



Recommended Retrofill Procedures for the Replacement of Oil With Envirotemp® FR3Ô Fluid

<u>Important Steps</u>	<u>Key Points</u>	<u>Comments</u>
1. Access the Unit	<ul style="list-style-type: none">- in accordance with owner's regulations- record all nameplate information- determine allowable tank vacuum	make sure unit is de-energized
2. Ground All Equipment	<ul style="list-style-type: none">- includes transformer, pump, tanks	ensures complete discharge
3a. Perform Megger Test	<ul style="list-style-type: none">- use procedure recommended by instrument manufacturer.- record fluid temperature	should be done with fluid at ambient temperature
3b. Discharge Transformer	<ul style="list-style-type: none">- HV windings and cable	eliminates any capacitive charge
3c. Reground Equipment		controls static charge buildup
4a. Take Oil Samples	<ul style="list-style-type: none">- take samples for fluid analysis, DGA per ASTM D3613	Provides a base line of transformer condition at time of retrofill.
4b. Pressure Test	<ul style="list-style-type: none">- pressurize the unit at 8 psig- check for leaks at gaskets- wait 18 hours and check for lost pressure	Transformer should remain sealed (hold 3-5 psig) for its lifetime.
4c. Inspect Gaskets	<ul style="list-style-type: none">- note areas of leaks	
5. Drain Oil	<ul style="list-style-type: none">- If transformer is level or tilted towards the drain plug, force oil out by applying a positive head space pressure of 5 psig using dry nitrogen gas. Otherwise, pump out oil through the bolted access.	minimum: Repair or replace leaky gaskets. Tighten all gaskets. preferred: Replace all gaskets.
6. Minimum ½ Hour Drip	<ul style="list-style-type: none">- 2 hours is preferred	longer drip time is advantageous
7. Flush with Hot EFR3 Fluid (~ 5% of Transformer Volume)	<ul style="list-style-type: none">- Use minimum pressure to avoid dislodging contaminants. Flush through the fill plug or bolted access.- Be sure to flush radiators.- Set bolted access in place ASAP.	Recommended flushing fluid temperature is 50-80° C.

8. Allow ½ Hour Drip		Longer drip time is advantageous
9. Vacuum Residual Fluid from Bottom Transformer		minimizes the residual oil
10. Pull vacuum	- Start fill through drain plug when base pressure is reached.	Min.50°C fluid temp.,use 0.5 µm filters.Base pressure is 30 mm Hg or tank rating, whichever is greater
11. Dry nitrogen blanket	- Bring head space pressure to 2-3 psig	
12a. Wait prior to Megger test	- 4 hours is preferred. Wait time depends on fluid fill temperature	
12b. Perform Megger test	- If value decreased, investigate cause	
12c. Discharge & Reground	- as in 3b and 3c .	
13. Install retrofill label	- fill out label using indelible pen	
14. Wait to energize unit	- 24 hours is preferred. Wait time depends on fluid fill temperature	allows air bubbles to dissipate
15. Take Oil Samples	- check & maintain positive pressure - take samples as in 4a	verifies unit is leak-free provides a base line for new fluid.
16a. Energize unit (no load)		
16b. Wait prior to adding load	- 3 hours minimum	
16c. Connect load	- Observe unit for leaks	
17. Next day, check unit's temperature and pressure	- Observe unit for leaks and other signs of problems	
18. Follow standard maintenance schedule and procedures	- Pay close attention to signs of leaks from old gaskets - take samples as in 4a after six months	

NOTE: Not all oil can be removed, particularly from the insulating paper, by a simple drain and flush. The conventional oil in the insulation will eventually leach out into the Envirotemp FR3 fluid. At approximately 7 percent conventional oil contamination, the resultant fire point may fall below 300°C. Following this procedure should limit the residual oil to less than 3%. Depending on the size, type, and operating temperature, it may take 6 to 18 months to reach equilibrium. No incompatibilities between the two fluid types are known.

A transformer designed for conventional mineral oil may run a degree or two warmer after being retrofilled with Envirotemp FR3 fluid, all other factors being equal.

Envirotemp FR3 Fluid Flash & Fire Point Variation with Mineral Oil Content

