

Weibull Analysis of Switching Contact Resistance in Laboratory and Commercial Circuit Breakers

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Abstract—Silver / Tungsten powder metal electric contacts are used in circuit breakers because of their combination of high conductivity from silver, and high melting temperature from tungsten. In operations of the circuit breaker, switching arcs erode and oxidize the contact surface to create a high resistance layer that can lead to high temperature at the contacts. This arc erosion product is usually a mixture of silver, tungsten, tungsten oxides and silver tungstate. The formation of this layer and its distribution is modified by the metallurgy and electrical parameters. The measurement of the contact resistance depends on the random location of the contact spot and is therefore highly statistical in nature. Weibull Distribution is used to analyze switching contact resistance in laboratory switch apparatus and commercial 20A circuit breakers. This is to understand the statistical nature of the measurement and the correlation to the dynamic contact erosion process.