An Ounce of Prevention

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When I went through Firefighter 101 training, the instructors emphasized that the primary purpose of a fire department is to prevent fires, not put them out. The old adage about "an ounce of prevention is worth a pound of cure" is applicable to the power quality world as well. Recording disturbances that shut down processes or disrupt the quality of the product is valuable, but even more valuable is preventing them from occurring in the first place. The same power quality monitor used to do the former can provide the information necessary for the latter. It just takes a little attention to the details.

Many people are too busy in today's Internet-speed economy to step back and look at things until they become a crisis. However, one should look at the data with the mind set of determining are things getting worse, are there marginal operating conditions present, is there "an accident just waiting to happen"?

One way to quickly view RMS variation data is using a 3-D magnitude-duration chart. The mag-dur chart plots the magnitude or amplitude of the voltage versus the duration of the sag or swell versus how many times that value or range of values occurs. Figure 1 shows an example of such over a one week period. Note that the majority of the sags have a magnitude of 80-89% of nominal and last 1-5 cycles. While the severity of these is often not enough to cause a process interruption, it can be a valuable clue that something is about to happen.

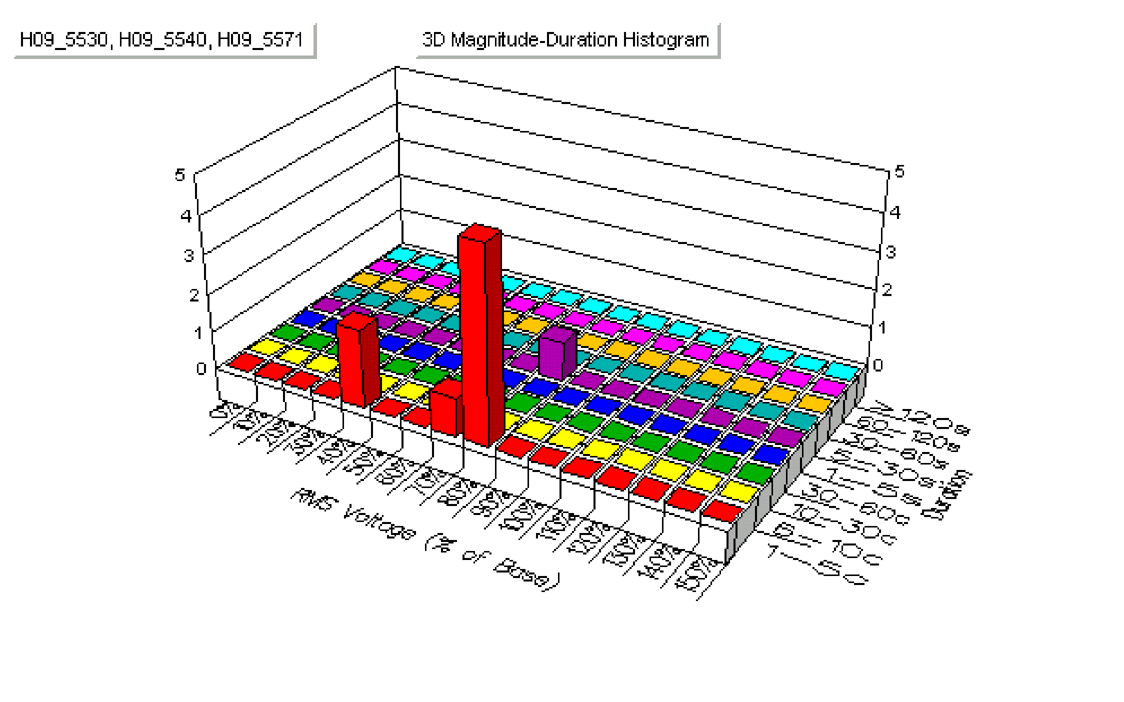

Figure 1. Mag-dur chart

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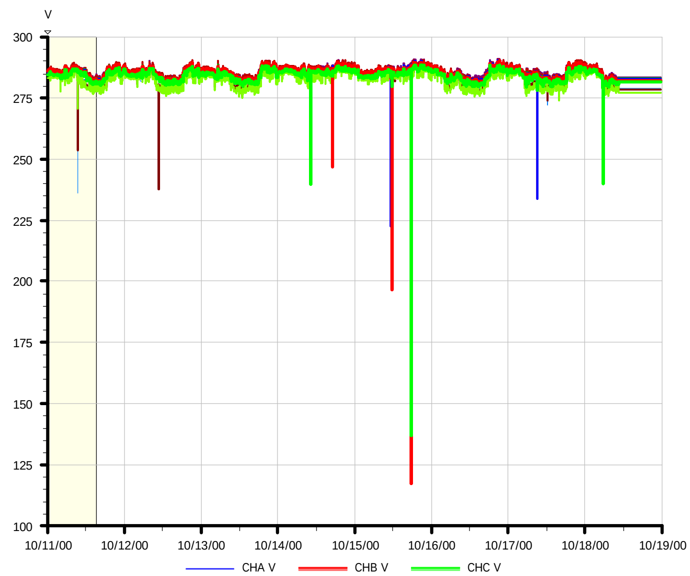
Closer examination of the information from a timeline in Figure 2 shows that the events don't seem to occur at any particular time or pattern. Eventually, an event occurred that was severe enough to cause computers that weren't on a UPS to reset themselves.



10/11/00 00:00:00.00 - 10/19/00 00:00:00.00

Figure 2 – Timeline

Closer examination of the events themselves found that the majority of them were sags of 1-2 cycles long that only involved one phase and were self-clearing, as shown in Figures 3 and 4. Eventually, there was a sag that involved all three phases, and caused the problem with the computers. By looking at the load current at the time of the sags, it is evident that the problem was caused upstream, back towards the source of the electricity, as the current decreased when the voltage decreased. Further coorelation to other conditions determined that it was a very windy day. A likely scenario, given the numerous single phase sags leading up the disruptive event, was that there are conductors on the poles that were swinging in the wind and brushing up against a high impedance ground, such as a tree branch. Eventually, two conductors were involved at the same time, and then all three, as shown in Figure 5.

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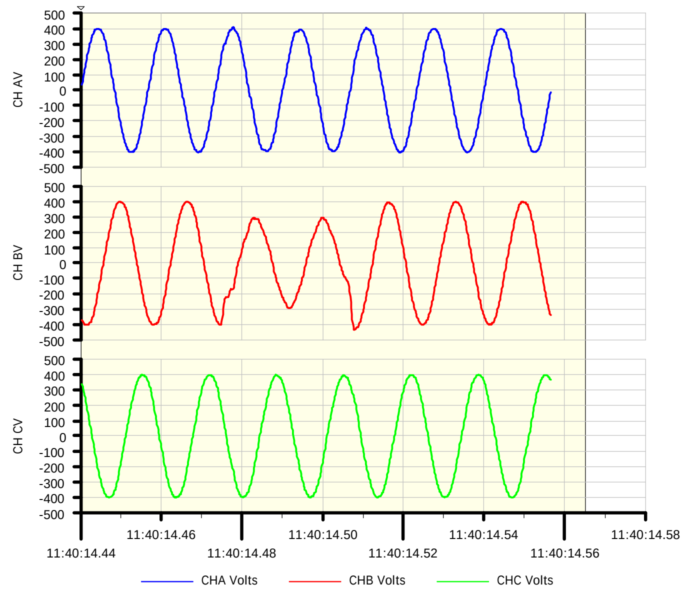

10/15/00 11:40:14

Figure 3 – SLTG – Phase B

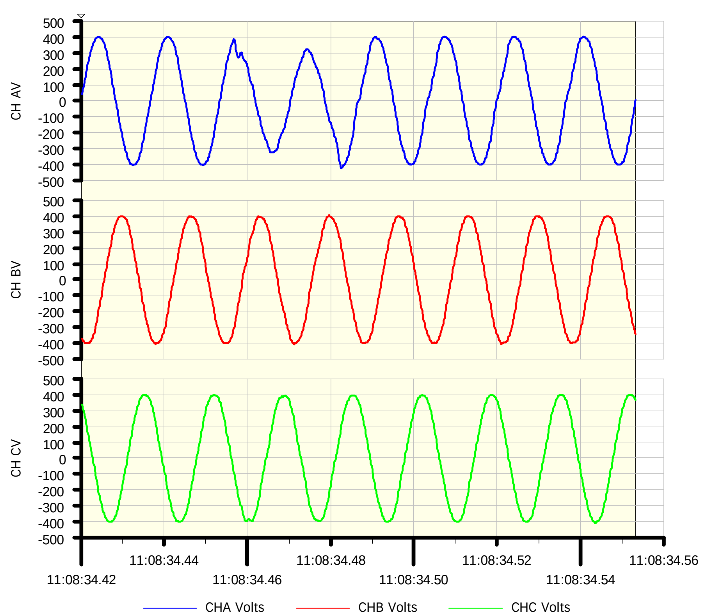

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Figure 4 – SLTG – Phase A

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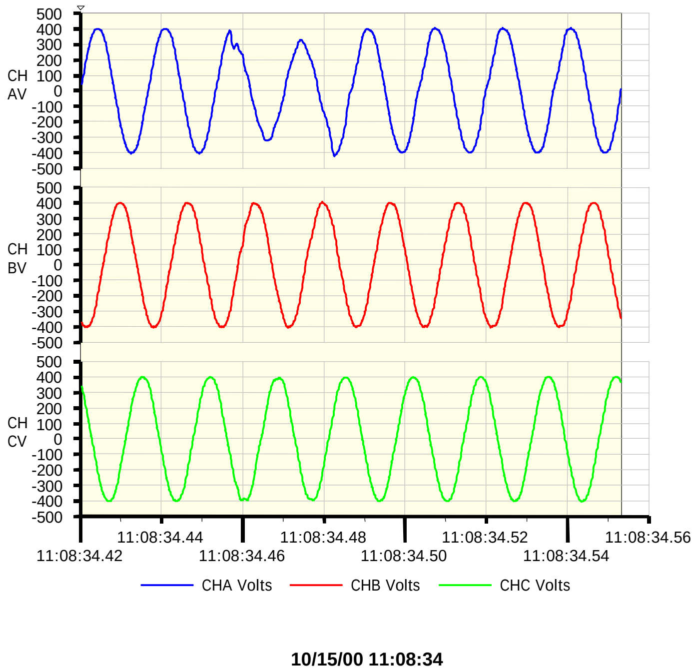

Figure 5 – 3 Phase sag

Armed with this data, the facility manager could have contacted the local electric utility to send a crew out to find the source of the ground before it became a problem for that facility and others fed by that circuit.

Remember Smokey the Bears motto, "Only you can prevent PQ problems".

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