# PQMS – Power Quality Monitoring System: Improve Power Systems Through IEDs

Sajesh V.V , Engineer-II, Protection

Schweitzer Engineering Laboratories Pvt. Ltd.

### What is Power Quality ?

 Changes in electric power supply that may cause equipment to fail, misoperate, or degrade.







#### Noisy transformers

Overheating

Blown fuses

### Introduction-PQMS

- Due to increase in Electrical Loads
- More serious the disturbance, Greater the interest
- Different kinds of Disturbances

### Power Quality Monitoring System

#### Digital Multimeters

#### IEDs distributed throughout the system

- Meters
- Relays
- Communication processors
- Ethernet Network
- Software
- Visualization and recording
- Centralizes and structures the information from various parts of system.

### Typical PQMS System



# **Digital Multimeters**

- True RMS Measurements- Upto 50<sup>th</sup> Harmonics
- Inclusion of New measurement quantities
  - Harmonic distortion
  - Power Distortion
  - K-factor
  - Peak factor/ Crest factor
  - Voltage Unbalance
  - Voltage Sag Swell and Interruption
- Installation for relatively long periods

# Requirements of PQMS

- RMS Operational and Demand metering
  - High accuracy metering
- Revenue Metering
  - o.2 accuracy
- Power Quality
  - IEC 61000-4-30
- Control Functions
  - For triggering or controlling Capacitor Banks, Transformers. Harmonic filters etc.

#### Disturbance Monitoring

• Voltage Sag Swell and Interruption



## **Disturbance Monitoring**



Determine the origin of faults

# Capabilities of PQMS

- Identify disturbances
- Determining the cause of problem
- Distinguish a Power outage and a Voltage Sag
- Provide Data for Equipment specification
- Verify protection settings
- Determine the use of Power conditioning Equipments.

#### Typical PQMS Software

- Electrical Quantities
- Alarms
- Event records\
- Waveform Visualization
- Access to all IEDs
- Sharing data with other systems

BUSBAR - 15	5 kV								NOM	ENAL V	OLTAGE	13.8kt
I. SHORT DURATION EVENTS		2. LONG DURATION EVENTS			3. STEADY-STATE							
INTERRUPTIONS		SUSTAINED INTERRUPTION			HARMONIC DISTORTION							
3 PHASE 0	HISTORIC	3 PHASE	0	POSSIBLE CAUSES	A	O,O	00	10 10.142 0.00			6.00 0.00 0.00	II 0.00 0.00
A PHASE 0	INTA	A PHASE	0	* EQUIPMENT	- 6	0	00	0.00				
B PHASE 0	INTE	<b>B PHASE</b>	0	FAILURE	N	D	00		3F 0.	00		
C PHASE 0	INTC	C PHASE	0	* POOR PROTECTION	IN UNBALANCE							
VOLTAGE SAGS		UNDERVOLTAGE				V	1V\3	92/11	N	310	1.0	115
3 PHASE 0	HISTORIC	3 PHASE	0	POSSIBLE CAUSES		0	.00	0.00	0.00	0.00	V2/A	1 = 2.0%
A PHASE 0	SAGA	A PHASE	0	* OVERLOAD	Pst			Plt	LIMITS (pu)			
B PHASE 0	SACE	<b>B PHASE</b>	0	= INCORRECT TAP	0.00		00	0.00	I< Pst	<2 0	0,8 < Ple	< 1,6
C PHASE 0	SAGC	C PHASE	0	# POOR VOLTAGE	4. INSTANTANEOUS VALUES							
VOLTAGE SWELL		OVERVOLTAGES			4	CURRENT	410	E VOLT	ACZ AN	at 9	F MMA	MW D.OC
3 PHASE 0	HISTORIC SW3P	3 PHASE	0	POSSIBLE CAUSES	c	0.00	0.0	0 13.	11 00	00 00	98 0.00	0.00
A PHASE 0	SWA	A PHASE	0	CAPACITORS INCORRECT TAP TURN OFF BIG LOADS	N	0.00	0.0	0	31	0.9	98 0.00	0.00
B PHASE 0	SWB	B PHASE	0		Seq0	0.00	0.0	0 13.	11 00	30		
C PHASE 0	SWC	C PHASE	0	a canada a canada a	seq2	0.00	0.0	0 13.	11 0.0	00		

# Conclusion

- Innumerable Benefits Better Power Quality
- Reduced Losses and Interruptions
- Specific Monitoring for customers
- Improved monitoring of factors that has Negative Impact on system
- Detect Disturbances
- Optimization of Distribution Equipment

# ThankYou !!