Partial Discharge Meter* berupa pola diagram elips Al_2O_3

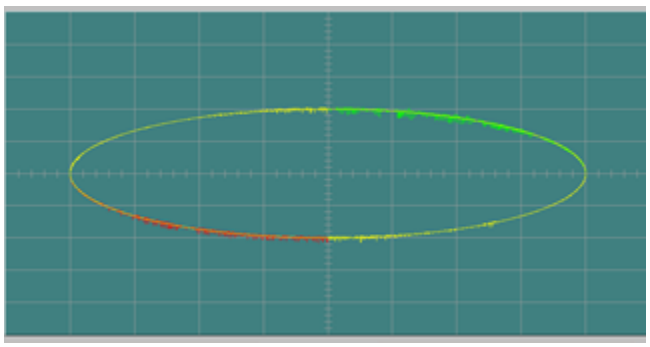
Pola diagram elips Minyak dedak padi murni dimodifikasi nanoalumina (Al_2O_3) dengan hasil *PD value* 12.82 pC.



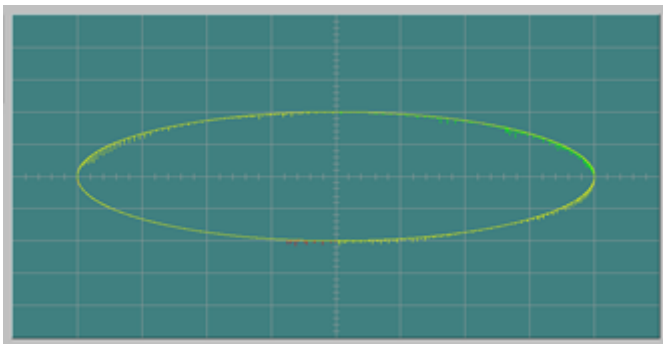
Pola diagram elips Minyak dedak padi murni dimodifikasi nanoalumina (Al_2O_3) dengan hasil *PD value* 8.47 pC.



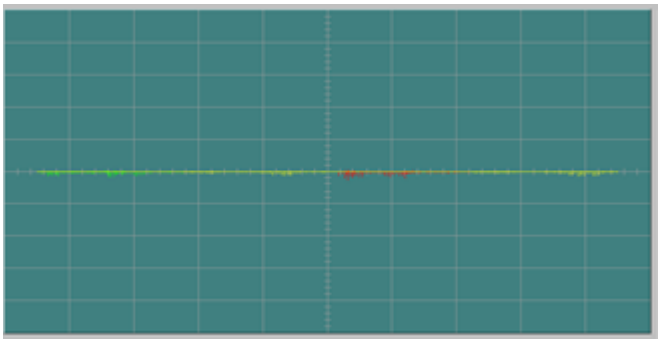
Pola diagram elips Minyak dedak padi murni dimodifikasi nanoalumina (Al_2O_3) dengan hasil *PD value* 10.16 pC.



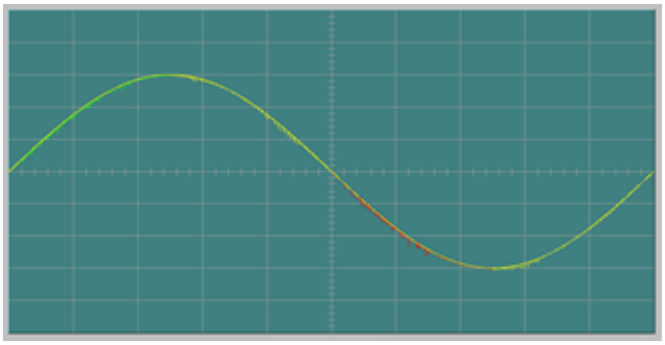
Pola diagram elips Minyak dedak padi murni dimodifikasi nanoalumina (Al_2O_3) dengan hasil *PD value* 9.95 pC.



Pola diagram linear Minyak dedak padi murni dimodifikasi nanoalumina (Al_2O_3) dengan hasil *PD value* 9.09 pC.



Pola diagram sinusoidal Minyak dedak padi murni dimodifikasi nanoalumina (Al_2O_3) dengan hasil *PD value* 10.98 pC.



- Hasil perhitungan distribusi Weibull tegangan tembus Minitab v.18 Least Square uji keandalan

Distribution ID Plot: RBO, Al_2O_3, TiO_2, Fe_3O_4, MT
Results for variable: RBO
Goodness-of-Fit

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Weibull	3.902	0.795

Table of Percentiles

Distribution	Percent	Percentile
Weibull	1	17.9550
Weibull	5	19.8989
Weibull	10	20.8231
Weibull	50	23.4500

Table of MTTF

Distribution	Mean
Weibull	23.2140

Results for variable: Al_2O_3
Goodness-of-Fit

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Weibull	2.319	0.990

Table of Percentiles

Distribution	Percent	Percentile
Weibull	1	26.5932
Weibull	5	28.1049
Weibull	10	28.7995
Weibull	50	30.6998

Table of MTTF

Distribution	Mean
Weibull	30.5096

Results for variable: TiO_2
Goodness-of-Fit

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Weibull	2.395	0.973

Table of Percentiles

Distribution	Percent	Percentile
Weibull	1	12.5363
Weibull	5	14.1931
Weibull	10	14.9929
Weibull	50	17.3058

Table of MTTF

Distribution	Mean
Weibull	17.1088

Results for variable: Fe_3O_4
Goodness-of-Fit

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Weibull	3.122	0.862

Table of Percentiles

Distribution	Percent	Percentile
Weibull	1	11.4703
Weibull	5	12.2565
Weibull	10	12.6206
Weibull	50	13.6255

Table of MTTF

Distribution	Mean
Weibull	13.5273

Results for variable: MT
Goodness-of-Fit

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Weibull	2.727	0.932

Table of Percentiles

Distribution	Percent	Percentile
Weibull	1	30.1276
Weibull	5	31.3288
Weibull	10	31.8745
Weibull	50	33.3478

Table of MTTF

Distribution	Mean
Weibull	33.1952

- Hasil perhitungan distribusi Weibull *Partial Discharge* Minitab v.18 Least Square uji kendalan (reliatbility)

Distribution ID Plot: RBO, Al_2O_3
Results for variable: RBO
Goodness-of-Fit

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Weibull	2.376	0.920

Table of Percentiles

Distribution	Percent	Percentile
Weibull	1	9.92118
Weibull	5	11.3226
Weibull	10	12.0030
Weibull	50	13.9834

Table of MTTF

Distribution	Mean
Weibull	13.8183

Results for variable: Al_2O_3

Goodness-of-Fit

Distribution	Anderson-Darling (adj)	Correlation Coefficient
Weibull	2.259	0.959

Table of Percentiles

Distribution	Percent	Percentile
Weibull	1	5.91649
Weibull	5	7.33360
Weibull	10	8.06306
Weibull	50	10.3343

Table of MTTF

Distribution	Mean
Weibull	10.1873

- Hasil estimasi distribusi Weibull (RBO) *Partial Discharge* Minitab v.18 dan Microsoft Excel 2016 menggunakan metode Maksimum Likelihood dan Newton Raphson

k	0	1	2	3	4	5	6	PD (pC)	(i)	α	β	Ln(x)	ln(ln(1/1- MR))	Correlation
β	4	7.1212908	10.33149	11.75191248	11.91799833	11.91989	11.919893	12.6	1			2.533697	-2.155616006	
v	233353.7618	969953331	5.49E+12	2.566E+14	4.02498E+14	4.05E+14	4.046E+14	12.85	2			2.553344	-1.175270415	
w	620165.0759	2.601E+09	1.48E+13	6.95395E+14	1.09113E+15	1.1E+15	1.097E+15	13.05	3	14.46	11.91989	2.568788	-0.601543551	0.919752586
s	1649978.862	6.98E+09	4.01E+13	1.88588E+15	2.95999E+15	2.98E+15	2.975E+15	13.87	4			2.629728	-0.147287035	
g(β)	0.219387309	0.086274	0.021636	0.002068563	2.30718E-05	2.94E-09	0	15.06	5			2.712042	0.281917795	
g'(β)	-0.07028737	-0.026875	-0.01523	-0.012454781	-0.012178383	-0.01218	-0.012175	15.87	6			2.764431	0.794336831	

MR	PDF	F(Xi)	1-F(Xi)	1-F(Xn-i+1)	S	AD	S	AD*	p-value
0.109375	0.1510679	0.176215	0.823784893	0.048159667	-4.76928				
0.265625	0.1778818	0.217295	0.782705482	0.19702103	-9.45284				
0.421875	0.2003865	0.255111	0.744888818	0.543917951	-9.87506	0.4182463	-38.5095	0.4966675	0.2126821
0.578125	0.284653	0.456082	0.543917951	0.744888818	-7.55722				
0.734375	0.2533173	0.802979	0.19702103	0.782705482	-4.17983				
0.890625	0.1097197	0.95184	0.048159667	0.823784893	-2.67524				

- Hasil estimasi distribusi Weibull (Al_2O_3) *Partial Discharge* Minitab v.18 dan Microsoft Excel 2016 menggunakan metode Maksimum Likelihood dan Newton Raphson

k	0	1	2	3	4	5	PD (pC)	(i)	α	β	Ln(x)	(ln(1/1- MF	Correlation
β	4	6.148708	7.271357	7.42968839	7.432170861	7.432171	8.47	1			2.136531	-2.15562	
v	73977.70058	13198908	2.04E+08	301435304.1	303275993.7	3.03E+08	9.09	2			2.207175	-1.17527	
w	177023.0631	32096027	5.01E+08	739214498.7	743739859.5	7.44E+08	9.95	3	10.88	7.432	2.297573	-0.60154	0.959
s	425000.1196	78272187	1.23E+09	1817355824	1828508174	1.83E+09	10.16	4			2.318458	-0.14729	
g(β)	0.174878402	0.0487204	0.005432	8.25966E-05	1.96843E-08	0	10.98	5			2.396075	0.281918	
g'(β)	-0.0813877	-0.0433978	-0.03431	-0.033271931	-0.033256074	-0.03326	12.82	6			2.551006	0.794337	

MR	PDF	F(Xi)	1-F(Xi)	1-F(Xn-i+1)	S	AD	S	AD*	p-value
0.109375	0.1510679	0.144249	0.855750663	0.033675366	-5.3272	0.314	-37.8826	0.3725992	0.420
0.265625	0.1778818	0.231523	0.768477362	0.342278566	-7.60562				
0.421875	0.2003865	0.402852	0.597147949	0.547621898	-7.55678				
0.578125	0.284653	0.452378	0.547621898	0.597147949	-9.16179				
0.734375	0.2533173	0.657721	0.342278566	0.768477362	-6.14086				
0.890625	0.1097197	0.966325	0.033675366	0.855750663	-2.09035				

- Hasil estimasi distribusi Weibull (Al_2O_3) Tegangan Tembus Minitab v.18 dan Microsoft Excel 2016 menggunakan metode Maksimum Likelihood dan Newton Raphson

k	0	1	2	3	4	5	6	7	8	9	10
β	1	1.9979912	3.980121	7.838348038	14.81927195	24.94237	34.020613	37.65859	38.03	38.038246	38.04
v	152.93	4650.1358	4112414	2.26169E+12	5.69421E+22	7.35E+37	2.752E+51	7.65E+56	2.796E+57	2.829E+57	2.83E+57
w	523.1804828	15912.96	14080859	7.75224E+12	1.95513E+23	2.53E+38	9.481E+51	2.64E+57	9.637E+57	9.751E+57	9.75E+57
s	1789.977644	54459.436	48216697	2.65738E+13	6.71347E+23	8.7E+38	3.266E+52	9.08E+57	3.321E+58	3.36E+58	3.36E+58
g(β)	0.998992457	0.4984987	0.247298	0.119990341	0.053975977	0.019772	0.0046422	0.000401	3.572E-06	2.894E-10	0
g'(β)	-1.00100325	-0.2514965	-0.0641	-0.017188318	-0.005331962	-0.00218	-0.001276	-0.00106	-0.001046	-0.001046	-0.00105

BDV (kV)	(i)	α	β	Ln(x)	ln(ln(1/(1- MR)))	Correlation
29.17	1	31.04	38.04	3.373140784	-1.974458694	0.990
29.84	2			3.395849775	-0.972686141	
30.73	3			3.425239376	-0.366512921	
31.4	4			3.446807893	0.144767396	
31.79	5			3.459151775	0.714455486	

MR	PDF	F(Xi)	1-F(Xi)	1-F(Xn-i+1)	S	AD	S	AD*	p-value
0.12963	0.111064644	0.0892807	0.910719	0.085021035	-4.880826105				
0.314815	0.226532031	0.1989628	0.801037	0.214113217	-9.467663556				
0.5	0.426131885	0.492635	0.507365	0.507365007	-6.93255679	0.232	-26.16195	0.288164	0.618
0.685185	0.399767515	0.7858868	0.214113	0.801037218	-3.239532848				
0.87037	0.250754074	0.914979	0.085021	0.910719262	-1.641373165				

- Hasil estimasi distribusi Weibull (TiO_2) Tegangan Tembus Minitab v.18 dan Microsoft Excel 2016 menggunakan metode Maksimum Likelihood dan Newton Raphson

k	0	1	2	3	4	5	6	7	8
β	4	4.0021509	7.389053	11.66669058	14.50793731	15.17831	15.205686	15.20573	15.21
v	450433.4815	453215.4	7.57E+09	1.75684E+15	6.67539E+18	4.68E+19	5.072E+19	5.07E+19	5.073E+19
w	1289409.765	1297378.3	2.18E+10	5.08853E+15	1.93948E+19	1.36E+20	1.475E+20	1.47E+20	1.475E+20
s	51613427.61	3716210.6	6.28E+10	1.47446E+16	5.63687E+19	3.96E+20	4.289E+20	4.29E+20	4.289E+20
g(β)	0.228969727	0.2288243	0.09781	0.030875724	0.005081855	0.000192	2.98E-07	7.18E-13	0
g'(β)	-106.454161	-0.0675616	-0.02287	-0.010866963	-0.007580691	-0.00702	-0.006996	-0.007	-0.006996

BDV (kV)	(i)	α	β	Ln(x)	ln(ln(1/(1- MR)))	Correlation
15.56	1			2.744703519	-1.974458694	
16.29	2			2.790551423	-0.972686141	
16.87	3	17.78	15.21	2.825536897	-0.366512921	0.973
18.26	4			2.904712875	0.144767396	
18.96	5			2.942331497	0.714455486	

MR	PDF	F(Xi)	1-F(Xi)	1-F(Xn-i+1)	S	AD	S	AD*	p-value
0.12963	0.11271021	0.1232665	0.876734	0.070246427	-4.749152732				
0.314815	0.189334489	0.2321492	0.767851	0.223383946	-8.877715091				
0.5	0.258524441	0.3621671	0.637833	0.637832902	-7.326642583	0.282	-26.41178	0.350122	0.473
0.685185	0.278817753	0.7766161	0.223384	0.767850822	-3.618782974				
0.87037	0.149616551	0.9297536	0.070246	0.876733537	-1.839490836				