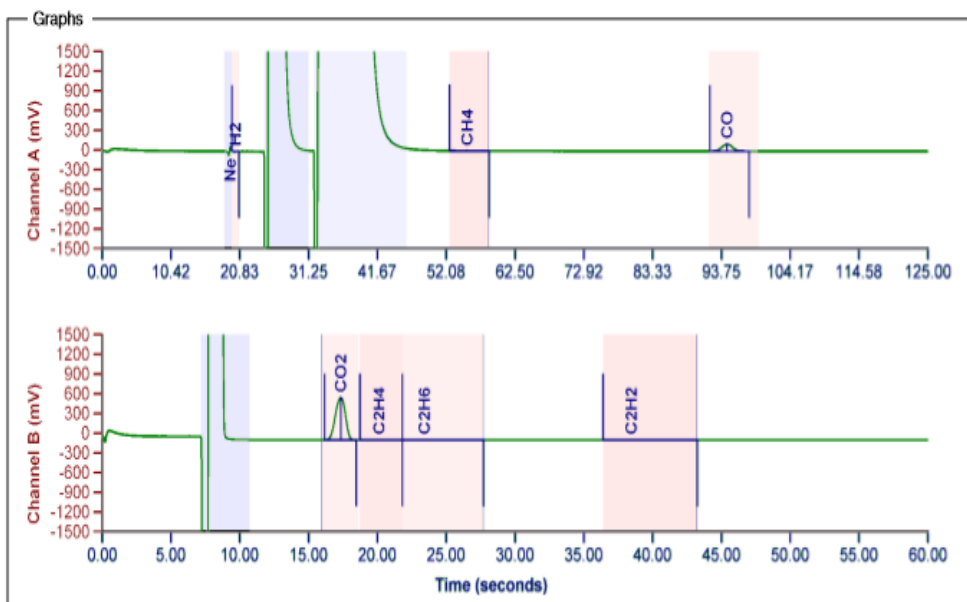


LAMPIRAN B



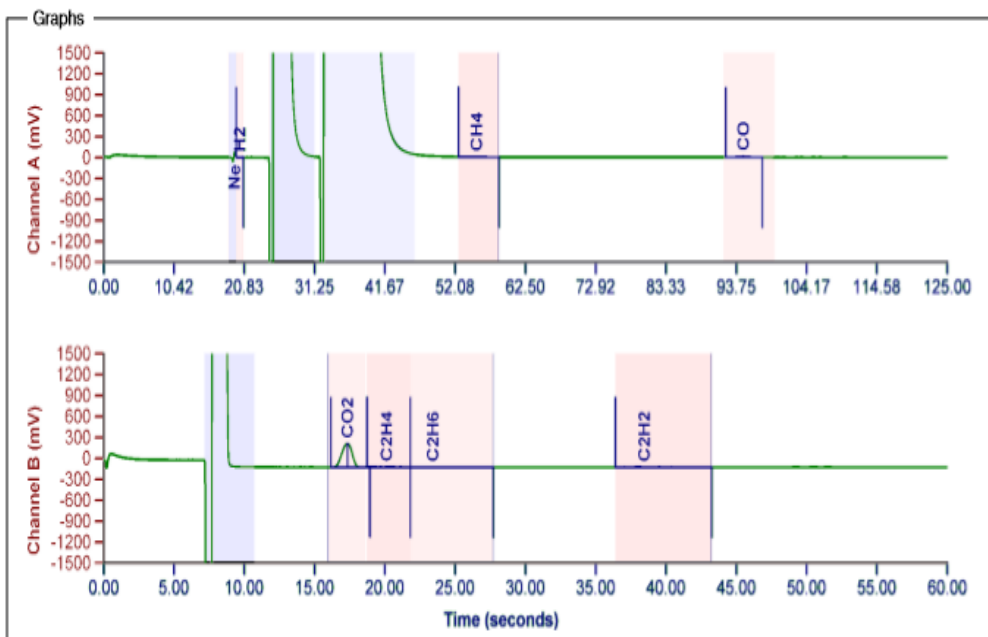
Transformer Fault Gas Analysis

Results																											
<div style="border: 1px solid black; padding: 5px;"> <p style="margin: 0;">Sample</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">Equipment ID: JO-19000603-1_kinden</td> <td style="width: 50%; border: none;">Serial Number: JO-19000603-1</td> </tr> <tr> <td style="border: none;">Apparatus Type: TRN</td> <td style="border: none;">Sampling Point: Samp Pt 1</td> </tr> <tr> <td style="border: none;">Designation: Alt Temp Rise</td> <td style="border: none;">Syringe ID: 1</td> </tr> <tr> <td style="border: none;">Sampled By: Arjun</td> <td style="border: none;">Date Sampled: 2019/03/01</td> </tr> <tr> <td style="border: none;">Oil Temperature: 25 °C</td> <td style="border: none;">Tank Pressure: 3 psig</td> </tr> <tr> <td colspan="2" style="border: none;">Comment: Oil type: ASTM D3612</td> </tr> </table> </div>		Equipment ID: JO-19000603-1_kinden	Serial Number: JO-19000603-1	Apparatus Type: TRN	Sampling Point: Samp Pt 1	Designation: Alt Temp Rise	Syringe ID: 1	Sampled By: Arjun	Date Sampled: 2019/03/01	Oil Temperature: 25 °C	Tank Pressure: 3 psig	Comment: Oil type: ASTM D3612															
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<div style="border: 1px solid black; padding: 5px;"> <p style="margin: 0;">Analysis Files</p> <p style="margin: 0;">Method: 20190304 Daily Method.prm</p> <p style="margin: 0;">Calgas: 20190301105850 Calibration.prs</p> <p style="margin: 0;">Air: 20190301152201 Air.prs</p> <p style="margin: 0;">Oil: 20190304091422 Oil.prs</p> <p style="margin: 0;">Calgas O2N2: 20190301105850 Calibration.prs</p> <p style="margin: 0;">Air O2N2: 20190301152201 Air.prs</p> <p style="margin: 0;">Oil O2N2:</p> </div>	<div style="border: 1px solid black; padding: 5px;"> <p style="margin: 0;">Measurement Results</p> <table style="width: 100%; border: none;"> <tr><td style="width: 70%;">H2 (Hydrogen)</td><td style="text-align: right;">0 ppm</td></tr> <tr><td>CH4 (Methane)</td><td style="text-align: right;">0 ppm</td></tr> <tr><td>CO (Carbon Monoxide)</td><td style="text-align: right;">25 ppm</td></tr> <tr><td>CO2 (Carbon Dioxide)</td><td style="text-align: right;">359 ppm</td></tr> <tr><td>C2H4 (Ethylene)</td><td style="text-align: right;">0 ppm</td></tr> <tr><td>C2H6 (Ethane)</td><td style="text-align: right;">0 ppm</td></tr> <tr><td>C2H2 (Acetylene)</td><td style="text-align: right;">0 ppm</td></tr> <tr><td>O2 (Oxygen)</td><td style="text-align: right;">- ppm</td></tr> <tr><td>N2 (Nitrogen)</td><td style="text-align: right;">- ppm</td></tr> <tr><td>TDG:</td><td style="text-align: right;">- %</td></tr> <tr><td>TDCG:</td><td style="text-align: right;">0.00 %</td></tr> <tr><td>THCG (O2N2):</td><td style="text-align: right;">- %</td></tr> <tr><td>THCG (Pressure):</td><td style="text-align: right;">0.02 %</td></tr> </table> </div>	H2 (Hydrogen)	0 ppm	CH4 (Methane)	0 ppm	CO (Carbon Monoxide)	25 ppm	CO2 (Carbon Dioxide)	359 ppm	C2H4 (Ethylene)	0 ppm	C2H6 (Ethane)	0 ppm	C2H2 (Acetylene)	0 ppm	O2 (Oxygen)	- ppm	N2 (Nitrogen)	- ppm	TDG:	- %	TDCG:	0.00 %	THCG (O2N2):	- %	THCG (Pressure):	0.02 %
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THCG (Pressure):	0.02 %																										
<div style="border: 1px solid black; padding: 5px;"> <p style="margin: 0;">Analysis Identification</p> <p style="margin: 0;">Analyzed By: Arjun</p> <p style="margin: 0;">Date Acquired: 2019/03/04</p> <p style="margin: 0;">Instrument ID: 11511006</p> <p style="margin: 0;">Version: PPMreport 3.6.0</p> </div>																											



Transformer Fault Gas Analysis

Results	
Sample	
Equipment ID: JO-19000603-1_kinden	Serial Number: JO-19000603-1
Apparatus Type: TRN	Sampling Point: Samp Pt 1
Designation: Alt No Load 105%	Syringe ID: 1
Sampled By: Arjun	Date Sampled: 2019/03/01
Oil Temperature: 25 °C	Tank Pressure: 3 psig
Comment: Oil type: ASTM D3612	
Analysis Files	
Method: 20190304 Daily Method.prm	
Calgas: 20190301105850 Calibration.prs	
Air: 20190301152201 Air.prs	
Oil: 20190304085634 Oil.prs	
Calgas O2N2: 20190301105850 Calibration.prs	
Air O2N2: 20190301152201 Air.prs	
Oil O2N2:	
Analysis Identification	
Analyzed By: Arjun	
Date Acquired: 2019/03/04	
Instrument ID: 11511006	
Version: PPMreport 3.6.0	
Measurement Results	
H2 (Hydrogen)	0 ppm
CH4 (Methane)	0 ppm
CO (Carbon Monoxide)	3 ppm
CO2 (Carbon Dioxide)	188 ppm
C2H4 (Ethylene)	0 ppm
C2H6 (Ethane)	0 ppm
C2H2 (Acetylene)	0 ppm
O2 (Oxygen)	- ppm
N2 (Nitrogen)	- ppm
TDG:	- %
TDCG:	0.00 %
THCG (O2N2):	- %
THCG (Pressure):	0.00 %



Transformer Fault Gas Analysis

Results

Sample

Equipment ID: JO-19000603-1_kinden	Serial Number: JO-19000603-1
Apparatus Type: TRN	Sampling Point: Samp Pt 1
Designation: Aft No Load 105%	Syringe ID: 1
Sampled By: Arjun	Date Sampled: 2019/02/28
Oil Temperature: 25 °C	Tank Pressure: 3 psig
Comment: Oil type: ASTM D3612	

Analysis Files

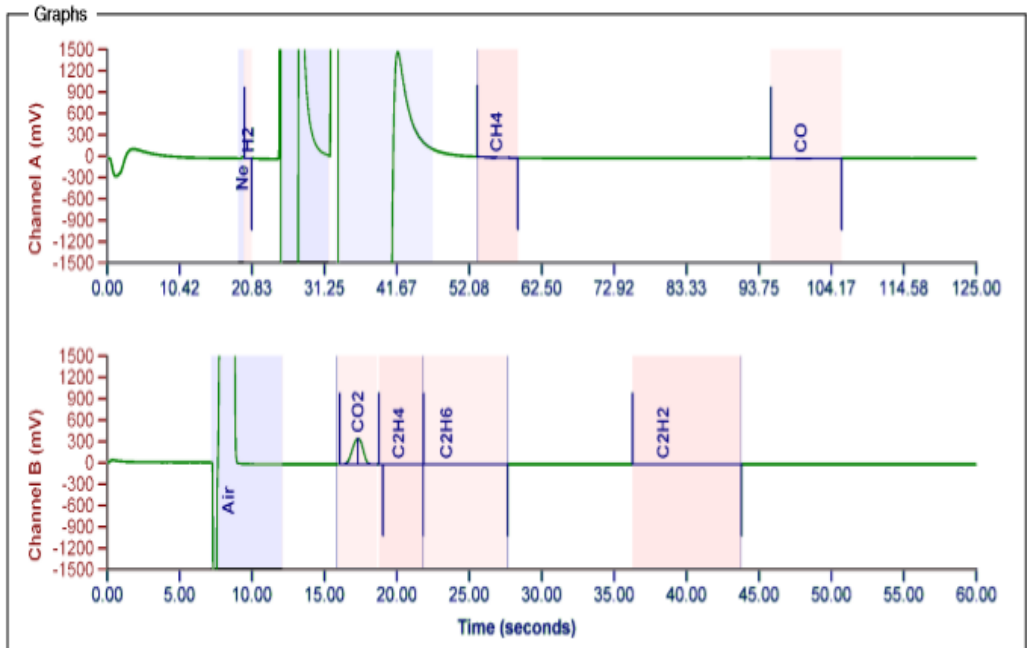
Method: 20190228 Daily Method.prm
 Calgas: 20190201084419 Calibration.prs
 Air: 20190201092831 Air.prs
 Oil: 20190228100935 Oil.prs
 Calgas O2N2: 20190201084419 Calibration.prs
 Air O2N2: 20190201092831 Air.prs
 Oil O2N2:

Measurement Results

H2 (Hydrogen)	0 ppm
CH4 (Methane)	0 ppm
CO (Carbon Monoxide)	0 ppm
CO2 (Carbon Dioxide)	208 ppm
C2H4 (Ethylene)	0 ppm
C2H6 (Ethane)	0 ppm
C2H2 (Acetylene)	0 ppm
O2 (Oxygen)	- ppm
N2 (Nitrogen)	- ppm
TDG:	- %
TDCG:	0.00 %
THCG (O2N2):	- %
THCG (Pressure):	0.00 %

Analysis Identification

Analyzed By: Arjun
 Date Acquired: 2019/02/28
 Instrument ID: 11511006
 Version: PPMreport 3.6.0



Transformer Fault Gas Analysis

Results

Sample

Equipment ID: JO-19000603-1_kinden	Serial Number: JO-19000603-1
Apparatus Type: TRN	Sampling Point: Samp Pt 1
Designation: Bfr No Load 105%	Syringe ID: 1
Sampled By: Arjun	Date Sampled: 2019/02/27
Oil Temperature: 25 °C	Tank Pressure: 3 psig
Comment: Oil type: ASTM D3612	

Analysis Files

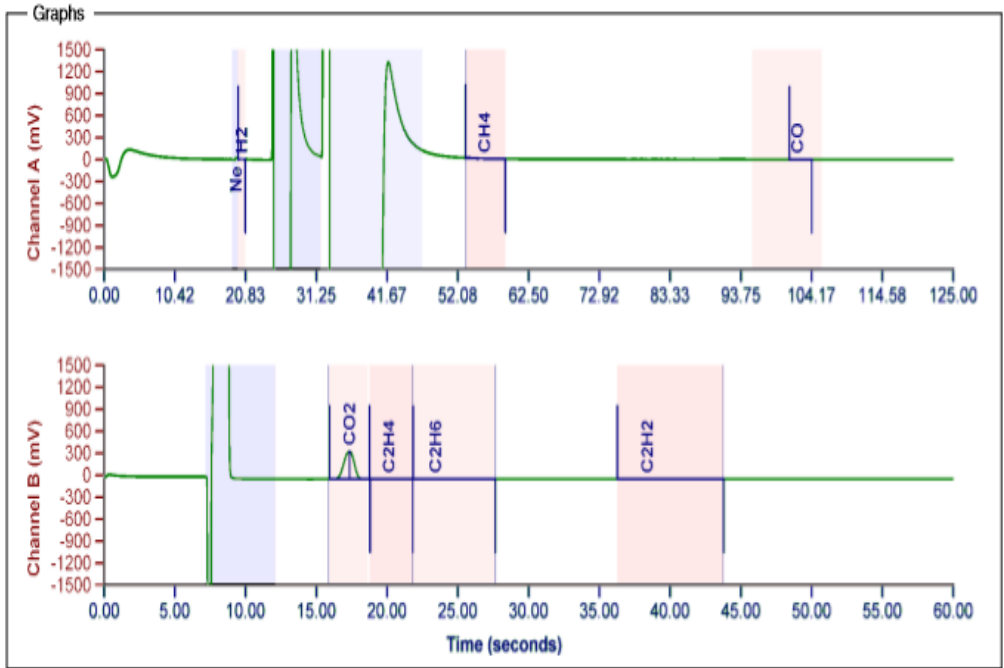
Method: 20190228 Daily Method.prm
 Calgas: 20190201084419 Calibration.prs
 Air: 20190201092831 Air.prs
 Oil: 20190228093330 Oil.prs
 Calgas O2N2: 20190201084419 Calibration.prs
 Air O2N2: 20190201092831 Air.prs
 Oil O2N2:

Measurement Results

H2 (Hydrogen)	0 ppm
CH4 (Methane)	0 ppm
CO (Carbon Monoxide)	0 ppm
CO2 (Carbon Dioxide)	216 ppm
C2H4 (Ethylene)	0 ppm
C2H6 (Ethane)	0 ppm
C2H2 (Acetylene)	0 ppm
O2 (Oxygen)	- ppm
N2 (Nitrogen)	- ppm
TDG:	- %
TDCG:	0.00 %
THCG (O2N2):	- %
THCG (Pressure):	0.00 %

Analysis Identification

Analyzed By: Arjun
 Date Acquired: 2019/02/28
 Instrument ID: 11511006
 Version: PPMreport 3.6.0



Insulating Oil Analysis Report

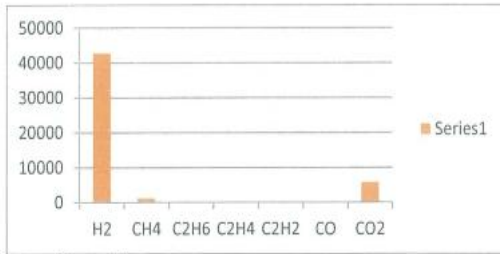
Customer Name	: PT. KINDEN	Operating Voltage	: 20/0,38	KV
Attention For	: PT. CMWI PIER	Rating	: 2000	KVA
Location	: Gardu trafo	Operating temp. of oil	: 55	C
Transformer ID	: trafo 2	Total Oil Volume	: -	Liter
Transformer Manufacture	: -	Insulating Oil Name	: -	
Serial Number	: 1705561	Sample Point	: B . M . T	

TEST DETAILS	Overall Analysis Result
---------------------	--------------------------------

LAB NUMBER	L19002-2					 WARNING
Sampling Date	06-Jan-19					
Received Date	07-Jan-19					
Analysis Date	11-Jan-19					
Report Date	14-Jan-19					

Physical Test	Unit	Method	Test Result	CODE	Limitation		
					Max	Min	
<i>Standart Oil Quality Analysis</i>							
Breakdown Voltage	KV	IEC 60156	-			-	30
Water Content	ppm	IEC 60814	-			35	-
Total Acid Number	mg KOH/g	IEC 60206	-			0.15	-
Oil Quality Index		(WP 222)	-			-	160
Interfacial Tension @25C	mN/m	ISO 6295	-			-	28
Color ASTM		ASTM D 1500	-			3.5	-
Appearance	Visual	Visual	Jernih			Kuning	-

<i>Dissolved Gas Analysis (DGA)</i>								
Hydrogen (H2)	ppm	ASTM D3612-B	42727				100	-
Methane (CH4)	ppm	ASTM D3612-B	1282				120	-
Ethane (C2H6)	ppm	ASTM D3612-B	255				65	-
Ethylene (C2H4)	ppm	ASTM D3612-B	7				5	-
Acetylene (C2H2)	ppm	ASTM D3612-B	< 1				35	-
Carbon Monoxide (CO)	ppm	ASTM D3612-B	134				350	-
Carbon Dioxide (CO2)*	ppm	ASTM D3612-B	5815				2500	-
Oxygen	ppm	ASTM D3612-B	2260				-	-
Nitrogen	ppm	ASTM D3612-B	49551				-	-
TDCG	ppm	ASTM D3612-B	44405				720	-
CO2 / CO		ASTM D3612-B	43.4				50±20	-
% Gas	%	ASTM D3612-B	10.2					
Equipment Condition		ASTM D3612-B	1				2	-



Source of abnormality :

Dissolved Gas Analysis : - TDCG Abnormal

Fault Gas Concentration, Particular hydrogen and gas ratio analysis give evidence partial discharge type fault - not necessarily occurring at the present time. Carbon monoxide and / or carbon dioxide concentrations are high indicating there maybe some abnormal cellulose insulation degradation.

Action to be taken :

Resample within Three (3) Months

Direktur,

[Signature Box]

Note: This report is valid only to the sample which tested to DWIKARYA Laboratory

Any complain should be send not more than 30 days after this report was published



PT. BAMBANG DJAJA

Jl. Rungkut Industri III/56, Surabaya

Internal Test

TRANSFORMER TESTING RESULT

Rated (kVA)	Phasa	Freq (Hz)	Voltage		Vector G.	Serial Number	STANDART
2000	3	50	Primary	Secondary	Dyn5	19R249570	IEC 60076
			20000	400			

Insulation Resistance	Oil Temp (°C)	DC 2500 V Megger (MΩ)			
	32	H - E	L - E	H - L	
		4570	4820	6620	
		Standard - Minimal			
		1000	1000	1000	

Resistance	Tap	1U - 1V	1U - 1W	1V - 1W	2u - 2v	2u - 2w	2v - 2w
Ω	3	2.1900	2.1930	2.1890	0.0007173	0.0007336	0.0007202

Iron Loss Test	Freq	50	Hz	No Load Current		No Load Loss (watt)
	Voltage (V)	I Nominal (Amp)		I0 (Amp)	% I0	
	400	2886.8	10.84	0.376	2479.00	
	Toleransi Nominal				2.0	2700.0
	Toleransi Maximal				2.6	3105.0

Copper Loss Test	Tap	Nom Current (A)	Inject Current (A)	Correction Factor	Voltage Impedance		Load Loss (Watt)		Eff	Reg
					Measured	Correction	Measured	Correction		
	3	57.7	57.73	1.000	1311.34	1311.45	23340.00	23344.06	98.59	1.51

Calculation	Temp.	P (watt)				Load Loss (Watt)	Total Losses (Watt)	%			Impedansi
		Pc	$I_1^2 R_1$	$I_2^2 R_2$	P_w			lr	lx	lz	
	32	23344.06	10953.33	9046.25	3344.48	26101.06	28580.06	1.17	6.45	6.56	6.58
	75	28101.06	12717.35	10503.14	2880.57			1.31	6.45	6.58	
	Toleransi Nominal @75° C					25000.0	27700.0	Toleransi Imp	Min	Nom	Max
Toleransi Maximal @75° C					28750.0	30470.0	@75° C ±	6.30	7.00	7.70	

Leakage test	Start			Finish			Result (24Hours)
	Pressure (Psi)	Date	Time	Pressure (Psi)	Date	Time	
Oil was injected into transformer with full assembled	7.00	26-Feb-2019	15.00	7.00	27-Feb-2019	15.00	No oil leaks out of transformer

Applied Potential Test			
Winding under test	Test Value		Result
HV - LV & Ground	Voltage Test	50 KV	GOOD
	duration	60 seconds	
LV - HV & Ground	Voltage Test	3 KV	GOOD
	duration	60 seconds	

Induce Potential Test				
Test Value			Winding under test	Result
Two times rated Voltage	800	Volt	2U - 2V	GOOD
Frequency	200	Hz	2U - 2W	GOOD
Duration	30	seconds	2V - 2W	GOOD

Surabaya, 27-Feb-2019

Tested by,



TRANSFORMER TESTING RESULT TAPING 7

Rated (kVA)	Phasa	Freq (Hz)	Voltage		Vector G.	Serial Number	STANDART
			Primary	Secondary			
2000	3	50	20,000	400	Dyn5	19R249570	IEC 60076

Resistance	Tap	1U - 1V (Ω)	1U - 1W (Ω)	1V - 1W (Ω)	2u - 2v (Ω)	2u - 2w (Ω)	2v - 2w (Ω)
	7	1.9492	1.9585	1.9500	0.0007206	0.0007333	0.0007194

Iron Loss Test	Freq	50	Hz	No Load Current		No Load Loss (watt)
	Voltage (V)	I Nominal (Amp)		I0 (Amp)	% I0	
	400	2886.8		10.245	0.355	

Copper Loss Test		Nom Current (A)	Inject Current (A)	Correction Factor	Voltage Impedance		Load Loss (Watt)		Eff	Reg
Voltage	Tap				Measured	Correction	Measured	Correction		
18,000	7	64.2	64.11	1.001	1126.35	1127.06	24430.00	24460.52	98.53	1.55

Calculation	Temp.	P (watt)				Load Loss (Watt)	Total Losses (Watt)	%			Impedansi
		Pc	$I_p^2 R_p$	$I_s^2 R_s$	P_w			lr	lx	lz	
	33	24460.52	12052.88	9055.42	3352.22	27314.36	29742.36	1.22	6.14	6.26	6.29
75	27314.36	13941.76	10474.55	2898.05	1.37			6.14	6.29		

TEMPERATURE RISE REPORT (PROSES)

Rated (kVA)	Phasa	Freq (Hz)	Voltage		Vector G.	Serial Number	STANDART
2000	3	50	Primary	Secondary	Dyn5	19R249570	IEC 60076
			20,000	400			

Total Losses 29742.36 Watt Rated Current 64.15 A Tap position 7
 TR-KODE TR-CRA7A41B-ABAA

Process of Temperature Rise

Time	Voltage	Current	Losses	Ambient temp °C				Radiator °C		Body °C		Top oil °C	
				T1	T2	T3	AVG	Upper	Bottom	Upper	Bottom	Temp	Rise
19.00	716.9	70.580	29640.0	34.0	32.6	32.4	33.0	34.0	32.5	34.4	33.1	32.0	-1.0
20.00	687.4	67.240	29650.0	34.4	33.1	32.7	33.4	56.2	40.8	55.9	37.0	60.0	26.6
21.00	677.3	66.230	29640.0	34.9	33.6	33.2	33.9	66.6	47.4	65.9	42.1	70.0	36.1
22.00	673.7	65.750	2960.0	35.0	34.0	33.2	34.1	70.4	52.1	69.6	44.5	78.0	43.9
23.00	672.2	65.510	29640.0	35.5	34.5	33.6	34.5	72.4	53.5	72.4	47.6	81.0	46.5
0.00	671.0	65.320	29630.0	35.4	34.4	33.4	34.4	74.7	52.8	73.6	49.4	82.0	47.6
1.00	670.1	65.320	29640.0	34.7	33.9	33.0	33.9	74.8	52.1	73.7	49.7	82.0	48.1
2.00	670.0	65.220	29640.0	35.1	34.2	33.2	34.2	75.4	54.7	74.0	50.2	83.0	48.8
3.00	669.7	65.220	29640.0	34.8	34.0	33.0	33.9	75.6	52.9	74.0	51.2	83.0	49.1
4.00	669.0	65.270	29640.0	34.2	33.5	32.5	33.4	74.6	54.9	72.3	49.3	83.0	49.6
5.00	669.5	65.270	29640.0	34.4	33.6	32.5	33.5	75.2	51.6	73.2	51.1	83.0	49.5
6.00	669.9	65.180	29630.0	34.5	33.6	32.5	33.5	74.7	51.6	76.1	51.3	83.0	49.5
7.00	669.2	65.160	29630.0	34.6	33.7	32.5	33.6	73.6	53.1	75.3	51.4	83.0	49.4
7.00	659.0	64.150	28700.0	34.6	33.7	32.5	33.6	73.6	53.1	75.3	51.4	83.0	49.4
8.00	657.9	64.190	28680.0	35.7	34.9	32.8	34.5	71.8	55.2	73.8	51.5	82.0	47.5



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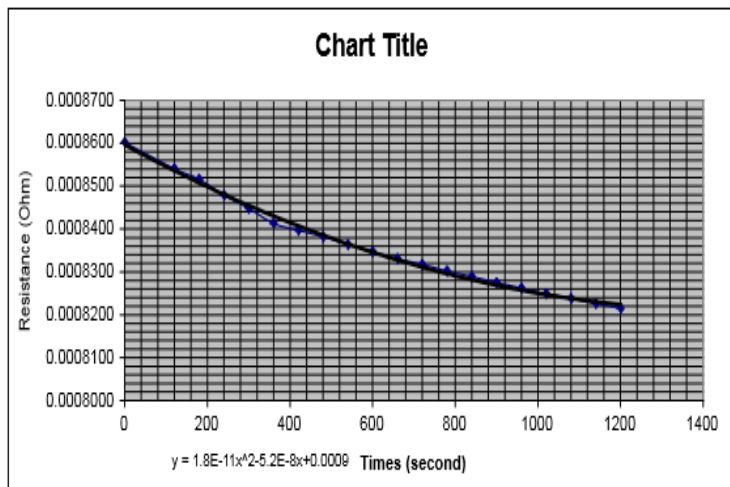
Jl. Rungkut Industri III/56, Surabaya

TEMPERATURE RISE REPORT (WINDING LV RESISTANCE)

Rated (kVA)	Phasa	Freq (Hz)	Voltage		Vector G.	Serial Number	STANDART
			Primary	Secondary			
2000	3	50	20,000	400	Dyn5	19R249570	IEC 60076

Average winding temperature by resistance LV side
 $AWT2 = R2/R1 \times (235 + T1) - 235$

second	Ohm
0	0.0008602
120	0.0008541
180	0.0008516
240	0.0008479
300	0.0008448
360	0.0008413
420	0.0008397
480	0.0008382
540	0.0008364
600	0.0008347
660	0.0008331
720	0.0008317
780	0.0008302
840	0.0008289
900	0.0008275
960	0.0008262
1020	0.0008249
1080	0.0008238
1140	0.0008226
1200	0.0008



R1	=	0.0007206	ohm
R2	=	0.0008602	ohm
T1	=	33.0	°C
AWT2	=	84.9	°C

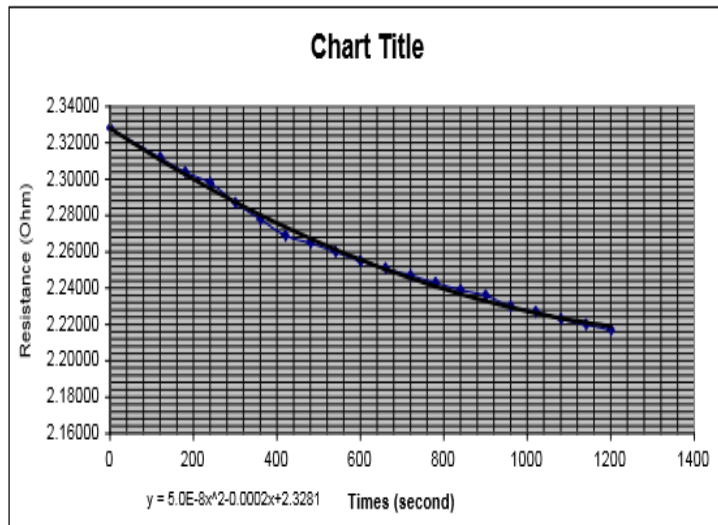
TEMPERATURE RISE REPORT (WINDING HV RESISTANCE)

33	Phasa	Freq (Hz)	Voltage		Vector G.	Serial Number	STANDART
2000	3	50	Primary	Secondary	Dyn5	19R249570	IEC 60076
			20,000	400			

Average winding temperature by resistance HV side

$$AWT2 = R2/R1 \times (235 + T1) - 235$$

second	Ohm
0	2.32810
120	2.31200
180	2.30400
240	2.29800
300	2.28700
360	2.27800
420	2.26900
480	2.26500
540	2.26000
600	2.25500
660	2.25100
720	2.24700
780	2.24300
840	2.23900
900	2.23600
960	2.23000
1020	2.22700
1080	2.22300
1140	2.22000
1200	2.21700



R1	=	1.9492000	ohm
R2	=	2.3281000	ohm
T1	=	33.0	°C
AWT2	=	85.1	°C



PT. BAMBANG DJAJA

Jl. Rungkut Industri III/56, Surabaya

TEMPERATURE RISE REPORT (CALCULATION)

Rated (kVA)	Phasa	Freq (Hz)	Voltage		Vector G.	Serial Number	STANDART
			Primary	Secondary			
2000	3	50	20.000	400	Dyn5	19R249570	IEC 60076

Temperature rise calculation		Specified
MEASUREMENT OF TEMPERATURE AT TOTAL LOSS , after the last three hours.		
- Ambient temperature [TA1]	33.4 °C	
- Top Oil temperature [TO1]	83.0 °C	
- Bottom Oil temperature [TB1]	53.1 °C	
- Average Oil temperature [AOT1]		
AOT1 = 1/2[TO1 + TB1]	68.1 °C	
- Average oil temperature rise , above cooling medium [AOTR1]		
AOTR1 = AOT1 - TA1	34.7 K	
- Top Oil Temperature Rise , above cooling medium.		
TOR = TO1 - TA1	49.6 K	<= 60
MEASUREMENT OF TEMPERATURE AT RATED CURRENT, at the time of shutdown		
- Ambient temperature [TA2]	34.5 °C	
- Top Oil temperature average [TO2]	82.0 °C	
- Bottom Oil Temperature [TB2]	55.2 °C	
- Average Oil Temperature [AOT2]		
AOT2 = 1/2[TO2 + TB2]	68.6 °C	
- Average oil temperature rise , above cooling medium [AOTR2]		
AOTR2 = AOT2 - TA2	34.1 K	
- Average Winding Temperature , by resistance [AWT]		
AWT1 , For HV winding	85.1 °C	
AWT2 , For LV winding	84.9 °C	
- Average Oil Temperature Rise Drop [during 1 hours stabilisation]		
AOTRD = AOTR1 - AOTR2	0.5 K	
- Corrected Average Winding Temperature [CAWT]		
CAWT1 , for HV winding = [AWT1 + AOTRD]	85.6 °C	
CAWT2 , for LV winding = [AWT2 + AOTRD]	85.4 °C	
- Average winding temperature rise , above cooling medium.		
AWTR , for HV winding = [CAWT1 - TA2]	51.1 K	<= 65
AWTR , for LV winding = [CAWT2 - TA2]	51.0 K	<= 65
- Gradient : HV winding = CAWT1 - AOT1	17.6 K	
LV winding = CAWT2 - AOT1	17.4 K	

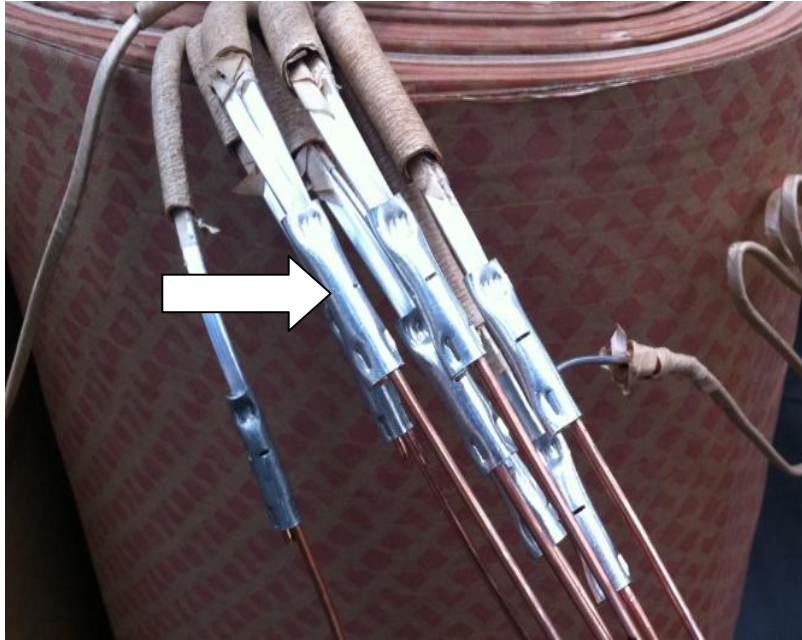
Resume:

Top Oil Temp Rise (K) :	49.6	<= 60	
Winding Temp Rise HV (K) :	51.1	<= 65	
Winding Temp Rise LV (K) :	51.0	<= 65	

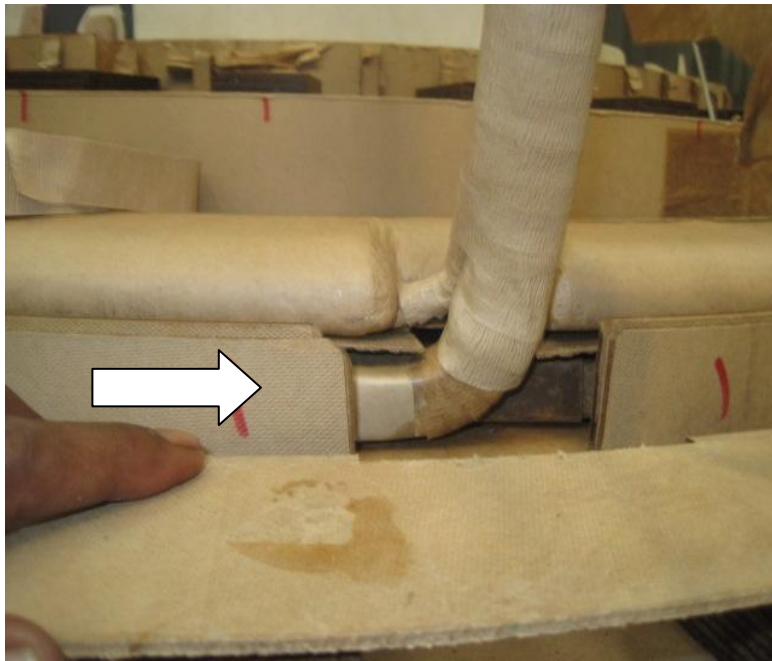
Standard:

Date of test : 1-Mar-19

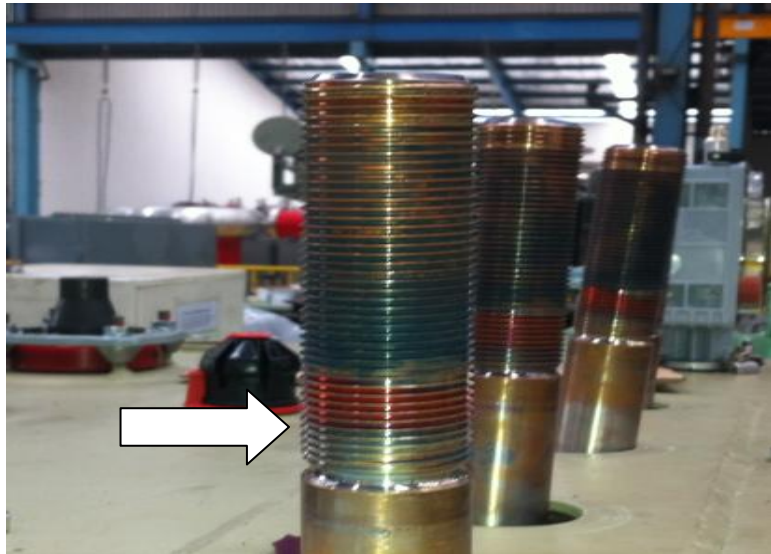
Tested by :



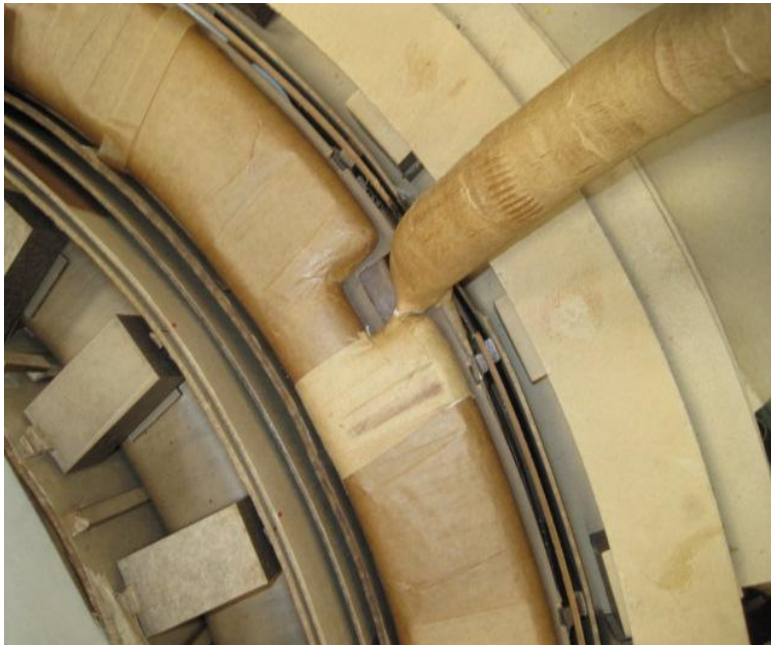
Gambar 4. 1 Peyambungan Led Kurang Rapi



Gambar 4. 2 Isolasi Kertas Yang Belum Kering



Gambar 4. 3 Lead LV Yang Kotor Akibat Proses Vaccum



Gambar 4. 4 Lead Kurang Rapi

