Instant power replay solves a breaker trip

Application Note

Testing Functions
Case Study

Measuring tools: Fluke 1750 Power Recorder

Operator: Michael Gipe, Fluke Power Electronics Engineer

Tests conducted: Power quality event recording

After experiencing some nuisance tripping of breakers in the subpanel feeding the second floor of this industrial building, we installed a Fluke 1750 Power Recorder at the subpanel to gather information about power usage.

For several weeks, we experienced no circuit breaker trips, and the recorded data from the 1750 showed excellent quality power delivery.

The next week, using the current event detector with a 20 A threshold to match the single phase branch feeds, we discovered that there were several events where current exceeded the breaker trip rating. While there were no tripped breakers during the week, it was clear that something was overloading the circuit to the point where a breaker trip was likely to happen.

A search of the facility found an employee who had moved a Tenny temperature chamber into a lab area and was using it to perform elevated temperature tests on some products. The chamber was on wheels and was plugged into a standard 120 V, 20 A branch outlet.

The power recorder captured the operation of the temperature chamber and its effect on the power at the sub-panel.

Data analysis

The current event view shows several events outside the 20 A breaker tolerance curve. The longest event is shown in Figure 1.

The event exhibits a double initial current surge, followed by a sustained current over 20 amps. Although the circuit breaker did not trip during this event, its rating was exceeded and it would be likely to trip occasionally under similar conditions. These conditions are frequent during use of the temperature chamber, as can be seen in the graph above, where this event is immediately followed by another similar event whose beginning can be seen at the right side.

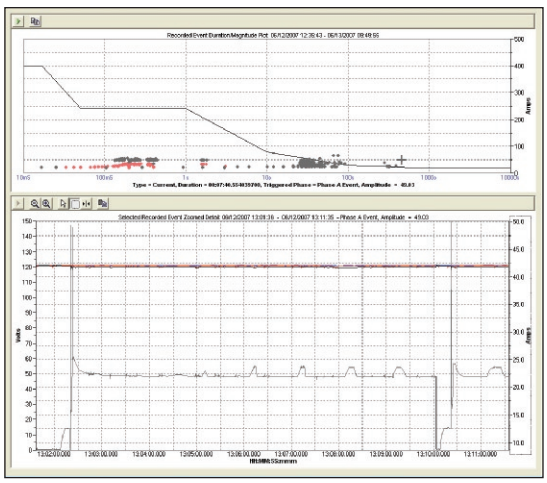

Figure 1. Current event view, top level events

Zooming into the initial region of the event in Figure 2, we see the turn-on loads of the temperature chamber's dual compressor system. The first compressor turns on with a large initial surge, followed by the secondary compressor surge. This load profile clearly identifies the temperature chamber as the cause of the overload.

Temperature chamber peak current is 49.7 amps. In Figure 3, the sustained load is near 25 amps.

We can zoom in further, in Figure 4, to see even more detailed resolution of this initial current surge. Note that the phase A voltage sags during this current surge, but the voltage drop is small, indicating that the power feed at the sub-panel is very stiff, and can accommodate substantial demand.

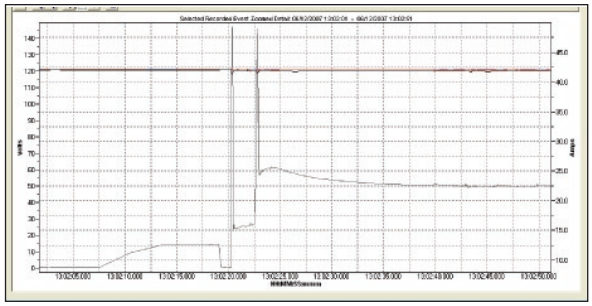

Figure 2. Compressor activity

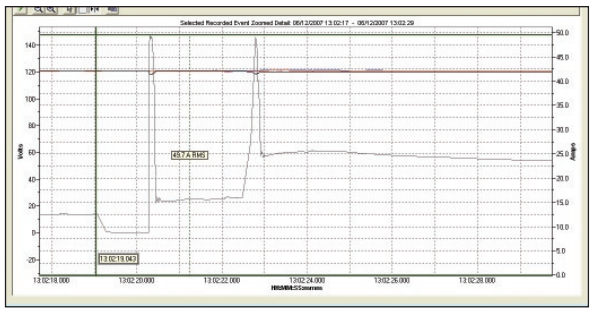

Figure 3. Load evaluation

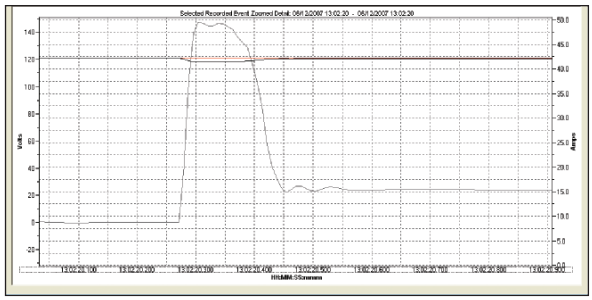

Figure 4. Interpreting voltage drop

Conclusion

The power feed to the second floor is robust. The nuisance tripping is most certainly due to temporary overload of a standard 20 amp appliance branch circuit from using an industrial temperature chamber on the circuit. The temperature chamber should be connected to a dedicated branch circuit, sized to meet the requirements of the chamber, minimum 20 amps.

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