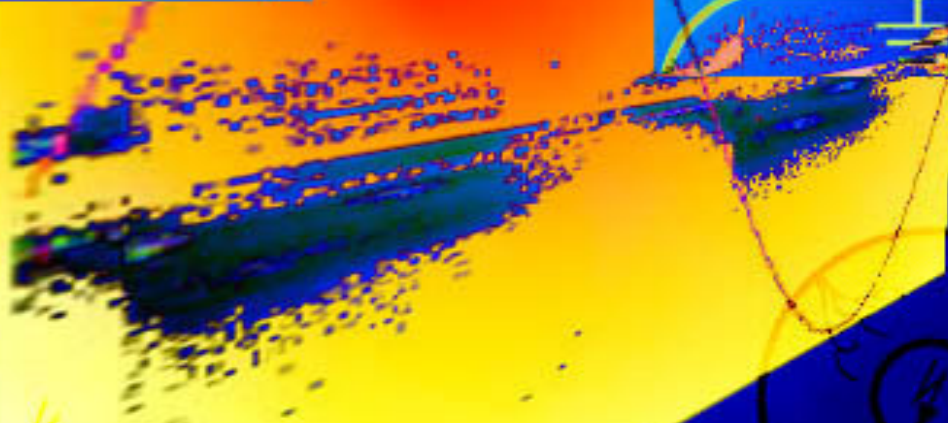
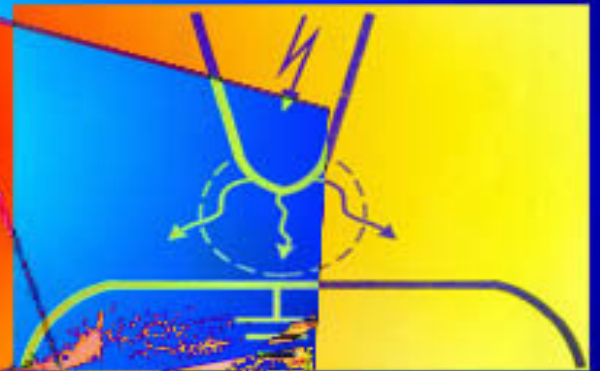
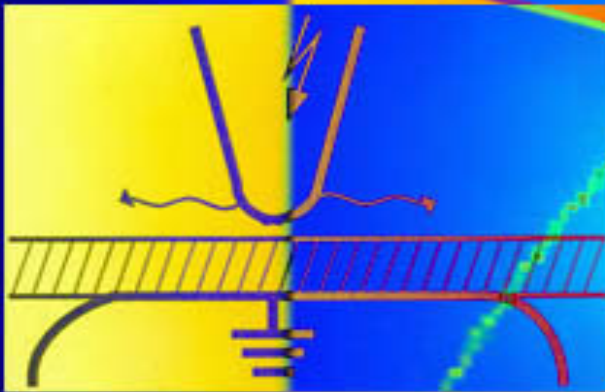


ASD

Automation Systems and Diagnostics

Integrated Systems Design and Development



PD²

Partial Discharge Diagnostic System

Wear, tear, and the aging process are among the main factors affecting the service life of equipment for transmitting and distributing electrical power. Most utilities today are running maintenance schemes based on cable age, surface discharges and other possible factors that lead to faults causing high voltage short circuits, which, in turn, cause blackouts for the customer. Early detection of these weak points will lead to a more effective maintenance plan and less possibility of system failure.

Obtaining reliable information helps making the correct choice between the alternatives of maintenance, retrofit, or purchasing new installation. The advantages for the utilities include planned maintenance activities that are dependant on the condition of the equipment, the well-targeted use of funds for the purchase of new equipment, and the identification of existing operating risks.

When a high voltage is applied to an insulation material, partial discharges (PD) can occur in the voids in that material. The magnitude of such discharges indicates the level of ageing of the material. Few and weak discharges normally indicate a healthy material, many and strong discharges indicate an aged insulation. Possible PD sources include:

- Turn-to-turn faults in power transformers
- High voltage underground cable
- Electrodes at floating potential
- Voids in insulation material
- Free particles in gas-insulated switchgear
- Surface discharge
- Contamination of foreign particles in the insulation system

Automation Systems and Diagnostics, Inc developed Partial Discharge Diagnostic system (PD²), a complete, self-contained, multiple-channel phase system that will replace the old selection switch PD technology. PD² system can simultaneously measure and analyze up to seven different channels. Both measurement and analysis parts offer full diagnosis regarding partial discharges in your transformer and cables. In addition, the system offers users full control through a well organized configuration menu.



SYSTEM'S ARCHITECTURE & FUNCTION

When a transformer is intended for test, it is connected at its both sides. The low voltage side is connected to the power supply through step up transformer and reactors. The high voltage side is connected to the PC via calibration coupler, impedances boxes and signal conditioner filter. Before applying power to the TUT, users should operate the software, define some configurable parameters and define the TUT ID number and specifications. Users then access the measurement panel from software and start PD Calibration. The calibration coupler should be connected to each of the three TUT bushings respectively while each phase is PD calibrated.

Via software, the user can check noise and linearity. The user should disconnect the Calibration Coupler from TUT HV side and make AC Calibration from software. The Power Supply is activated by software, when the user ramps up the AC power to the desired percentage of the rated voltage. During this, supply current is monitored from the power supply controller. Also, the user should monitor the reactors' currents displayed by three meters in the system consol. If the supplied current appears to be higher than proposed, the reactors are tuned from consol to produce minimum current. AC multiplier is calculated by software. Testing procedure is started from software after calibration; the software will read the AC voltage and Partial Discharge values. Readings during calibration or testing are taken from the HV side through the Impedance Box and Signal Conditioner Filter to the PC via Data Acquisition Card.

SYSTEM'S MAIN HARDWARE

- Krohn-Hite Filter

It is a programmable multi channel filter system. Three Butterworth configured filter cards are used forming three channels. The high pass frequency, low pass frequency and filter amplifier gain can be programmed as desired. After filtering, the signal enters a peak detector of a discharge time of 500 ms inside the Krohn-Hite.



- Pacific Power Supply and Controller

It's an MS-series three phase switching power supply with selectable frequencies of 50, 60 or 400 Hz and a variable oscillator range of 47 to 500 Hz. It ensures flexible and reliable AC power ranging from 62.5 to 625 kVA for each 3060MS.

Pacific Controller reads the power supply status throughout operation and generates signals that control frequency and voltage. Output Voltage, Current, Active Power, Reactive Power, etc are displayed; in addition to many other available features.



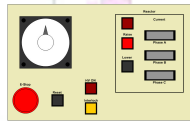
- Impedance Box

Three ASD designed impedance boxes are utilized in the system. Each box is connected to one of the channels (filter card) at one end, while connected to the required transformer bushing (phase) at the other. The impedance box contains circuitry to separate the PD and AC signals, as well as an amplification stage.



- Control Panel

ASD designed control panel, fixed to the consul, includes visual indicators and push buttons to help control and monitor system's functions. A power factor meter displays the output power factor of power supply. An emergency button is pressed in case of overheating or unexpected behavior. High voltage ON and interlock indicators are available in addition to a reset button to be pressed when interlock is fixed. Reactors are fully controlled through monitoring the current displays at each phase and using the raise / lower buttons to increase or decrease the reactance's inductance.



SAFETY FEATURES

- Overload relay which turns off the output contactor of the Power Supply in case of over current.
- Emergency Stop button to turn off the output contactor of the Power Supply in case of abnormality.
- If the Interlock switch is opened when emergency button is pressed or door is opened, the Interlock Indicator is on and the output contactor of the Power Supply is turned off. The software detects the opened interlock and resets the Power Supply.

- Output push button on Pacific Controller then Reset button in Control Panel should be pushed when interlock is fixed.

SYSTEM'S SOFTWARE

ASD's PD2 software puts your system in a powerful automated mode for your convenience and optimal PD measurement accuracy; in addition to monitoring multiple channels at real-time and showing these results visually with on-screen plot. An attractive, user-friendly interface combines many options that give the system additional power and versatility. These features include:

- Editing user-configurable system settings related to software control algorithms, file paths, installed hardware, and other options
- Defining transformer name plate data
- Performing PD background noise and linearity tests
- Performing PD and AC calibration
- Performing filter gain calibration
- Performing PD measurements
- Showing real-time graphical and numerical displays of your AC voltage and all Pico-Coulomb channels
- Transformer call-back allows any transformer data on record to be reused to save time on data entry and calibration
- Storing your results in Microsoft Access™ database format, including calibration data, test data, transformer data, matrix data and AC calibration data.
- Contains an additional database package that allows you to view and search your data without the need to use any external software
- Allows displaying and printing organized test reports including your company name, contact information, transformer data, test results, and more

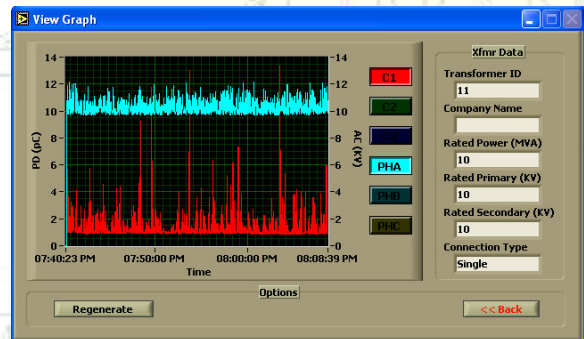
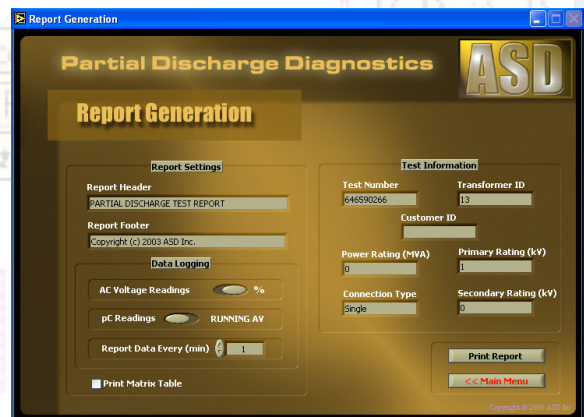
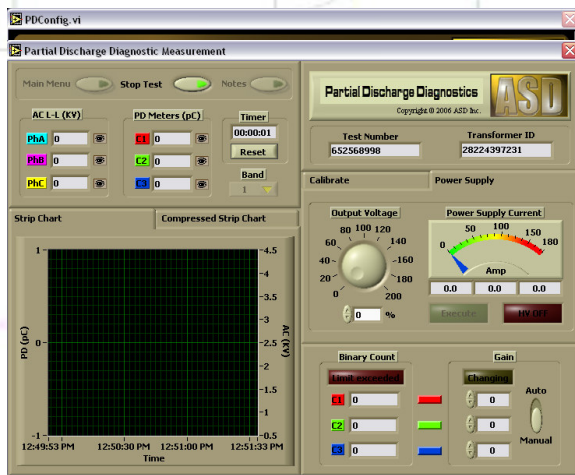
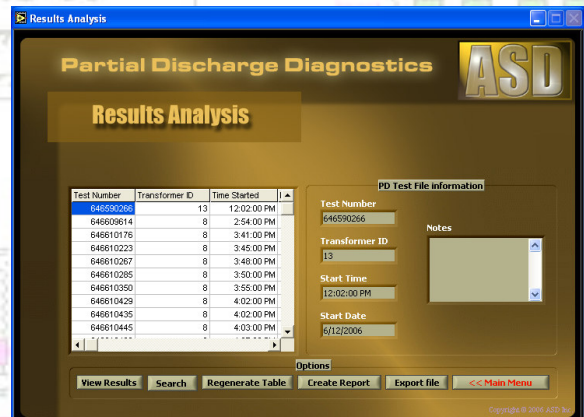
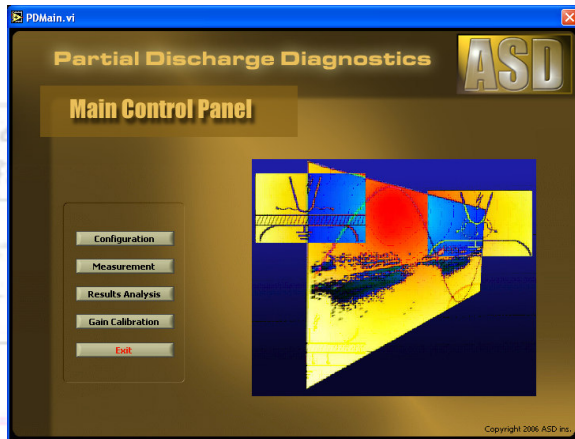
There are several other options such as user configurable fields for customization of your PD tests, hardware and software specifications, logging rates, etc.

Below are some of the software displays that will give clearer idea of the software functions.

Partial Discharge Diagnostic System



Web: www.ASDpower.com



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