Future applications

There are many applications for the intelligent power quality monitoring concept. Some of the more important applications are listed below.

Industrial power quality monitoring applications

- Energy and demand profiling with identification of opportunities for energy savings and demand reduction
- Harmonics evaluations to identify transformer loading concerns, sources of harmonics, problems indicating misoperation of equipment (such as converters), and resonance concerns associated with power factor correction
- Voltage sag impacts evaluation to identify sensitive equipment and possible opportunities for process ride-through improvement
- Power factor correction evaluation to identify proper operation of capacitor banks, switching concerns, resonance concerns, and optimizing performance to minimize electric bills
- Motor starting evaluation to identify switching problems, inrush current concerns, and protection device operation
- Short-circuit protection evaluation to evaluate proper operation of protective devices based on short-circuit current characteristics, time-current curves, etc.

Power system performance assessment and benchmarking

- Trending and analysis of steady-state power quality parameters (voltage regulation, unbalance, flicker, harmonics) for performance trends, correlation with system conditions (capacitor banks, generation, loading, etc.), and identification of conditions that need attention
- Voltage sag characterizing and assessment to identify the cause of the voltage sags (transmission or distribution) and to characterize the events for classification and analysis (including aggregation of multiple events and identification of sub events for analysis with respect to protective device operations)
- Capacitor-switching characterization to identify the source of the transient (upline or downline), locate the capacitor bank, and characterize the events for database management and analysis
- Performance index calculations and reporting for system benchmarking purposes and for prioritizing of system maintenance and improvement investments

Applications for system maintenance, operations, and reliability

- Locating faults. This is one of the most important benefits of the monitoring systems. It can improve response time for repairing circuits dramatically and also identify problem conditions related to multiple faults over time in the same location.

- Capacitor bank performance assessment. Smart applications can identify fuse blowing, can failures, switch problems (restrikes, reignitions), and resonance concerns.

- Voltage regulator performance assessment to identify unusual operations, arcing problems, regulation problems, etc.

- Distributed generator performance assessment. Smart systems should identify interconnection issues, such as protective device coordination problems, harmonic injection concerns, islanding problems, etc.

- Incipient fault identifier. Research has shown that cable faults and arrester faults are often preceded by current discharges that occur weeks before the actual failure. This is an ideal expert system application for the monitoring system.

- Transformer loading assessment can evaluate transformer loss of life issues related to loading and can also include harmonic loading impacts in the calculations.

- Feeder breaker performance assessment can identify coordination problems, proper operation for short-circuit conditions, nuisance tripping, etc.

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