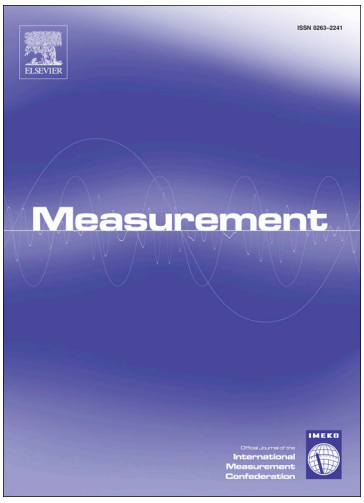

Characteristics of shunting effect in resistance spot welding in mild steel based on electrode displacement

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Characteristics of shunting effect in resistance spot welding in mild steel based on electrode displacement

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Abstract

Shunting effect of resistance spot welding is evaluated based on the electrode displacement signals. The shunted welds in mild steel with different weld spacing were produced. The results showed that the weld spacing and nugget diameter were polynomial-correlated, and the minimum welding spacing of 20 mm can be derived from the results. Both the peak value and gradient of electrode displacement in the weld stage indicated strong correlations with the nugget diameters of shunted welds. Additional shunt path was found to further aggregate the shunting, suggesting the decline in the values of profile features. Furthermore, it is found that the shunting effect led to the decline of the dynamic resistance curves, which is contradictive to the trends between acceptable-sized and undersized welds claimed based on the single weld study. The paper shows that electrode displacement curves of shunting can be incorporated into existing quality monitoring system.

Keywords: Resistance spot welding; Shunting; Electrode displacement

1. Introduction

Resistance spot welding (RSW) has extensively been applied to metal sheet assembly in the automobile industry. In the manufacturing of a body-in-white (BIW) structure, many spot welds are continuously produced within the same region of a component, where the problems of shunting and poor fit-up are inevitable. As a parallel electrical path from the existing weld (shunt weld) is formed, the welding current flowing to the new weld (shunted weld) is reduced, as shown in Figure 1. The insufficient generation of heat caused by shunting adversely influences the strength and nugget diameter of the shunted weld. This, together with poor fit-up problem introduced by existing welds, narrows the weldability lobe and leads to expulsion [1].