cps Power Monitoring Solutions

AN AFFILIATE OF ENERGY OTTAWA

3 Reasons Why You Need a Power Monitoring System

My first paper titled "Visualizing Electric Power – Power Monitoring 101" described the key components and basic functionality and capabilities of a PQView® power monitoring system. Many utilities, generators and large users already have the hardware components and communication infrastructure in place and investing in the software application could quickly start providing the benefits listed in this post. At the end of the day, the goal is to reduce costs and improve customer satisfaction.

I believe that after you read these benefits, you will appreciate the results you can obtain from full-time power monitoring.

1) Detect defective equipment or conditions before catastrophic failure or prolonged outages

The savings from this benefit alone can cover the costs of a power monitoring system. At an electrical utility, premature failure of station transformers, on-load tap-changers, power cables etc. can be costly. If you can detect and isolate problems before catastrophic failure, you can make minor repairs and prevent a prolonged outage causing damage to your reputation. You can also prevent expensive environmental cleanup in the event of a fire or oil spill. Customers can quickly determine if there are voltage events impacting their production and if these events are being caused by problems on their electrical system or the problem originates on the utility side of the meter. Figure 1 shows the waveform event recorded by a PQ meter showing that the current disappeared momentarily and the voltage started to collapse on one phase. Experience from previous similar events lead us to believe that the tap-changer on this substation transformer was experiencing problems and could potentially fail. The transformer was taken out of service and the photo in Figure 2 shows minor damage that was repaired before the tap-changer was restored back to service without excessive damage and a prolonged outage.

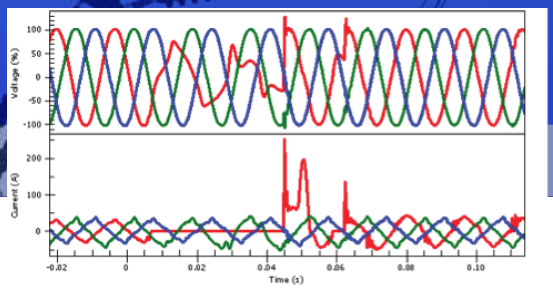

Figure 1: Waveform event showing possible tap-changer failure

Figure 2: Minor damage to tap-changer components

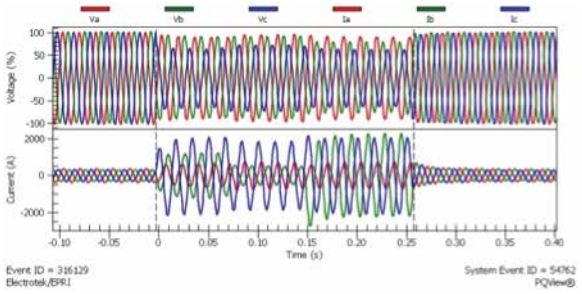

Figure 3: Fault event recorded at substation

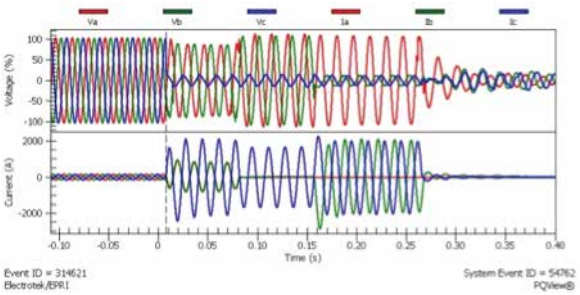

Figure 4: Fault event recorded at solar farm

2) Verify relay protection and control settings

Multiple events captured from multiple sites with high resolution sampling rates can be used to compare protection settings on different components in an electrical distribution system and reduce prolonged outages. The example I used describes how an electrical utility was experiencing short-duration outages caused by the substation breaker auto-reclosing to clear a fault somewhere on the distribution circuit. Figure 3 shows the event captured by the power quality meter at the substation. This event re-occurred a number of times in one morning and it was difficult to determine where the fault originated. A power quality meter installed at a large solar farm also captured similar waveform events as shown in Figure 4. The magnitude of the fault and the signature of the waveform event showed that the fault was down stream in their facility. Their protection scheme was not clearing the fault at their location and it was impacting the utility's customers. After the relay protection settings were reconfigured, the utility was confident that their customers would not experience future outages because of the same events. The generator was able to ensure that their faulty equipment would clear internally and the remainder of their generation would remain in production.

3) Provide better customer service

Power disturbances are unavoidable for a number of reasons and can greatly impact modern electronic equipment found in industrial complexes, institutional and commercial facilities and even residential properties. I was investigating power quality complaints for an electrical utility for over 20 years and it was frequently difficult to investigate disruptions caused by voltage disturbances because we did not record the initial event when it occurred. Our practice was to install a power quality analyzer at the customer's facility for a week or two and try to record a similar event. Events caused by loose connections usually occurred on a high enough frequency to capture them and resolve the problem. Many times we removed the analyzer, assured the customer that everything was fine for the period that the recorder was installed and asked them to call us back if the problem occurred again. The customer was seldom satisfied with this answer and often we had to return and try and resolve the same problem later.

After we started monitoring power full-time at most of our substation, things changed. Events such as a capacitor switching event or a thunderstorm caused voltage disturbances on the grid that impacted our customers and we now knew the magnitude and duration of these events with an exact timestamp. When a customer called reporting these disturbances, we were able to correlate their events with the data we collected. We could now explain to the customer what caused their disruption. We could assist them or work with their consultant to develop mitigation methods to reduce the impact of future events. Full time monitoring at the customer site was also beneficial when it was available because we then knew the exact characteristics of the event at their facility or utilization point. The information was also invaluable when investigating damage claims or workplace accidents that resulted in electrical contact.

The utility benefited from this data collection because it helped determine if there was voltage sags, swells and transients occurring that were not related to a known outage. Some of these captured events lead to determining locations requiring more tree trimming reducing future power outages. High speed access to the data also assisted with troubleshooting the location of the cause of the outage. Faster location of the fault reduced the duration of the outage improving customer service and reducing restoration costs.

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