Arc Flash &
Power Distribution Analysis

Introduction

Safety, minimizing equipment downtime, avoiding damage to distribution equipment, maximizing the life of distribution equipment, and energy cost savings are the main reasons for performing Arc Flash and Power Distribution Analysis tasks.

Arc Flash Hazard Analysis

Arc Flash Hazard Analysis has become one of the hottest topics over recent years due to the introduction of the National Fire Protection Association's NFPA 70E guideline. NFPA 70E is becoming the standard guideline for employers who are implementing safety programs to comply with the current OSHA regulations and NEC requirements.

The following are key requirements of the employer:

- An arc flash hazard analysis on all electrical equipment.
- Electrical equipment labeling, identification of flash protection boundaries, hazard category, and required personal protective equipment (PPE), while working on the energized equipment.
- Implementation of electrical safety program in compliance with guidelines and employee training.

Employers who set up and maintain programs to follow OSHA regulations, NEC requirements, and NFPA 70E guidelines will have minimized the potential for accidents and provided a safe working environment for their employees.

An arc flash hazard analysis provides the data needed to implement the safety programs. This analysis provides the flash hazard boundary, the amount of energy a worker will be exposed to in the event of an arc flash, the hazard class of equipment, and the recommended PPE required to work on electrical equipment. Warning labels for individual equipment listing the above information can also be generated from the analysis. Modifications to the power distribution system can also be modeled and analyzed to determine methods of reducing the hazard levels if required.

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Short Circuit Analysis

A short circuit study provides the available fault currents at various time intervals at the busses throughout the system. The results of this study help determine the required interrupting ratings and settings for the protective devices. The study will also point out areas of concern where the available faults exceed the fault duty ratings of the busses and devices. Safety and equipment integrity are jeopardized in these areas. A plan can then be developed and implemented to decrease the available fault currents in these areas to an acceptable level.

Protective Device Coordination Study

A protective device coordination study is performed in order to verify that the correct devices are selected throughout the system and are properly set, ensuring that the power distribution system is fully protected. If a fault or overload condition occurs, the closest protective device is activated, thereby isolating the fault. The end result is equipment protection and disruption minimization to the rest of the system.

Load Flow Study

A load flow study is performed to calculate the voltages, currents and phase angles for each bus on the power distribution system. This information is used to verify that the distribution equipment is used within its ratings, that cables/conductors are sized properly, that voltage levels are within an acceptable range, and to determine if a power factor correction is required. Implementing changes discovered during this analysis will lead to longer equipment life, less capital costs, and energy savings.

Motor Starting Analysis

A motor starting analysis is performed to calculate voltages, currents and starting times required when starting large motors. When additional large motors are planned to be added to the system, they can be incorporated into the model to verify that there will not be any major disturbances to the power distribution system during the starting and operation of these motors.

Power Distribution Summary

To accomplish the Power Distribution System Analysis tasks, a site visit is required to verify and update the system one-line diagram and supporting documentation. Field data including protective device settings, equipment nameplate data, load information, cable data, and utility contributions are also gathered during the site visit. This information is used to build a computer model of the power distribution system. Once the computer model for the system is built, the impact of future expansions to the power distribution system can be entered and evaluated quickly.

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