

Research on the Relationship between Contact Breakaway Initial Velocity and Arc Duration

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Abstract—The electrical contact erosion of relay directly depends on the arc energy. The arc duration is proportional to the arc energy. Thus, the dc arc duration has important effect on the life and the reliability of relay. Most studies of dc arc have concentrated on the influence of the contact opening velocity that is a mean value or a constant on arc duration and arc energy. This paper emphasizes on the influence of the contact breakaway initial velocity on arc duration. Here, the contact breakaway initial velocity is the velocity of moving contact at the moment of moving contact being broken away from stationary contact. According to the experimental model designed, the waveforms of arc voltage and arc current are measured in the resistive load circuit and the inductive load circuit. The relationships between the contact breakaway initial velocity and the molten metal bridge duration (abbreviated to the bridge duration), metallic phase arc duration, gaseous phase arc duration, and the total arc duration are analyzed. It is proved that increasing the contact breakaway initial velocity from 0.08m/s to 0.3m/s leads to decreases in the bridge duration, metallic phase arc duration, gaseous phase arc duration, and the total arc duration.

Keywords-arc; contact breakaway initial velocity; molten metal bridge; metallic phase arc; gaseous phase arc