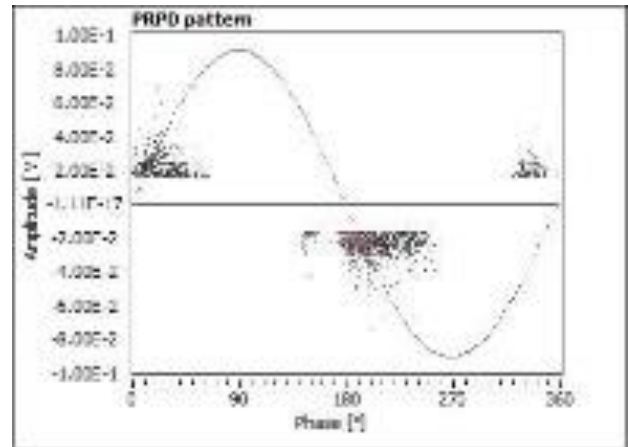


Partial Discharge Assessment (Measurement, Data Analysis & Interpretation)

Learn about how to evaluate the conditions of the medium and high voltage electrical assets by performing Partial Discharge test and analysis. (Cables, Switchgear, Transformer and Rotating Machines)

13th – 16th March 2023 | 09:00 – 17:00 (GMT+8) | Kuala Lumpur, Malaysia



Certified Competency Partial Discharge Assessment (4 Days)

These four days Masterclass will describe from the technical point of view the existing techniques and the assessment procedure for each individual asset (from cables, switchgear, Transformer, and rotating machines), how to evaluate the data and how to decide what to do (based on the asset tested and test result).

In-depth Partial Discharge and measurement techniques

The training will begin with partial discharge phenomena, from the definition, the physical process behind it and the representation used. This will expand into the Internal Pd phenomena using the physical laws which will help participant better understand the shape of the graphs. Participant will have complete understanding of the partial discharge phenomena and why they are triggered within insulation systems.

The instructor will further explain how to do the measurement, type of sensors, position, procedure for the different asset type and type of Pd measurement. Participant will learn how to properly perform the measurement and evaluate the test results.

Data analysis and interpretation: (Cables, Switchgear, Transformer and Rotating Machines)

One of the most difficult tasks is interpreting the PD data and determining the time an insulation system may remain in service before damaging and costly failure can occur. The instructor will show and explain the principles of data analysis for each asset (**such as cables, switchgear, Transformer, and rotating machines**) and type of test (**online and offline**).

Real PD data in form of PDPattern (graph analysed to study the partial discharge phenomena) eg: simplified drawings will be used to explain the data interpretation. Examples of PD maps will be shown to explain how to interpret the result. With this participant will be able to evaluate the condition of the asset tested, thus perform the proper follow up action.

The objective of the training is to improve existing knowledge or provide a different approach in case there are focus on a single PD technology, data acquisition procedure with a step-by-step guidelines and best practices.

Advance your knowledge and learn about:

- Physical knowledge of partial discharge phenomena.
- PD Pattern analysis.
- Partial discharge measurement techniques and measurement limitations.
- Capability of selecting the right PD Acquisition unit based on the type of PD test to be done.
- Capability of selecting the right PD sensor based on the type of asset and acquisition unit.
- PD Data analysis principles for each asset / test.
- How PD Map is built and how to interpret the results / Assessment of the asset based on the PD data analysis results.
- Capability of selecting the right following action based on the assessment results.

I'm using IRIS, omicron and etc, will this certified training be beneficial to me?

This certified competency PD will be presented from a "consultant point of view" not representing any PD brand equipment. It will explain the principles behind the partial discharge measurement and data analysis techniques which are applicable to all the test equipment. The instructor will also further discuss any particular instrument attendees are using by providing some tips and tricks.

Participant will be able to apply the principles and the ways of interpreting the data to any technology (instrument) even if different technology has different software as the principles is still the same. At the end of the training, the attendees will be able to select the right technology based on the asset/test they want to perform. Participant will also be equipped themselves with the practical knowledge on how to perform assessment (Measurement, Data Analysis & Interpretation) using different kind of equipment available in the market.

This program is intended for:

This comprehensive course will be valuable to all levels of engineers and managers dealing with condition assessment of medium and high voltage electrical assets who work in the power industry from generator companies to transmission and distribution system operators. Engineers working in oil and gas industry who are involved in performing PD measurement in Critical MV assets such as Motors, distribution transformers, cables and switchgears will gain from the course.

- Electrical engineers: to learn about partial discharge and gain knowledge.
- Engineers interested on PD data analysis and interpretation.
- Asset managers: to evaluate the condition of their assets.
- Project engineer/ manager involved in new project who want to have a clear idea of what is needed and how to evaluate the different solutions available in the market.
- Maintenance engineers/technicians: to perform condition assessment test and/or re-commissioning after repair.
- Engineering and maintenance personnel who are involved in condition assessments of electrical assets.
- Company who employed 3rd party to perform partial discharge testing: will learn what information to look for in order to do the correct analysis based on the asset/test performed. This will help to evaluate the test reports provided by third party contractors and in selecting the right test follow up action.
- Any industries/engineers involved with: Cables (MV: 6kV – 35kV / High and Extra HV: 66kV – 500kV), Switchgear (AIS 6kV – 35kV / GIS: 35kV – 500kV), Transformers (MV: 6kV – 35kV/ HV and EHV: 66kV – 500kV), Motors (6.6kV – 11kV / 17.5kV) and Generators (6.6 – 30kV).

Certified Competency Partial Discharge Assessment (4 Days)

DAY 1

In-depth Partial discharge & Measurement

Definition of Partial discharge

- Standard definition
- Graphical representation

Partial discharge classification

- Type of partial discharge phenomena

Partial discharge process

- Physical explanation for inception of partial discharge in internal voids
- Partial discharge process explanation
- Representation of the ideal process under AC voltage

Partial discharge phenomenon representation

- Phase Resolved PD Pattern

Partial discharge first identification based on Phase Resolved PD Pattern

- PD Pattern analysis for the basic types of partial Discharge

Partial discharge apparent charge measurement

- PD apparent charge
- PD measurement principle and limitation
- PD measurement limitations mitigation
- Type of PD detectors
- PD measurement applications
 - Factory tests
 - Field tests

Partial discharge detection principles

- Type of measurement circuits

Type of PD sensors

- Conductive sensors
- Inductive sensors
- Antenna sensors
- Acoustic sensors

Delivered values and limitations

Practical Sessions:

- Review of different PD detectors and PD sensors
- Practical detection of PD signals using the different instruments

DAY 2

Partial discharge assessment on Cables & Switchgears Cables

Cable systems

- Signal propagation principle
- Measurement limitations

Online PD measurement

- Test setup
- Types of PD sensors used
- Generic test procedure

DAY 2

PD data interpretation principle

What to do if PD is detected

- PD Data analysis
- Cable assessment flow chart based on Online PD
- measurement result

Case Study: 33kV cable system – PD in a transition joint

Exercise on data analysis

Offline PD measurement

- Test setup
- Types of High voltage generator used
- Types of PD sensors used
- Generic test procedure for VLF PD test

PD data interpretation principle for VLF PD test

What to do if PD is detected

- PD Data analysis
- Cable assessment flow chart based on Offline PD measurement result

Case Study: 11kV cable system assessment / Exercise on data analysis

Comparison Online vs Offline

Air / Gas Insulated switchgear system

Online PD measurement

- Test setup
- Types of PD sensors used
- Generic test procedure

PD data interpretation principle

What to do if PD is detected

- PD Data analysis
- Switchgear assessment flow chart based on Online PD measurement result

Case Study: 33kV Switchgear – PD on cable box

Exercise on data analysis

Offline PD measurement

- Test setup
- Type of High voltage generator used
- Types of PD sensors used
- Generic test procedure

PD data interpretation principle

What to do if PD is detected

- PD Data analysis
- Switchgear assessment flow chart based on Offline PD measurement result
- Case Study: 33kV Switchgear – PD on components surfaces / Exercise on data analysis

Comparison Online vs Offline

Practical Sessions:

- Practical test setup and data collection on dummy cable and switchgear system
- Data analysis example

Certified Competency Partial Discharge Assessment (4 Days)

DAY 3

Partial discharge assessment on Oil Filled & Dry Type Transformers

Oil Filled Transformers & Dry Type Transformers:

- Signal detection principles
- Measurement limitations

Online PD measurement

- Test setup
- Types of PD sensors used
- Generic test procedure

PD data interpretation principle

What to do if PD is detected

- PD Data interpretation
- Transformer assessment flow chart based on Online PD measurement result

Case Study: 11/0.4kV Oil Filled transformer – PD in the tank

Offline PD measurement

- Test setup
- Types of High voltage generator used
- Types of PD sensors used
- Generic test procedure
- PD measurement outcomes and information required for a correct analysis

PD data interpretation principle

What to do if PD is detected

- PD Data interpretation
- Transformer assessment flow chart based on Offline PD measurement result

Case Study: 25/0.75kV Oil Filled transformer – PD in the tank
Exercise on data interpretation

Comparison Online vs Offline

Practical Session:

- Practical test setup and data collection on dummy Transformer
- Data analysis example

DAY 4

Partial discharge assessment on Rotating machines:

Main assets characteristics and classification

- Insulation system characteristics
- Rotating machines classification

Partial discharge phenomena in High voltage rotating machines:

- Type of PD Phenomena
- Signal detection principles
- Measurement limitations

Online PD measurement

- Test setup for detecting the PD phenomena in the different Rotating Machines
- Types of PD sensors used
- Generic test procedure
- PD measurement outcomes and information required for a correct analysis

PD data interpretation principle

- PD signal identification
- PD signal amplitude comparison
- PD signal trend analysis

What to do if PD is detected

- Hydro Generator assessment flow chart based on Online PD measurement result
- Air cooled Generator assessment flow chart based on Online PD measurement result
- Hydrogen cooled Generator assessment flow chart based on Online PD measurement result
- Motor assessment flow chart based on Online PD measurement result

Case Study: 11kV Motor – PD in the motor leads

Offline PD measurement

- High Frequency PD measurement
- Low Frequency PD measurement
- Test setup for detecting the PD phenomena in the different Rotating Machines
- Types of High voltage generator used
- Types of PD sensors used
- Generic test procedure
- PD measurement outcomes and information required for a correct analysis

PD data interpretation principle

- PD signal identification
- PD signal amplitude trend

Case Study: 11kV Motor – PD in the cable box and winding
Exercise on data interpretation

Comparison Online vs Offline

Practical Sessions:

- Practical test setup and data collection on dummy rotating system
- Data analysis example

Certified Competency Partial Discharge Assessment (4 Days)

Practical Demonstration:

The instructor will also demonstrate on how to setup the test and how to pre-locate the PD signals to further enhance participant experience in performing partial discharge. Participant will get the opportunity to experience themselves on the practical demonstrations before the assessment.

The demonstration will consist of :

- Detection of PD Pulse
- Cable system:
 - Online PD measurement setups
 - Signal pre-localization
- Switchgear system:
 - Online PD measurement setups
 - Signal pre-localization
- Transformers – for transformer connected to cable system:
 - Online PD measurement setups
- Rotating Machine:
 - Online PD measurement setups

ASSESSMENT & CERTIFIED COMPETENCY CERTIFICATE

Having the ability to be competent in conducting Partial Discharge once you are back at your workplace is crucial for every participant.

This 4 days Certified Competency Partial Discharge assessment course comprises Four days of classroom tuition and practical demonstration guidance, for understanding and mastering the application, principles and requirements of Partial Discharge assessment. There is a competency assessment at the end of the training based on the asset you are participating. Practical exercises are performed throughout the course based on real life examples.

The assessment on the end of the training will be in two parts with:

Mixture of 10 multiple choice and open questions (1 mark each question)

3 Practical Assessment Task (5 available marks per Task)

5 different levels of competency certificate are provided according to the "Exam result" and training session followed.

Successful participant will be certified as competent in the following:

- PD measurement principles
- Detection techniques
- PD Pre-localization (cables and switchgear)
- PD assessment strategies on "Asset"



Energy1 Asia is a sub-division of PETRO1 focus on provide trainings & technical Consultancy services. We help decision makers apply high level technical expertise to their daily task and strategic issues across a host of industries and disciplines including energy, manufacturing, maritime, defense, Aviation, Water treatment and chemicals. With this, we had successfully made impact to Energy professional mainly the Top 50 Energy players in the Asia Pacific Region

- | | | |
|---|---|------------------------------|
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| ▪ Tenaga nasional berhad. | ▪ Perbadanan bekalan air pulau pinang | • MTR Corporation Limited |
| ▪ San Fernando Electric Light & Power | ▪ Aliran ihsan resources berhad | • Dominant OPTO Technologies |
| ▪ Sarawak Energy | ▪ Visayan Electrical company | • Finisar Malaysia |
| ▪ SP Powergrid Ltd. | ▪ Glow Company | • Sanmina System |
| ▪ Power Seraya | ▪ Suruhanjaya Tenaga | • Bose System |
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| ▪ Companhia de Electricidade de Macau | ▪ Meralco | • CLP Power HK |
| | ▪ Provincial Electricity Authority Thailand | • ExxonMobil |
| | ▪ PTT Global Chemical | |

Registration Form

Certified Competency Partial Discharge Assessment (4 Days)

Attend full 4 days or choice of Electrical Assets (From Cables, Switchgear, Transformers, Rotating Machines)

In-depth PD and measurement techniques / PD assessment on Cables and switchgear (2 Days)	PD assessment on Transformers (Oil / Dry) (1 Day)	PD assessment on Rotating Electrical Machines (1 Day)	PROGRAM DETAILS Kuala Lumpur, Malaysia Date: 13 th – 16 th March 2023 Time: 09:00 – 17:00 (GMT+8)
SGD 1899 ()	SGD 1199 ()	SGD 1199 ()	STEPS TO REGISTER: Simply fill up the registration form and email it to: Email to : registration@energy1asia.com Call us : +603 7727 3952 Mobile /Whatsapp: +6012 568 4696 (Harn)
Full 4 days (**Recommended)		SGD 3999 ()	
<ul style="list-style-type: none">The above investment price is for Per Delegate.This course is limited to 15 attendees to ensure that the course can remain interactive.The above investment fee is inclusive of venue, course material, tea breaks and lunch.The above investment fee excludes SST 6%.			
If you or your company is facing travel restrictions, we may be able to arrange the training at your preferred location for remote participation or conduct the training in-house with minimum 10 pax. Please contact intraining@petro1.com.my to discuss this possibility.			

Delegates Details

1. Name: _____ Mr Mrs Ms Dr

Job Title: _____

Email : _____

Contact No: _____

Department: _____

2. Name: _____ Mr Mrs Ms Dr

Job Title: _____

Email : _____

Contact No: _____

Department: _____

3. Name: _____ Mr Mrs Ms Dr

Job Title: _____

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Contact No: _____

Department: _____

Head of Department: _____

Invoice Details

Invoice Attention to: _____

Company: _____

Industry: _____

Address: _____

Postcode: _____ Country: _____

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Authorized Signature : _____

Payment Method

By Direct Transfer: Please quote invoice numbers on remittance advice.

ACCOUNT NAME : PETRO1 SDN BHD

BANK : United Overseas Bank (Malaysia) BHD

ACCOUNT NO : 2609008514 (USD)

All bank charges to be borne by payers. Please ensure that PETRO1 SDN BHD received the full invoice amount.

CREDIT CARD PAYMENT

Credit card payment will include a charge 3.1%.

Payment Policy: Upon receipt of a completed registration form, it confirms that the organization is registering for the seat(s) of the participant(s) to attend the conference or training workshop. Payment is required with registration and must be received prior to the event to guarantee the seat. Payment has to be received 7 working days prior to the event date to confirm registration.

DATA PROTECTION

The information you provide will be safeguarded by Petro1 that may be used to keep you informed of relevant products and services. We take it seriously when it comes to protection of our client data.

Sales and service Tax (SST):

The above investment fee is excluding of SST 6%. The SST charges of 6% will be include during issuance of the invoices.

Cancellation & Substitutions:

Should you be unable to attend, substitutes are always welcome anytime at no additional cost. Please inform us as early as possible. Payment is non-refundable if cancellation occurs 7 working days prior to event commencement. However, delegates will receive a 100% credit on the amount paid which can be used in another PETRO1 SDN BHD training course for up to one year from the date of issuance. The credit is transferable to other persons in the same company and applicable against any future PETRO1 SDN BHD public course/ Online Live Webinar. If cancellation occurs 7 working days prior to the registration date and there is no substitute, the organizer reserves the right to charge 50% of the total investment from your organization.

In the event that, PETRO1 SDN BHD, postpones or cancels a course, delegate payments at the date of cancellation or postponement will be credited to a future PETRO1 SDN BHD course. This credit will be available for up to one year from the date of issuance, and it is transferable to other persons in the same company and applicable against any future PETRO1 SDN BHD public course.

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Program Change policy:

The organizer reserves the right to make any amendments and/or changes to the webinar, Date/ time, facilitator replacements and/or modules if warranted by circumstances beyond its control.

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