DIGITAL DEVICE FOR ONLINE HEALTH MONITORING OF ARRESTERS AND TRANSIENTS MONITORING ON NETWORK

Sohan Kumar Dasale, Ganesh Baviskar, Nitin Jha, D John Yesuraj
Crompton Greaves Limited, Nasik

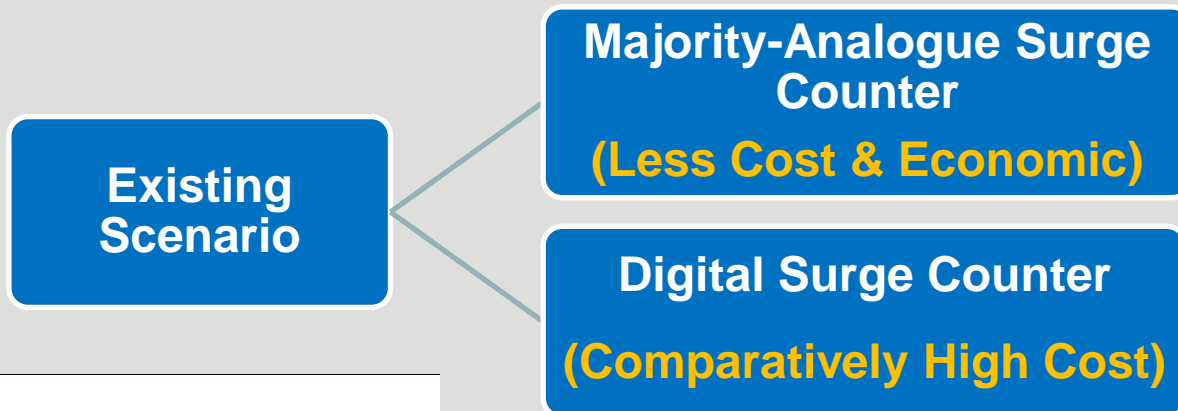**Name of Presenter : Nitin Jha**
Date of Presentation: 29.04.2016

Smart solutions.
Strong relationships.

SURGEPROTECH

ieema
your link to electricity

Content:

SURGEPROTECH

ieema
your link to electricity

Introduction:

• Surge Arresters are the first line of protection in power network against high voltage vagaries in the system

• Surge Arrester failure can lead to :

  ➢ Exposure of over voltage to other equipments

  ➢ Failure of equipment

• Hence, **keeping an eye on the arrester itself is prudent and necessary**

• In existing Scenario, surge counters are simple in nature & they indicate only the leakage current and the number of times it has operated.

Existing Scenario

Majority-Analogue Surge Counter

(Less Cost & Economic)

Digital Surge Counter

(Comparatively High Cost)

SURGEPROTECH

ieema
your link to electricity

Analogue Surge Counter:

• Cost Effective and simple

• Measures total leakage current

• Measures total number of surge counts

• Not designed to capture any other information like surge magnitude, time stamps, communication.

Drawback:

Generate additional low residual voltage in the protective circuit formed by arrester and surge counter, leading to increased voltage seen by the protected object at every surge.

SURGEPROTECH

ieema
your link to electricity

Need of Digital Surge Counter:

- Real time monitoring of surge arrester's health

- Real time monitoring of system transient

- Interfacing of surge arresters with substation automation system

- Safety:

    -   As no series impedance or gaps is used, No risk of internal arcing and explosion due to passage of short circuit current

Sr. No	Particular	Analogue Surge Counter	Digital Surge Counter
1	Total Leakage Current Measurement	√	√
2	Total Surge Counts	√	√
3	Magnitude of Surge Counts	X	√
4	Date and time of occurrence	X	√
5	Remote & Real time monitoring	X	√
5	Series impedance or Gap	√	X

SURGEPROTECH

Indigenously Developed Digital Surge Counter (DSC-15-1):

We have developed a digital solution which monitors:

- Total leakage current

- Transients on the network by measuring surge counts

- Magnitude of surge counts

- Total Surge Counts

- Date and time of occurrence

- Provides real-time surge and total leakage current information to control room
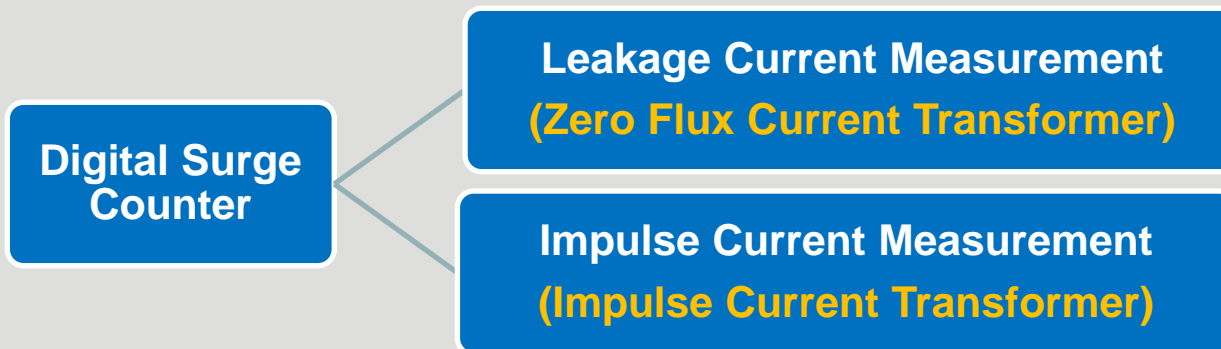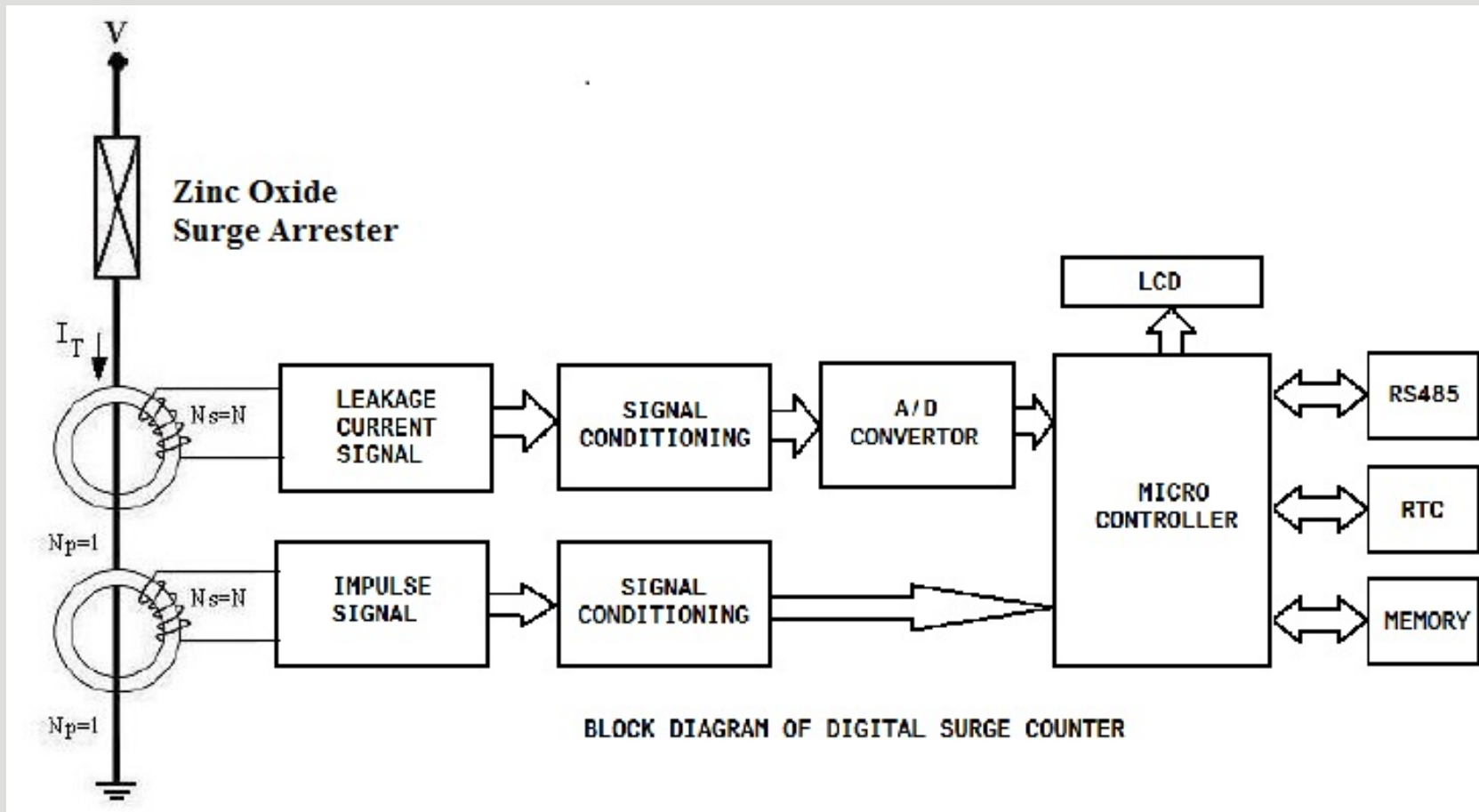
through MODBUS protocol on RS485

SURGEPROTECH

ieema
your link to electricity

Content:

- Introduction

- **Measurement Principle**

- Salient Features

- Experimental Results

- Conclusion

SURGEPROTECH

ieema
your link to electricity

Measurement Principle:

• Digital Surge Counter (Primary terminal) is connected between the arrester's bottom terminal and the ground at eye level on to the structure.

• The current flowing through the primary conductor of the surge counter is sensed by inductively coupled sensors i.e. Current Transformers.

• For accurate measurement of leakage current, Zero flux CT was used.

•The sampled signal from these current transformers, was given to signal conditioning circuit and is digitized by analogue to digital converter.

• Processing of digital signal and extraction of necessary intelligence is done at micro controller and result is displayed on LCD screen.

Digital Surge Counter	Leakage Current Measurement (Zero Flux Current Transformer)
	Impulse Current Measurement (Impulse Current Transformer)

SURGEPROTECH

ieema
your link to electricity

Block Diagram:

BLOCK DIAGRAM OF DIGITAL SURGE COUNTER

Content:

- Introduction

- Measurement Principle

- **Salient Features**

- Experimental Results

- Conclusion

SURGEPROTECH

ieema
your link to electricity

Salient Features:

Sr. No	Particulars		Values
1	Total Leakage Current Measurement	Measuring Range of total Leakage Current	0.5mA to 15 mA
		Error in total leakage current measurement	< 5%
		Frequency	50 or 60 Hz
2	Surge Counting / Registration	Amplitude classification of 8/20μsec wave	Below 100 A
			100 A ~ 999 A
			1000 A ~ 4999 A
			5000 A ~ 9999 A
			Above 10000 A
		Minimum counting threshold (8/20μsec wave)	50 A
		Error in impulse current amplitude measurement	< 20%
		Time stamp, resolution	Yes, < 0.5 s
		Memory Capacity	1000 registration (FIFO Type)
3	Communication	Protocol	MODBUS on RS485
		Range	500 m
4		Power Supply	230 ±10% V AC / 110~230 V DC

SURGEPROTECH

ieema
your link to electricity

Content:

- Introduction

- Measurement Principle

- **Experimental Results**

- Remote Monitoring

- Conclusion

SURGEPROTECH

ieema
your link to electricity

Experimental Results:

The Performance of Developed Digital Surge counter has been verified extensively for:
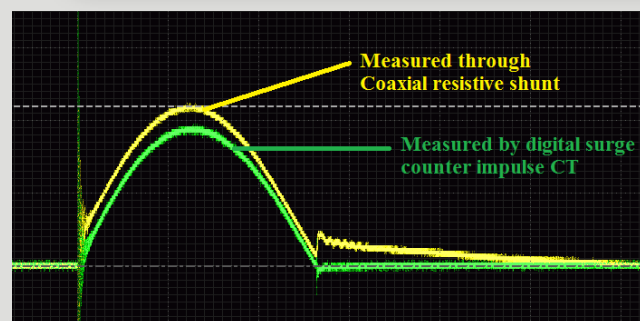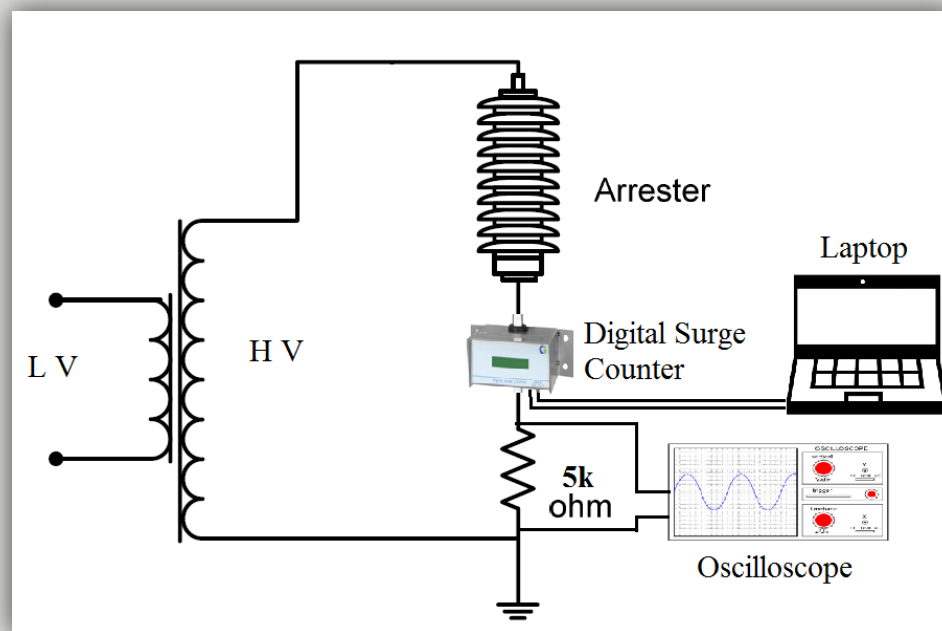
- Total leakage current measurement

- Impulse current measurement
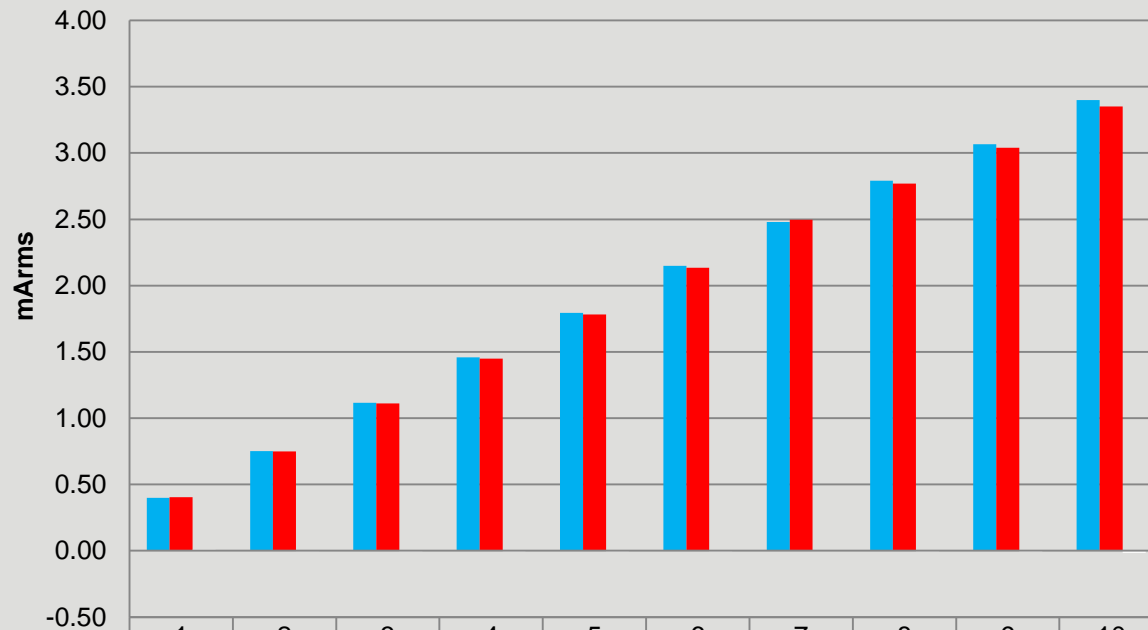
Total leakage current measurement:

For validation of total leakage current digital surge counter was connected in series with a 156 kV LA unit at out test facility.

Impulse current measurement:

For validation of impulse current performance, digital surge counter was tested on ZnO block test setup.


Measured through Coaxial resistive shunt

Measured by digital surge counter impulse CT

Power Frequency Total Leakage Current Trend:

	1	2	3	4	5	6	7	8	9	10
■ Total leakage current through Shunt resistor	0.40	0.75	1.12	1.46	1.79	2.15	2.48	2.79	3.07	3.40
■ Total Leakage current measured by Digital surge counter	0.40	0.75	1.11	1.45	1.78	2.14	2.50	2.77	3.04	3.35
□ Error	0.8%	-0.3%	-0.5%	-0.6%	-0.7%	-0.7%	0.6%	-0.7%	-0.8%	-1.5%

SURGEPROTECH

ieema
your link to electricity

Impulse current 8/20µsec Trend:
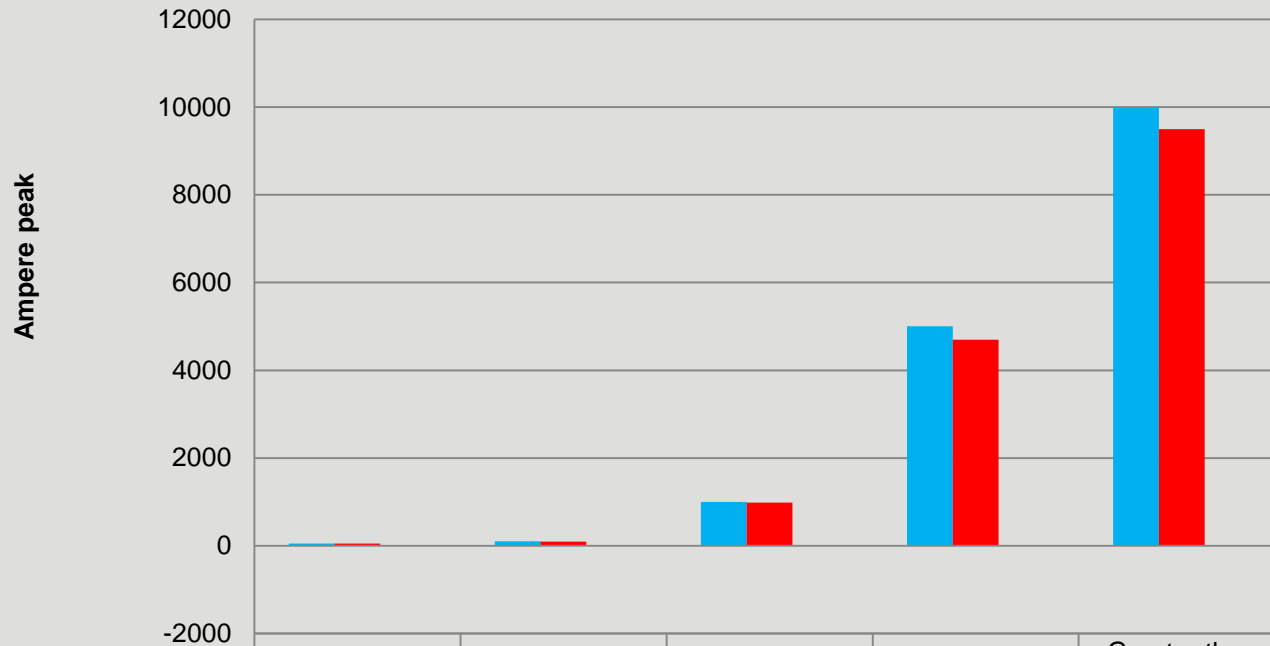
	Below 100 A	100~999 A	1000~4999 A	5000~9999 A	Greater than 10000 A
■ Actual Current measured by Coaxial Shunt	50	100	1000	5000	10000
■ Measured current by Digital Surge Counter	46	95	980	4700	9500
□ Error	-8.00%	-5.00%	-2.00%	-6.00%	-5.00%

Monitoring from Remote end:

Measurement		
Slave Address	:	1
Device Sr No.	:	CGL0216019
LA Sr No.	:	0000000000
Description	:	DSC-15-1
Leakage Current	:	1.38 mA
Below 100A	:	0
100A - 999A	:	1
1000A - 4999A	:	5
5000A - 10000A	:	2
>=10000A	:	7
TOTAL COUNTER	:	15
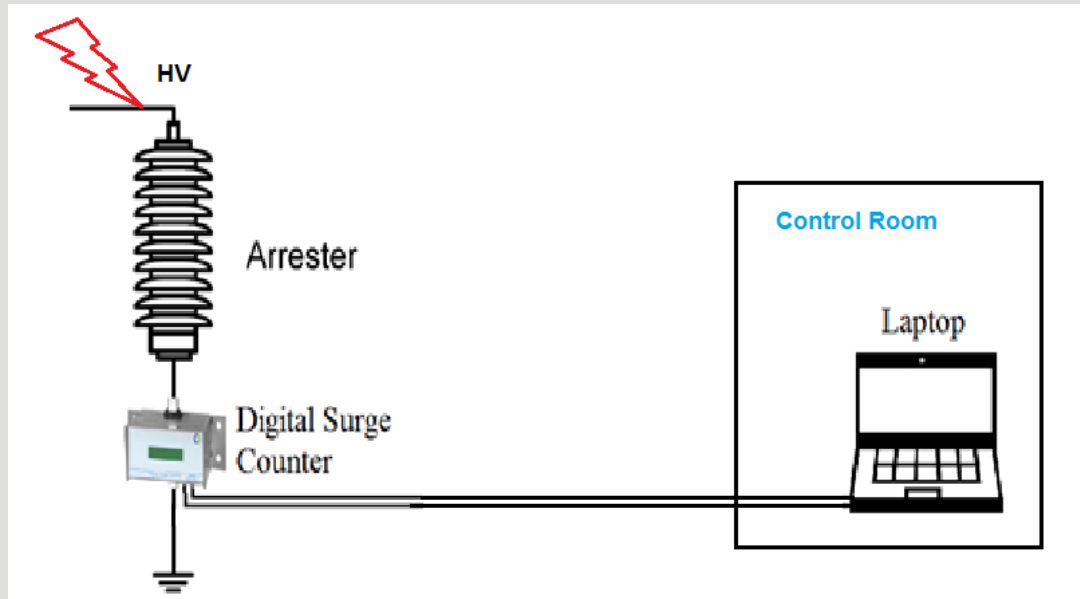
- Intelligence measured by Digital surge counter can be transferred to control room.
- Details of measurement will be displayed in computer / Laptop screen
- Communication- Protocol MODBUS on RS485

SURGEPROTECH

ieema
your link to electricity

Content:

Conclusion:

• Digital surge counter provides real-time monitoring of Surge Arresters.

• These advance features though add cost to counter, they provide sensitive and important information to the system operator in real time, which helps to keep the system safe and stable.

• The system transient data can also be used for investigations in case of arrester failure.

Thank you