





	Customer	San	nple	F	Report
Company:	Massachusetts Bay Transport	ation Authority	•	Lab Order No:	236658
Main Contact:	Ibrahim T. Asidah	ID No:	236658-001		
Address:	21 Arlington Ave, Bldg. #2	Date Sampled:	02/12/2020	Revision:	
	Charlestown 00400	Date Received:	02/28/2020	Date Issued:	03/20/2020
	Charlestown, 02129	Work Order:		Laboratory:	Marlborough, MA
E-mail:	iasidah@mbta.com	Purchase Order:	4000092615	Authorized By:	
		Task No:			
EQUIPMENT INFO	ORMATION		Equipment Type:	XFMR	
Substation:	115KV Yard	Equipment No:		Transformer Name:	TA
Serial No:	E1100059A	Maximum MVA:	40	Maximum KV:	115.00
Design Type:	Core Type	Cooling:	FA	Max. Temp Rise:	
No of Phases:	N	Phase Name:		Insulant Type:	Mineral
Manufacturari	EFACEC Portugal	Yr Manufactured:	2014	Volume:	6012
Manufacturer.					
	Gas Blanketed	XFMR/TRN Type:	Transformer	Units:	Gallons

SAMPLING INFORMATION

Syringe No:	Sample Date:	02/12/2020	Top Oil Temp (C):	
Container No:	Sampled By:	S.WALTERS	Humidity:	
Miscellaneous ID:	Time:	1:55 am	Ambient Temp (C):	
Reason for Testing:	Secondary Name:		Sample Point:	Main Tank Bottom

CRITICALITY and RESAMPLE FREQUENCY

Criticality: Low

Resample Frequency: 6 months

Dissolved Gas Analysis

The results indicate that there is a low volume of combustible gas present.

Oil Quality Tests

Resuls are acceptable.

Additional Oil Quality Tests

Miscellaneous Tests







Additional Oil Quality Tests Serial No: E1100059A

E1100059A	Sample Date:	2/12/2020	3/27/2015
	Analysis Date:	3/20/2020	
	Sample Point:	Bottom	Bottom
	Sample No:	1	1
Additional Oil Quality Tests	Doble Sample Id:	236658-001	149622-001
	Report ID:	236658	149622
	Top Oil Temp (C):		13
Viscosity (Saybolt) (SUS)	D2161	54.9	55.0

Dissolved Gas Analysis Serial No: E1100059A

E1100059A	Sample Date:	2/12/2020	3/27/2015
	Analysis Date:	3/20/2020	
	Sample Point:	Bottom	Bottom
	Sample No:	1	1
Dissolved Gas Analysis	Doble Sample Id:	236658-001	149622-001
	Report ID:	236658	149622
	Top Oil Temp (C):		13
Hydrogen (H2) (ppm)	ASTM D3612 IEC 60567	1.0^	0.0
Oxygen (O2) (ppm)	ASTM D3612 IEC 60567	587^	11000
Nitrogen (N2) (ppm)	ASTM D3612 IEC 60567	79300^	74400
Methane (CH4) (ppm)	ASTM D3612 IEC 60567	0.539^	0.600
Carbon Monoxide (CO) (ppm)	ASTM D3612 IEC 60567	5.21^	6.90
Ethane (C2H6) (ppm)	ASTM D3612 IEC 60567	0.3^	0.0
Carbon Dioxide (CO2) (ppm)	ASTM D3612 IEC 60567	305^	133
Ethylene (C2H4) (ppm)	ASTM D3612 IEC 60567	0.1^	0.0
Acetylene (C2H2) (ppm)	ASTM D3612 IEC 60567	0.0^	0.0
Total Gas (ppm)		80199^	85540
Comb. Gas (ppm)		7^	8
Est. TCG, % of Gas Space		0.01^	0.01
Ethylene-Acetylene Ratio		0.00^	0.00
PPM/Day (ppm/day)		-0.0	

Miscellaneous Tests Serial No: E1100059A

E1100059A	Sample Date:	2/12/2020	3/27/2015
	Analysis Date:	3/20/2020	
	Sample Point:	Bottom	Bottom
	Sample No:	1	1
Miscellaneous Tests	Doble Sample Id:	236658-001	149622-001
	Report ID:	236658	149622
	Top Oil Temp (C):		13
PCB Content (ppm)	D4059	<2	< 2
Aroclor Detected		ND	

Oil Quality Tests Serial No: E1100059A





E1100059A	Sample Date: Analysis Date:	2/12/2020 3/20/2020	3/27/2015
	Sample Point:	Bottom	Bottom
	Sample No:	1	1
Oil Quality Tests	Doble Sample Id:	236658-001	149622-001
	Report ID:	236658	149622
	Top Oil Temp (C):		13
Water Content (ppm)	D1533 IEC 60814	1^	2
Relative Saturation (%)		Need Data [^]	5
Color D1500	D1500	L0.5^	L 0.5
Dielectric, D 877A (kV)	D877		47
Dielectric, D 1816, 1mm gap (kV)	D1816	30^	39
Interfacial Tension (mN/m)	D971	47^	47
Neut. Number (mgKOH/g)	D974	<0.01^	< 0.01
Pour Pt (°C)	D97 ISO 3016	<-40	< -40
Power Factor @ RT (%)	D924	0.024^	0.004
Power Factor @ 100°C (%)	D924	1.027^	0.135
Specific Gravity By D4052 (60/60)	D4052	0.8855^	
Specific Gravity (Rel. Density) (60/60)	D1298		0.885
Viscosity @ 40°C (mm2/s (cSt))	D445 ISO 3104	8.86	8.87
Inhibitor Content:D2668 (%)	D2668	0.300^	0.307
Visual Examination	D1524	C&B^	C&B







Customer	Sample	5	Report
Company: Massachusetts Bay Transpor	tation Authority	Lab Order No:	236658
Main Contact: Ibrahim T. Asidah	ID No: 236658-	002	
Address: 21 Arlington Ave, Bldg. #2	Date Sampled: 02/12/20	020 Revision:	
Ohardaatawa 00400	Date Received: 02/28/20	Date Issued:	03/20/2020
Charlestown, 02129	Work Order:	Laboratory:	Marlborough, MA
E-mail: iasidah@mbta.com	Purchase Order: 4000092	2615 Authorized By:	
	Task No:		
EQUIPMENT INFORMATION	Equipn	nent Type: XFMR	
Substation: South Boston	Equipment No:	Transformer Name:	С
Serial No: 11073356	Maximum MVA: 40	Maximum KV:	115.00
Design Type:	Cooling:	Max. Temp Rise:	
No of Phases: N	Phase Name:	Insulant Type:	
Manufacturer: National	Yr Manufactured: 1987	Volume:	7600
Preservation: Sealed Conservator	XFMR/TRN Type:	Units:	Gallons
Alarm Set:			

SAMPLING INFORMATION

Syringe No:		Sample Date:	02/12/2020	Top Oil Temp (C):	55
Container No:		Sampled By:	K.O'LEARY	Humidity:	39.00
Miscellaneous ID:		Time:	1:00 am	Ambient Temp (C):	4
Reason for Testing:	Sec	condary Name:		Sample Point:	Main Tank Bottom

CRITICALITY and RESAMPLE FREQUENCY

Criticality: Low

Resample Frequency: 6 months

Dissolved Gas Analysis

Overheating of cellulose.

Oil Quality Tests

Water results are excellent.

Additional Oil Quality Tests

Miscellaneous Tests







Additional Oil Quality Tests Serial No: 11073356

11073356	Sample Date:	2/12/2020	9/26/2007	3/30/2006
	Analysis Date:	3/20/2020		
	Sample Point:	Bottom	Bottom	Bottom
	Sample No:	2	1	11
Additional Oil Quality Tests	Doble Sample Id:	236658-002	77866-001	67739-011
	Report ID:	236658	77866	67739
	Top Oil Temp (C):	55	36	
Viscosity (Saybolt) (SUS)	D2161	56.0	56.2	56.0

Dissolved Gas Analysis Serial No: 11073356

Dioconton One / manyone	Condition 11070000					
11073356	Sample Date:	2/12/2020	9/29/2010	9/26/2007	3/30/2006	10/3/2000
	Analysis Date:	3/20/2020				
	Sample Point:	Bottom	Bottom	Bottom	Bottom	Bottom
	Sample No:	2	2	1	11	2
Dissolved Gas Analysis	Doble Sample Id:	236658-002	99930-002	77866-001	67739-011	41698-002
	Report ID:	236658	99930	77866	67739	41698
	Top Oil Temp (C):	55	32	36		
Hydrogen (H2) (ppm)	ASTM D3612 IEC 60567	3.6^	0.0	3.5	6.0	0.0
Oxygen (O2) (ppm)	ASTM D3612 IEC 60567	119^	2860	1490	1880	1080
Nitrogen (N2) (ppm)	ASTM D3612 IEC 60567	43400^	48400	41100	44000	49200
Methane (CH4) (ppm)	ASTM D3612 IEC 60567	85.5^	58.0	57.0	49.0	26.0
Carbon Monoxide (CO) (ppm)	ASTM D3612 IEC 60567	252^	235	283	257	300
Ethane (C2H6) (ppm)	ASTM D3612 IEC 60567	88.4^	48.0	59.0	27.0	8.0
Carbon Dioxide (CO2) (ppm)	ASTM D3612 IEC 60567	754^	930	1030	643	596
Ethylene (C2H4) (ppm)	ASTM D3612 IEC 60567	4.1^	3.3	2.3	2.4	1.0
Acetylene (C2H2) (ppm)	ASTM D3612 IEC 60567	0.0^	0.0	0.0	0.0	0.0
Total Gas (ppm)		44707^	52534	44025	46864	51211
Comb. Gas (ppm)		434^	344	405	341	335
Est. TCG, % of Gas Space		0.50^	0.39	0.56	0.48	0.47
Ethylene-Acetylene Ratio		0.00^	0.00	0.00	0.00	
PPM/Day (ppm/day)		0.0				

Miscellaneous Tests Serial No: 11073356

11073356	Sample Date:	2/12/2020	9/26/2007	3/30/2006
	Analysis Date:	3/20/2020		
	Sample Point:	Bottom	Bottom	Bottom
	Sample No:	2	1	11
Miscellaneous Tests	Doble Sample Id:	236658-002	77866-001	67739-011
	Report ID:	236658	77866	67739
	Top Oil Temp (C):	55	36	
PCB Content (ppm)	D4059	<2	2	2
Aroclor Detected		ND		

Oil Quality Tests Serial No: 11073356







11073356	Sample Date:	2/12/2020	9/26/2007	3/30/2006	10/3/2000	5/7/1999
	Analysis Date:	3/20/2020				
	Sample Point:	Bottom	Bottom	Bottom	Bottom	Bottom
	Sample No:	2	1	11	2	3
Oil Quality Tests	Doble Sample Id:	236658-002	77866-001	67739-011	41698-002	37056-003
	Report ID:	236658	77866	67739	41698	37056
	Top Oil Temp (C):	55	36			
Water Content (ppm)	D1533 IEC 60814	2^	8	4	9	10
Relative Saturation (%)		1.0^	8			
Color D1500	D1500	L1.5^	1.5	1.0		
Dielectric, D 877A (kV)	D877		53	53		
Dielectric, D 1816, 1mm gap (kV)	D1816	37^	38	41		
Interfacial Tension (mN/m)	D971	39^	41	43	40	42
Neut. Number (mgKOH/g)	D974	<0.01^	0.01	0.01	0.01	0.01
Pour Pt (°C)	D97 ISO 3016	<-40	-40	-40		
Power Factor @ RT (%)	D924	0.012^	0.024	0.020		
Power Factor @ 100°C (%)	D924	0.430^	0.951	1.140		
Specific Gravity By D4052 (60/60)	D4052	0.8807^				
Specific Gravity (Rel. Density) (60/60)	D1298		0.882	0.881		
Viscosity @ 40°C (mm2/s (cSt))	D445 ISO 3104	9.19	9.22	9.18		
Inhibitor Content:D2668 (%)	D2668	N/D^	ND	ND	0.020	0.000
Visual Examination	D1524	C&B^	C&B	C&B		







	Customer	Sam	iple	F	Report
Company	Massachusetts Bay Transport	ation Authority	•	Lab Order No:	236658
Main Contact	Ibrahim T. Asidah	ID No:	236658-003		
Address	21 Arlington Ave, Bldg. #2	Date Sampled:	02/19/2020	Revision:	
	Olas da starra e contro	Date Received:	02/28/2020	Date Issued:	03/20/2020
	Charlestown, 02129	Work Order:		Laboratory:	Marlborough, MA
E-mail	iasidah@mbta.com	Purchase Order:	4000092615	Authorized By:	
		Task No:			
EQUIPMENT INFO	ORMATION		Equipment Type:	XFMR	
Substation	SBSS	Equipment No:		Transformer Name:	В
Serial No	11073358	Maximum MVA:	40	Maximum KV:	115.00
Design Type		Cooling:		Max. Temp Rise:	
No of Phases	N	Phase Name:		Insulant Type:	Mineral
Manufacturer	National	Yr Manufactured:	1987	Volume:	7650
	O Displanted	VEMP/TON Tons		Units:	Gallons
Preservation	Gas Blanketed	XFMR/TRN Type:		Units:	Galloris

SAMPLING INFORMATION

Syringe No:	Sample Date:	02/19/2020	Top Oil Temp (C):	50
Container No:	Sampled By:	K.O'LEARY	Humidity:	28.00
Miscellaneous ID:	Time:	1:00 am	Ambient Temp (C):	4
Reason for Testing:	Secondary Name:		Sample Point:	Main Tank Bottom

CRITICALITY and RESAMPLE FREQUENCY

Criticality: Low

Resample Frequency: 6 months

Dissolved Gas Analysis

Overheating of cellulose.

Oil Quality Tests

Water results are excellent. Other results are acceptable.

Additional Oil Quality Tests

Miscellaneous Tests







Additional Oil Quality Tests Serial No: 11073358

11073358	Sample Date:	2/19/2020	9/27/2007	3/30/2006
	Analysis Date:	3/20/2020		
	Sample Point:	Bottom	Bottom	Bottom
	Sample No:	3	3	10
Additional Oil Quality Tests	Doble Sample Id:	236658-003	77866-003	67739-010
	Report ID:	236658	77866	67739
	Top Oil Temp (C):	50	35	
Viscosity (Saybolt) (SUS)	D2161	56.0	56.1	55.4

Dissolved Gas Analysis Serial No: 11073358

Dioconton Cuo / manyone		Condition 11070000				
11073358	Sample Date:	2/19/2020	9/29/2010	9/27/2007	3/30/2006	10/3/2000
	Analysis Date:	3/20/2020				
	Sample Point:	Bottom	Bottom	Bottom	Bottom	Bottom
	Sample No:	3	4	3	10	4
Dissolved Gas Analysis	Doble Sample Id:	236658-003	99930-004	77866-003	67739-010	41698-004
	Report ID:	236658	99930	77866	67739	41698
	Top Oil Temp (C):	50	32	35		
Hydrogen (H2) (ppm)	ASTM D3612 IEC 60567	5.3^	0.0	5.6	7.4	6.0
Oxygen (O2) (ppm)	ASTM D3612 IEC 60567	215^	4840	1320	3040	2140
Nitrogen (N2) (ppm)	ASTM D3612 IEC 60567	40000^	54200	38100	47200	41200
Methane (CH4) (ppm)	ASTM D3612 IEC 60567	77.8^	52.0	48.0	40.0	14.0
Carbon Monoxide (CO) (ppm)	ASTM D3612 IEC 60567	311^	298	368	347	372
Ethane (C2H6) (ppm)	ASTM D3612 IEC 60567	78.1^	40.0	44.0	19.0	4.0
Carbon Dioxide (CO2) (ppm)	ASTM D3612 IEC 60567	686^	878	964	639	514
Ethylene (C2H4) (ppm)	ASTM D3612 IEC 60567	3.7^	2.8	2.6	2.2	1.0
Acetylene (C2H2) (ppm)	ASTM D3612 IEC 60567	0.0^	0.0	0.0	0.0	0.0
Total Gas (ppm)		41377^	60311	40852	51295	44251
Comb. Gas (ppm)		476^	393	468	416	397
Est. TCG, % of Gas Space		0.66^	0.42	0.77	0.58	0.69
Ethylene-Acetylene Ratio		0.00^	0.00	0.00	0.00	
PPM/Day (ppm/day)		0.0				

Miscellaneous Tests Serial No: 11073358

11073358	Sample Date:	2/19/2020	9/27/2007	3/30/2006
	Analysis Date:	3/20/2020		
	Sample Point:	Bottom	Bottom	Bottom
	Sample No:	3	3	10
Miscellaneous Tests	Doble Sample Id:	236658-003	77866-003	67739-010
	Report ID:	236658	77866	67739
	Top Oil Temp (C):	50	35	
PCB Content (ppm)	D4059	<2	2	2
Aroclor Detected		ND		

Oil Quality Tests Serial No: 11073358







11073358	Sample Date:	2/19/2020	9/27/2007	3/30/2006	10/3/2000	5/7/1999
	Analysis Date:	3/20/2020				
	Sample Point:	Bottom	Bottom	Bottom	Bottom	Bottom
	Sample No:	3	3	10	4	4
Oil Quality Tests	Doble Sample Id:	236658-003	77866-003	67739-010	41698-004	37056-004
	Report ID:	236658	77866	67739	41698	37056
	Top Oil Temp (C):	50	35			
Water Content (ppm)	D1533 IEC 60814	3^	5	5	6	11
Relative Saturation (%)		1.7^	5			
Color D1500	D1500	L1.5^	1.5	1.0		
Dielectric, D 877A (kV)	D877		55	58		
Dielectric, D 1816, 1mm gap (kV)	D1816	33^	41	38		
Interfacial Tension (mN/m)	D971	40^	42	40	42	41
Neut. Number (mgKOH/g)	D974	<0.01^	0.01	0.01	0.01	0.01
Pour Pt (°C)	D97 ISO 3016	<-40	-40	-40		
Power Factor @ RT (%)	D924	0.018^	0.033	0.026		
Power Factor @ 100°C (%)	D924	0.661^	1.778	1.600		
Specific Gravity By D4052 (60/60)	D4052	0.8807^				
Specific Gravity (Rel. Density) (60/60)	D1298		0.882	0.881		
Viscosity @ 40°C (mm2/s (cSt))	D445 ISO 3104	9.18	9.21	9.00		
Inhibitor Content:D2668 (%)	D2668	N/D^	ND	ND	0.020	0.000
Visual Examination	D1524	C&B^	C&B	C&B		







	Customer	Sam	nple	F	Report
Company	Massachusetts Bay Transpo		'	Lab Order No:	
Main Contact:	Ibrahim T. Asidah	ID No:	236658-004		
Address	21 Arlington Ave, Bldg. #2	Date Sampled:	02/19/2020	Revision:	
	Oh arila ataurra 00400	Date Received:	02/28/2020	Date Issued:	03/20/2020
	Charlestown, 02129	Work Order:		Laboratory:	Marlborough, MA
E-mail:	iasidah@mbta.com	Purchase Order:	4000092615	Authorized By:	
		Task No:			
QUIPMENT INFO					
QUIPINIENT INFO	DRMATION		Equipment Type:	XFMR	
Substation:	i e	Equipment No:		XFMR Transformer Name:	
Substation:	i e	Equipment No: Maximum MVA:			
Substation:	11073557			Transformer Name:	
Substation: Serial No:	11073557	Maximum MVA:		Transformer Name: Maximum KV:	
Substation: Serial No: Design Type:	11073557	Maximum MVA: Cooling:		Transformer Name: Maximum KV: Max. Temp Rise:	
Substation: Serial No: Design Type: No of Phases:	11073557	Maximum MVA: Cooling: Phase Name:		Transformer Name: Maximum KV: Max. Temp Rise: Insulant Type:	

SAMPLING INFORMATION

Syringe No:	Sample Date:	02/19/2020	Top Oil Temp (C):	50
Container No:	Sampled By:	K.O'LEARY	Humidity:	28.00
Miscellaneous ID:	Time:	1:00 am	Ambient Temp (C):	4
Reason for Testing:	Secondary Name:		Sample Point:	Main Tank Bottom

CRITICALITY and RESAMPLE FREQUENCY

Criticality: Low

Resample Frequency: 6 months

Dissolved Gas Analysis

Overheating of cellulose.

Oil Quality Tests

Water results are excellent. Other results are acceptable.

Additional Oil Quality Tests

Miscellaneous Tests







Additional Oil Quality Tests Serial No: 11073557

11073557	Sample Date:	2/19/2020
	Analysis Date:	3/20/2020
	Sample Point:	Bottom
	Sample No:	4
Additional Oil Quality Tests	Doble Sample Id:	236658-004
	Report ID:	236658
	Top Oil Temp (C):	50
Viscosity (Saybolt) (SUS)	D2161	56.0

Dissolved Gas Analysis Serial No: 11073557

Sample Date:	2/19/2020
Analysis Date:	3/20/2020
Sample Point:	Bottom
Sample No:	4
Doble Sample Id:	236658-004
Report ID:	236658
Top Oil Temp (C):	50
ASTM D3612 IEC 60567	2.5^
ASTM D3612 IEC 60567	170^
ASTM D3612 IEC 60567	33400^
ASTM D3612 IEC 60567	79.1^
ASTM D3612 IEC 60567	230^
ASTM D3612 IEC 60567	63.0^
ASTM D3612 IEC 60567	463^
ASTM D3612 IEC 60567	4.8^
ASTM D3612 IEC 60567	0.0^
	34412^
	379^
	0.59^
	0.00^
	Need Data
	Analysis Date:

Miscellaneous Tests Serial No: 11073557

11073557	Sample Date:	2/19/2020
	Analysis Date:	3/20/2020
	Sample Point:	Bottom
	Sample No:	4
Miscellaneous Tests	Doble Sample Id:	236658-004
	Report ID:	236658
	Top Oil Temp (C):	50
PCB Content (ppm)	D4059	<2
Aroclor Detected		ND

Oil Quality Tests Serial No: 11073557







11073557	Sample Date:	2/19/2020
	Analysis Date:	3/20/2020
	Sample Point:	Bottom
	Sample No:	4
Oil Quality Tests	Doble Sample Id:	236658-004
	Report ID:	236658
	Top Oil Temp (C):	50
Water Content (ppm)	D1533 IEC 60814	1^
Relative Saturation (%)		0.6^
Color D1500	D1500	2.0^
Dielectric, D 1816, 1mm gap (kV)	D1816	34^
Interfacial Tension (mN/m)	D971	40^
Neut. Number (mgKOH/g)	D974	<0.01^
Pour Pt (°C)	D97 ISO 3016	<-40
Power Factor @ RT (%)	D924	0.025^
Power Factor @ 100°C (%)	D924	0.857^
Specific Gravity By D4052 (60/60)	D4052	0.8806^
Viscosity @ 40°C (mm2/s (cSt))	D445 ISO 3104	9.18
Inhibitor Content:D2668 (%)	D2668	N/D^
Visual Examination	D1524	C&B^