

Asset Insight Report Demo 198

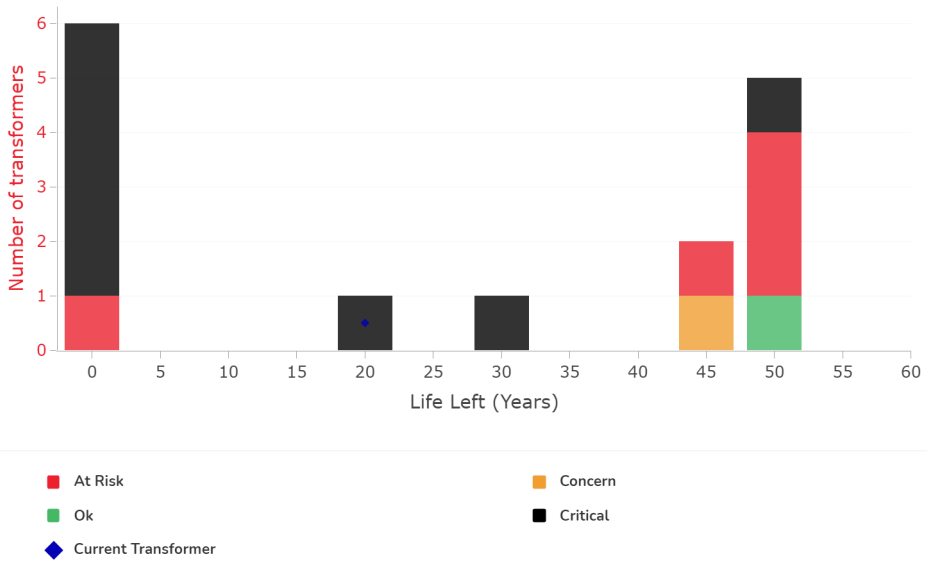
Transformer Details

LOCATION	SENSOR ID	NAME PLATE AGE
Unspecified	No sensor installed	34

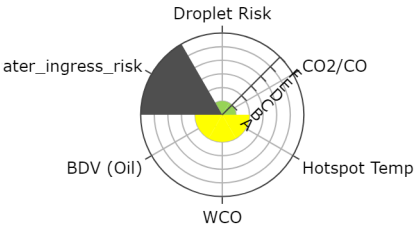
Health Overview

HSP TEMP	HSP WCP	HSP DP ESTIMATE	LIFE LEFT	MIN BDV
70.6℃	0.5%	301	23 yrs	98%

Fleet Overview

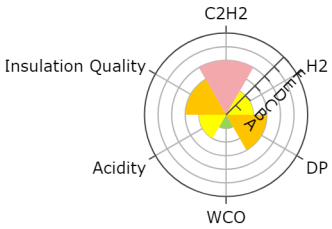


Operating Risk Index



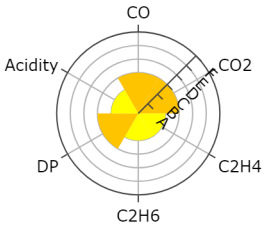
Extremely serious condition | Very poor condition | Poor condition | Acceptable condition | Good condition | As new condition

Dielectric Index



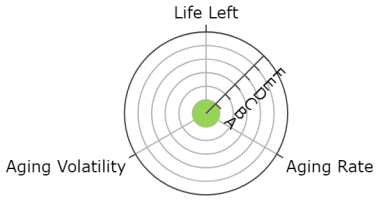
Extremely serious condition | Very poor condition | Poor condition | Acceptable condition | Good condition | As new condition

Solid Insulation Risk Index



Extremely serious condition | Very poor condition | Poor condition | Acceptable condition | Good condition | As new condition

Ageing Risk Index



Extremely serious condition | Very poor condition | Poor condition | Acceptable condition | Good condition | As new condition

INSIGHTS

CONCERN	CONDITION INDEX	DATE OF EVENT
Significant Levels of Acetylene (C2H2) : 14ppm D	Dielectric D	12-Jan-2022

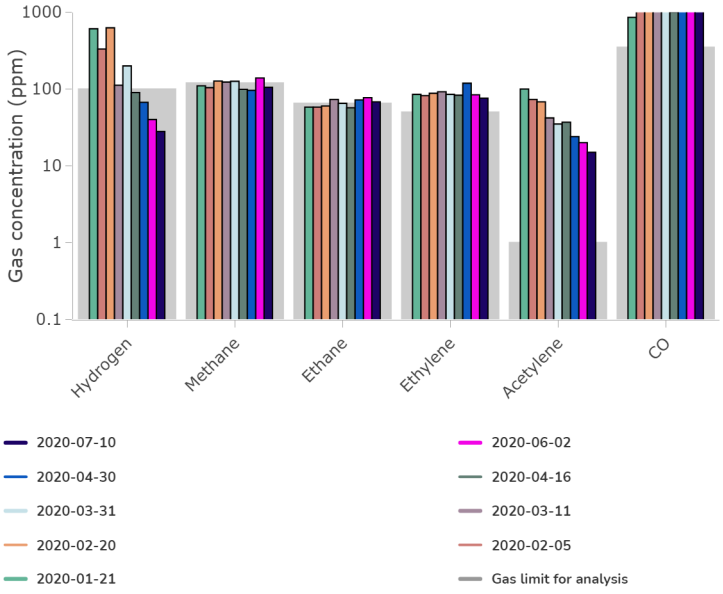
Threshold: 11 ppm

The transformer is generating significant levels of a very dangerous gas which indicates a dangerous fault.

Recommendation

Immediately consider the removal of the transformer from service and implement a program of diagnosis to assess the possibility of repair or need for emergency replacement.

Rogers Gas Limit Analysis



CONCERN	CONDITION INDEX	DATE OF EVENT
Low DP : 387 C	Dielectric D	15-Aug-2022

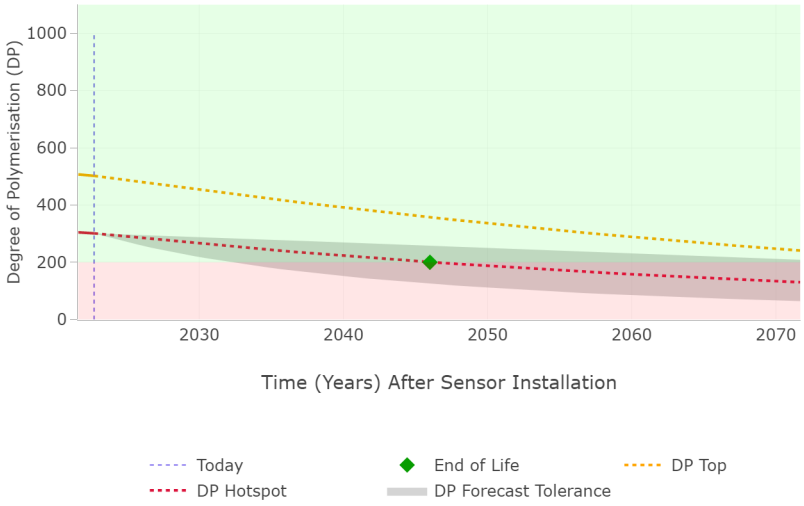
Threshold: ≤ 400 DP

The Transformer has degraded cellulose insulation DP (Degree of Polymerization). Low DP paper has poor mechanical strength and this can result in cracks, voids, and poor interwinding separation strength.

Recommendation

The transformer is aged but best practice indicates it still has useful life (in the absence of other fault signatures). That life can be maximized and the replacement date delayed by ensuring moisture levels are low, periods of high (near nameplate load) is minimized, and the cooling system (including oil) is serviced for maximum efficiency. Due to the aging state of the transformer insulation, a careful approach should be taken when interpreting other signs of partial discharge, arcing, or vibration.

DP Forecast



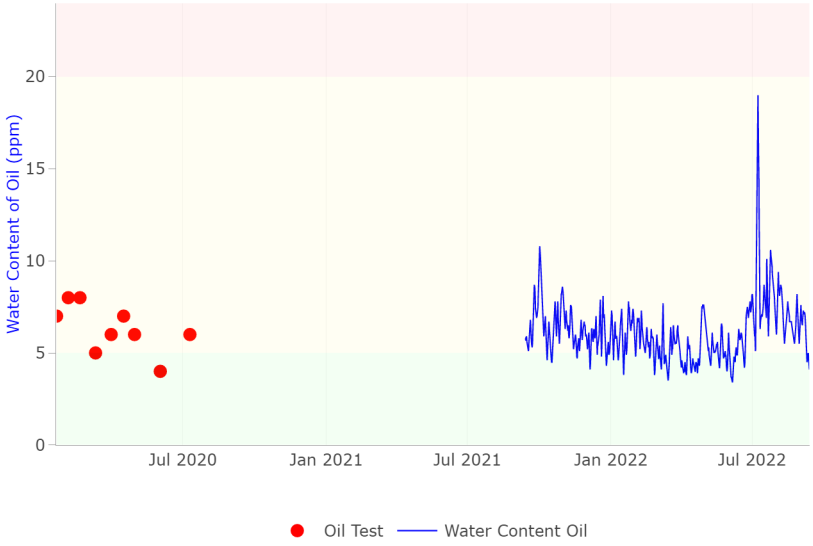
CONCERN	CONDITION INDEX	DATE OF EVENT
Poor Insulation Quality C	Dielectric D	10-Jul-2020

The combination of elevated moisture and acidity contaminating the oil likely indicates a poor state of the insulating qualities of the oil. This can lead to partial discharge and load stress-related failure.
Poor condition of the cellulose insulation may increase these risks as the Degree of Polymerization drops below 400 DP.

Recommendation

Consider the assessment of the power factor, dissipation factor, and dielectric response factor of the transformer insulation and implement refurbishment as necessary (drying, oil replacement or refurbishment) to protect the remaining life of the transformer.

Water Content of Oil



CONCERN	CONDITION INDEX	DATE OF EVENT
Significant Levels of Carbon Monoxide (CO) : 1107ppm C	Solid Insulation C	10-Jul-2020

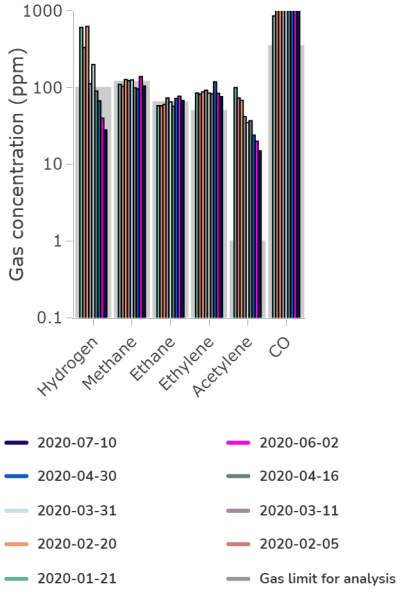
Threshold: 570 ppm

The transformer is generating gas which indicates hot temperature oxidization of the cellulose insulation. This could be the result of overloading or the development of a cooling problem (such as blocked oil ducts). It may also be the early signs of a serious fault in the core.

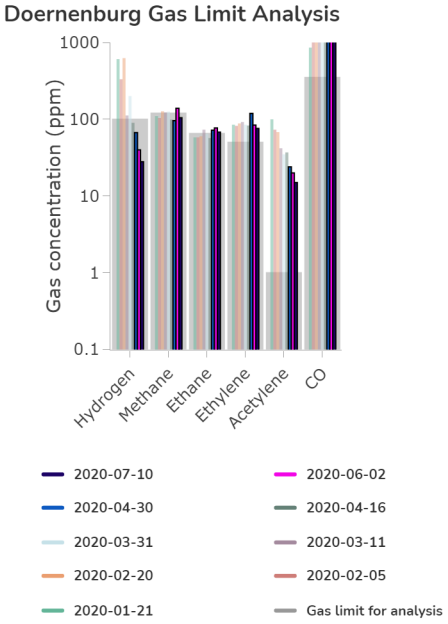
Recommendation

Analysis of the cause of gassing is recommended and any necessary rectification works completed in order to protect the remaining life of the transformer. This should be done in a timely way, possibly before the next scheduled rectification works.

Rogers Gas Limit Analysis



Doernenburg Gas Limit Analysis



CONCERN	CONDITION INDEX	DATE OF EVENT
Significant Levels of Carbon Dioxide (CO2) : 9779ppm C	Solid Insulation C	10-Jul-2020

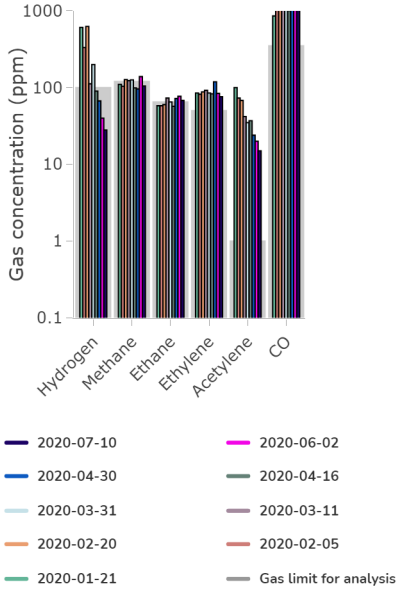
Threshold: 4000 ppm

The transformer is generating gas which indicates hot temperature oxidization of the cellulose insulation. This could be the result of overloading or the development of a cooling problem (such as blocked oil ducts). It may also be the early signs of a serious fault in the core.

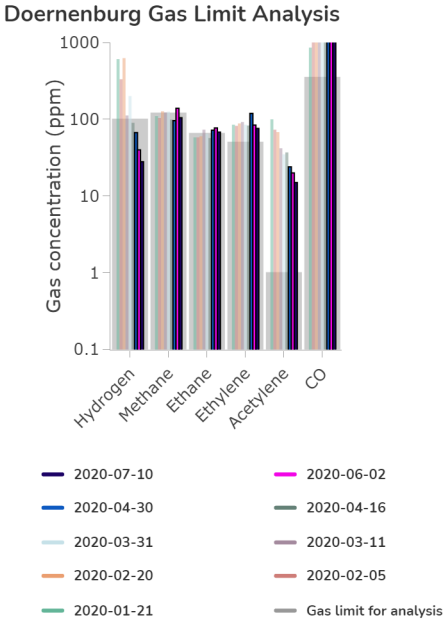
Recommendation

Analysis of the cause of gassing is recommended and any necessary rectification works completed in order to completely protect the remaining life of the transformer. This should be done in a timely way, possibly before the next scheduled rectification works.

Rogers Gas Limit Analysis



Doernenburg Gas Limit Analysis



CONCERN	CONDITION INDEX	DATE OF EVENT
High Hot Spot Temperature : 70.6°C B	Operating F	24-Jul-2022

Threshold: DP > 350 80°C for Kraft, 110°C for TUK
DP ≤ 350 70°C for Kraft, 100°C for TUK
DP ≤ 200 60°C for Kraft, 90°C for TUK

High hot spot temperatures place the transformer at risk of moisture droplets and bubbling, plus accelerated aging. High hot spot temperature can be caused by excessive load, extreme ambient conditions, or poor cooling system performance.

Low DP

The transformer's cellulose insulation is badly degraded. DP is less than 350 (DP = 301) and because of this the risk index for 'High Hot Spot Temperature' has been adjusted.

Update: A -> B

Recommendation

Analyze the root cause of the high hot spot temperatures and rectify in order to protect the remaining life of the transformer.

Temperature Profile

CONCERN	CONDITION INDEX	DATE OF EVENT
High Water Content of Oil : 19ppm B	Operating F	08-Jul-2022

Threshold: DP > 350 20 ppm
DP ≤ 350 15 ppm
DP ≤ 200 10 ppm

Periods of moderate to high water content of the oil are being observed where the insulation breakdown strength will be reduced to 75% of normal. High moisture in oil often occurs when the operating temperature of a wet transformer falls quickly after a period of high load.

Low DP

The transformer's cellulose insulation is badly degraded. DP is less than 350 (DP = 301) and because of this the risk index for 'High Water Content of Oil' has been adjusted.

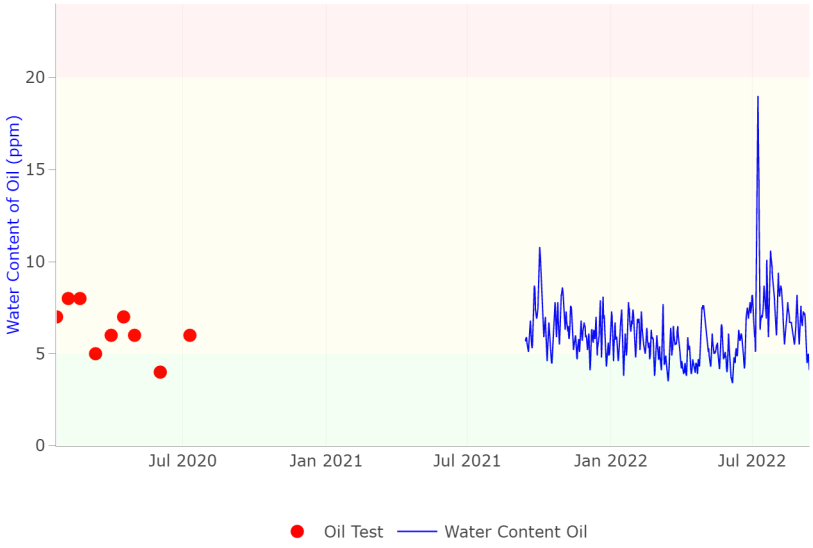
Update: A -> B

Recommendation

Monitor WCO closely and consider drying. Consider changing load management procedures to prevent fast temperature drops after periods of high load.

Note: The first three days of WCO data are not taken into account in this insight as it can take up to three days for the moisture sensor to settle.

Water Content of Oil



CONCERN	CONDITION INDEX	DATE OF EVENT
Low Breakdown Voltage of Oil (BDV) : 60kV B	Operating F	10-Jul-2020

Threshold: DP > 350 ≤ 50 kV
DP ≤ 350 ≤ 60 kV
DP ≤ 200 ≤ 70 kV

Oil test results indicate a low breakdown voltage, likely due to contamination in the oil (moisture or breakdown products). It indicates aging or degraded oil performance and should be carefully monitored.

Low DP

The transformer's cellulose insulation is badly degraded. DP is less than 350 (DP = 301) and because of this the risk index for 'Low Breakdown Voltage of Oil (BDV)' has been adjusted.

Update: A -> B

Recommendation

Continue to monitor the state of the oil insulation. Review the partial discharge state of the transformer as low BDV of the oil can cause accelerated PD development.

No relevant graph available.

CONCERN	DGA ANALYSIS	DATE OF EVENT
Discharges of low energy		21-Jan-2020

The IEC analysis indicates low energy arcing is occurring within the transformer. This arcing probably includes some sort of follow on current.

Recommendation

Implement detailed analysis of the cause of the gassing and plan a repair or monitoring program to protect the remaining life of the asset.

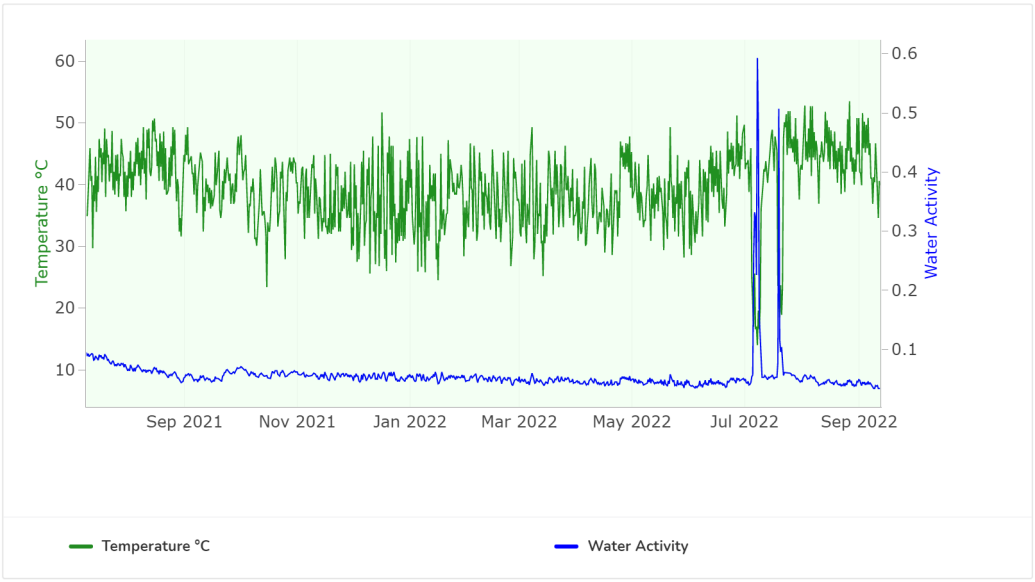
CONCERN	DGA ANALYSIS	DATE OF EVENT
Thermal Decomposition		12-Jan-2022

The Doernenburg analysis indicates that there is thermal decomposition occurring within the transformer likely due to overloading or poor cooling system performance (faulty cooling system performance or blocked oil ducts).

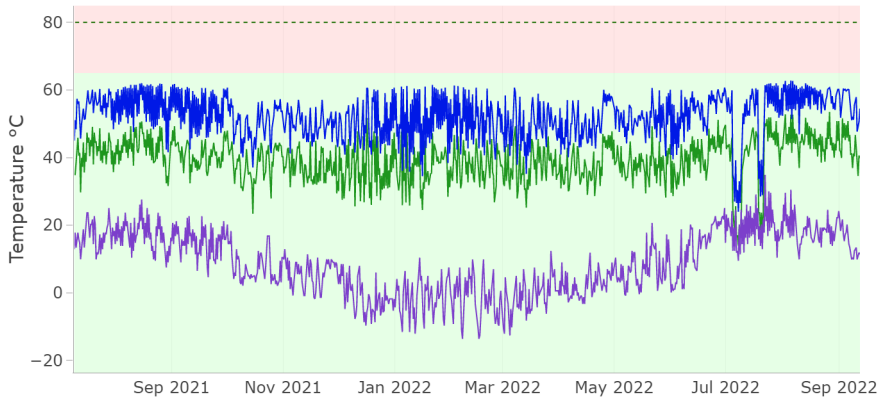
Recommendation

Review transformer loading given climatic conditions. Check cooling system performance. Plan rectification action to protect the remaining life of the transformer.

Bottom Measured Temperature & AW

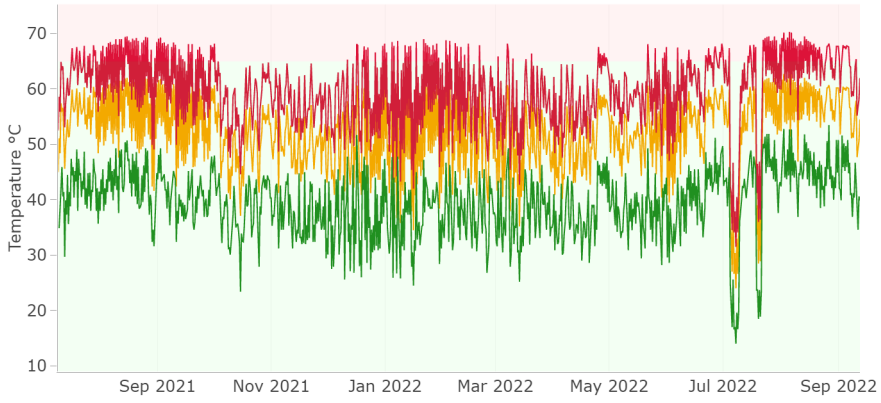


Measured Temperatures



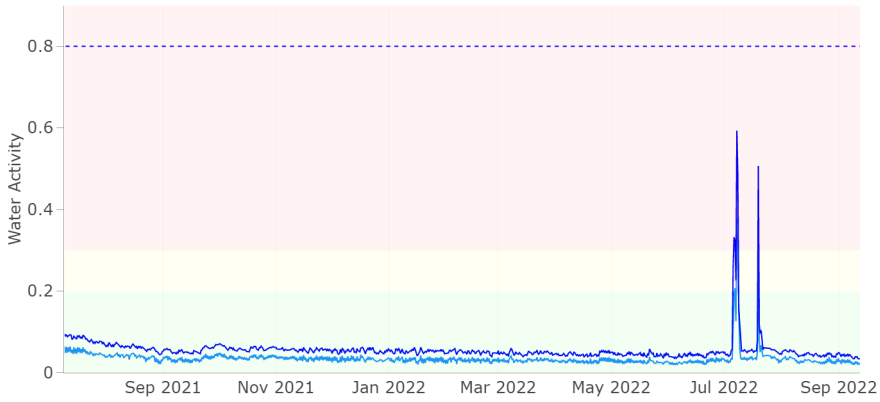
Bottom Temperature
Ambient Temperature
External Temperature (Top)
Alert (Not Active)

Temperature Profile



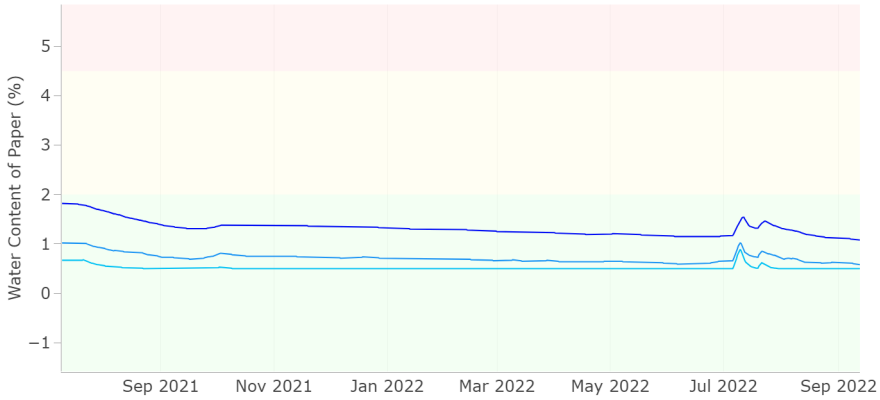
Top
Hotspot
Bottom

Water Activity Profile



Top
Bottom
Alert (Not Active)

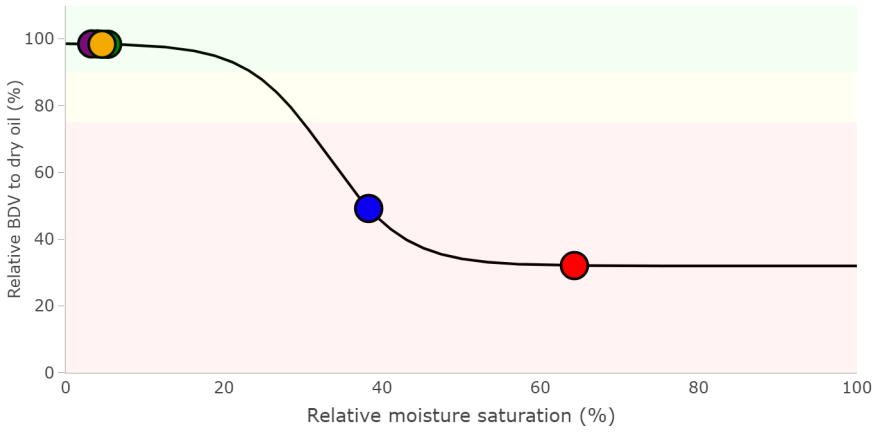
Water Content of Paper



Note that it takes a few weeks for new or replaced oil to reach an equilibrium with the paper insulation. During this time WCP graphs may not be accurate.

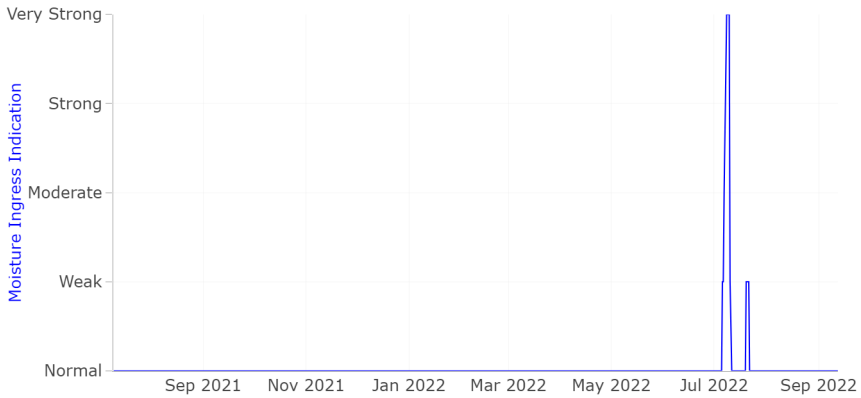
Top WCP by Diffusion
Hotspot WCP by Diffusion
Bottom WCP by Diffusion

Minimum Breakdown Voltage



Reference curve of BDV by RH in oil
Min Bottom BDV - All
Min Top BDV - All
Min Bottom BDV - Month
Min Top BDV - Month
Min Top BDV - Week
Min Bottom BDV - Week

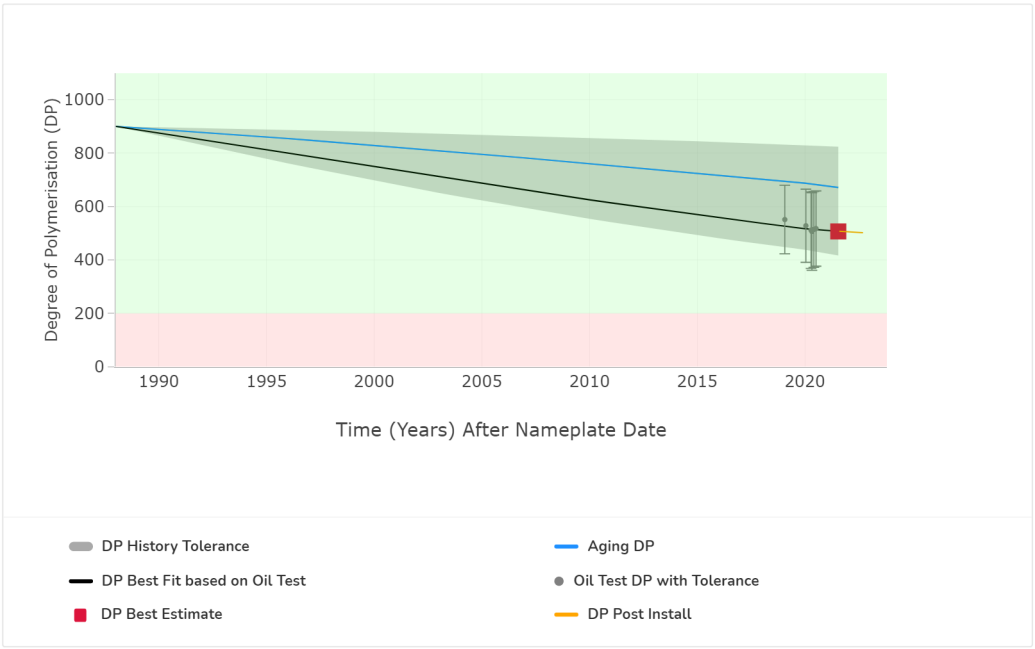
Moisture Ingress in Oil Indication



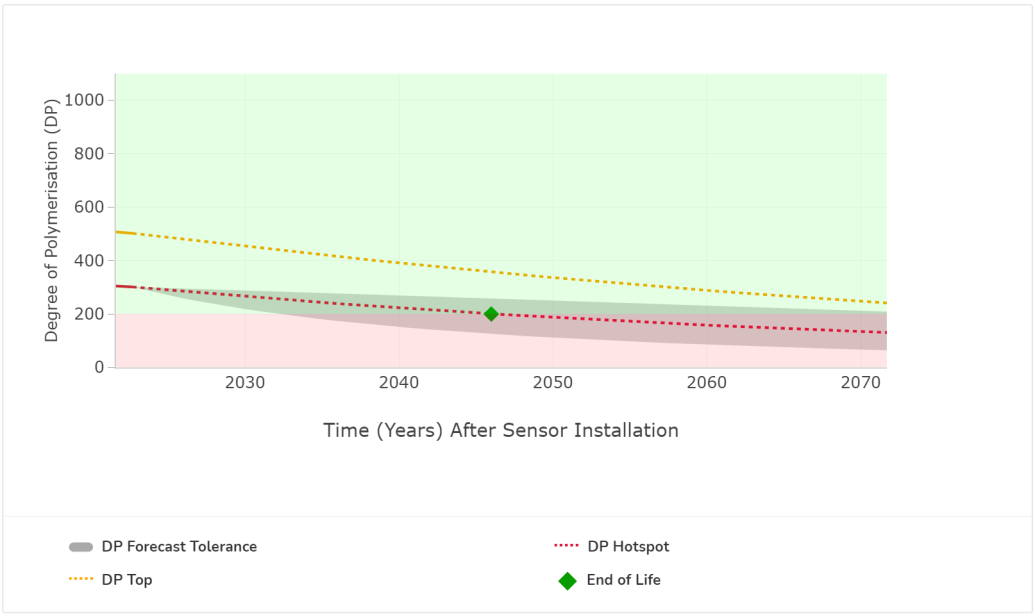
Moisture ingress indicators show the likelihood of a water leak on the transformer but may also be caused by other factors.

Moisture Ingress Indication

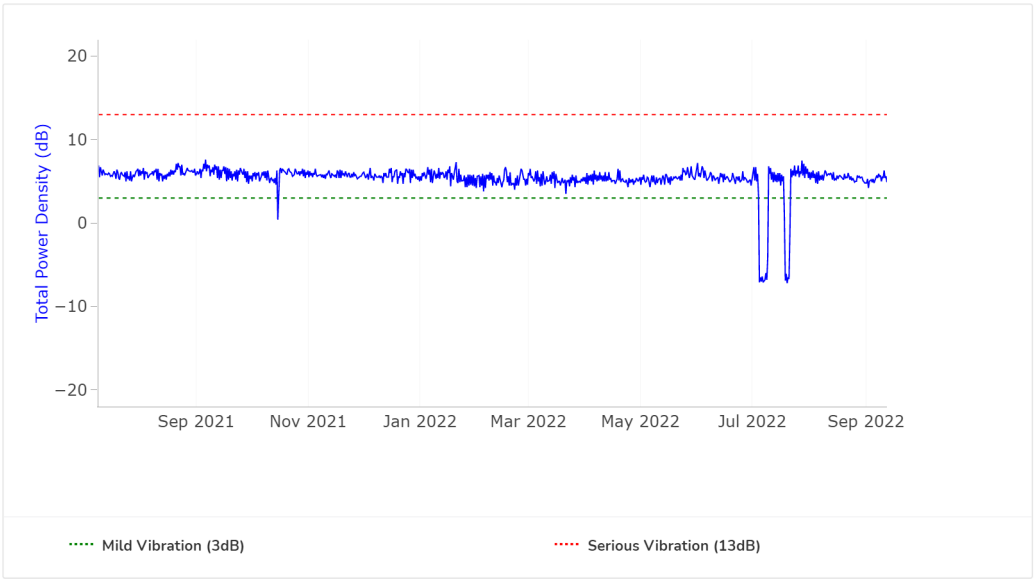
DP History



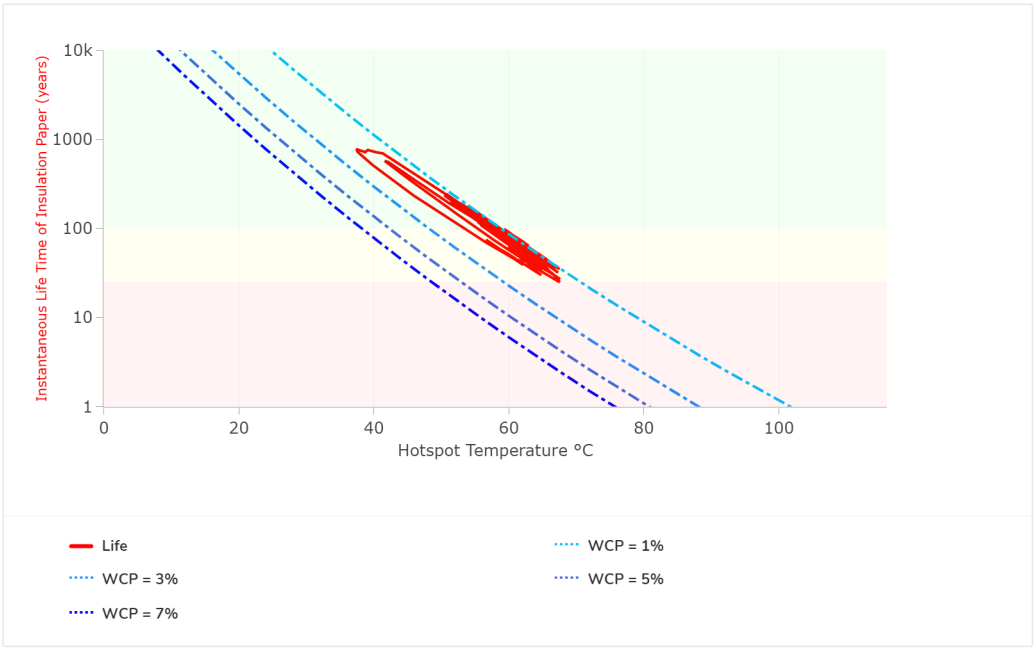
DP Forecast



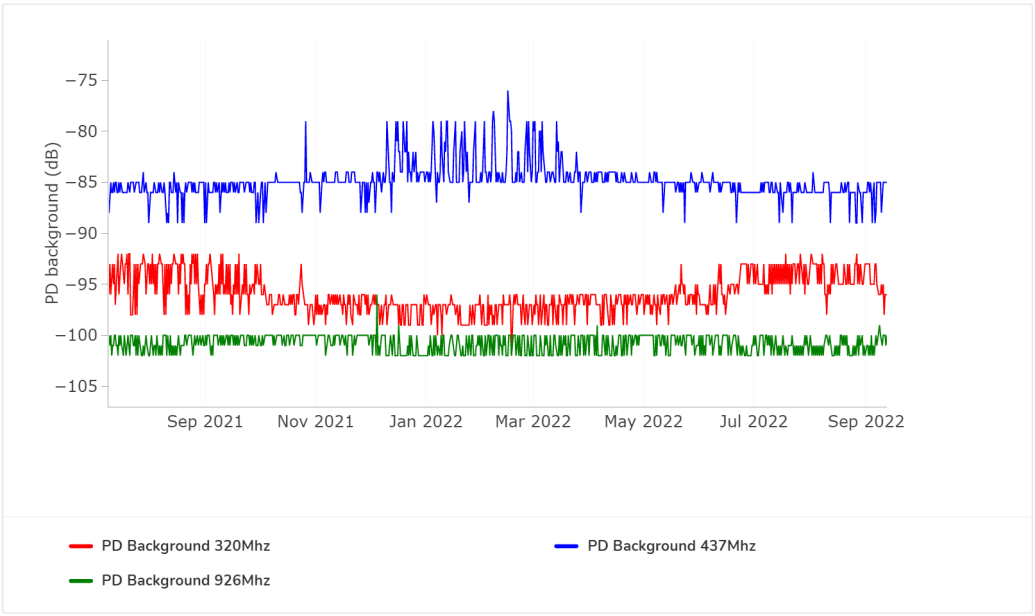
Vibrations



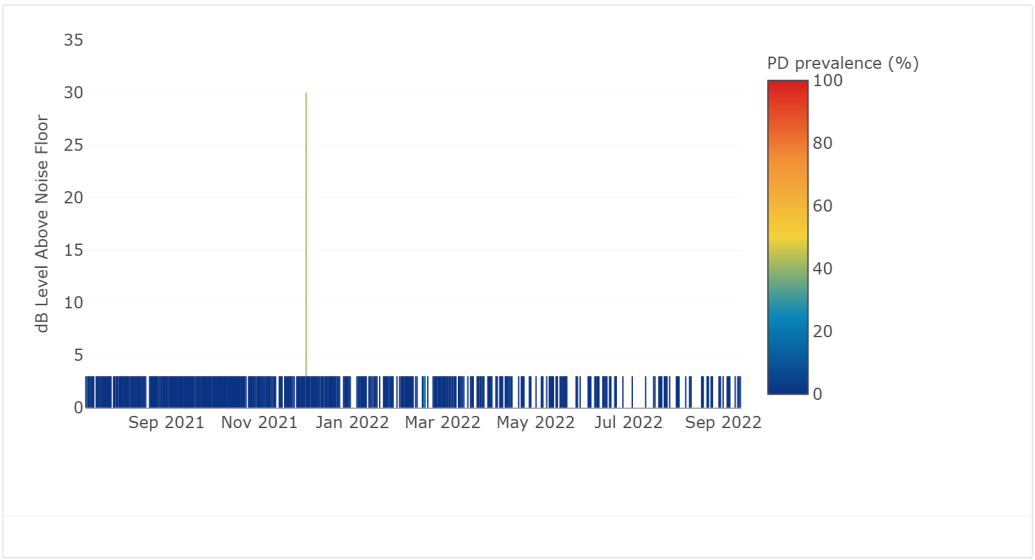
Instantaneous Life vs Temperature



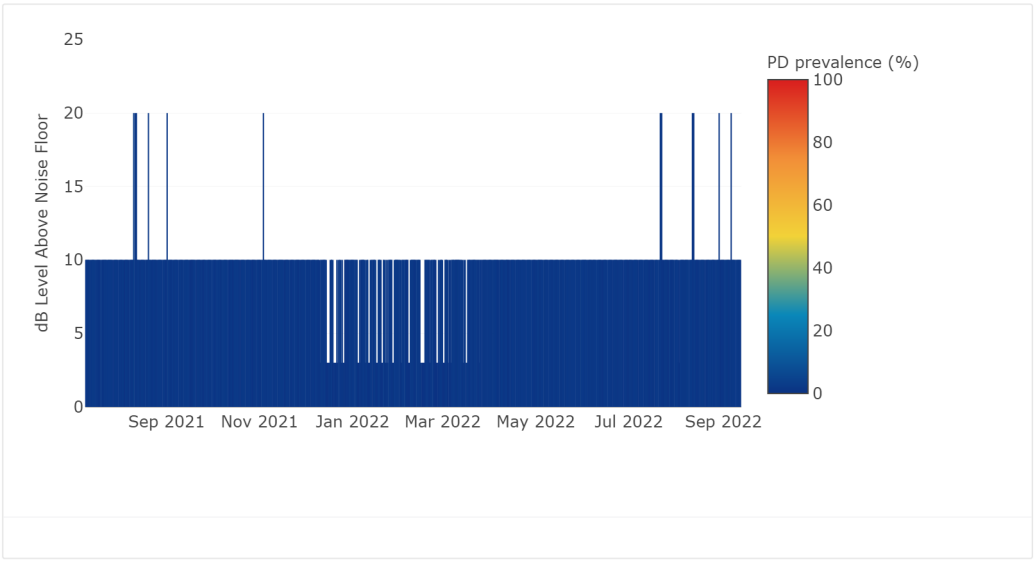
PD Background



PD Activity (320MHz)



PD Activity (437MHz)



PD Activity (926MHz)