POWER

Transformer Oil Testing (TOT) Digital Platforms

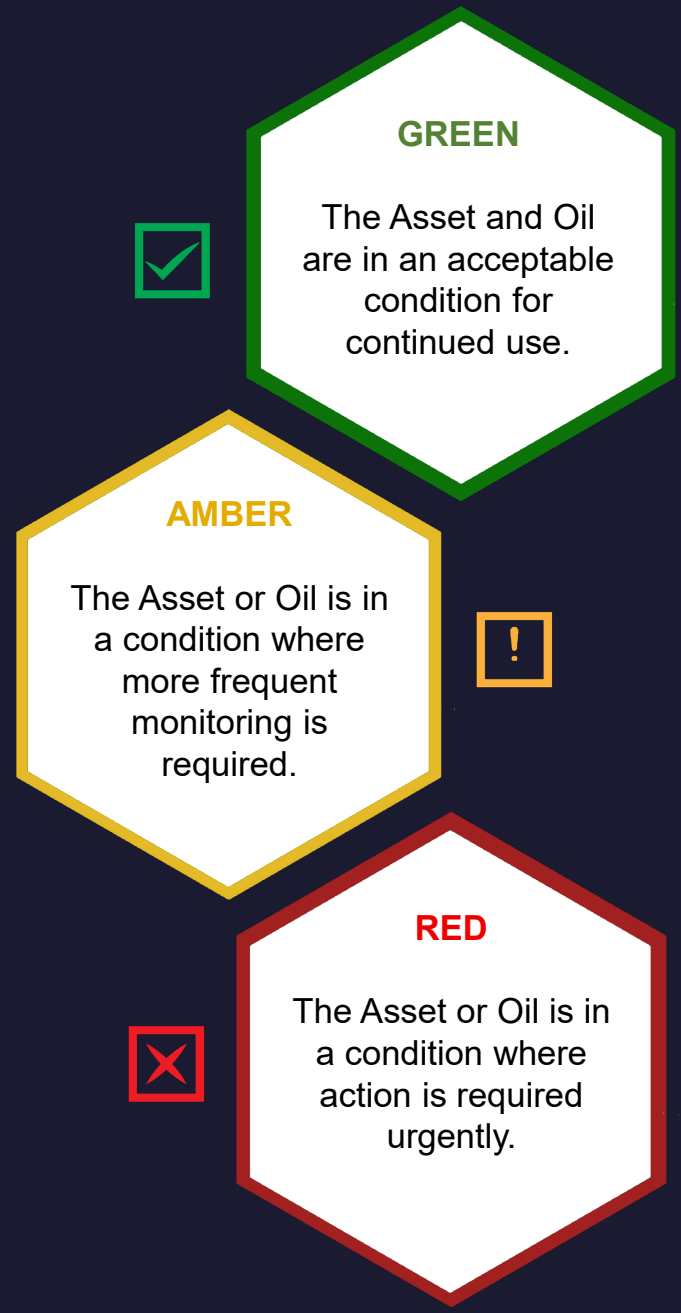
2026

Moving Forward

Leading the way for sustainable solutions

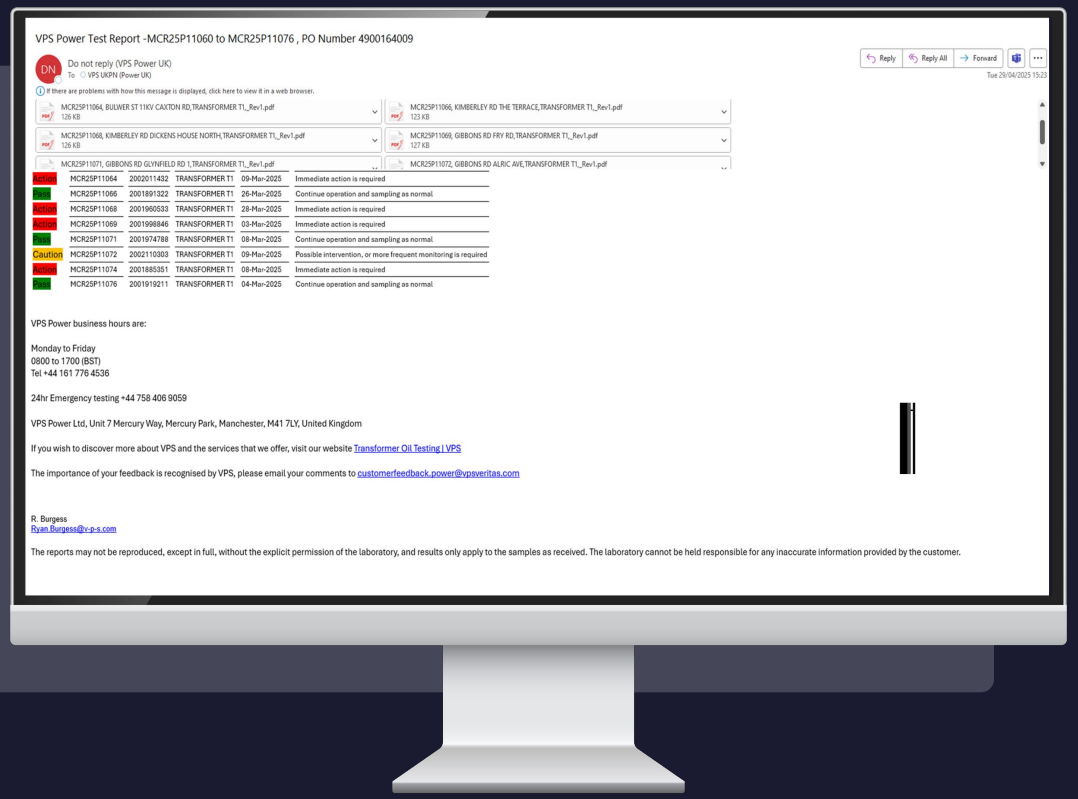
Technical Report

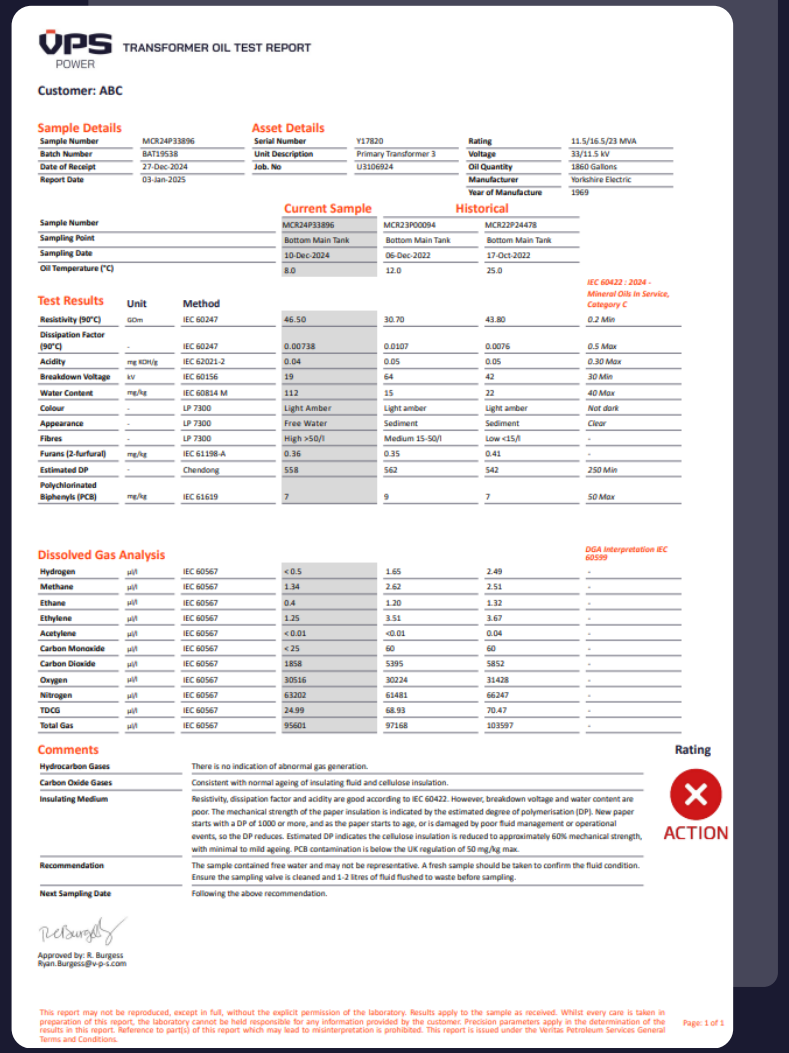
- VPS Power have electrical oil and transformer experts allowing for bespoke diagnostic comments.
- The condition of the oil or equipment is shown by an easy-to-understand colour coding system.
- Historical samples are used for trending purposes to help predict a fault and prevent potential outages
- VPS Power Reports include:
  - Sample and transformer details
  - Fluid, gas, insulating paper, environmental & investigative results
  - Trends using previous samples
  - Comments from technical experts



Reports

Report Summary with Ratings:
This feature provides visibility of the status of the report, when you receive the email with the pdf reports.




VPS POWER
TRANSFORMER OIL TEST REPORT

Customer: ABC

Sample Details

Sample Number	MCR24P33896
Batch Number	BAT19538
Date of Receipt	27-Dec-2024
Report Date	03-Jan-2025

Asset Details

Serial Number	Y17820
Unit Description	Primary Transformer 3
Job. No	U3106924
Rating	11.5/16.5/23 MVA
Voltage	33/11.5 kV
Oil Quantity	1860 Gallons
Manufacturer	Yorkshire Electric
Year of Manufacture	1969

	Current Sample	Historical	
Sample Number	MCR24P33896	MCR23P00094	MCR22P24478
Sampling Point	Bottom Main Tank	Bottom Main Tank	Bottom Main Tank
Sampling Date	10-Dec-2024	06-Dec-2022	17-Oct-2022
Oil Temperature (°C)	8.0	12.0	25.0

Test Results	Unit	Method				IEC 60422 : 2024 - Mineral Oils In Service, Category C
Resistivity (90°C)	GOm	IEC 60247	46.50	30.70	43.80	0.2 Min
Dissipation Factor (90°C)	-	IEC 60247	0.00738	0.0107	0.0076	0.5 Max
Acidity	mg KOH/g	IEC 62021-2	0.04	0.05	0.05	0.30 Max
Breakdown Voltage	kV	IEC 60156	19	64	42	30 Min
Water Content	mg/kg	IEC 60814 M	112	15	22	40 Max
Colour	-	LP 7300	Light Amber	Light amber	Light amber	Not dark
Appearance	-	LP 7300	Free Water	Sediment	Sediment	Clear
Fibres	-	LP 7300	High >50/l	Medium 15-50/l	Low <15/l	-
Furans (2-furfural)	mg/kg	IEC 61198-A	0.36	0.35	0.41	-
Estimated DP	-	Chendong	558	562	542	250 Min
Polychlorinated Biphenyls (PCB)	mg/kg	IEC 61619	7	9	7	50 Max

Dissolved Gas Analysis						DGA Interpretation IEC 60599
Hydrogen	µl/l	IEC 60567	< 0.5	1.65	2.49	-
Methane	µl/l	IEC 60567	1.34	2.62	2.51	-
Ethane	µl/l	IEC 60567	0.4	1.20	1.32	-
Ethylene	µl/l	IEC 60567	1.25	3.51	3.67	-
Acetylene	µl/l	IEC 60567	< 0.01	<0.01	0.04	-
Carbon Monoxide	µl/l	IEC 60567	< 25	60	60	-
Carbon Dioxide	µl/l	IEC 60567	1858	5395	5852	-
Oxygen	µl/l	IEC 60567	30516	30224	31428	-
Nitrogen	µl/l	IEC 60567	63202	61481	66247	-
TDCG	µl/l	IEC 60567	24.99	68.93	70.47	-
Total Gas	µl/l	IEC 60567	95601	97168	103597	-

Comments

Hydrocarbon Gases	There is no indication of abnormal gas generation.
Carbon Oxide Gases	Consistent with normal ageing of insulating fluid and cellulose insulation.
Insulating Medium	Resistivity, dissipation factor and acidity are good according to IEC 60422. However, breakdown voltage and water content are poor. The mechanical strength of the paper insulation is indicated by the estimated degree of polymerisation (DP). New paper starts with a DP of 1000 or more, and as the paper starts to age, or is damaged by poor fluid management or operational events, so the DP reduces. Estimated DP indicates the cellulose insulation is reduced to approximately 60% mechanical strength, with minimal to mild ageing. PCB contamination is below the UK regulation of 50 mg/kg max.
Recommendation	The sample contained free water and may not be representative. A fresh sample should be taken to confirm the fluid condition. Ensure the sampling valve is cleaned and 1-2 litres of fluid flushed to waste before sampling.
Next Sampling Date	Following the above recommendation.

Rating: ACTION

Approved by: R. Burgess
Ryan.Burgess@v-p-s.com

Technical Reports

Pass

VPS POWER — TRANSFORMER OIL TEST REPORT

Customer:

Sample Details

Sample Number	MCR24P26238	Serial Number	Y18536
Batch Number	BAT18290	Unit Description	Transformer 1
Date of Receipt	08-Oct-2024	Order No	E47380
Report Date	10-Oct-2024	Job. No	J10607E

Asset Details

Rating	7.5/15 MVA
Voltage	33/11 kV
Oil Quantity	1460 Gallons
Manufacturer	Yorkshire Electric
Year of Manufacture	1971

Sampling Point	Bottom Main Tank
Sampling Date	02-Oct-2024
Oil Temperature (°C)	15.0

Test Results

	Unit	Method		IEC 60422 : 2013 - Mineral Oils in Service, Category C
Acidity	mg KOH/g	IEC 62021-2	0.09	0.30 Max
Breakdown Voltage	kV	IEC 60156	72	30 Min
Water Content	mg/kg	IEC 60814 M	18	40 Max
Colour	-	LP 7300	Light Amber	Not dark
Appearance	-	LP 7300	Sediment	Clear
Fibres	-	LP 7300	Low <15/l	-

Dissolved Gas Analysis

				DGA Interpretation IEC 60599
Hydrogen	µl/l	IEC 60567	5.37	-
Methane	µl/l	IEC 60567	4.15	-
Ethane	µl/l	IEC 60567	1.61	-
Ethylene	µl/l	IEC 60567	5.56	-
Acetylene	µl/l	IEC 60567	< 0.01	-
Carbon Monoxide	µl/l	IEC 60567	127	-
Carbon Dioxide	µl/l	IEC 60567	1448	-
Oxygen	µl/l	IEC 60567	20323	-
Nitrogen	µl/l	IEC 60567	63024	-
TDCG	µl/l	IEC 60567	143.69	-
Total Gas	µl/l	IEC 60567	84939	-

Comments

Hydrocarbon Gases	No indication of abnormal gas generation.
Carbon Oxide Gases	Consistent with normal ageing of insulating fluid and cellulose insulation.
Insulating Medium	Acidity, breakdown voltage and water content are good according to IEC 60422.
Recommendation	Sample represents transformer / insulating fluid in satisfactory condition for continued service.
Next Sampling Date	02-Oct-2025

Rating: PASS

Approved by: A. Jenkins
Andrew.Jenkins@vpsvertas.com

This report may not be reproduced, except in full, without the explicit permission of the laboratory. Results apply to the sample as received. Whilst every care is taken in preparation of this report, the laboratory cannot be held responsible for any information provided by the customer. Precision parameters apply in the determination of the results in this report. Reference to part(s) of this report which may lead to misinterpretation is prohibited. This report is issued under the Veritas Petroleum Services General Terms and Conditions.

Page: 1 of 1

Caution

VPS POWER — TRANSFORMER OIL TEST REPORT

Customer: ABC
Location

Sample Details

Sample Number	MCR24P32992	Serial Number	T1234
Batch Number	BAT19386	Unit Description	Transformer 4
Date of Receipt	16-Dec-2024	Order No	PO1234
Report Date	18-Dec-2024	Job. No	15255454

Asset Details

Rating	1250 kVA
Voltage	11.5/0.433 kV
Oil Quantity	820 Litres
Manufacturer	Winder
Year of Manufacture	1999

	Current Sample	Historical	
Sample Number	MCR24P32992	MCR24P30568	MCR23P23025
Sampling Point	Bottom Main Tank	Bottom Main Tank	Bottom Main Tank
Sampling Date	03-Dec-2024	18-Oct-2024	11-Sep-2023
Oil Temperature (°C)	10.0	15.0	25.0

Test Results

	Unit	Method				IEC 60422 : 2024 - Mineral Oils in Service, Category C
Acidity	mg KOH/g	IEC 62021-2	0.06	0.07	0.07	0.30 Max
Breakdown Voltage	kV	IEC 60156	74	80	78	30 Min
Water Content	mg/kg	IEC 60814 M	18	17	20	40 Max
Colour	-	LP 7300	Light Amber	Light amber	Light amber	Not dark
Appearance	-	LP 7300	Clear & Bright	Clear & bright	Clear & bright	Clear
Fibres	-	LP 7300	Low <15/l	Low <15/l	Low <15/l	-
Furans (2-furfural)	mg/kg	IEC 61198-A	0.61	0.43	0.50	-
Estimated DP	-	Chendong	493	536	517	250 Min

Dissolved Gas Analysis

						DGA Interpretation IEC 60599
Hydrogen	µl/l	IEC 60567	< 0.5	3.41	6.75	-
Methane	µl/l	IEC 60567	7.88	19.25	1.26	-
Ethane	µl/l	IEC 60567	12.5	16.57	1.54	-
Ethylene	µl/l	IEC 60567	69.11	89.53	5.47	-
Acetylene	µl/l	IEC 60567	0.65	0.71	<0.01	-
Carbon Monoxide	µl/l	IEC 60567	< 25	<25	<25	-
Carbon Dioxide	µl/l	IEC 60567	582	626	906	-
Oxygen	µl/l	IEC 60567	32629	27691	34151	-
Nitrogen	µl/l	IEC 60567	69873	60649	82532	-
TDCG	µl/l	IEC 60567	96.14	136.47	27.84	-
Total Gas	µl/l	IEC 60567	103180	89102	117616	-

Comments

Hydrocarbon Gases	A high temperature thermal fault (t > 700°C) is confirmed.
Carbon Oxide Gases	Consistent with normal ageing of insulating fluid and cellulose insulation.
Insulating Medium	Acidity, breakdown voltage and water content are good according to IEC 60422. The mechanical strength of the paper insulation is indicated by the estimated degree of polymerisation (DP). New paper starts with a DP of 1000 or more, and as the paper starts to age, or is damaged by poor fluid management or operational events, so the DP reduces. Estimated DP indicates the cellulose insulation is reduced to approximately 50% mechanical strength, showing some deterioration but still well away from the critical condition.
Recommendation	Resample in THREE MONTHS to monitor the fault and ensure the gases remain stable. Normal operation should be continued in this period.
Next Sampling Date	03-Mar-2025

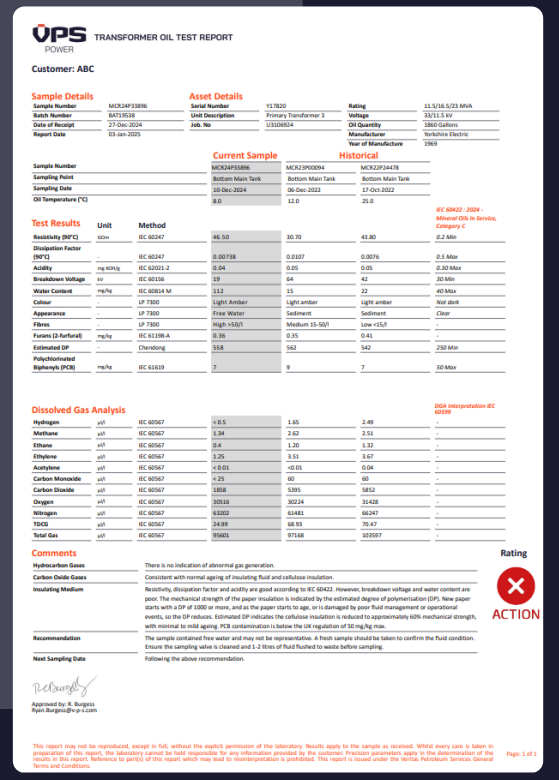
Rating: CAUTION

Approved by: A. Jenkins
Andrew.Jenkins@vpsvertas.com

This report may not be reproduced, except in full, without the explicit permission of the laboratory. Results apply to the sample as received. Whilst every care is taken in preparation of this report, the laboratory cannot be held responsible for any information provided by the customer. Precision parameters apply in the determination of the results in this report. Reference to part(s) of this report which may lead to misinterpretation is prohibited. This report is issued under the Veritas Petroleum Services General Terms and Conditions.

Page: 1 of 1

Action



VPS POWER — TRANSFORMER OIL TEST REPORT

Customer: ABC

Sample Details

Sample Number	MCR24P33896	Serial Number	Y17820
Batch Number	BAT19528	Unit Description	Primary Transformer 3
Date of Receipt	27-Dec-2024	Job. No	U3106924
Report Date	03-Jan-2025		

Asset Details

Rating	11.5/16.5/23 MVA
Voltage	33/11.5 kV
Oil Quantity	1860 Gallons
Manufacturer	Yorkshire Electric
Year of Manufacture	1969

	Current Sample	Historical		
Sample Number	MCR24P33896	MCR23P00094	MCR22P24478	
Sampling Point	Bottom Main Tank	Bottom Main Tank	Bottom Main Tank	
Sampling Date	10-Dec-2024	06-Dec-2022	17-Oct-2022	
Oil Temperature (°C)	8.0	12.0	25.0	

Test Results

	Unit	Method				IEC 60422 : 2024 - Mineral Oils in Service, Category C
Resistivity (90°C)	GOhm	IEC 60247	46.50	30.70	43.80	0.2 Min
Dissipation Factor (90°C)	-	IEC 60247	0.00738	0.0107	0.0076	0.5 Max
Acidity	mg KOH/g	IEC 62021-2	0.04	0.05	0.05	0.30 Max
Breakdown Voltage	kV	IEC 60156	19	64	42	30 Min
Water Content	mg/kg	IEC 60814 M	112	15	22	40 Max
Colour	-	LP 7300	Light Amber	Light amber	Light amber	Not dark
Appearance	-	LP 7300	Free Water	Sediment	Sediment	Clear
Fibres	-	LP 7300	High >50/l	Medium 15-50/l	Low <15/l	-
Furans (2-furfural)	mg/kg	IEC 61198-A	0.36	0.35	0.41	-
Estimated DP	-	Chendong	558	562	542	250 Min
Polychlorinated Biphenyls (PCB)	mg/kg	IEC 61619	7	9	7	50 Max

Dissolved Gas Analysis

						DGA Interpretation IEC 60599
Hydrogen	µl/l	IEC 60567	< 0.5	1.65	2.49	-
Methane	µl/l	IEC 60567	1.34	2.62	2.51	-
Ethane	µl/l	IEC 60567	0.4	1.20	1.32	-
Ethylene	µl/l	IEC 60567	1.25	3.51	3.67	-
Acetylene	µl/l	IEC 60567	< 0.01	<0.01	0.04	-
Carbon Monoxide	µl/l	IEC 60567	< 25	60	60	-
Carbon Dioxide	µl/l	IEC 60567	1858	5395	5852	-
Oxygen	µl/l	IEC 60567	30516	30224	31428	-
Nitrogen	µl/l	IEC 60567	63202	61481	66247	-
TDCG	µl/l	IEC 60567	24.99	68.93	70.47	-
Total Gas	µl/l	IEC 60567	95601	97168	101597	-

Comments

Hydrocarbon Gases	There is no indication of abnormal gas generation.
Carbon Oxide Gases	Consistent with normal ageing of insulating fluid and cellulose insulation.
Insulating Medium	Resistivity, dissipation factor and acidity are good according to IEC 60422. However, breakdown voltage and water content are poor. The mechanical strength of the paper insulation is indicated by the estimated degree of polymerisation (DP). New paper starts with a DP of 1000 or more, and as the paper starts to age, or is damaged by poor fluid management or operational events, so the DP reduces. Estimated DP indicates the cellulose insulation is reduced to approximately 60% mechanical strength, with minimal to mild ageing. PCB contamination is below the UK regulation of 50 mg/kg max.
Recommendation	The sample contained free water and may not be representative. A fresh sample should be taken to confirm the fluid condition. Ensure the sampling valve is cleaned and 1-2 litres of fluid flushed to waste before sampling.
Next Sampling Date	Following the above recommendation.

Rating: ACTION

Approved by: R. Burgess
Ryan.Burgess@vp-s.com

This report may not be reproduced, except in full, without the explicit permission of the laboratory. Results apply to the sample as received. Whilst every care is taken in preparation of this report, the laboratory cannot be held responsible for any information provided by the customer. Precision parameters apply in the determination of the results in this report. Reference to part(s) of this report which may lead to misinterpretation is prohibited. This report is issued under the Veritas Petroleum Services General Terms and Conditions.

Page: 1 of 1

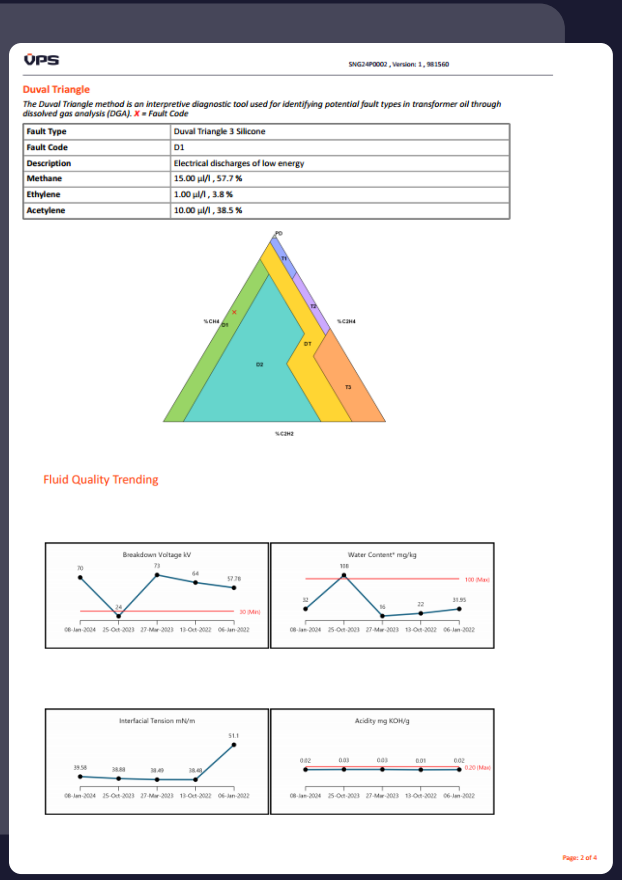
IEC 60422
Edition 4.0 2013-01
INTERNATIONAL STANDARD
NORME INTERNATIONALE
Mineral insulating oils in electrical equipment – Supervision and maintenance guidance
Huiles minérales isolantes dans les matériels électriques – Lignes directrices pour la maintenance et la surveillance

NORME INTERNATIONALE
INTERNATIONAL STANDARD
CEI IEC 1203
Première édition First edition 1992-12
Esters organiques de synthèse à usages électriques – Guide de maintenance des esters pour transformateurs dans les matériels
Synthetic organic esters for electrical purposes – Guide for maintenance of transformer esters in equipment

IEC 62975
Edition 1.0 2021-01
INTERNATIONAL STANDARD
NORME INTERNATIONALE
Natural esters – Guidelines for maintenance and use in electrical equipment
Esters naturels – Lignes directrices pour la maintenance et l'utilisation dans les matériels électriques

ISO 17025 accredited reports issued to the most up-to-date international standards by the UK's most experienced Transformer Diagnostics Advisors. Reports are supported by a dedicated **Technical hotline**.

Advanced Technical Reports



VPS

SNG24P0002 , Version: 1 , 981560

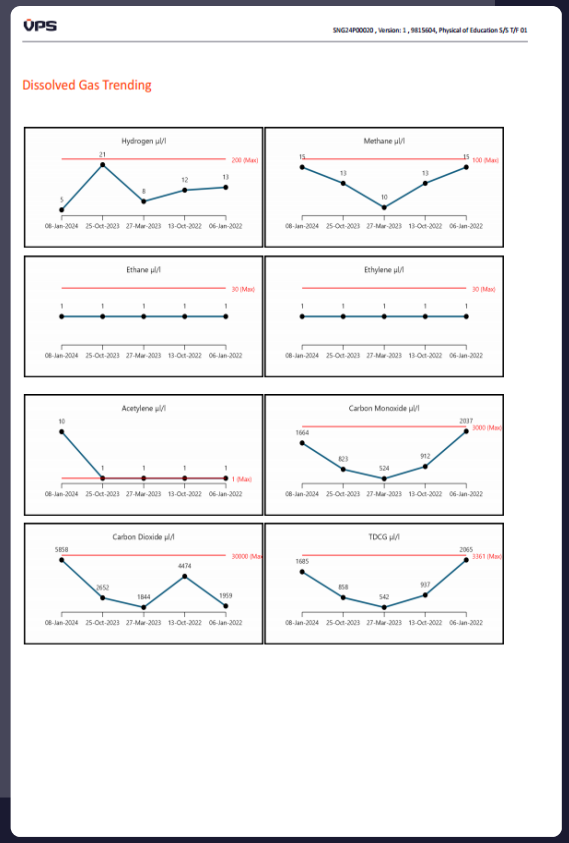
Duval Triangle

The Duval Triangle method is an interpretive diagnostic tool used for identifying potential fault types in transformer oil through dissolved gas analysis (DGA). X = Fault Code

Fault Type	Duval Triangle 3 Silicone
Fault Code	D1
Description	Electrical discharges of low energy
Methane	15.00 µl/l , 57.7 %
Ethylene	1.00 µl/l , 3.8 %
Acetylene	10.00 µl/l , 38.5 %

Fluid Quality Trending

Page: 2 of 4



VPS

SNG24P0003D , Version: 1 , 981560A, Physical of Education S/S T/F 01

Dissolved Gas Trending

Advanced technical reports provide a more detailed insight into your assets health displaying thermal and electrical fault models and trending of test data.

MyTransformers:

VPS' latest business intelligence tool, focused on transformer oil condition monitoring and asset integrity.

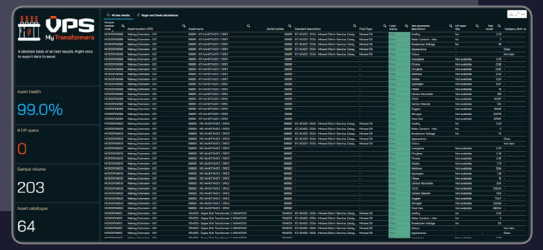
Summary dashboard

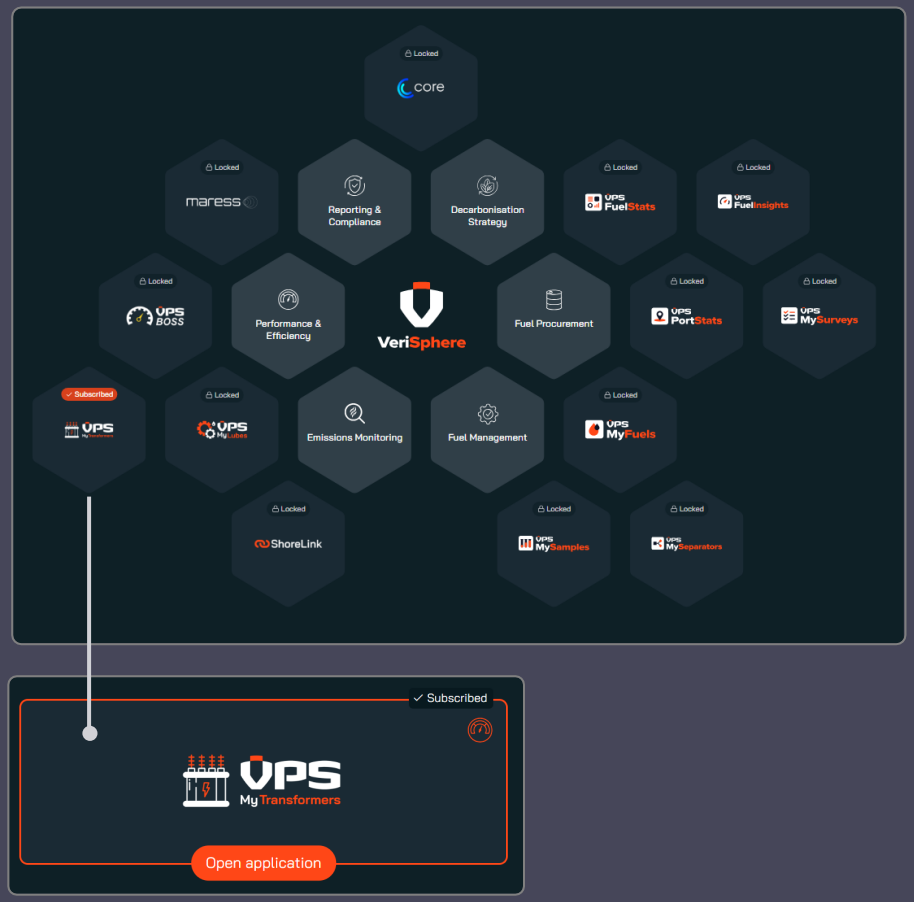
Grouped test result analysis

Detailed test result analysis

Asset rate of change

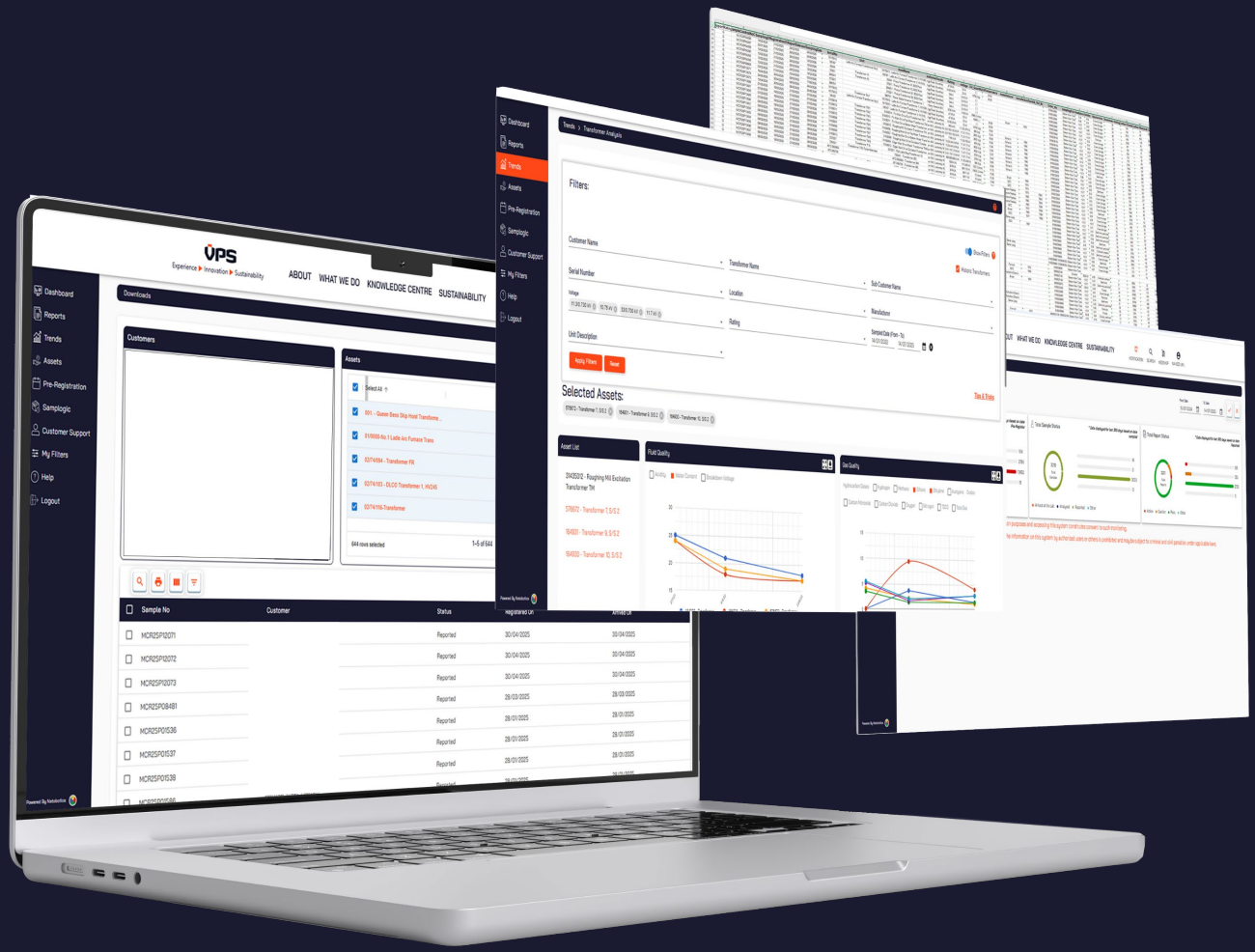
All test result data





- Custom MyTransformers dashboard.
- Monitor asset and equipment health.
- Roger ratios and Duval triangle calculations.

Customer Portal



DASHBOARD

Summarize sample submissions and report rating statuses.

REPORTS

Access PDFs and export data to Excel effortlessly.

TRENDS

Visualize current and historical results with interactive line graphs.

ASSETS

Review existing assets, set sampling frequencies, and activate email notifications.

SCHEDULER

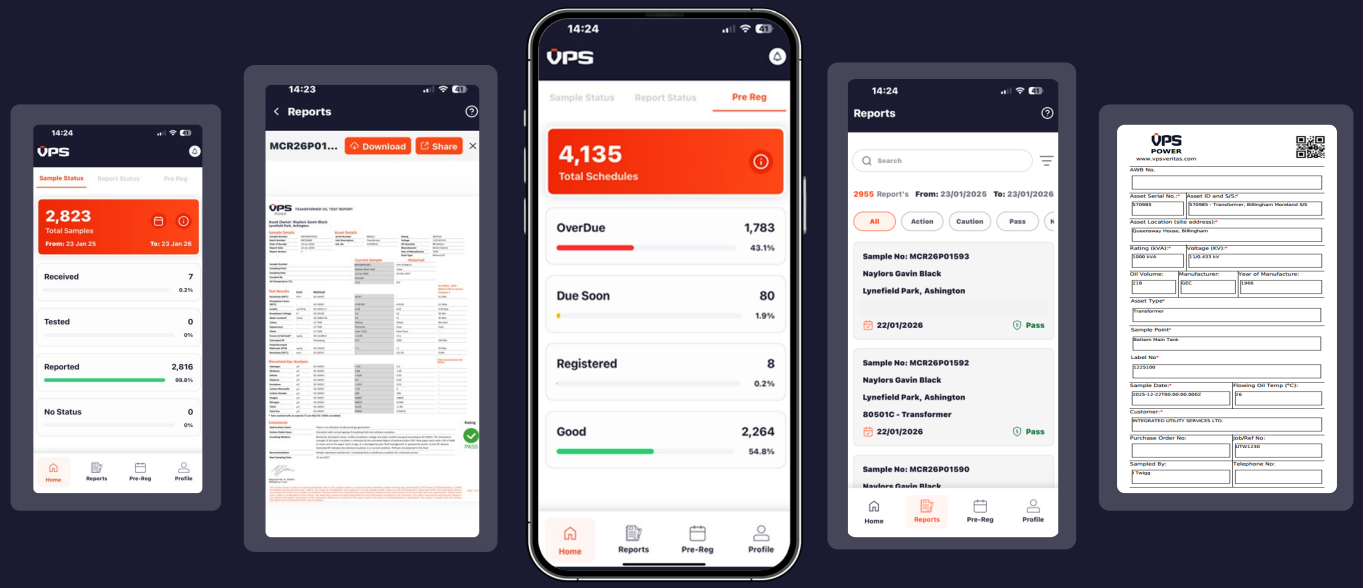
Track upcoming/overdue sampling and generate electronic labels.

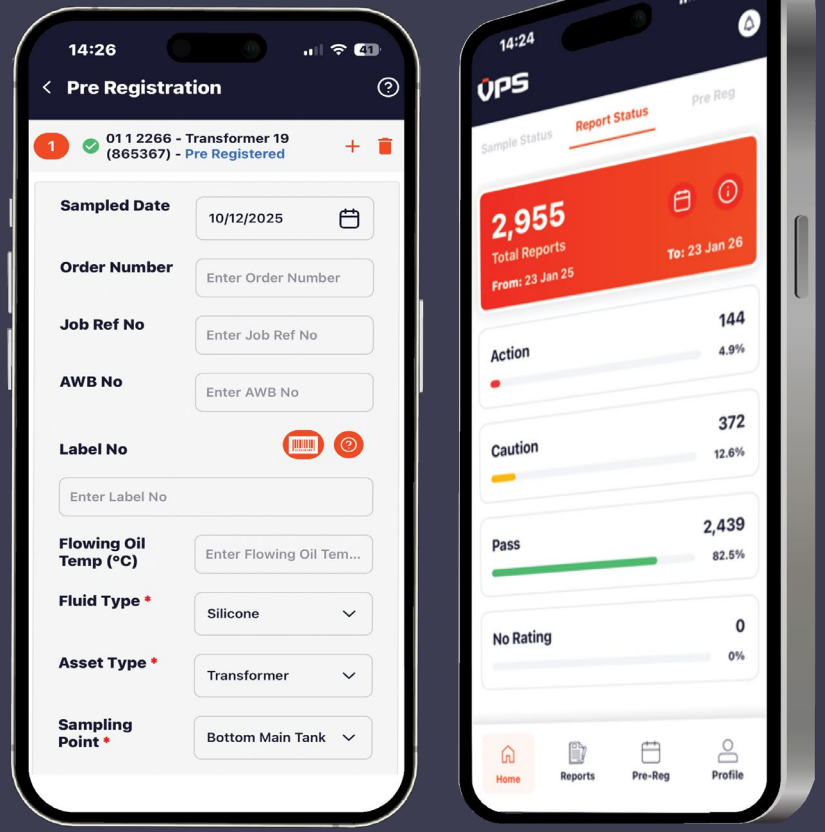
SAMPLOGIC

Arrange seamless sample collection and tracking.

Mobile App

Review sample and report rating status, upcoming/overdue assets for sampling, current and historical results, and register/create electronic labels for samples with QR code technology.





MyTransformers

VPS MyTransformers

Set-up bookmarks to monitor key assets' integrity and transformer oil performance.

Drill-down from a company level overview to asset level quality statistics.

User-friendly dashboarding feature provides asset managers with immediate insights on asset integrity.

Gain access to all your transformer oil testing data with VPS within a few clicks.

Forensic workflow feature enables users to immediately identify anomalies and outliers in asset integrity and performance.

POWER

Contact

James Robinson
Business Manager - VPS Power
James.Robinson@vpsveritas.com

Naheed Umarji
Sales Manager - VPS Power
Naheed.Umarji@vpsveritas.com

vpsveritas.com

Moving Forward

Leading the way for sustainable solutions