

Say no to toxic relationships.

Ditch mineral oil and retrofit new life into your transformer with FR3[®] fluid by Cargill.





Upgrade your existing mineral oil filled transformers and retrofit with FR3® fluid by Cargill for greatly improved fire safety, more reliability, and up to 10 years additional asset life.

Long lead times on new transformers, avoiding higher insurance premiums, and needing to get more loading capacity from existing transformers are just a few of the reasons why customers choose to retrofit their transformers with FR3 fluid. Whatever your reason - retrofitting your distribution and power transformers with FR3 fluid provides a number of benefits to both your bottom line and the communities you serve.





Superior fire safety

FR3® fluid has exceptionally high flash and fire points - in fact, over two times greater than mineral oil. While helping reduce the risk of explosion and fire—thus reducing the risk of damage to equipment and people, FR3 fluid, according to international standards, can also:

- Eliminate the need for costly fire-mitigation systems
- Reduce clearance requirements to buildings and equipment
- Potentially reduce insurance premiums and liability service

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Reported fires in 25+ years

2x

Mineral oil's flash and fire points

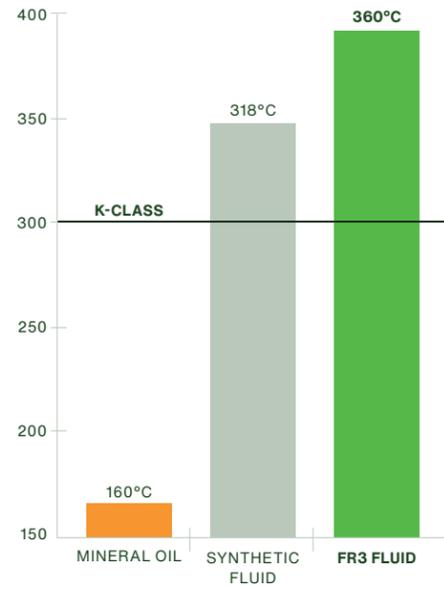


Better for the planet

Contribute to your company's commitments to sustainability and reduce your carbon footprint by choosing FR3 fluid. 100% biodegradable and made from >95% vegetable oil, FR3 fluid is non-toxic, leading to greatly reduced remediation costs if a spill occurs. It has many environmental benefits over mineral oil, including:

- Global Warming Potential (GWP) of zero, carbon neutral
- Non-toxic in water, soil, and to wildlife and humans

Dielectric Fluid Fire Point Comparison



10

Biodegrades in as little as 10 days

0

Carbon Neutral



Improved reliability

FR3® fluid's unique formulation leads to performance-enhancing moisture tolerance to help transformers be more reliable. Its higher moisture saturation value and "self-drying" mechanism leads to longer paper insulation life and reliability. Retrofilling with FR3 fluid:

- Continuously dries paper insulation, thus reducing the risk of dielectric failure
- Requires less service and maintenance intervention*

10x

Higher moisture saturation point compared to mineral oil



Increased loading capacity

With FR3 fluid in your transformers, you can increase the transformer temperature rise limits without sacrificing transformer life or reliability. In fact, choosing FR3 fluid to replace mineral oil in an existing transformer allows:

- Up to 15% more loading capacity without any additional modifications or retrofitting of your transformer*

15%

Additional loading or load capacity



Extended asset life

Not only does replacing mineral oil with FR3 fluid allow your transformers to better respond to fluctuating power demand, but it extends asset life by continuously absorbing and drying water from the paper insulation. Retrofilling with FR3 fluid:

- Recovers the dielectric capacity of your transformer
- Adds up to 10 years to the life of your transformer

50%

Up to 50% extended asset life

10

Up to 10 years of life added to transformer

*Compared to mineral oil.





Retrofill Considerations

Sealing system of the transformer

FR3® fluid is recommended for non-free breathing transformers. Free breathing transformers can be retrofilled with FR3 fluid by adapting a system that limits the renovation of the air in contact with the fluid.

Rated capacity and voltage class

For up to 138 kV, retrofilling is easily possible, typically without any internal modifications needed to the transformer. FR3 fluid has been retrofilled in tens of thousands of transformers with an established, proven and trusted process.

Health and age of transformer

First, an assessment of the transformer condition is recommended before retrofilling to ensure a suitable return of the investment.

Then, any existing technical problem in the transformer should be resolved before retrofilling.

Bushings and tap changers

Bushings can operate normally inside a transformer tank with FR3 fluid. Oil impregnated bushings must be kept sealed with original insulating liquid. In some cases, the manufacturer may require a small reduction of the maximum current and the use of a BIL above windings.

Tap changers can operate normally inside a transformer tank with FR3 fluid. While vacuum type tap changers are preferred, oil type can also be retrofilled with FR3 fluid. Some manufacturers may recommend additional safety margins.



Retrofill FAQs

Can I retrofill any mineral oil filled transformer with FR3® fluid?

Yes, FR3 fluid is fully miscible with mineral oil and works with both distribution and power transformers.

For large power transformers (>138 kV voltage class), Cargill recommends a design review to ensure no additional changes are needed.

Do I need to get all the mineral oil out of my transformer to get the benefits of FR3 fluid?

No, but Cargill recommends that 7% or less of the total fluid be residual mineral oil. If more than 7% of the fluid is residual mineral oil, FR3 fluid's benefits begin to decline.

In a typical retrofill, Cargill would expect to see 3-5% residual mineral oil remaining, which does not significantly impact FR3 fluid's performance.

Do I need to derate my transformer if I retrofill with FR3 fluid?

No, there is no need to derate the voltage class. In fact, you will likely be able to increase your transformer's load rating with FR3 fluid because of its ability to operate at up to 15°C higher temperatures without impacting the reliability or the life of the transformer.

Can I rerate my transformer after retrofilling it with FR3 fluid?

Yes, you may be able to rerate your transformer by increasing the temperature limits. It may be possible to increase the loading capacity up to +15%.

Is retrofilling the same as retrofitting?

No, retrofilling involves only replacing the insulating fluid and other minor maintenance activities, such as replacing gaskets.

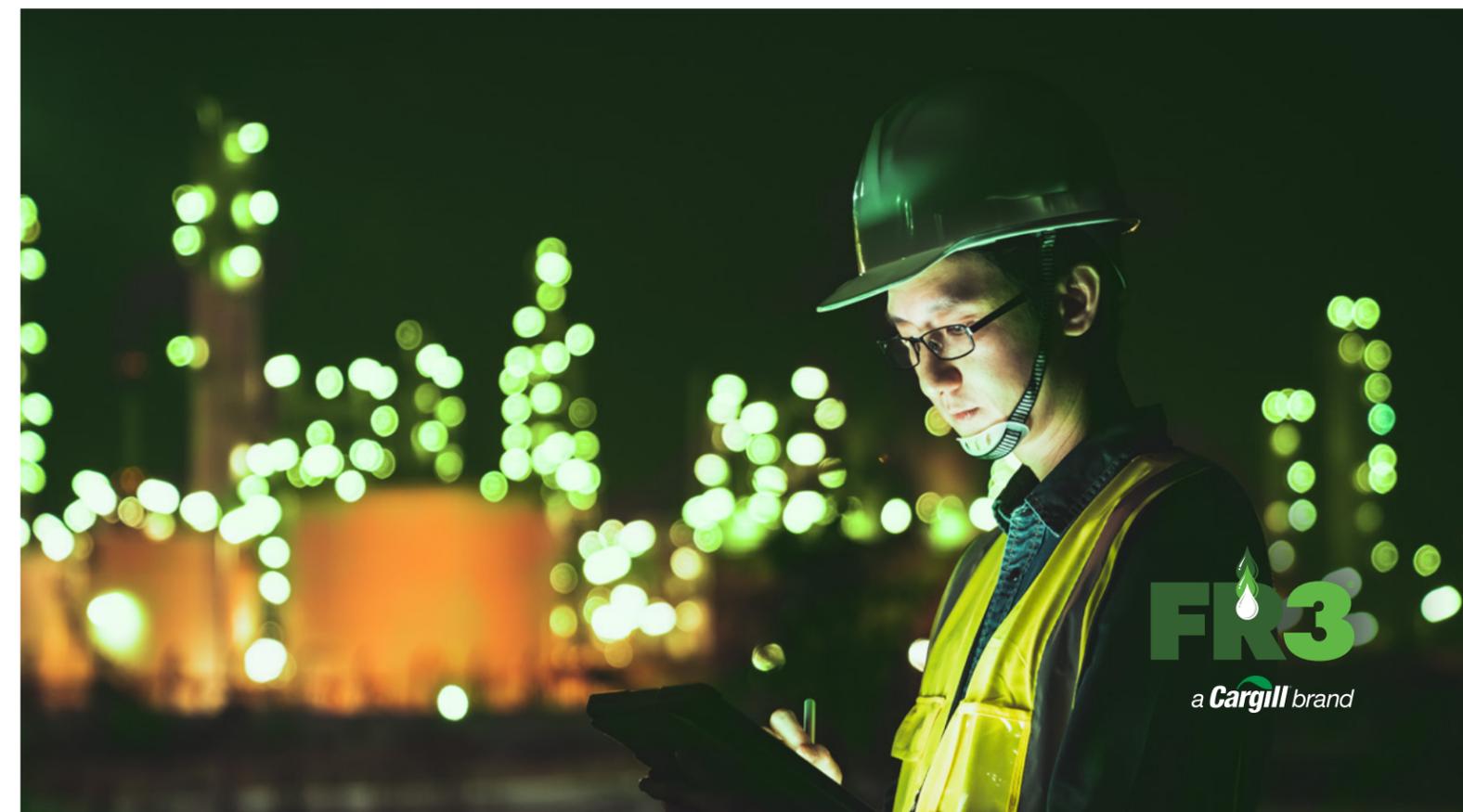
Retrofitting involves replacing the insulating liquid plus additional transformer components and other interventions/refurbishments.

Will my transformer run warmer with FR3 fluid?

You may see a 5°C increase in operating temperature, which is still safely in the operating zone of a standard transformer design.

What is the process for retrofilling with FR3 fluid?

The process is simple! Follow the same process as you would mineral oil. Contact your service provider to learn more about this process.



FR3
a Cargill brand



Learn more about how retrofilling with FR3[®] fluid
can improve your transformers at [FR3fluid.com](https://www.FR3fluid.com).