MEASURE it ...

INDUSTRIE AUTOMATION GRAZ

High Voltage Transformator online monitoring system

Andras Kajati

Industrie Automation Graz

MEASURE it ...

Industrie Automation Graz Ing. W. Häusler GmbH

Process

HUMIDITY | DEWPOINT | PRESSURE | FLOW

HVAC

GASES | VENTILATION TECHNOLOGY | AEROSOLS | DATALOGGERS

ENVIRONEMENT

METEOROLOGY | IMMISSION/DUST | DATA AQUISATION

CALIBRATION

LOW PRESSURE | SALT BATH CALIBRATION | TEMPERATURE

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Company Vision

For 30 years the vision of Industrie Automation Graz - Ing. W. Häusler GmbH has been to sell innovative measurement and data acquisition solutions for the measurands **humidity, temperature, flow, pressure, gases** in the field of process optimization, quality management and safety.

The main focus is to satisfy the customers need which we will achieve through our consulting, engineering, training, repair and calibration service.

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Suppliers

VAISALA

OVAL

höntzsch
flow measuring technology

SATRON instruments

halstrup walcher

grant

KURZ INSTRUMENTS INC.

Nokeval

Ultraflux

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MM70 and MMT330 series

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Measurement Performance

Water Activity

- Measurement range aw 0 ... 1
- Response time (90 %) at +20 °C in still
- oil (with stainless steel filter)
- 10 min
- Sensor HUMICAPâ 180L2
- Accuracy (Including Non-linearity, Hysteresis, and Repeatability):
- 0 ... 0.9 ±0.02
- 0.9 ... 1.0 ±0.03

Temperature

- Measurement range -40 ... +180 °C (-40 ... +356 °F)

What matters most in online DGA monitoring?

- Reliable gas trending – No false alarms
- Robust and maintenance free monitoring

We listened the voices from the market, when designing our product

"OUR EXISTING DEVICE REQUIRES TOO MUCH MAINTENANCE ! "

"WE SUFFER FROM CROSS SENSITIVITIES"

"THERE IS SIMPLY NO STABILITY IN THE RESULTS!"

"WE JUST SUFFERED ANOTHER BROK MEMBRANE"

OIL/GAS SEEM TO BE LEAKING FROM THE ENCLOSURE

"I DONT WANT TO PLAY WITH CONSUMABLES ANYMORE"

"WE KEEP RECEIVING FALSE ALARMS"

How Vaisala can improve the situation?

NO CONSUMABLES, NO CALIBRATION GAS, NO CARRIER GAS!

ROBUST IP66 HOUSING TO FIT ANY OUTDOOR ENVIRONMENT

MINIMIZE MOVING PARTS

ENABLING USER FRIENDLY SOLUTION & LONG TERM STABLE MONITORING

BEST IN CLASS SAMPLING TECHNOLOGY

FULLY OPTICAL NDIR MEASUREMENT WITH AUTOMATIC CALIBRATION

H2 AND H2O MEASUREMENT DIRECTLY FROM THE OIL THAT USES NO MEMBRANE

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Vaisala Transformer Monitoring Offering

MHT410 – Single gas DGA

OPT100 Multigas DGA

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The Vaisala Optimus ™ OPT100 DGA Monitor for Transformers

- Hydrogen H_2
- Carbon monoxide CO
- Carbon dioxide CO_2
- Methane CH_4
- Ethane C_2H_6
- Ethylene C_2H_4
- Acetylene C_2H_2

} 7 fault gases

- Moisture in oil H_20
- Total Gas Pressure / Vaisala Solution for leak detection

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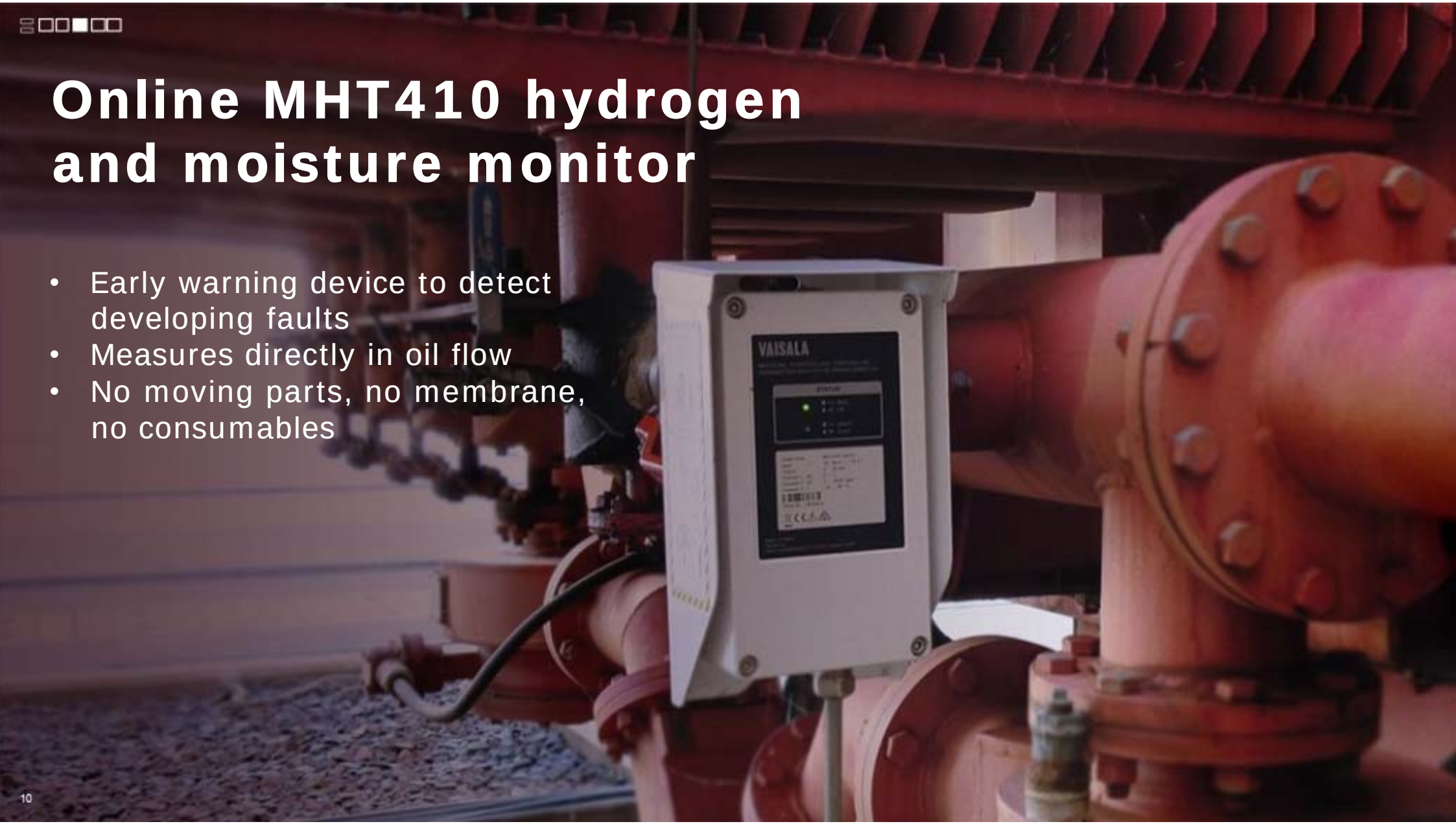
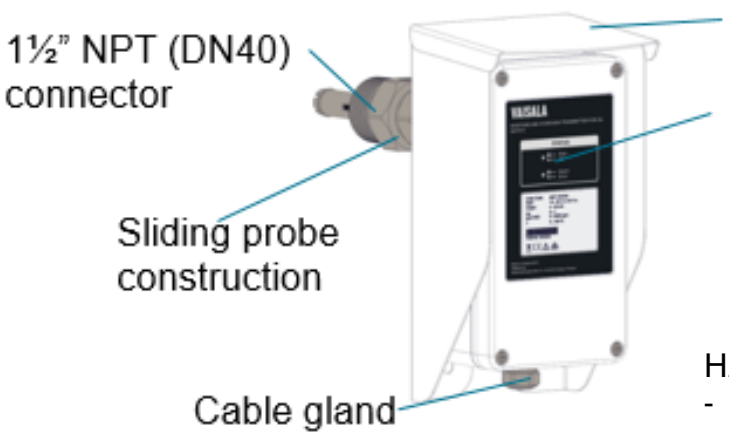
Online MHT410 hydrogen and moisture monitor

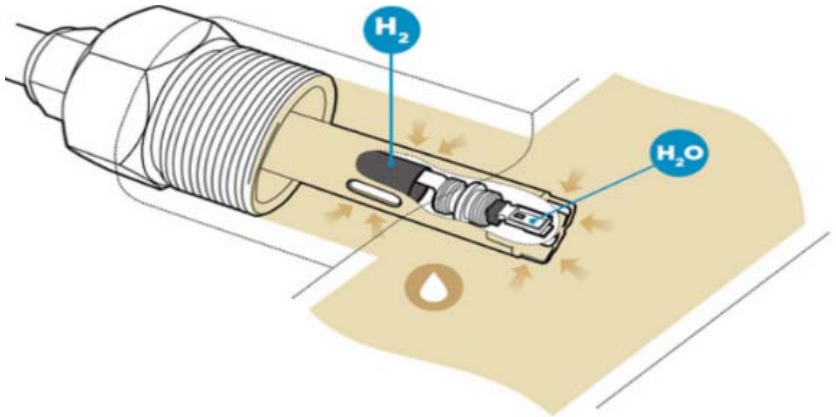
- Early warning device to detect developing faults
- Measures directly in oil flow
- No moving parts, no membrane, no consumables

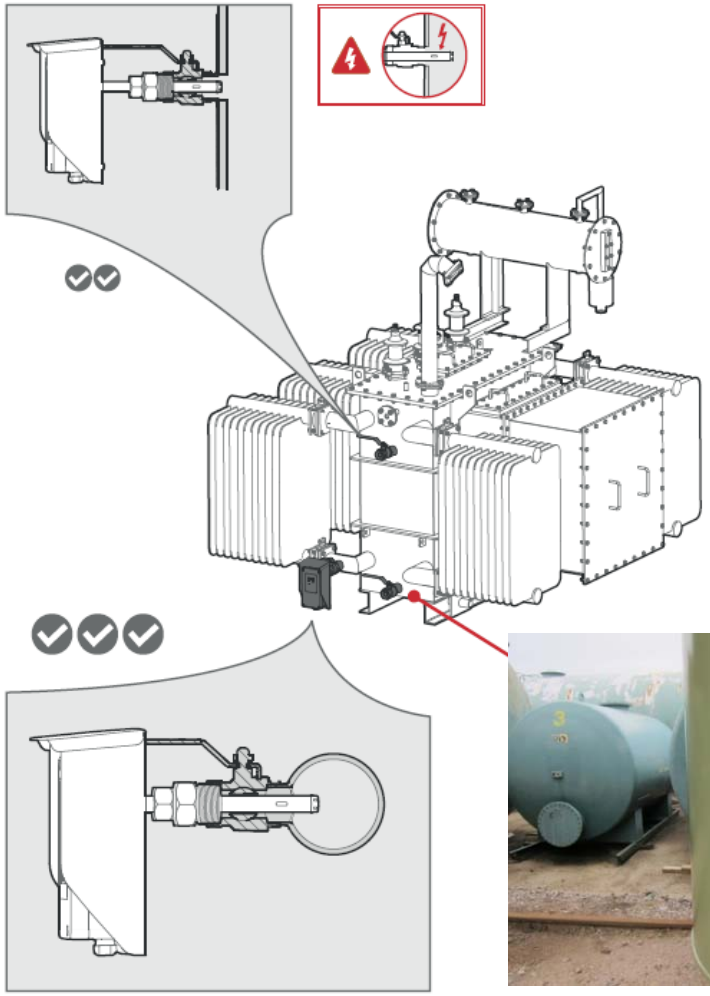


MHT410- Concept



H2, Moisture &T sensors
- Exposed to flow
- Quick response





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Easy to Install

- Easy installation less than 2 hours
- Can be
  - Self standing next to transformer
  - Wall mounted
- 2 Stainless steel pipes
  - Inlet of oil from transformer
  - Outlet to return oil to transformer
- Power connection 100-240 VAC
  - Separate power module
- Measurement cycle
  - Once cycle per hour
  - 1 liter of oil circled trough OPT100

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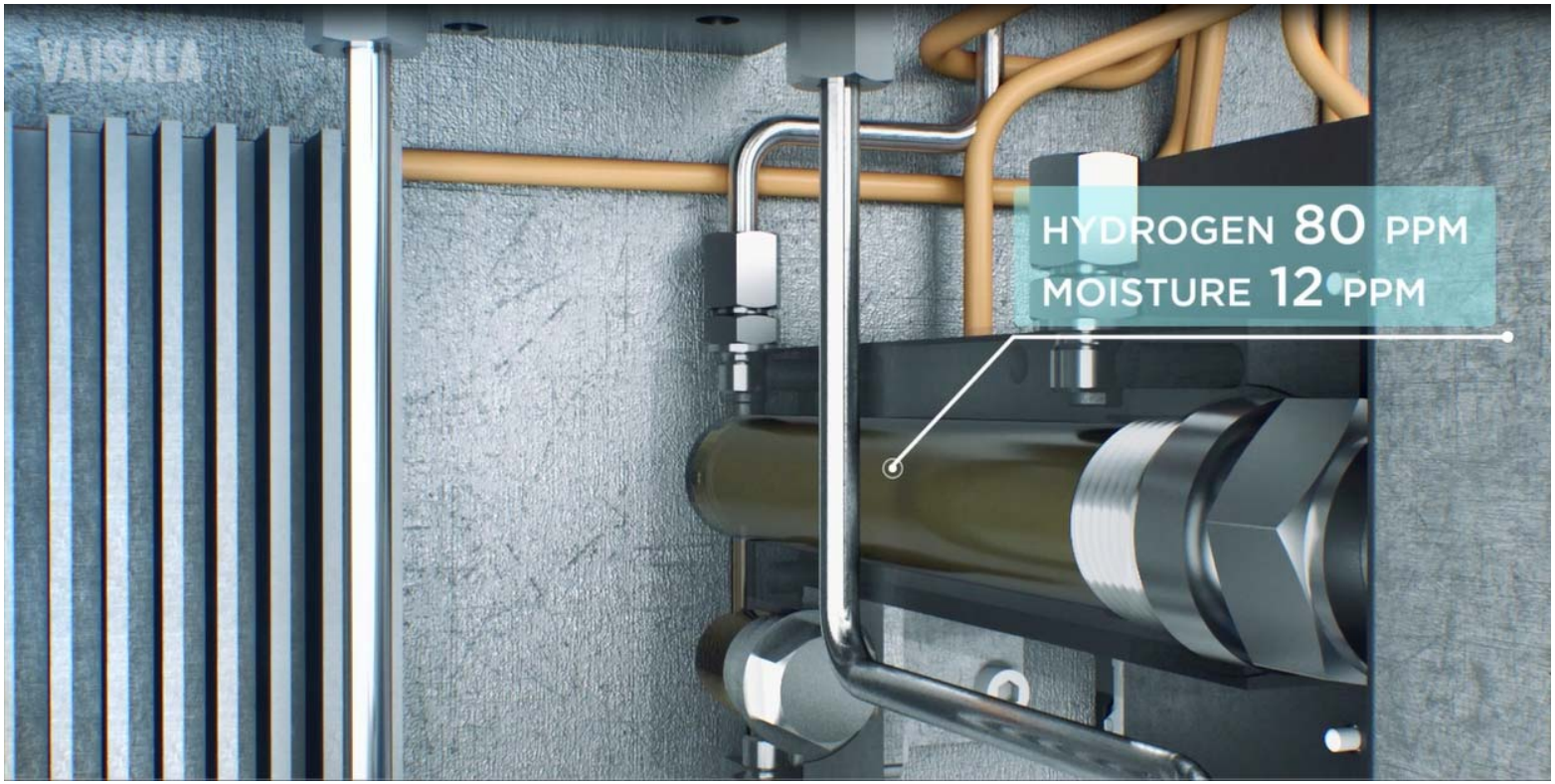
Measurement process of multigas devices

- Moisture and H2 measurement
- Separating gases from oil (critical point for next step)
- Measurement of gases

Hydrogen, Moisture and Temperature measurement directly from transformer oil



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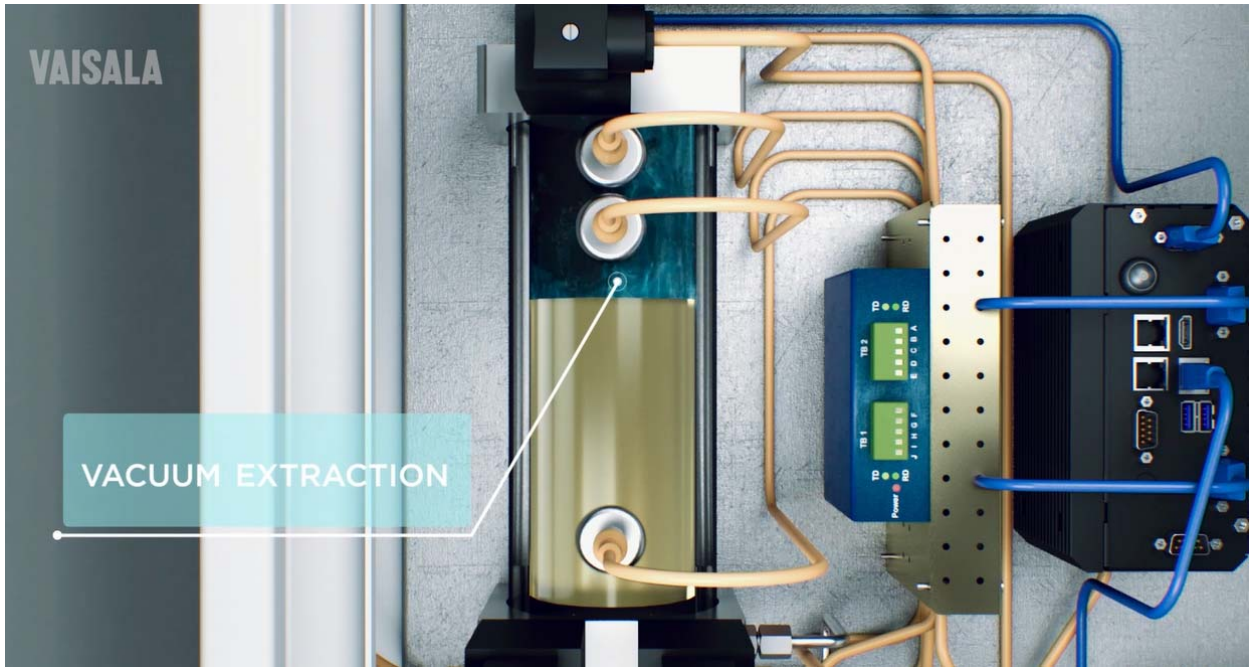
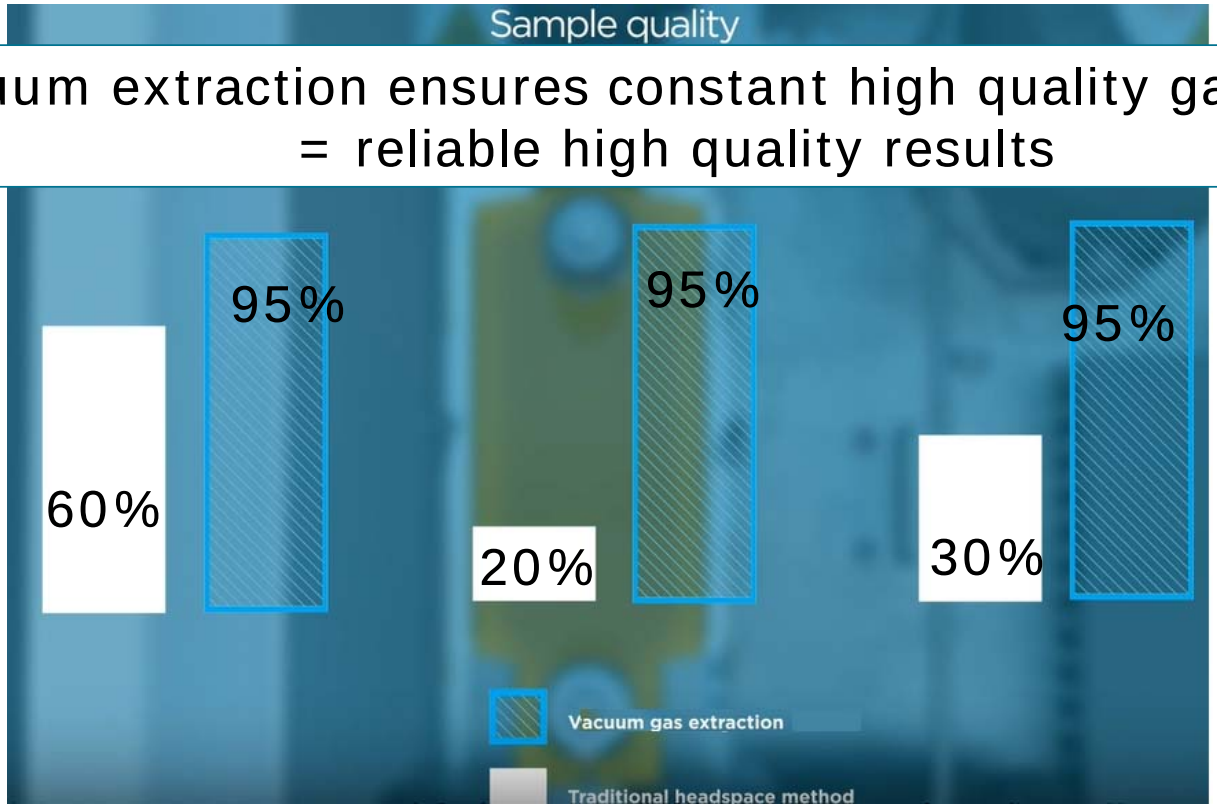
Vacuum Extraction – the most reliable way of extracting gases from oil, eliminating data fluctuations caused by changes in pressure, temperature or type of oil used



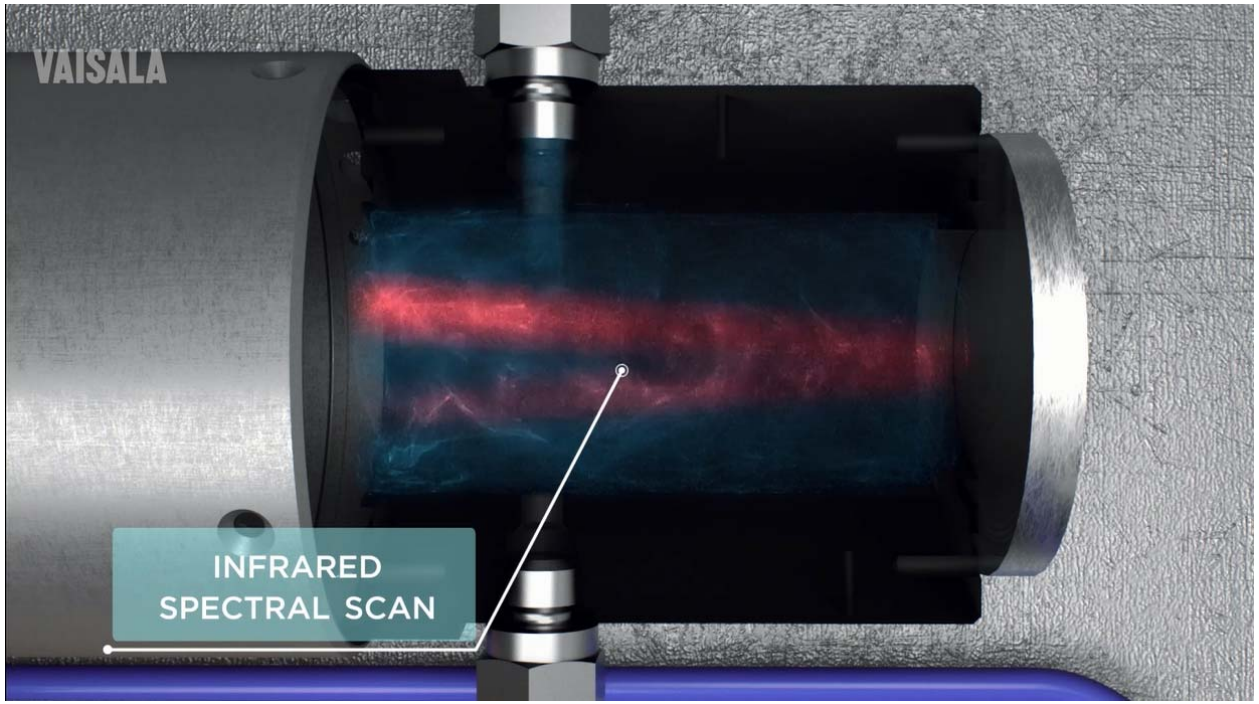
Vacuum extraction vs Head Space
How much dissolved gasses is extracted?

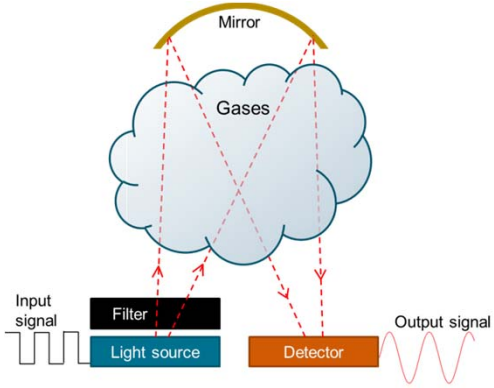


NOT vulnerable to:
- Pressure
- Temperature
- Time
- Oil type

Forcing gas out of oil in easy & effective way

The Non-Dispersive Infrared (NDIR) sensor is based on Vaisala core-sensing technology with Autocalibration

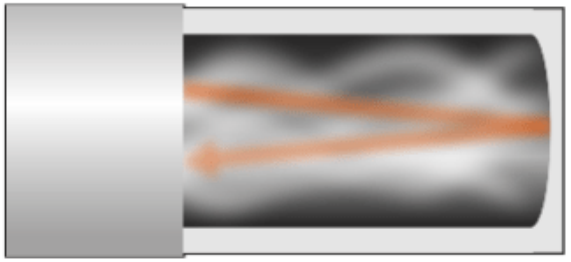




- Gas molecules absorb infrared light.
- More molecules on the optical path
-> stronger absorption.
Measured gas can be selected with the wavelength of the light.

Reliable gas trending with infrared technology

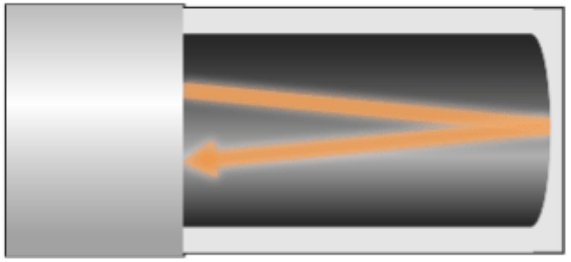
Reliable gas trending with infrared technology

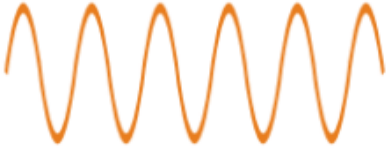


Measurement signal

$$\text{Absorption} = 1 - \frac{\text{Output with gas}}{\text{Output without gas}}$$

Reference signal (momentary maximum light)





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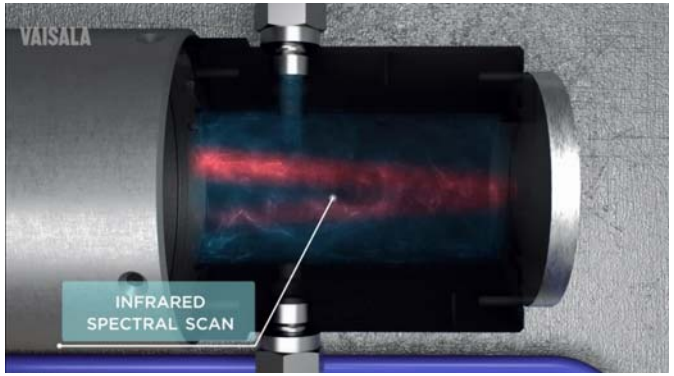
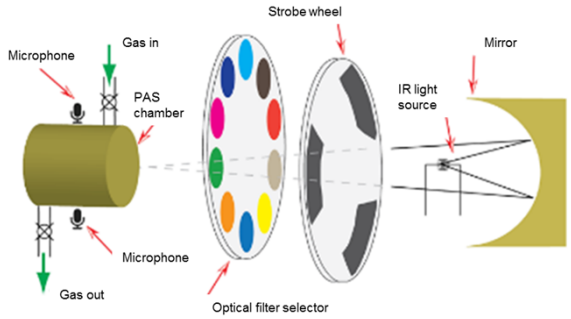
Multigas DGA – Different technologies to analyze gas samples

Non-dispersive infrared (NDIR)



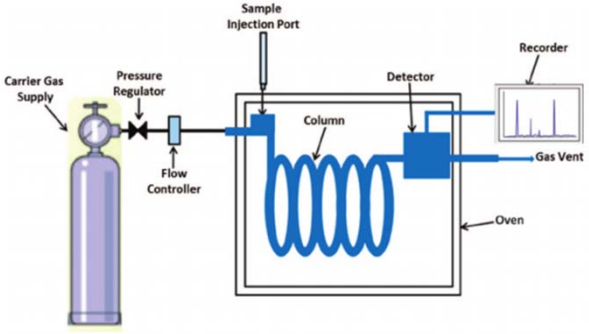
- Very lean & simple
- No moving parts
- No sensitive components
- Enables autocalibration
- Hermetical structure

Photo-acoustic (PAS)



- Moving components
- Sensitive microphones
- Limited in autocalibration
- Non-hermetic

Gas Chromathograph (GC)



- Complex structure
- Moving components
- Manual calibration
- Consumables

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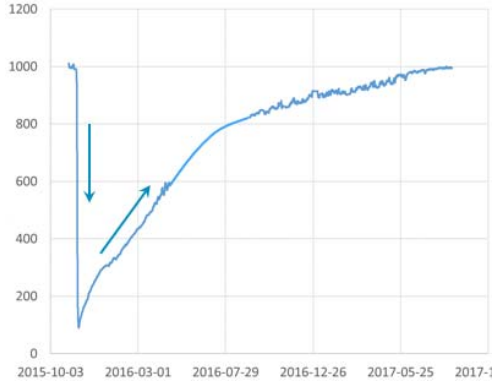
Different transformer sealing methods and TGP result

- Sealed transformer: TGP below ambient pressure
  - If more, then you have an air leakage

- Nitrogen blanketed transformer:
  - TGP ambient air +200mbar

- Free breathing transformer:
  - TGP will reach ambient pressure



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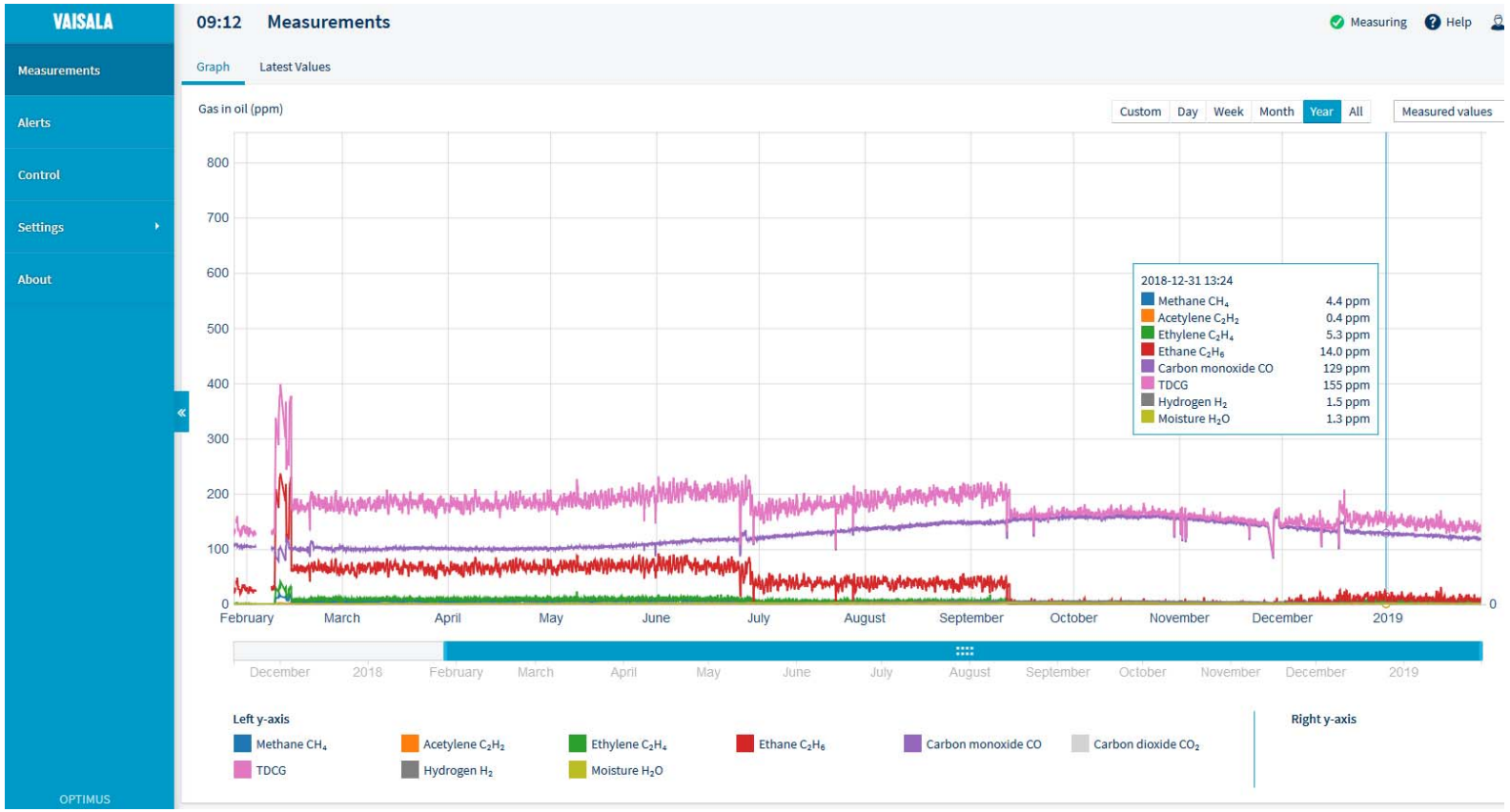
Web User Interface - Results



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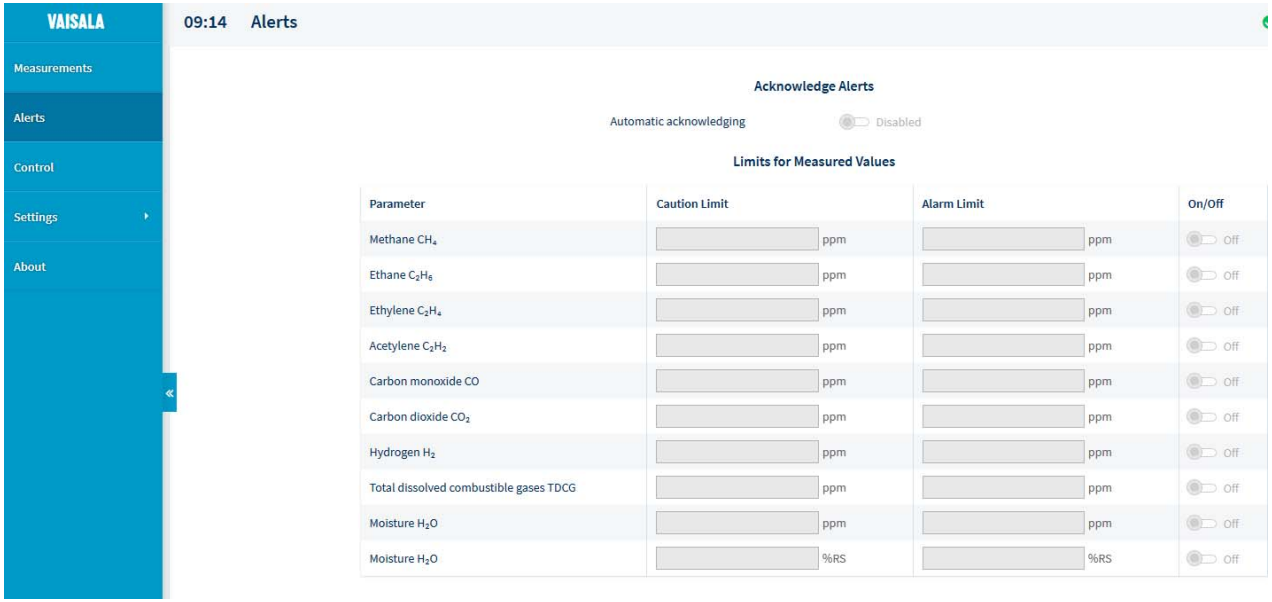
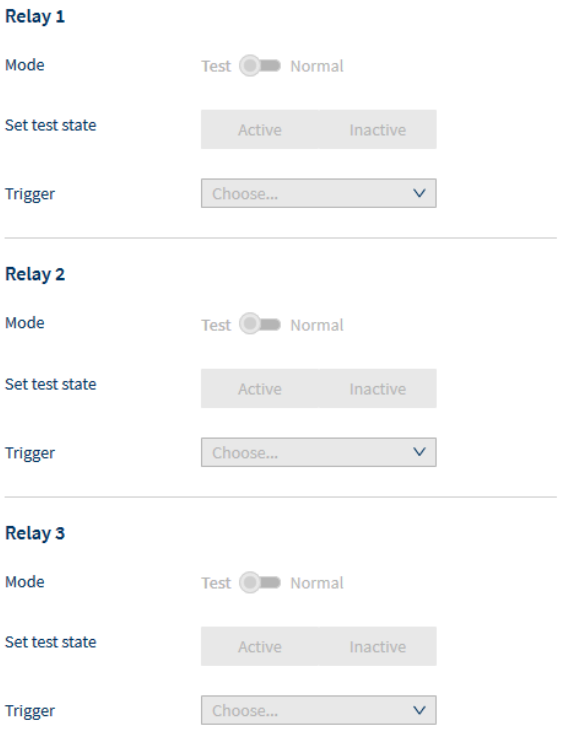
Web User Interface - Settings



Parameter	Unit	Latest	Avg 1 day	ROC 1 day	ROC 7 days	ROC 30 days
Methane CH_4	ppm	4.5	4.0	-0.4	-0.3	-0.7
Ethane C_2H_6	ppm	3.6	6.9	1.7	4.2	-2.6
Ethylene C_2H_4	ppm	5.9	5.3	0.0	0.8	-1.0
Acetylene C_2H_2	ppm	0.4	0.3	0.2	0.3	0.1
Carbon monoxide CO	ppm	119	118	-1.4	-2.6	-11.5
Carbon dioxide CO_2	ppm	1240	1238	-7.7	-11.4	-46.4
Hydrogen H_2	ppm	1.7	1.5	0.2	0.1	-0.4
TDCG	ppm	135	136	0.5	2.7	-17.8
Moisture H_2O	ppm	0.9	1.0			



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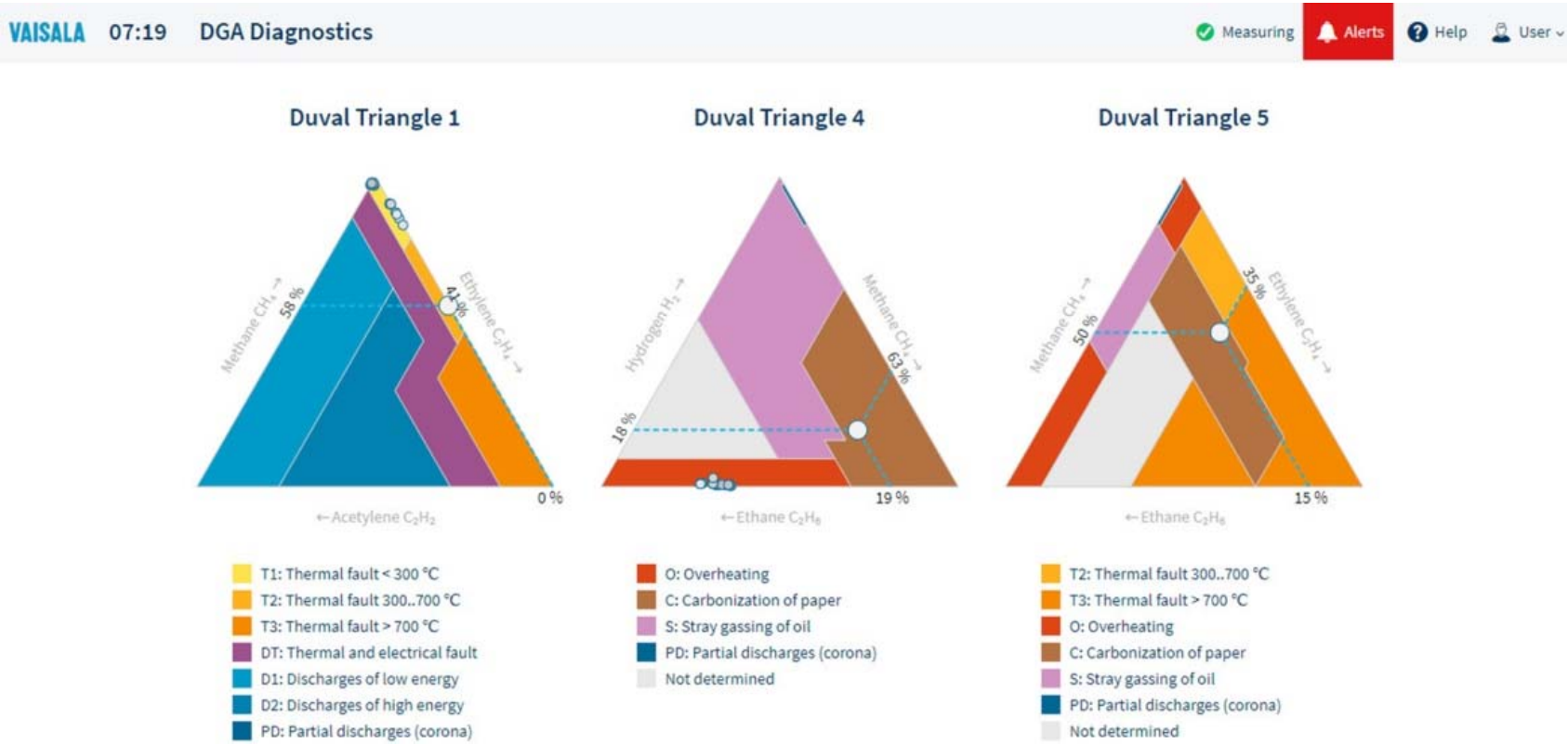
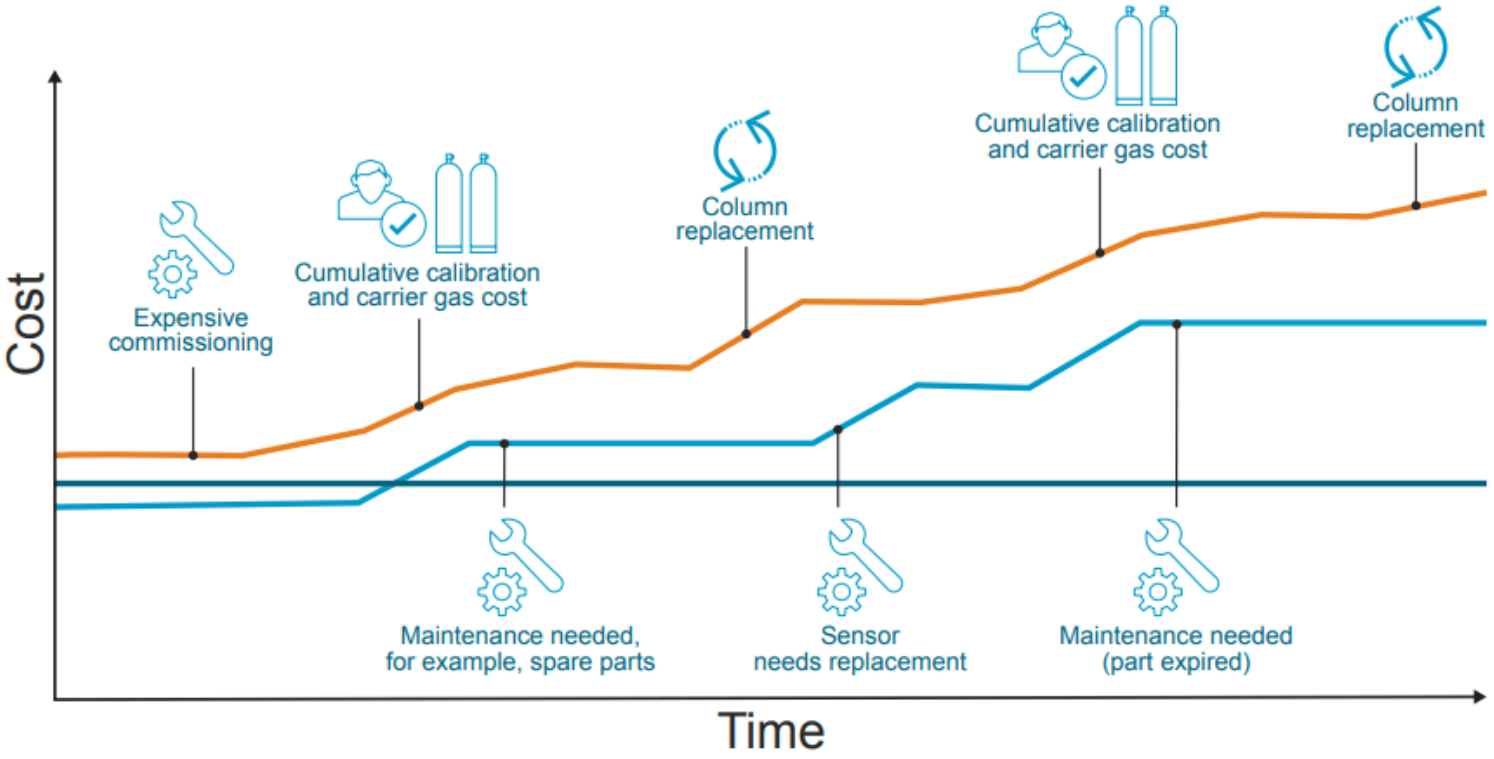
Reliable gas trending allows better fault diagnostics



Selecting monitor: Total cost of ownership TCO



- Capital costs
- Cosot of ownership including engineering, installation, calibration and maintenance

The Vaisala Optimus™ OPT100 Technical Summary

Key points of Vaisala OPT100 to remember:

- 1L of oil every hour (1L vs 1-2dl)
- Vacuum extraction gets 90% of gases out from oil (Headspace about 35%)→ very good sample
- Vaisala NDIR to analyze all gases → accurate measurement with Vaisala made laser
- Total Gas Pressure: effective way to measure leakages(no mathematical estimates, no guessing, no moving parts)
- maintenance free, no consumables, no calibrations needed, no life time costs

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Thank you for your attention!