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DIELECTRIC FLUID ANALYSIS

MARGINAL

REAL BIG WATER & POWER
Portage Trail Substation
Cuyahoga Falls, OH

Sample ID: PWP-C-03422-5-1-LTC
Equip. Desc.: C-03422-5-1; Load Tap Changer
Lubricant Type: Shell Dalina
Reservoir Cap.: 345.00 Gal(s) 1,305.83 Ltr(s)
Operations: 7,362
Lube Time: Not Provided Hr(s)

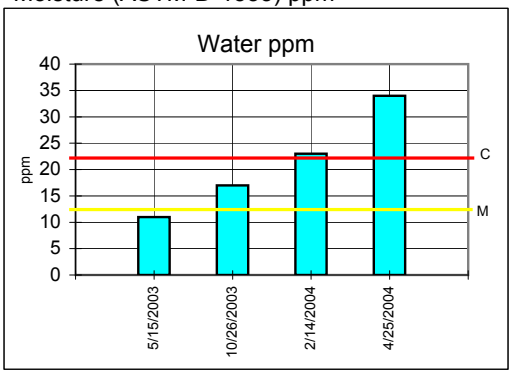
Sample Date: 4/25/2004
Received Date: 4/28/2004
Test Date: 4/30/2004
Prev. Sample: 2/14/2004 N
First Sample: 3/1/2004
No. Samples: 4

Recommendation(s):
Although both Oxygen & Nitrogen level s have decreased, these gases remains much higher than expected. Consider efforts to check gas bladder pressure differential for ambient infiltration.

PHYSICAL PROPERTIES

Sample Date(s)		05/15/03	10/26/03	02/14/04	04/25/04		REF.
Fluid Temp	°C	17.9	18.1	18.6	19.0		25.0
Water ppm	D-1533	11	17	23	34		30
TAN	D-974	0.34	0.67	1.72	2.13		0.12
Tens dynes/c	D-971	42	43	48	50		48
Dielect kV	D-877	19	24	28	30		> 28
Dielect kV mı	D-1816	44	48	55	60		> 56
Power 25°C	D-924	0.002	0.002	0.002	0.002		≤ 0.002
Power 100°C	D-924	0.037	0.040	0.042	0.045		≤ 0.050
Color	D-1500	L 0.20	L 0.20	L 0.23	L 0.25		L 0.5
Visual	D-1524	Clr Brt	Clr Brt	Clr Brt	Clr Brt		Clr Brt
Sedim	D-1524	NIL	NIL	NIL	0		NIL
Spec Gravity	D-1298	0.885	0.889	0.890	0.891		0.883

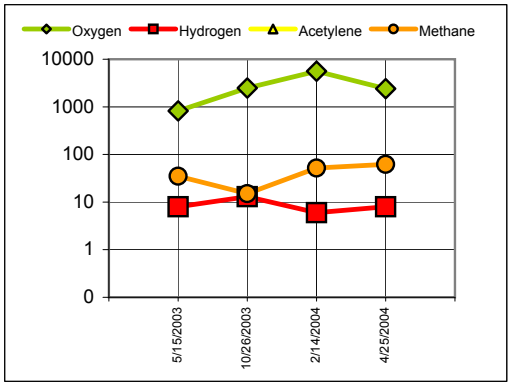
Moisture (ASTM-D-1533) ppm



ASTM-D-3612

DISSOLVED GAS ANALYSIS (ASTM-D-3612) ppm:							REF.
Hydrogen	H_2	8	13	6	8		500
Methane	CH_4	35	15	52	62		150
Ethane	C_2H_6	12	2	9	10		150
Ethylene	C_3H_4	7	2	31	35		120
Acetylene	C_2H_2	N/D	N/D	N/D	N/D		900
Carb Mono	CO	449	931	853	1,013		1,000
Carb Diox	CO_2	6,728	5,052	8,639	9,611		10,000
Nitrogen	N_2	27,692	58,939	72,808	72,098		10,000
Oxygen	O_2	819	2,486	5,602	2,414		10,000
Total	Gas	35,750	40,999	88,000	85,251		100,000
Tlt Comb	Gas	511	963	951	1,128		1,850
TCG	%	0.4294	0.8521	0.5909	0.9323		≤ 1.0
PCB	ppm	15	19	33	41		≤ 55

DGA (ppm) ASTM-D-3612



ASTM-D-3612

ELEMENTAL ANALTSIS (ppm)							REF.
Iron	^{26}(Fe) 55.84	11	19	28	56		1
Chromium	^{24}(Cr) 51.99	0	0	0	0		0
Aluminum	^{13}(Al) 26.98	0	0	0	0		0
Copper	^{9}(Cu) 63.54	1	2	3	6		4
Lead	^{82}(Pb) 207	0	0	1	2		2
Tin	^{58}(Sn) 118.6	0	0	1	1		1
Silver	^{47}(Ag) 107.86	0	0	0	0		0
Nickel	^{28}(Ni) 58.71	0	0	0	0		0

Elemental (ppm) ASTM-D-