

LIQUID LEVEL TESTING

PORTALEVEL® MAX INDUSTRIAL

TECHNICAL SPECIFICATIONS

4.

INDUSTRY: ELECTRIC POWER TRANSMISSION & DISTRIBUTION

APPLICATION: TRANSFORMER OIL LEVEL

BACKGROUND:

Transformers are used in electric power transmission and distributions and are devices that transfer electric power at different voltage levels. The main components within the transformers are the core and windings which are oil immersed. An oil conservator and Buchholz relay is also commonly found to monitor oil levels.

APPLICATION:

As transformers age, they become more likely to lose internal oil. It is important for oil levels in the transformer main tanks to be full, as they act as an insulator and allows the transformers to function efficiently. High voltage transformer and switch gear units are also often designed to be submerged in oil which act as an insulator, making sure any technicians working on the units are not at risk of potentially fatal shocks. For transformers that are not fitted with an oil conservator or Buchholz relay, few means of oil level inspection exist and traditional methods include inspection by opening the lid of the transformer. When the lid is opened, the insulating oil is exposed to the moisture in the atmosphere and will increase the rate of oil deterioration causing the life of insulating oil to shorten. This contributes to more frequent oil changes, significant downtime to the system when an oil change is conducted and the formation of sludge which reduces efficiency. A non-invasive oil monitoring liquid level indicator is necessary.

SOLUTION:

The Portalevel MAX INDUSTRIAL will be a safe, efficient and reliable solution to inspect oil levels in transformers non-invasively, typically in transformers that have no means of external oil indication. With the Portalevel MAX INDUSTRIAL oil level inspection can be done routinely without opening the lid of the transformer and thus prevent unwanted moisture from being absorbed by the oil which deteriorates the oil.

POSSIBILITIES:

Many companies around the world are beginning to use the Portalevel MAX INDUSTRIAL for checking the oil levels in Transformer & Switch Gear units. Since this equipment can non-invasively check the presence from the outside of the tanks, technicians can operate safely and with confidence.



5.

INDUSTRY: STEEL PRODUCTION FACILITY

APPLICATION: TRANSFORMER OIL LEVEL

BACKGROUND:

Transformers are used in electric power transmission and distributions and are devices that transfer electric power at different voltage levels. There are two types of transformers that were present on site: (1) 33kV to 6.6kV and (2) 6.6kV to 440V where the former is much larger sized. Both types contain tapchangers and cable boxes which are filled with oil or a fluid compound essential for the operational of the transformer. Across the site, there are approximately hundreds of such transformers installed.

APPLICATION:

Many of these transformers do not have the means to indicate oil / fluid level externally. The existing solution is to shut the transformer down and inspect oil levels by opening the covers which results in a significant downtime to the power distribution network in the production facility. There were also concerns in the accuracies of many of the existing built-in level meters in the tank.

SOLUTION:

The Portalevel™ MAX INDUSTRIAL is identified to be a portable and reliable non-invasive solution capable of identifying fluid levels quickly and is very simple to operate. Oil inspection can now be done externally and on "live" transformers. Inspecting with increased efficiency, the oil inspections can now be conducted routinely saving overall maintenance and labour costs as only a single user is required to operate the equipment.

IMPLEMENTATION:

A standard unaltered Portalevel™ MAX INDUSTRIAL is sufficient for the application. We also supplied the "Special Applications" sensor along with the unit to ensure stronger and more efficient power output from the device capable to identify oil levels across the full range of their transformers.

RESULT: SAFETY OF LIFE, ASSET & FACILITIES

Safety critical tool which minimises risk to human life by ensuring inspectors can identify the oil level even when it cannot be seen in a sight glass or other method.



technical specifications

MANUFACTURER: Coltraco Ltd, 46 Mount Street, London W1K 2SA, United Kingdom

FUNCTION: Portable Ultrasonic Liquid Level Indicator

VERIFIABLE LIQUIDS: oil, ammonia, mayonnaise, amongst a range of others

TYPE: Portalevel MAX INDUSTRIAL

UNIT DIMENSIONS: 160 x 82 x 30 mm

WEIGHT: 300 g

OPERATING TEMPATURE: -20c TO +70c

STORAGE TEMPERATURE: -10C to +50C

DISPLAY: Membrane control operated, LCD back-lit display measuring 55 x 28 mm

POWER SUPPLY: 1 x PP3 9V battery (10 hour battery life)

SENSOR: supplied with two sensors (1) standard TX/RX sensor 14mm diameter head, contained within a magnetized sensor applicator, connected by BNC connectors to 1m length co-ax cable (2) special applications sensor with a higher energy output [recommendation is to start with standard sensor then move to the higher efficiency special applications sensor if required]

TECHNICAL NOTE:

different calibration band selection is available subjected to Coltraco Technical Team's approval after reviewing the customer's intended application and if the default calibration band fails to identify the level

what's in the box?

- The Portalevel™ MAX INDUSTRIAL comes in a ready-to-go-package
- Complete with all items required to carry out liquid level indication:
- main unit, special sensor, standard sensor, ultrasonic gel, carrying case, calibration certificate and instruction manual.



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WE GREATLY VALUE THE WORK WE CONDUCT ON SPECIAL APPLICATIONS AS IT ALLOWS US TO DEEPEN OUR EXPERTISE AND BROADEN OUR KNOWLEDGE. THROUGH SUCCESSIVE SHORT FEEDBACK LOOPS BETWEEN PRACTICAL OPERATION AND DESIGN WE CONTINUE TO DEVELOP AND IMPROVE OUR TECHNOLOGY.”

Quote from Coltraco's Technical Manager

approvals and certification

- Assembled under IPC-A-610 American national standards, institute protocols and full ESD electrostatic discharge protocols; finished with lead-free Rohs compliant Tin/Copper SN100C patented solder
- Environmental metal enclosure rated to IP65
- UL Approved and Certified manufactured circuit boards to UL Specifications ABS Type and Manufacturers Approval
- RINA Classification Society Approved
- UK Government CAGE Code KD983
- P/N 2290334-MAX-IND

operations

SPA: The SPA capability enables an increased output to achieve better readings for poor condition cylinders, more challenging applications and large volume uses

CAL: The CAL button is the standard procedure feature enabling self-calibration prior to testing on each individual cylinder, to ensure accurate and reliable readings

BATTERY COMPARTMENT: The battery compartment is on the bottom of the unit and has a double gate way to be waterproof * must be opened by flat head tool, e.g. a screwdriver to change the battery

SPA: to check the SPA feature is working

CAL: to check the CAL feature is working

BAT OK: to check the level of Battery life

GROMIT: the gromit at the top of the unit is the ultra secure simple fastening for the Sensor

SEALING: Red sealing ring for watertight integrity and enhanced aesthetics

DISPLAY: 'Go-No-Go' readings for quick and easy use

ON: simple power ON button – powered by 1 x 9V battery providing approximately 8 hours life

OFF: simple power OFF button – keep turned off to save battery life

V0.10: version 0.1

DIGITAL DISPLAY: numerical readings for an experienced user to gauge a better interpretation of the ultrasound's behaviour

BAR GRAPH DISPLAY: easy to interpret visual reading



ARC FLASH FATALITIES IN WA

This article has been written in response to High Voltage Solution (HVS) clients who have read & contacted HVS about the above fatalities.

(Reference: <http://www.abc.net.au/news/2015-02-03/two-dead-several-hurt-in-morley-galleria-shopping-centre-blast/6066398>)

by Peter Rhodes, HVS

High Voltage Solutions (HVS) proactive clients who have contacted HVS in recent weeks are concerned about Long & Crawford (L&C) oil filled switches & how best to determine how safe they are for personnel to operate.

Long & Crawford oil filled switches (ETV3/2, T4GF3 / GF3 / J / J3 / J4 / R3) have been around since 1970 (45 years of service up to 2015), a high percentage of these have been installed in underground substations / commercial buildings / hospitals / pumping stations where access is difficult to provide assistance if an incident occurred.



View of Long & Crawford ETV3 oil filled switch arrangement (A high percentage of these have been used in underground substations as shown above)

These oil filled fuse switches are used to supply adjacent transformers, which are also housed in the same location.

HOW IT SHOULD OPERATE:

If a fault develops in one of the transformer related assets (Transformer winding fault / cable box termination or a cable fault) the resulting rupturing caused the striker pin within the fuse to operate causing the tripper plate to be activated which tripped the circuit breaker.

FUSE PERFORMANCE

Electrical high rupturing current fuses are used as protection devices in medium voltage systems such as 11000 volt transformers. There are two types of failure currents:

1. Short circuit currents
2. Over currents

Short circuit currents

Short circuit currents have to be handled so fast that the fuse operation limits the maximum current. The current limitation of the short circuit current will be handled by a fuse element with serial constrictions.

In case of a short circuit current all serial constrictions will melt off at nearly the same time. Due to the high number of foot – points of the serial arcs, the resulting arc-voltage is high enough to quench the arc and to interrupt the current.

Over currents

With overcurrents the fuse element will melt at the hottest point. When the arc starts to burn it will be extended along the fuse element. To interrupt such an arc, the plasma has to be cooled to increase the electrical resistance of the arc to drive the arc – voltage above the recovery voltage. The cooling of the arc body appears by dissipating the heat of the arc into the fuse sand utilising the melt enthalpy of the sand.

A major problem occurs if the plasma of the arc is stable burning & does not reach the necessary temperature to melt the quartz sand around 1700°C., as the arc will not be interrupted. Due to the pressure build up inside the fuse, the fuse body will explode.



View of a failed / ruptured fuse

EXPLODING FUSES WITHIN OIL FILLED SWITCHES

If a fuse ruptures inside an oil filled fuse switch it will in most cases cause the oil filled switch to fail (This is subject to what back-up feeder protection is used up-stream from the oil filled switch).

GENERAL RULE REGARDING OIL FILLED FUSES:

Utilities with oil filled switches with fuses that have been in service for over 20 years, run the risk of oil seeping into the actual fuse, this will cause the fuse to rupture under fault conditions.

IN ROOT CAUSE OF FAILURES

HVS has had extensive knowledge and experience in root cause of failures in oil filled equipment. Practical solutions to prevent the above from occurring so that personnel remain safe, have regularly been identified and rectified across Australia and New Zealand.

*For more information email:
prhodes@highvoltagesolution.com
or phone:*

AUST: 1300 80 60 23 NZ: + 64 2741 99952

*Operating instructions available from
www.highvoltagesolution.com*



HIGH VOLTAGE PARTIAL DISCHARGE

SPECIALIZING IN CABLE TERMINATION & IN-LINE JOINT FAILURES

www.highvoltagesolution.com

Detect and locate Partial Discharge faults

SWITCH YARDS

- Voltage Transformers
- Current Transformers
- Surge Arrestors (OIP)
- Bulk Oil Circuit Breakers
- SF6 Circuit Breakers
- Line Inspection Surveys

INDOOR SWITCH BOARDS

- Air Insulated
- SF6
- Pitch Filled
- Pfister Terminations
- Heat Shrink Terminations
- Cold Applied Terminations
- Cable Boxes
- Voltage Transformers
- Current Transformers



TRANSFORMERS

Identify Partial Discharge within:

- Windings
- Bushings (OIP)
- Cable Box
- Cables
- Surge Arrestors

CABLES

- XLPE Cables
- Paper Lead
- Oil Filled
- Nitrogen Filled
- In-line Joints
- Terminations

Overhead line surveys using both infra-red & corona cameras.

In addition to the above Specialist Partial Discharge Surveys, HVS work with and support asset owners of Mines, Wind Farms, Line Companies and Generation in the following critical areas of their business.

- Retention of Life in HV Switchboard Audits
- High Voltage Asset Management
- High Voltage Electrical Audits / Inspections
- Insurance Investigations
- Factory Acceptance Testing
- Investigation into Switchboard Failures
- Power Harmonic Surveys
- Infra-Red Surveys
- Transmission Line Inspections (able to identify cracked bushings)
- Off Line Testing of Cables
- Commissioning of Cable Networks

EXCLUSIVE AGENCIES



HVS

High Voltage Solution

Call **Peter Rhodes** ... your partial discharge specialist

Phone New Zealand Office + 64 2741 99952

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