Case Study: Rubber/Plastic products - CRT terminals failures

Summary

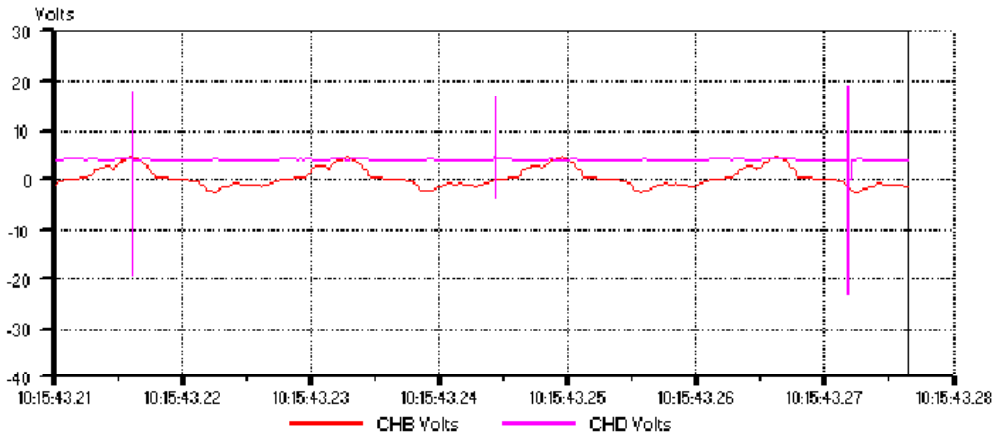
A tire manufacturer previously installed a monitoring and control system utilizing CRT terminals at 14 locations in their facility. Since the terminals were first installed in April of 1999, 20 of the terminals have failed. An EMI (Electromagnetic Interference) consultant was hired to find the problem, but was not successful in finding the cause. He reported that he read up to 60 volts on the data line to some of these terminals and recommended data line SPD's. The customer then asked the local utility company to help find the problem. A PQ Engineer investigated the problem and found that the cause of the monitor failures appears to be impulses on the dataline. He recommended that SPD's be installed on the service entrance panel.

Investigative Approach

The Engineer met with the customer to learn about the problem and checked a bond between the telephone ground and the power system ground. He set a Dranetz 658 analyzer at a receptacle serving a monitor location that had several failures. The Dranetz was set to monitor voltage on the 120 volt power source and between one wire of the dataline and ground. A Metrosonics PA-7 recorder was set to monitor phase to ground voltage and current inside the 240 volt ungrounded service transformer. Electrical panels were opened and checked for wiring errors.

Observations / Findings

In the investigation no problems of wiring errors were found. The cause of the monitor failures appears to be impulses on the dataline based on the available evidence. Also, the power system is a possibility since neutral to ground impulses with magnitudes up to 108 volts were occurring often. The customer said surge protection on the power and dataline inputs to all of the monitors had been installed for more than a month. This has kept the terminals from being damaged. The customer also mentioned that all of the data line wire that had been strung across the plant ceiling had been re-installed in metallic conduit and that no monitors had failed since this work was done. See Figures 1,2 and 3 for some power quality problems found by the monitoring.

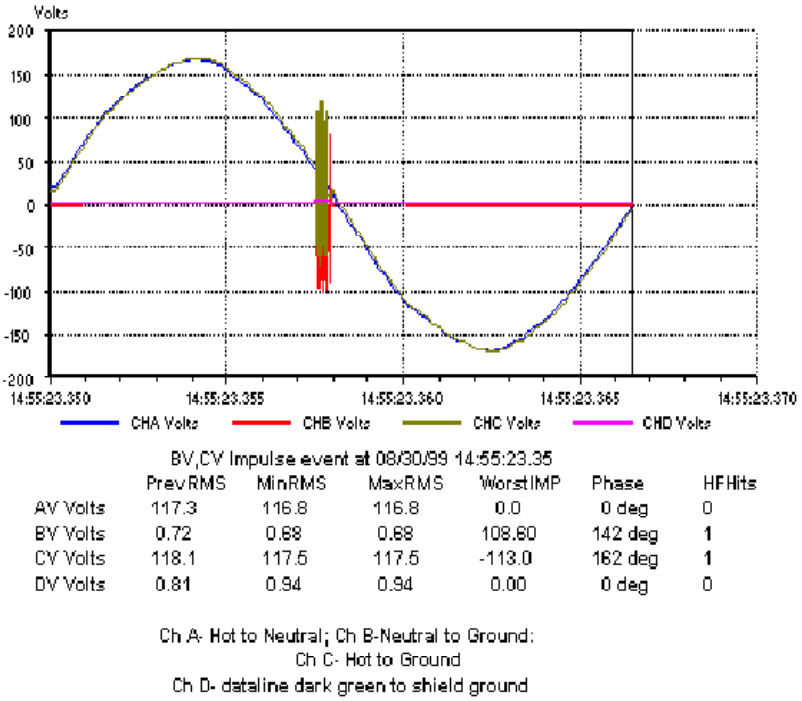


DV Impulse event at 08/27/99 10:15:43.21

	PrevRMS	MinRMS	MaxRMS	WorstIMP	Phase	HFHits
AV Volts	116.0	113.6	113.7	0.0	0 deg	0
BV Volts	1.13	1.93	1.98	0.00	0 deg	0
CV Volts	116.2	115.3	115.4	0.0	0 deg	0
DV Volts	4.05	4.02	4.04	-26.80	262 deg	3

Ch A- Hot to Neutral; Ch B-Neutral to Ground:
Ch C- Hot to Ground
Ch D- dataline dark green to shield ground

Figure 1: Impulses on dataline



BV,CV Impulse event at 08/30/99 14:55:23.35

	PrevRMS	MinRMS	MaxRMS	WorstIMP	Phase	HFHits
AV Volts	117.3	116.8	116.8	0.0	0 deg	0
BV Volts	0.72	0.68	0.68	108.60	142 deg	1
CV Volts	118.1	117.5	117.5	-113.0	162 deg	1
DV Volts	0.81	0.94	0.94	0.00	0 deg	0

Ch A- Hot to Neutral; Ch B-Neutral to Ground:
Ch C- Hot to Ground
Ch D- dataline dark green to shield ground

Figure 2: High magnitude neutral to ground impulses

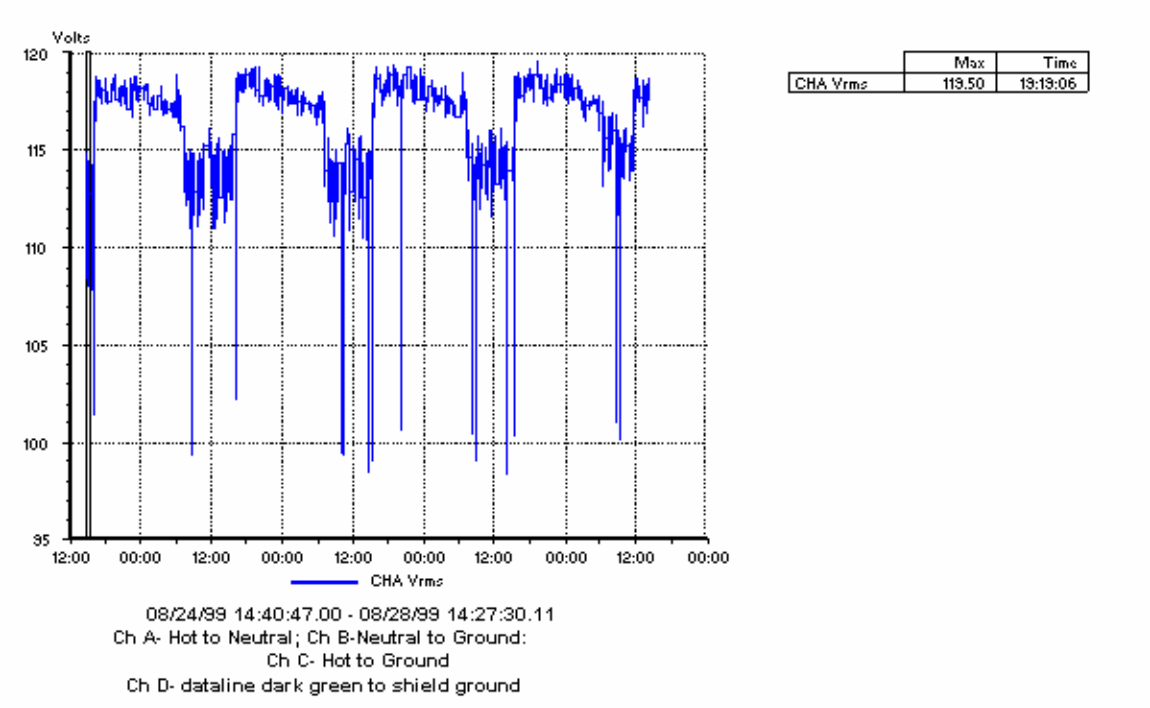


Figure 3: Low voltage at receptacle

Recommendations

The Engineer recommended that SPD's be installed on the service entrance panel as an enhancement to reliability for the plant. Surge protective devices (SPD) provide a defense against transient overvoltages created by lightning strikes, fuse expulsion, normal utility system operations and load switching internal to a facility.