Paris Session 2022

Significance of Operational Data on DGA Interpretation for Tap-Changers

SC D1

PS1 Q11: Do input data for interpretation have the required accuracy?
Are schemes and software programs for DGA evaluation meaningful enough for universal fault evaluation?
What information is necessary to make an evaluation representative?

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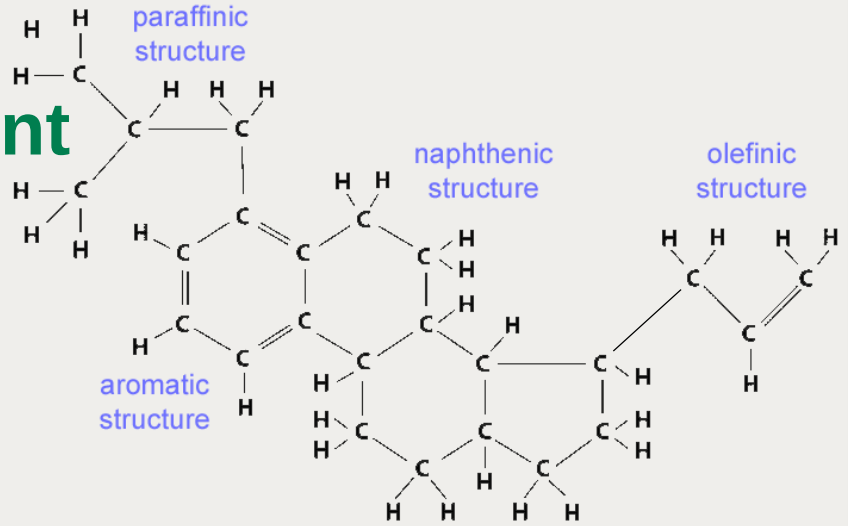
Dissolved Gas Analysis (DGA): Gas concentrations alone are not a sufficient indicator of the equipment condition.



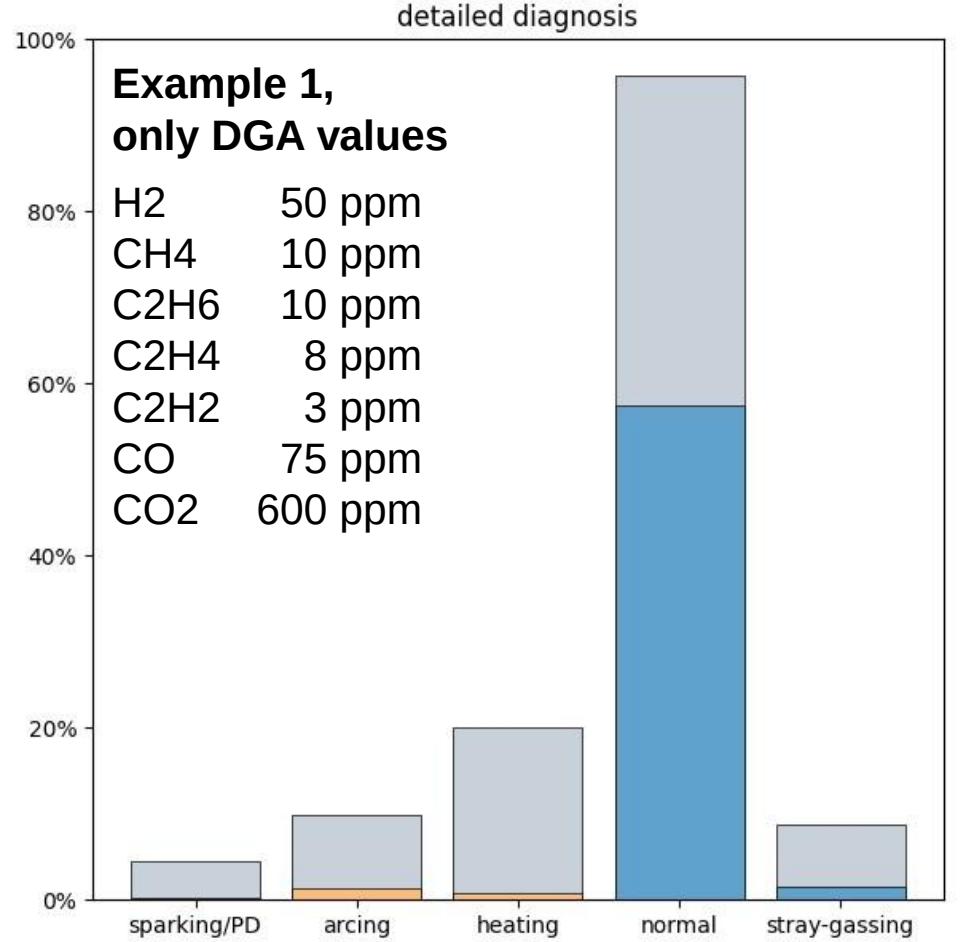
- DGA comprises an intrinsic uncertainty
- Current limit values (ppm, quotients) can only distinguish between normal and irregular behaviour
- Often, incipient failures are not detected, due to ambiguous gas patterns
- Reasons:
  - Different oils can provide varying gas patterns when exposed to a defined thermal stress
  - Poor sampling technique
  - Measurement uncertainty (gas extraction method, calibration of equipment, Ostwald coefficients)
  - “background gases” from normal operation, depending on load and breathing conditions
  - Multiple phenomena occurring simultaneously or at different times

✸ Artificial Intelligence (AI) Techniques can reproduce human expert knowledge

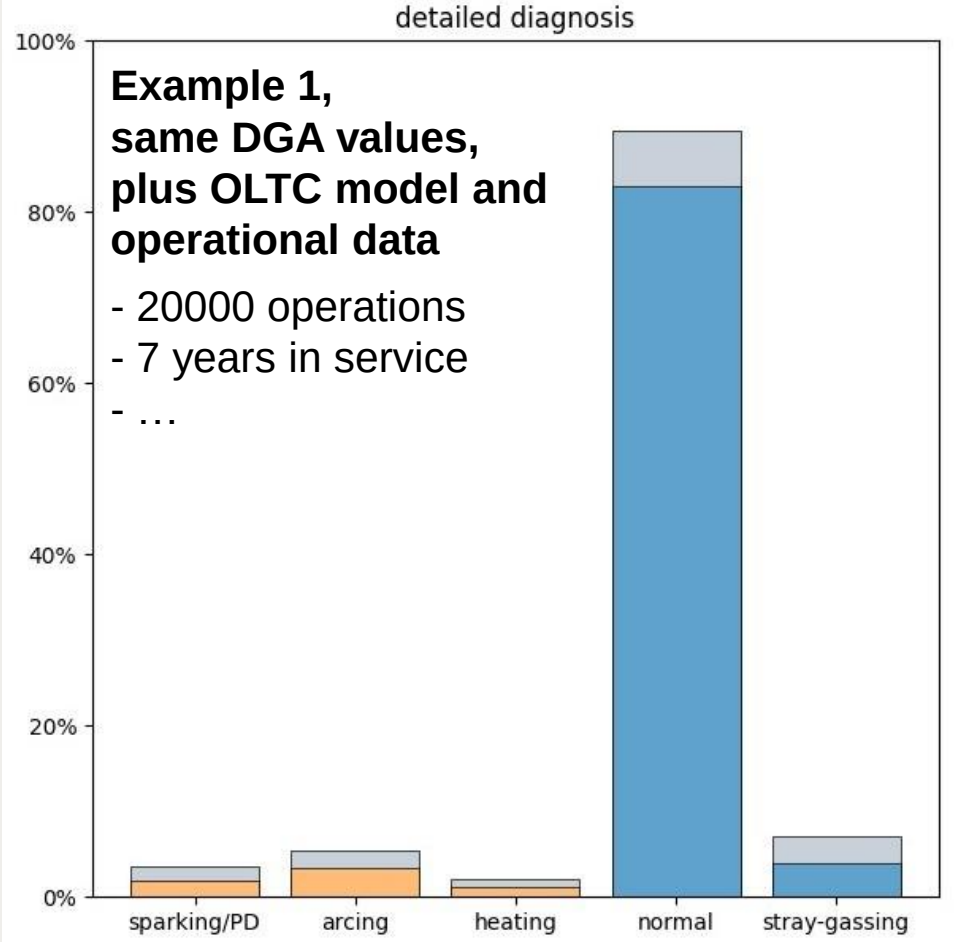
✸ Additional data can improve diagnosis

✸ On-load-Tap-Changer (OLTC) DGA becomes feasible

Example: vacuum type OLTC DGA using AI method

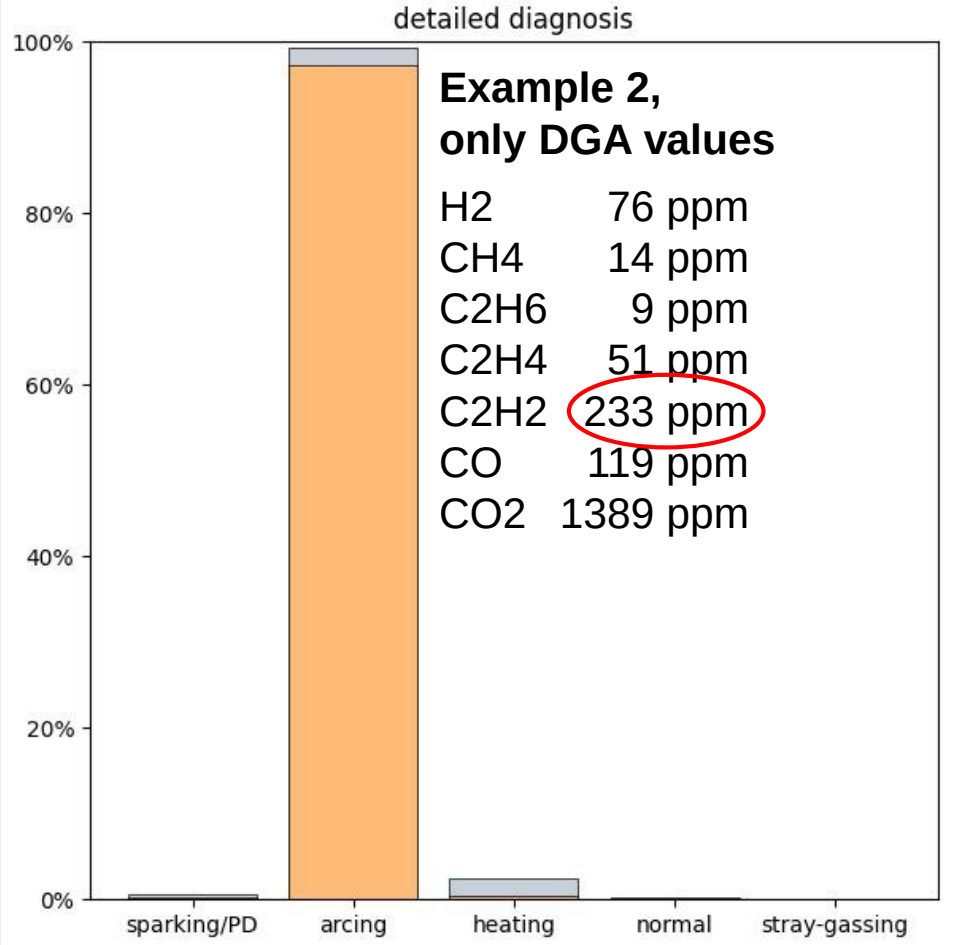


5 defined states



Only DGA ⇨ high uncertainty **DGA + operational data ⇨ low uncertainty**

Example: vacuum type OLTC DGA using AI method



Only DGA, but clear arcing failure ⇨ low uncertainty

Conclusion

- AI based methods provide additional value for DGA, compared to conventional interpretation methods.
- For vacuum type OLTCs, a precise diagnosis often requires additional data.
- Method can be easily transferred to transformers and applied in a similar way.