Project Flash: Arc Flash Calculations Utilizing Induction Motor Startup on an Electrical System

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*Abstract*—When analyzing an industrial electrical panel certain precautions have to be taken into consideration in order to prevent accidents. These accidents include but are not limited to Arc flash Shock hazards, etc. The purpose of this experiment is to calculate parameters such as Flash Protection Boundary, Arc Rating (Incident Energy), Approach boundary, etc. From these calculations, technicians can also select the appropriate PPE without under/overestimating the safety levels of the system. The methodology involves calculating a system’s fault current using an induction motor with set parameters and back-calculating values when given motor voltage, locked rotor reactance, starting current, etc.

Keywords—Arc Flash, Incident Energy, Electrical PPE, Fault Current, Induction Motor

# Introduction

As technology continues to develop, more research and engineering are utilized within the technological world in order to keep up with these changes. These include newer/ emerging systems being implemented within power systems. In order to ensure proper generation and delivery of electricity to these systems, substations are consistently monitored and adapted in order to fit the needs of users both commercially and residentially. While these improvements may have no noticeable effect in a residential setting, utilizing these improvements has many concerns within an industrial setting. The initial problem stems from understanding how arc flashes work and how to calculate these values in order to ensure safety of workers. To understand how this value is important, the term arc flash needs to be understood. Arc flashes occur during an arc fault where a short circuit is conducted between two hot (live) parts or even with ground. This event involves electricity moving through ionized air particles towards ground which creates high heat and light as energy flows. There are many causes of an arc flash which include direct contact with tools, component failures, corrosion, faulty installations etc. In order to prevent accidents engineers can calculate arc flash boundaries which will warn workers and give them guidance on what level of protective clothing is necessary. The issue that is presented is that as substation improvements are made, these calculations can differ from original calculations made. The project entails a new method of calculating these values by utilizing an induction motor. This motor will simulate a load acting on the system from which a wattmeter can be used to measure the current drop/ voltage sag. From there, the Utility short circuit can be calculated which refers to the maximum electrical power that can be delivered to a utility system during a short. While previous methods do not utilize the exact back calculations using a motor, other implementations have been researched and developed.

##### References

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