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Karachi Seminar & Office Inauguration



GE Agreement LV Sales in Pakistan



IFC Panels A New Milestone



Transformer DGA Techniques & Technologies



From the Desk of CEO

Akhlaq Ahmad

Another new year has begun like its predecessors, marking a year less of what we are granted in this world. And successful are those who utilised the moments past, best possible, Quran declares. This list of successful embraces those who had their today better than yesterday. Best wishes for the days past and hopes for the moments ahead.

2015 dawned with much higher ambitions and zeal for us with many milestones being achieved and new set and an expectation that our energy will expand the EPESOL family and the ecosystem of connections with it. Increasing our family size will not only be a challenge for all of us to survive in coming years but will provide fuel to touch new heights of **Excellence** and **Value Addition**, the core of our business. May Allah help us to uphold the promise made of becoming an Islamic Multinational in coming decade. Karachi office, we hope, will prove to be the first drop of rain followed by many others, we will be communicating you time to time. Stay connected with us in our journey & prayers!



A Scribe by the Editor

Noor Al Huda

The dawn of year 2015 has brought upon us, as a nation, many knotty challenges which include but are not limited to economic meltdown & chronic foreign debt, water & energy crisis, terrorism & sectarian extremism, institutional decay & organisational chaos, brain-drain & under-developed human capital, internal & geopolitical security quandary, systemic corruption & rampant embezzlement and ethical falloff; to name a few. In these testing times, we need to mobilize ourselves, from individual to collective levels, with sincerity, strategy and diligence to raise ourselves from pandemonium to elysium in our respective fields. Let's pray to Allah that He gives us strength to cope with these tryouts and guides us to the straight & right path - the path of those upon whom He bestows His favours. To conclude I would like to quote the Father of Nation, Quaid-e-Azam Muhammad Ali Jinnah, "Do your duty and have faith in God. There is no power on earth that can undo Pakistan." You can always drop your feedback and suggestions regarding this newsletter at epetribune@epesol.com.

TRANSFORMER DGA – INTERPRETATION TECHNIQUES & TECHNOLOGY (PART-2)



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1. INTRODUCTION

In the first part of the article we'd discussed various interpretation techniques of Transformer DGA according to two international standards, viz., IEC 60599 & IEEE C57.104. We'd seen that there are six different methods of interpretation available in the standards, viz., TDCG Method (IEEE), Key Gas Method (IEEE), Doernenburg Ratio Method (IEEE), Rogers Ratio Method (IEEE), Ratio Method (IEC) and Duval Triangle (IEC). In this part we'll discuss the technology & instruments available today to perform the practical DGA. At the extremity of the article DGA instruments from General Electric are presented in tabular form to supplement what is presented in the both parts of it.

2. TECHNOLOGY & INSTRUMENTS FOR DETECTING AND DETERMINING THE AMOUNT OF COMBUSTIBLE GASES PRESENT

2.1. PORTABLE INSTRUMENTS

Many of the gases generated by a possible malfunction in an oil-filled transformer are combustible. The on-site detection and estimation of combustible gases in the transformer in the field using a portable combustible gas meter can be the first and the easiest indication of a possible malfunction, and it may form the basis for further testing or an operating decision. When a more accurate determination of the total amount of combustible gases or a quantitative determination of the individual components is desired, a laboratory analytical method using a gas chromatograph (GC) or mass spectrometer may be used.

2.2. FIXED INSTRUMENTS

The reliability of transformer can be improved by either monitoring the gas space or the gases dissolved in the oil using self-contained, fixed mounted instruments. These continuously monitoring instruments indicate the presence of a certain gas or the total combustible gases as well as sound an alarm when the combustible gases exceed a pre-determined level. Optional recorders can also be used to provide a daily record of the combustible gases present. Communication means and software are also available today for remote monitoring of fleet of transformers at some central control center. If the amount of the individual gas components is desired, a laboratory analytical method using a gas chromatograph or mass spectrometer may be used. There are three somewhat related methods of monitoring the gases and a fourth method based on Photo-Acoustic Spectrography(PAS), as described in the following subsections.

2.2.1. METHOD 1

The first type of gas monitor continually compares the thermal conductivity of the transformer gas with that of pure nitrogen and is suitable for any transformer of the closed type with a gas space above the transformer oil. It is calibrated with hydrogen, although the proportions of the combustibles are not obtained from the instruments. The transformer gas is continually circulated through one section of a Wheatstone bridge and returned to the transformer. The other section of the bridge contains pure nitrogen and is balanced against the transformer gas. When combustible gases are produced in the transformer, they mix with the transformer gas and increase the thermal conductivity of the transformer gas. The increase in the thermal conductivity of the transformer gas unbalances the Wheatstone bridge, the unbalance is proportional to the total of the combustible gases as indicated on a meter.

2.2.2. METHOD 2

The second type of gas monitor continuously samples the transformer gas at fixed intervals and burns any combustible gases present to provide a measure of the total of the combustible gases. This type of monitor is used only on transformers with a positive pressure of nitrogen over the oil. At a fixed interval (usually 24 hours), a sample of the transformer gas is pumped from the unit, mixed with air, and passes over a platinum heating sensor of a Wheatstone bridge. Any combustible gas in the sample is burned. This increases the temperature of the sensor and unbalances the bridge, which was balanced against a second platinum sensor in air. The degree of unbalance is proportional to the amount of TCG present in the transformer gas as indicated on a meter.

2.2.3. METHOD 3

The third type of gas monitor continuously measures the amount of hydrogen and other combustible gases dissolved in the transformer oil. Hydrogen and the other combustible gases of unknown proportions diffusing through a permeable membrane will be oxidized on a platinum gas-permeable electrode; oxygen from the ambient air will be electrochemically reduced on a second electrode. The ionic contact between the two electrodes is provided by a gelled high-concentration sulfuric acid electrolyte. The electric signal generated by this fuel cell is directly proportional to the TCG concentration and is sent to a conditioning electric circuit. The resulting output signal is temperature-compensated. A relay is operated in conjunction with the present gas meter so that when the combustible gases exceed a preset value, the relay sounds an alarm. A the time of installation and each year thereafter, the equipment should be inspected to be sure the monitor is operating properly. The operator should follow the instruction guide of the manufacturer.

2.2.4. METHOD 4

The fourth type of gas monitors employ Photo Acoustic Spectroscopy (PAS). The Photo-acoustic effect is based on the conversion of absorbed light energy into heat by means of radiationless deexcitation processes. On irradiation of a solid or liquid sample by intensity modulated light, a heat wave of the same frequency is generated in the sample. The heat wave is transferred by diffusion to the surface of the sample, where oscillatory thermal effects are generated in the coupled gas. These can be detected as an acoustic signal. This technique is known as gas-coupled photo acoustic spectroscopy. Fig-1 shows basic principle of PAS and Fig-2 shows an example of PAS-based DGA system.



Fig.1 Basic Function of PAS Process

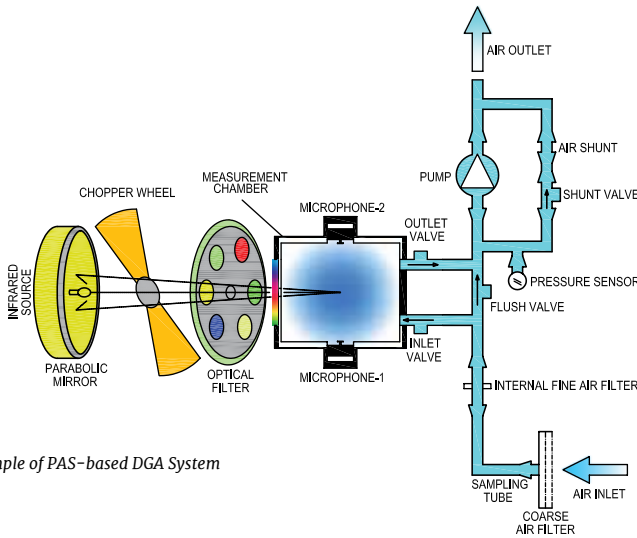


Fig.2 An Example of PAS-based DGA System

2.3 LABORATORY METHODS

2.3.1 GAS CHROMATOGRAPHY

Gas chromatography has been used to analyze gases dissolved in insulating oil during the last 60 years. This technique is introduced by James and Martin in 1952. However, this technique became more popular after IEEE, IEC and ASTM published guidelines on how to measure and analyze gases dissolved in transformer insulating oil. A basic GC, as shown in Fig-3, consists of a carrier gas source, a pressure regulator, a sample injection port and chromatography columns, flow meter, detector, and recorder or recording integrator.

Basic operating principle of GC involves volatilization of the sample in injection port of a gas chromatograph, followed by separation of the components of the mixture in chromatography columns. Argon, helium, nitrogen and hydrogen are normally used as carrier gases to transfer the sample from the injector, via the column, and into a detector or mass spectrometer. However, the nature of the carrier gases used may affect the separation characteristics of the GC system and can vary the sensitivity of the detection.

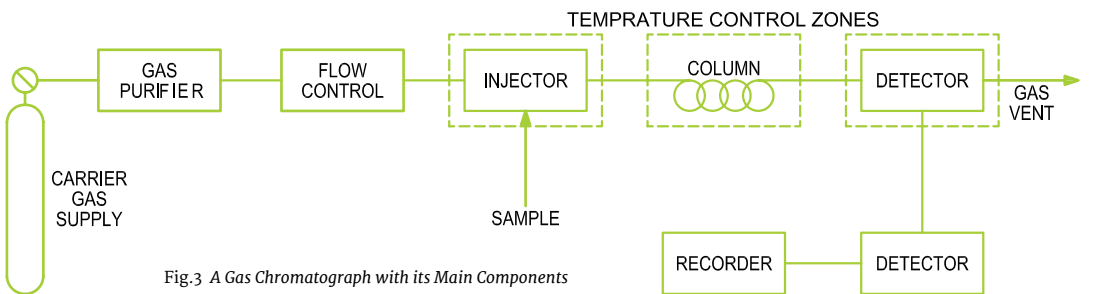


Fig.3 A Gas Chromatograph with its Main Components

Product	Category	Function	Description
Intellix GLA 100	Single Gas Dissolved Gas Analysis (DGA)	Small and Intuitive Transformer “Gas Level Alarm”	Small, intuitive and easy to install fault gas level alarm that provides a low cost warning solution to extend DGA monitoring to the smaller lower end transformers in the fleet.
Hydran 201Ti		Small Compact On-line Early Warning Transmitter	Basic transformer fault gas monitor with an optional separate controller (201Ci) with data communication and alarm capabilities.
Hydran M2		All-in-one On-line Transformer monitoring Device	Compact, real-time fault gas and moisture monitor that provides alarms when pre-set limits are reached and communicates data back. Optional additional sensors and local transformer mathematical models.
Kelman TAPTRANS	Multi-gas Dissolved Gas Analysis (DGA)	8-gas On-line Transformer and OLTC DGA Monitoring Unit	On-line DGA device monitoring all 7 fault gases plus oxygen and moisture. Features load sensor, inputs/outputs, configurable alarms and extensive communications and protocol options.
Kelman TRANSFIX		8-gas On-line Transformer DGA Monitoring Unit	On-line DGA device monitoring all 7 fault gases plus oxygen and moisture. Features load sensor, inputs/outputs, configurable alarms and extensive communications and protocol options.
Kelman MULTITRANS		8-gas On-line Bank of Three Single-phase Transformers DGA Monitoring Unit	On-line DGA monitoring device for 2 or 3 nearby individual transformer tanks. Discrete measurement of 7 fault gases plus oxygen and moisture with load sensor, inputs, outputs, alarms and extensive communication options.
Kelman MINITRANS		On-line Discrete Multi-gas DGA Transformer Monitoring Unit	Cost-effective discrete DGA device monitoring 3 significant fault gases plus moisture. Includes load sensor, outputs, extensive communications and configurable alarms
Intellix BMT 300 with PD	Enhanced Transformer Solutions	Bushing Monitoring & Partial Discharge System	GE’s Intellix BMT 300 is an intelligent, on-line system that continuously monitors not only the condition of transformer bushings but also the presence of Partial Discharge (PD) activity in the main tank. It will alert personnel of fault conditions at an early stage and provide vital health information on the bushings and the transformer.
Intellix MO150		Dynamic, Intelligent Transformer Monitoring System	Intelligent transformer monitoring system designed to collect real-time data obtained from an array of sensors and deliver information based on the results of IEEE/IEC standards transformer mathematical models.
Kelman Transport X		Compact Portable Dissolved Gas Analysis (DGA) System	Compact portable system that performs laboratory quality Dissolved Gas Analysis on manually taken transformer oil samples and renders a diagnostic on-site in 30 minutes.

Table-1: DGA Instruments by General Electric

4. REFERENCES

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EPESOL inaugurates office in Karachi

A long stood customer demand becomes a reality, new miles to set

'Value Addition' is the core of our business, Mr. Akhlaq Ahmad asserts

EPESOL with elation congratulates you on laying down the basis of its Karachi Office on January 13, 2015 in the presence of Engr. Naeem ur Rehman, Mr. Ammad Sharf, Mr. Mubashir Ahmad, Mr. Khawaja Asif Naeem and Mr. Umer Khan. Mr. Akhlaq Ahmad with Mr. Engr. Naeem cut the ribbon. It indeed is a great milestone crossed. After a successful launch of the Field Services Department in KSA, the next goal was to fill the niche in Karachi, said Mr. Mubashar Ahmad, Team Lead. World Wide Field Services. Amid the built up of pressure from southern power industry of Pakistan, EPESOL was focused to launch its second-to-none services, products and solutions to that part of country. CEO, EPESOL (Pvt.) Ltd. Mr. Akhlaq Ahmad in his inaugural address struck a chord and reiterated the nucleus of EPESOL business, 'the value addition'. Pakistan has enormous resources of power potential not less than any other country in the world, what lacks on the part of electrical engineers is the realization of their duties both as an engineer and a Muslim, EPESOL is determined to educate the engineers to the fullest of its own possibilities and resources under the banner of 'value addition' and thus we invite all factions out there to join hands with us in whatever way possible, said Mr. Akhlaq. Speaking on the occasion, Mr. Engr. Naeem ur Rehman congratulated the whole team of EPESOL on their step in Karachi and prayed for the best for EPESOL and Pakistan's Power Industry. In the shades of prayers and party the gathering concluded.



Continuing the custom

EPESOL determined to educate engineers

Held a seminar on modern techniques of substation monitoring and automation in Karachi

EPESOL has started the year 2015 with a seminar on "Substation Monitoring & Automation - An overview". At famed Marriot Hotel Karachi, the seminar was organized. To address the discrepancies and vulnerabilities in the power system, which is being aged and since its incorporation much has changed both in procedures and technology, the seminar was held. Speakers from GE and its partner in Pakistan EPESOL highlighted the key issues and discussed in detail their remedies. Mrs. Deniz Toklu Köse from GE enlightened the participants about the latest trends and technologies in Power System especially M&D of crucial power equipment. She pointed towards the danger of aging transformers in Pakistan and urged the participants

to take the M&D of Transformers and other crucial equipment seriously. Participants moved by her presentation and many turned towards EPESOL representatives for their customized solutions. Syed Amir Raza from GE presented the M&D Industrial Solutions of GE, localized by EPESOL. Transformers are the backbone of power industry and more than 25 years have been past since their commissioning in most parts of Power System, proper M&D will not only enhance their lives but will save from severe damages to the power system, said Mr. Akhlaq Ahmad, CEO EPESOL (Pvt.) Ltd in his presiding address. Participants from K-ELECTRIC, KANNUP, NESPAK, IPPs & other major consultants graced the seminar and was awarded with gifts and certificates in the end.



World best LV Solutions, Now in Pakistan



CEO EPESOL inks LV sales agreement with GE. Moment of pride, Akhlaq Ahmad

It indeed is a moment of pride for Pakistan and for EPESOL as GE has agreed to sign an agreement of sales of LV equipment and components to the power utility market. An EPESOL delegation led by CEO, Mr. Akhlaq Ahmad along with Mr. Khawaja Asif Naeem visited Dubai, United Arab Emirates to fine tune and finalise the details of LV agreement. The visit concluded with the detail discussion on

what is the current power requirements and how EPESOL and GE can work together to address the needs. The changes in the dynamics of power industry are rapid and to gain fruits out of this betterment is to have a sound and practical knowledge of the advancement with true sense of home ground and its needs. EPESOL with its commitment of 'Adding Values' is determined to bring Pakistani power

industry out of dismay and slump. GE LV sales agreement is a fresh breeze of hope in this humidity. This not only will contribute in the economy of Pakistan but will provide public, industry and utility with much needed juice, said Mr. Akhlaq Ahmad on the occasion. We are hopeful that this agreement will change the dynamics of how we were using LV part in our power system, Mr. Akhlaq concluded.



Groundbreakers, First indigenous IFC Panel of Pakistan

EPESOL has an honour of completing its first Interface Panel Cabinet for 220kV Shalamar Grid Station. This was the first panel of its kind

manufactured in Pakistan by any company. The 'Panels' team lead by Engr. Naeem did the wonder backed by 'Design' Team of Engr. Noor Al Huda.

EPESOL Panels, rocking the Power Systems!

- Customized AC/DC Panel with auto changeover facility & sync check facility with grid generator for TBEA.
- CT Box & Generator Protection Panel for Siemens' RYK sugar mills project.



Engineers to Audit and Conserve Energy

Practical steps by engineers is an efficient way out, CEO EPESOL

Seminar on "Energy Audit - Impacts and Prospects" was organized by IEEEP Lahore. Use of energy efficient equipment in industries & home appliances backed by energy conservation measures can help

mitigate prevailing energy crisis, unanimously stated by energy experts. Acting MD NTDC Engr. Abdul Razaq was the Chief Guest. CEO EPESOL (Pvt.) Ltd. Akhlaq Ahmad in his presentation detailed the dynamics of Energy Audit.

Valuable addition in EPESOL Family

Lt. Col. (R) Ammad Sharif has joined EPESOL in Karachi, having an experience of twice a decade in mechanical engineering, he is true gem of his field. Mr. Irfan Qureshi has joined us in Karachi, too, having 4 years of experience in sales & marketing. Team Marketing expands by two engineers, Mr. Ali Raza and Mr. Waqas, this quarter both having an experience of 4 years. Field Services strengthens more with two experienced engineers', Mr. Abbas Anwar and Mr. Umar Khayyam induction.

Sales Team bags emmense successes

Multan's MEPCO this quarter seemed high on Transformer Protection side with 48 relays order of Transformer protection relay 345 by GE. Feeder did not go unnoticed by them as well with 50 relays order of MIF Feeder Protection relay. FESCO also ordered 6 relays for Transformer Protection, 345 by GE. 12 D60s, a line protection relay by GE and a veteran and master of its field, was also ordered by FESCO. Lines and areas under FESCO are safe now from power mishaps, a good news for consumers.



International Field Services Brand Pakistan!

EPESOL around the globe, pinning brand Pakistan with its quality commitment.

- Commissioning of Online DGA Analysers in Saudi Arabia
 - » 27 units of GE Transfix at 380 kV Safaa, Al Fadous, Bisha, Makkah Central, Al Mashaar, BSP and Al Fareeda Substations.
 - » 12 units of GE MiniTrans at 380 kV Al-Ahsa, 110/13.8 kV Rabigh and Al-Fareeda and 132/33kV Thathleeth Substation.
- Commissioning of Generator Protection Panel in Iraq
 - » Comprehensive testing & commissioning, interface verification with DCS and excitation panel, primary testing of the generator then auto synchronization of the generator to the system.
- Testing of GE 469 Motor Protection Relays in Saudi Arabia
 - » Firmware upgrading, setting verification, RTD's configuration & comprehensive functional testing of 11 relays at Jubail plants.
- Commissioning of Transformer Protection Panels in Iraq
 - » Functional testing and commissioning of 5 protection panels, interface wiring verification & energizing of transformers after complete verification of wiring and primary tests of the transformers.



Field Services, Serving at home!

Happiness is to traverse the whole country with top quality

- Generator protection panels at RYK Mills
 - » Testing & commissioning of generator protection panels, interface verification then Auto synchronization with the HV side. It is worth mentioning that these panels are not commonly manufactured in Pakistan and EPESOL has the honour of manufacturing and then successful commissioning of these panels.
- Retrofitting of GE G60 & G30 Relay
 - » Upgraded Design, installation, wiring, configuration, testing and commissioning of new relay as per design & system parameters at Liberty Power Plant, Daherki and Fauji Fertilizer Bin Qasem Respectively.
- Functional Testing of GE G60 Relay at Engro, Dherki
- Commissioning of Online DGA Analyser, Bin Qasim II.
 - » Commissioning of 03 GE Hydran M2. Communication of all units to control room 350 meters afar through Ethernet to fiber conversion.
- Generator protection panels at Korangi
 - » Testing & commissioning, interface verification, primary testing and auto synchronization.
- Testing Project of Orient Power Baloki
 - » Testing of all plant protection relays from Busbar to Synchronization.
 - » IR, Capacitance & Dissipation Factor, Turn ratio and Winding Resistance, Vacuum Bottle Integrity, Contact Resistance and Timing testing of power, auxiliary transformers and breakers.

7 years of International Field Services
Experience starting from 2007