REINHOLD ENVIRONMENTAL Ltd.

2018 APC & Wastewater Round Table & Expo Presentation

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Conventional ESP Power Supply Fault Finding

Basic Precipitator Controls Troubleshooting

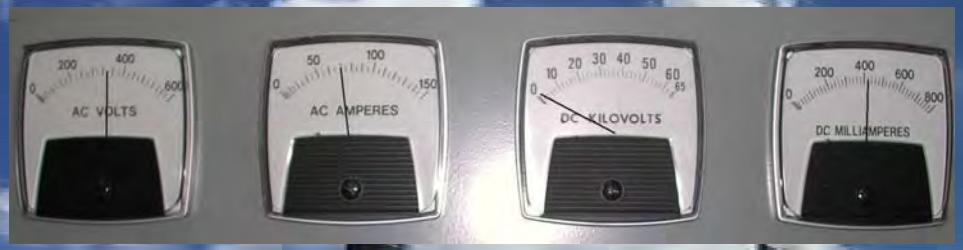
We spend a lot of time on the phone helping electrical maintenance crews go through equipment that is apparently causing operations people concern. The electricians job is almost always to rule out whether the power supply entities are at fault. There are a number of techniques that we use to carve our way through the process. A discussion of some of these can shed light and give confidence to the maintenance people that the equipment is not always to blame and in the process can help narrow down where to investigate further.

REDKOH INDUSTRIES

Why Have You Been Called?

First, Let's Check The Obvious

- Are ALL the T/R's running?
- Are the power levels acceptable?
- Are ALL the rappers running?
- Have you checked alarm and error messages?
- Smoke? Smell?
- Are there abnormal meter readings?



One meter is reading zero (or very non-characteristic reading) while other meters are reading within normal range

Low or Zero primary volts while at the same time, rated or very high primary and secondary current

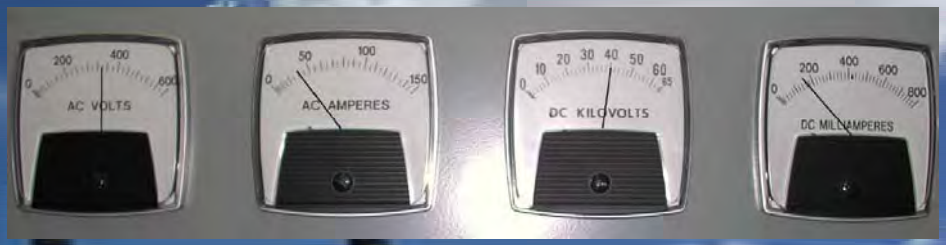
Interpreting T/R Control Electrical Readings

Primary voltage and secondary voltage are at maximum transformer rating while the primary current and secondary current are at zero. The spark rate will be zero.

Primary current and secondary current are normal or slightly higher than normal while the primary voltage and secondary voltage are much lower than normal. Spark levels are low to normal.

Interpreting T/R Control Electrical Readings

Primary voltage, secondary current, and primary current are all lower than normal at the same time. Spark rates are normal to high



Primary volts are normal or slightly higher while at the same time, the secondary and primary currents are much lower than normal. Spark levels will be low to normal

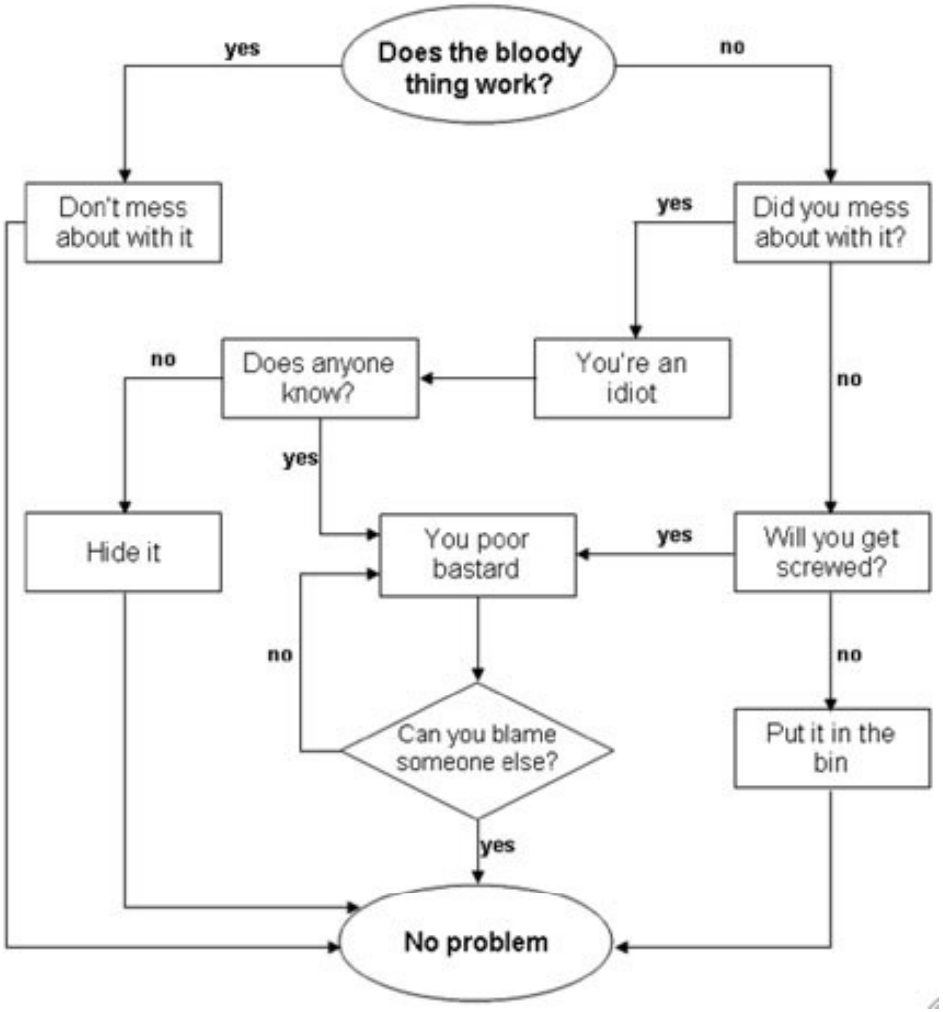
Interpreting T/R Control Electrical Readings

Electrical meters oscillate between readings on a 2 to 3 second cycle

Electrical meters oscillate between readings on a 10 to 15 second cycle

Interpreting T/R Control Electrical Readings

Start to Formulate a Step by Step Procedure



Get the Right Tools for the Job

- Volt Meter – WITH PROPER LEADS THAT WORK
- Oscilloscope – A “window” into ESP Controls
- Thermal Imaging Camera – Great for looking for loose connections
- Know where your spare parts are!

Isolate Precipitator Problems

T/R Open Circuit Test

- Ensure On-Off switch on the T/R control cabinet is in the OFF position
- Disconnect the precipitator high voltage frame from the T/R per your specific installation
- Turn On-Off switch on the T/R control cabinet to the ON position
- The control should power up to either rated primary or secondary voltage
- There should be no primary or secondary current
- If voltage is still low or zero, the problem is within the T/R tank

T/R Short Circuit Test

- Ensure On-Off switch on the T/R control cabinet is in the OFF position
- Open the high voltage housing and ground the precipitator high voltage frame per your specific installation
- Turn the On-Off switch on the T/R control cabinet to the ON position
- The control should power up to either rated primary or secondary current
- There should be no primary or secondary voltage
- If current is still low or zero, the problem is within the T/R tank

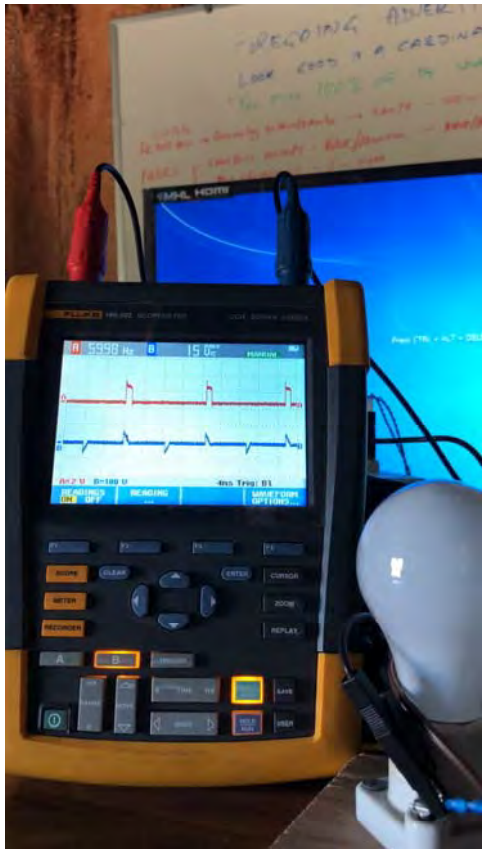

DANGER
HIGH
VOLTAGE

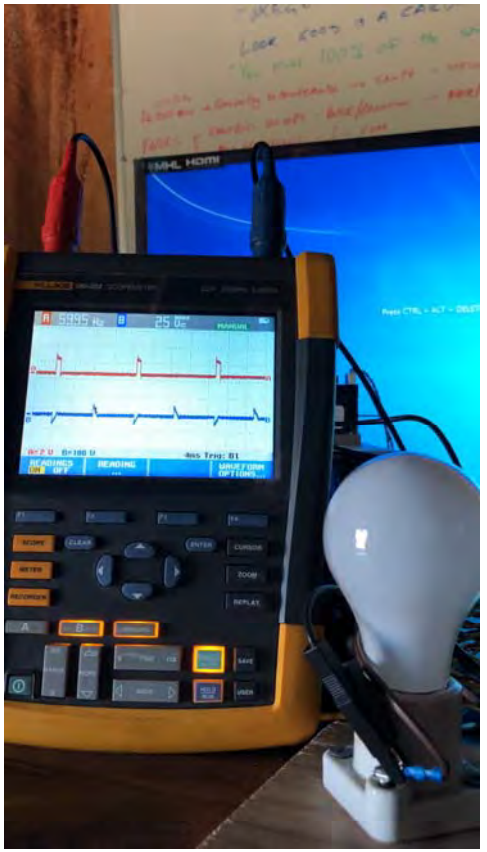
Control Cabinet Fault Finding

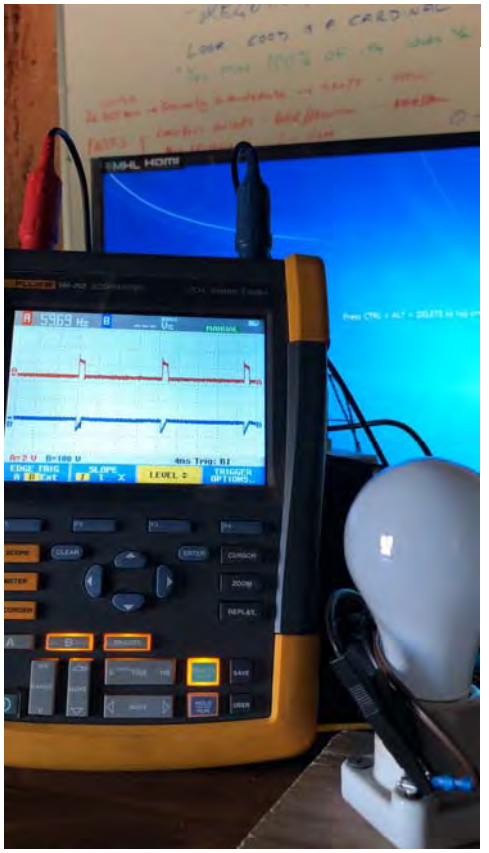
- Phasing
- Failing Power Fuses
- Loose Connections
- Faulty SCR
- Faulty Firing Circuit

Lightbulb Test

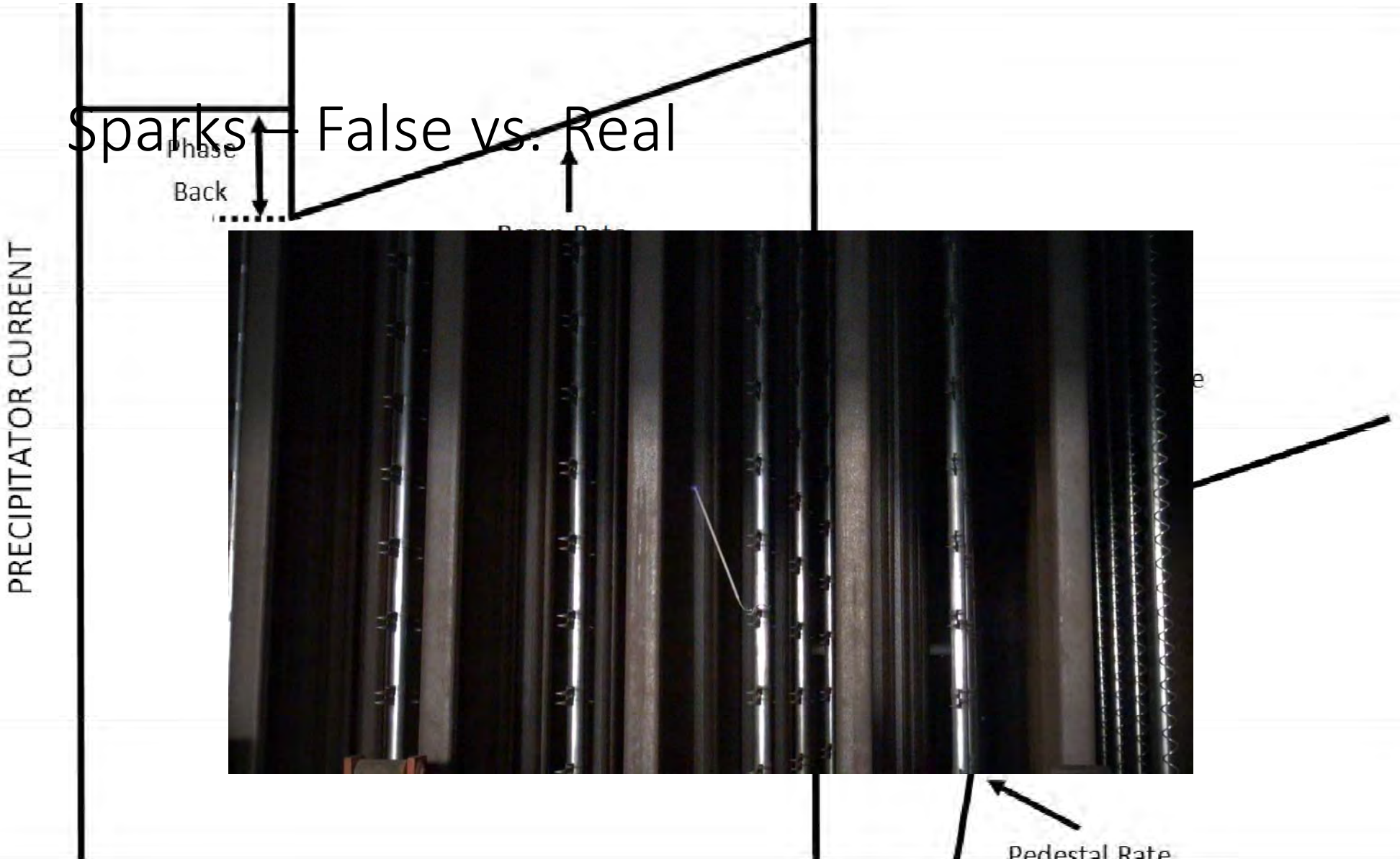
- Shut down control cabinet
- Disconnect wires going to the transformer rectifier
- Wire light bulbs in series (480 V total) and connect them in place of the transformer rectifier
- Re-energize the control cabinet and program the control to limit on primary volts
- Turn on the Start/Stop switch. The bulbs should dimly light. Make sure you are getting the programmed limit of the keypad/display
- Program the primary volt limit to 480 V. The bulbs should get brighter as the power increases
- There should be no flashing or strobe effect
- This will confirm that the cabinet is controlling the voltage to the transformer rectifier





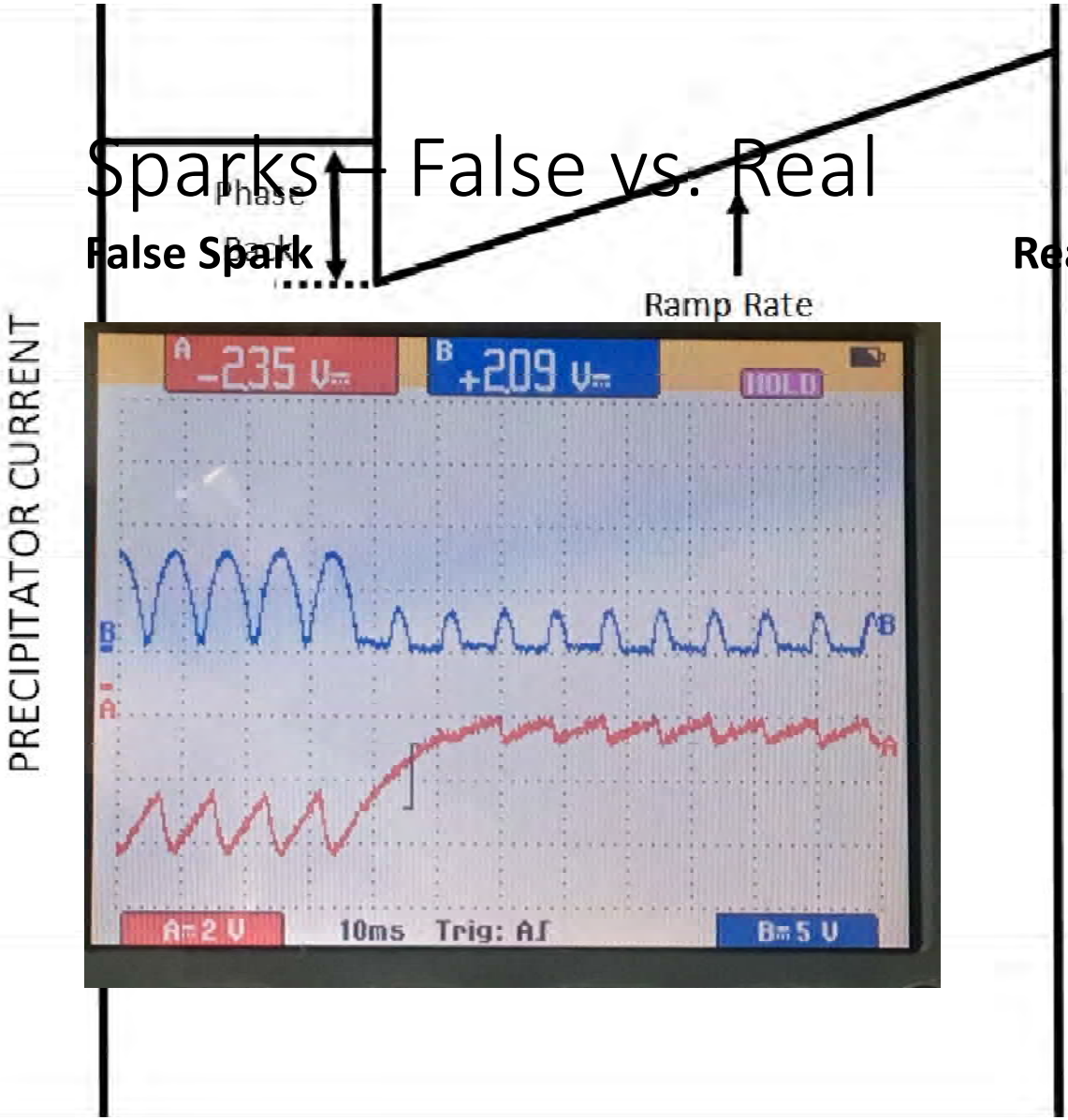


Sparks – False vs. Real

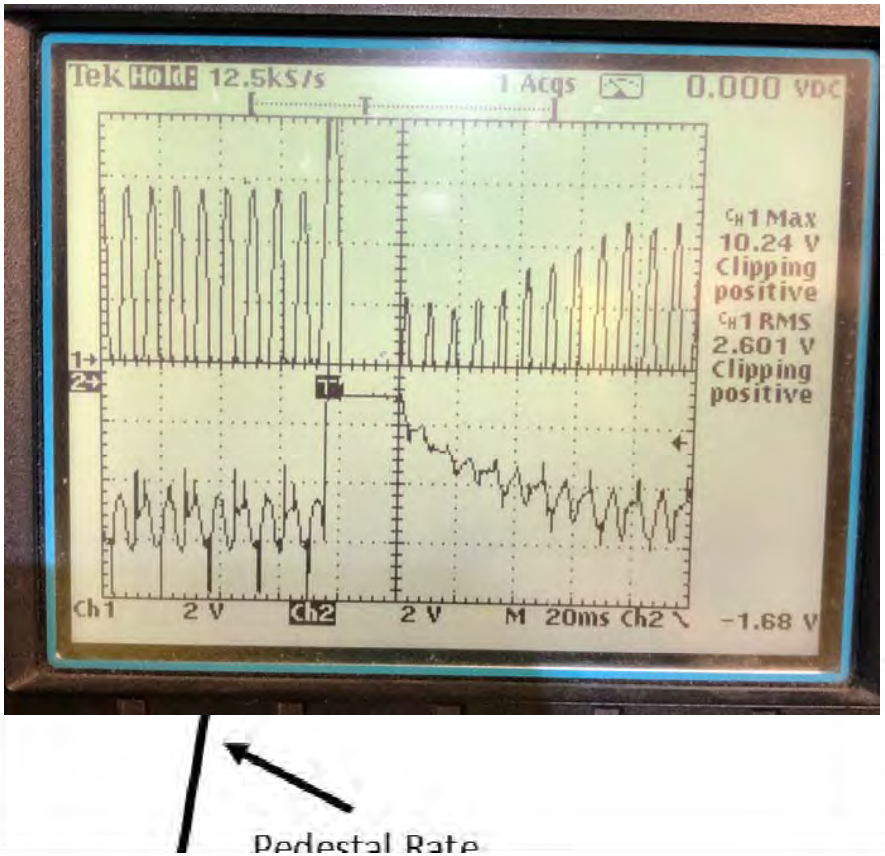


Sparks – False vs. Real

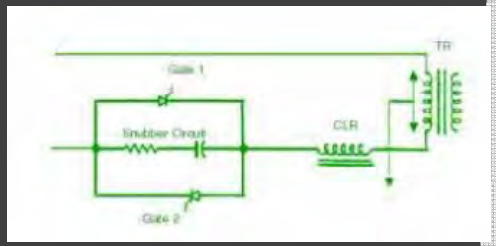
False Spark



Real Spark

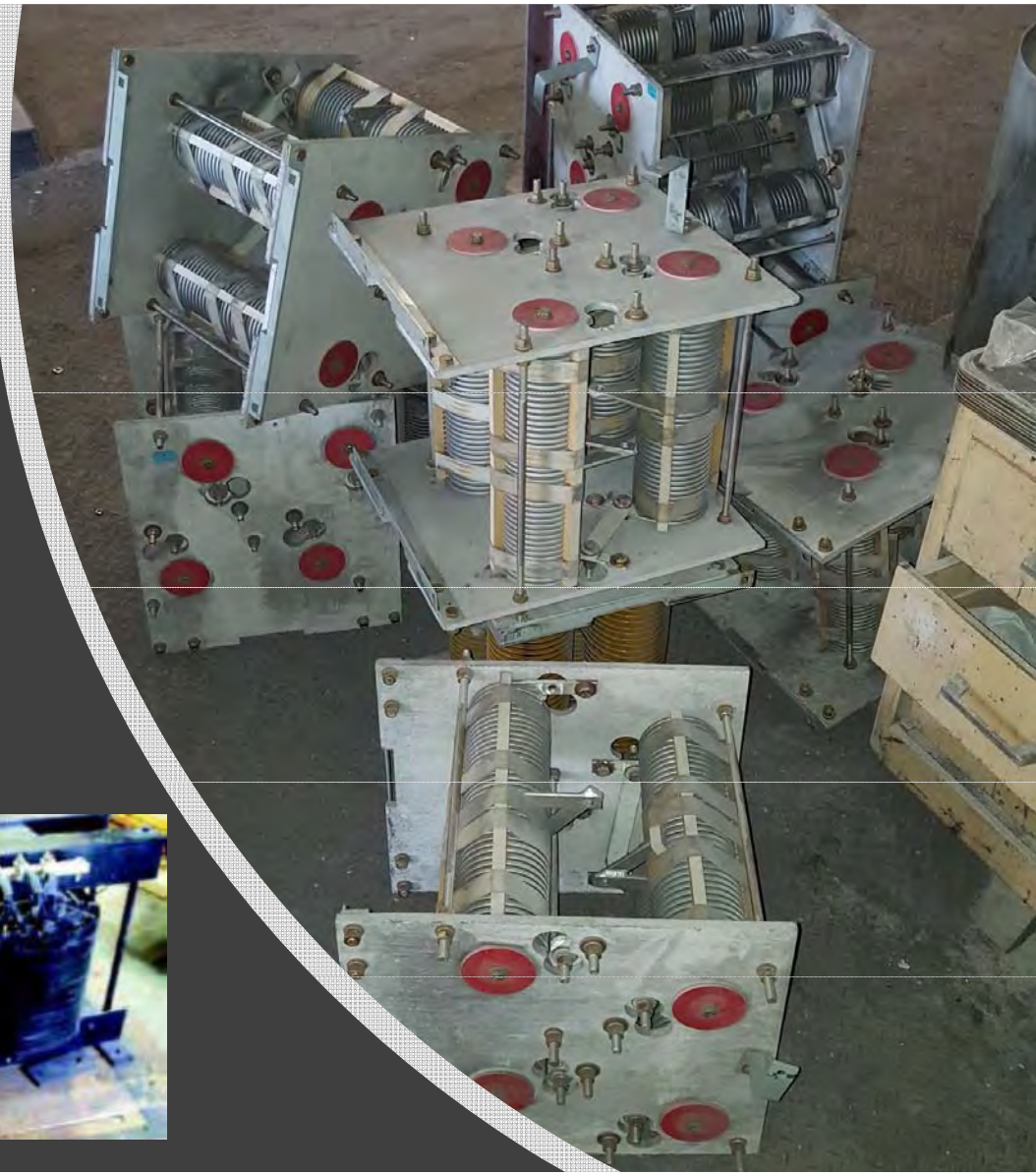


Faulty CLR



Time	Primary Volts	Primary Amps	Secondary Voltage (KV)	Secondary Current (ma)	Conduction Angle (degrees)
1	399	236	45	1500	155
2	396	236	44	1507	158
3	392	234	43	1500	162
4	382	228	42	1460	162
5	376	224	41	1430	162
6	362	216	40	1367	162
7	356	213	39	1350	162
8	338	202	37	1274	162

Electrical readings that indicate a CLR failure



Remember…
It’s Not
Always The
Controls!

Questions?