

NTT DIAGNOSTIC REPORT for Silicone Insulating Fluids

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Source of Information: IEEE Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers IEEE C57.111-1989			Table 1	Table 2		Table 3	
IEEE Suggested Applications			Silicone Fluid as Rec'd	Fluid in New Transformers		Service-Aged Silicone Fluid	
Analysis	Method	Current NTT Result	IEEE Limit	IEEE Acceptance	Unacceptable Values Indicate	IEEE Acceptance	Unacceptable Values Indicate
Color (Platinum-Cobalt Scale)	ANSI/ASTM D-2129		maximum 15	Not Specified by IEEE		Not Specified by IEEE	
Visual Examination	ANSI/ASTM D-1524		Not Specified by IEEE	*Clear, free of particles	Particulates, free water, contamination	*Clear, free of particles	Particulates, free water, contamination
Flash Point (°C)	ASTM D-92		minimum 300	Not Specified by IEEE		Not Specified by IEEE	
Fire Point (°C)	ASTM D-92		minimum 340	minimum **340	Contamination by volatile material	minimum **340	Contamination by flammable material
Pour Point (°C)	ASTM D-97		maximum -50	Not Specified by IEEE		Not Specified by IEEE	
Refractive index (35°C)	ASTM D-1807		1.4010 - 1.4040				
Viscosity at 0°C, cSt	ANSI/ASTM D-445 or D-2161		81-92				
Viscosity at 25°C, cSt	ANSI/ASTM D-445 or D-2161		47.5 - 52.5	**47.5 - 52.5	Fluid degradation, contamination	**47.5 - 52.5	Fluid degradation, contamination
Viscosity at 100°C, cSt	ANSI/ASTM D-445 or D-2161		15 - 17	Not Specified by IEEE		Not Specified by IEEE	
Specific Gravity (25°C)	ANSI/ASTM D-1298		0.9570 - 0.9640				
Volatile Matter (weight %)	ASTM D-4559		maximum 0.5	Not Specified by IEEE		Not Specified by IEEE	
Dielectric breakdown voltage (kV)	ANSI/ASTM D-877		minimum 35				
Dissipation factor @ 25°C (%)	ASTM D-924		maximum 0.01	maximum **0.1	Polar/ionic contamination	maximum **0.2	Polar/ionic Contamination
Volume Resistivity (25°C)	ASTM D-1169		1 X 10 ¹⁴	Not Specified by IEEE		Not Specified by IEEE	
Neutralization number (mg KOH/g)	ASTM D-974		maximum 0.01	maximum **0.01	Contamination	maximum **0.2	Degradation of cellulose
Water content (ppm)	ANSI/ASTM D-1533		maximum 50	maximum **50	Water contamination	maximum **100	Water contamination

KEY: *IEEE suggests these analyses be performed as a minimum. **IEEE suggests these analyses as additional tests for further evaluation of the fluid.
 ↑ indicates that the value of this test exceeded the maximum value indicated by IEEE. ↓ indicates that the value of this test is below the minimum value indicated by IEEE.

Table 4 "Nature of Contamination and Reclamation" *Consultation with the transformer manufacturer is important before any action is taken to reclaim fluid from a transformer.

Contamination	Fluid Appearance	Equipment	Filter Aid	Test	Comments
Water	Clear to milky white	Dehydrator	None	Water content, dielectric strength	Separated water should be siphoned or drained
Products of Arcing: Silicone dioxide, carbon, highly crosslinked gelatinous polymer	Clear with particulates to grey-white, strong odor	Cartridge filter/vacuum or filter press and vacuum	None or diatomaceous earth	Dielectric strength, volume resistivity, dissipation factor	This method will not return liquid to original mfg. spec.
Particulates	Clear with particles hazy	Cartridge filter or filter press	None or diatomaceous earth	Dielectric strength, visual	May be removed by filtration
Discoloration due to interaction with transformer	Faint to distinct coloration	Cartridge filter or filter press	Activated carbon	Power factor, acid number, flash point, dielectric strength	May have no effect on ANSI/ASTM D-877 performance, check with equipment mfg.
Mineral oil and low fire point contaminants of higher volatility	Clear to two phase	Highly volatile materials may be removed by heat and vacuum. Mineral oil contamination requires replacement of fluid.	None	Flash and fire points	The NEC requires that the fluid has a fire point of greater than or equal to 300°C.

Note: Our test results relate only to the sample or samples tested. Northern Technology & Testing does not imply that the contents of the sample received by this laboratory are the same as all such material in the environment from which the sample was taken. The analysis, opinions, or interpretations contained in this report are based upon material and information supplied by the client. Any interpretations or opinion expressed represent the best judgement of Northern Technology & Testing. Northern Technology & Testing assumes no responsibility and makes no warranty or representation, expressed or implied as to the conditions, productivity, proper operation, or profitability of any equipment or other property for which this report may be used or relied upon for any reason whatsoever. NTT assumes no responsibility for the foreign laboratory data which is by the customer.