



溶接の機能性の研究 社会科学による溶接構造物の製造技術の パラダイムシフトに関わる事例研究

*A Study on Welding Functionality
A Case Study of a Paradigm Shift in the Manufacturing Technology
of Welded Structures from a Social Science Perspective*

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This study explores a paradigm shift in the manufacturing of stainless-steel railway car bodies-large welded structures composed of thin stainless-steel sheets combined with structural members. The origin of this welding technology dates back to 1932 in the United States and has since been standardized and adopted in Japan under the Japan Railway Car Builders Association standards. However, once a technology becomes standardized, new techniques are often evaluated only in comparison with existing ones.

In this context, the authors applied laser welding to the production of stainless-steel railway car bodies and conducted a functional evaluation. As a result, a new quality assessment method was developed, in which the quality of the car body is quantified by the number of laser spot welds. Furthermore, by applying the principles of quality engineering, the functional evaluation of laser spot welding addressed the issue of variation in joint strength inherent in resistance spot welding. This functional approach indicates the potential to replace resistance spot welding with laser spot welding, thereby suggesting a paradigm shift in welding technology.

Key words : technology paradigm, Robust quality engineering, functionality evaluation, railway car body cell, electric resistance spot welding, laser spot welding

1. はじめに

ステンレス車両構体へのレーザスポット溶接の採

用の事例は、2002年に試験走行が開始した試作車両が世界初と言われている¹⁾²⁾。この試作車両には、鉄道事業者、鉄道車両メーカー、鉄鋼メーカーの3社が共同開発したレーザスポット溶接で組み立てた段ボール構造で車両の構造と組立方法を刷新した。2003年頃からは、従来構造でレーザ連続溶接を採

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