New Process Contributes to Improving Joint Quality of Ultra-High Strength Steel

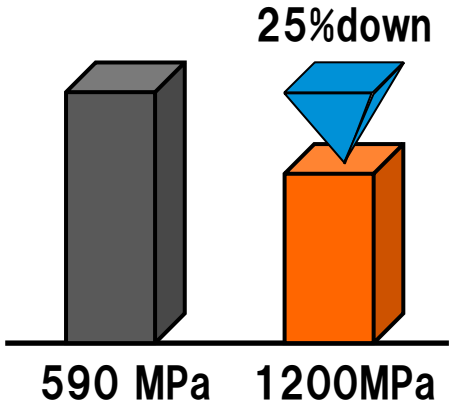
Solid-State Resistance Spot Joining : Cold Spot Joining

2024 Japan International Welding Show

Demand for Weight Reduction and Utilization of UHSS

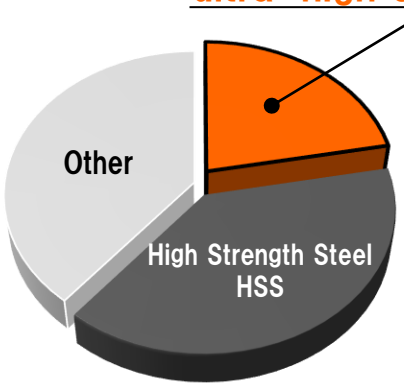
As emission regulations become stricter to achieve a decarbonized society, weight reduction is required to improve fuel efficiency and electricity costs.

▶Weight reduction*



*Current status of high-tensile strength materials for automobiles
Materia Vol. 53, No. 12 (2014) Kazuya Saito

▶Approximately 25% of car body is ultra-high strength steel



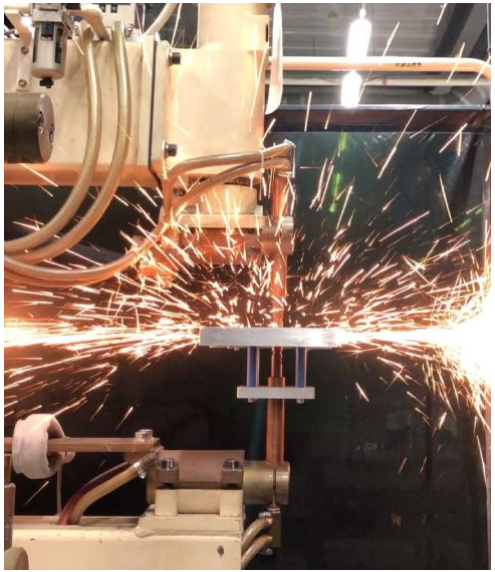
Example of application of UHSS

Expanding utilization of UHSS as a solution for weight reduction

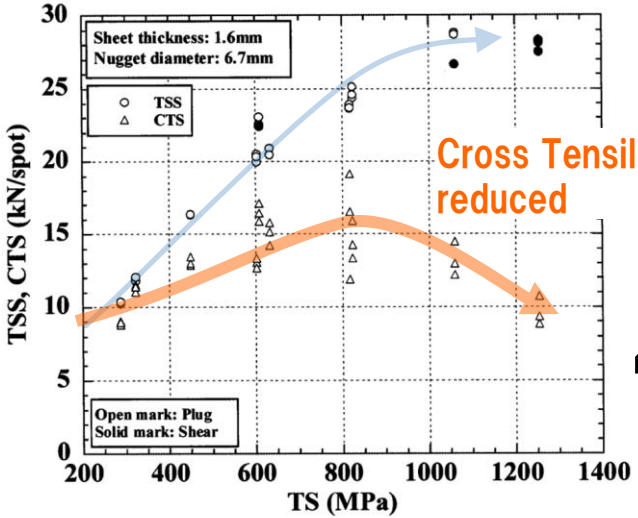
The Issues of Joining UHSS by Resistance Spot Welding

<The issues of Resistance Spot Welding × UHSS >

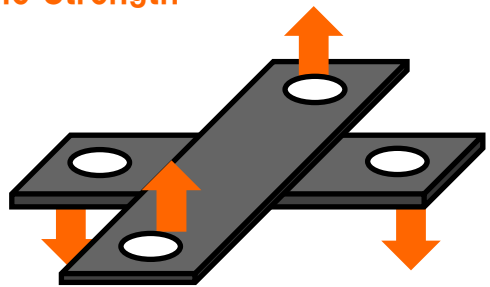
- Spatter tends to be generated due to the characteristics of UHSS
- Material properties tend to deteriorate during melting and solidification due to fusion welding



Effect of base steel strength on TSS and CTS of joints*



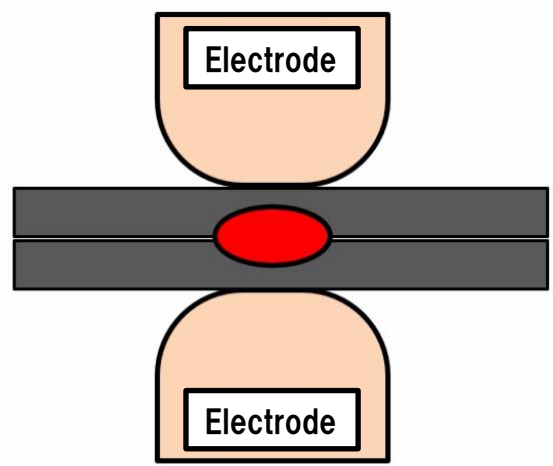
Cross Tensile Strength reduced



*Spot weldability of high strength steel sheets for automobiles
Nippon Steel Technical Review No.385 (2006) Hatsuhiko Oikawa et al.

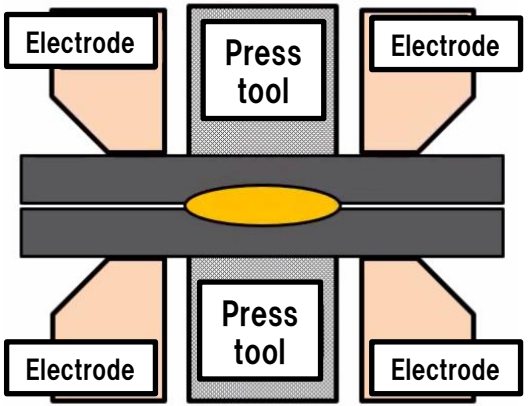
Solution for Utilization of UHSS

Resistance Spot Welding



Expanding joining area by melting

Cold Spot Joining

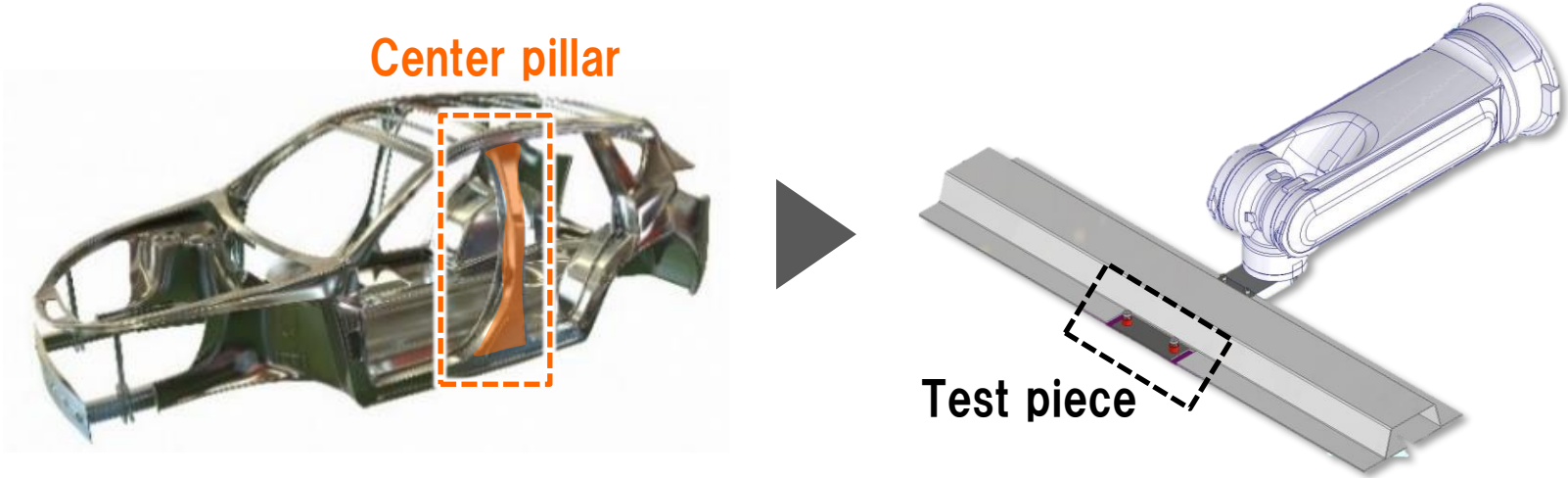


Expanding joining area by high pressure

The utilization of plastic flow under high pressure enables joining at low temperatures and suppresses the generation of spatter and the deterioration of material properties.

Demonstration : Joining of 1200 MPa class UHSS

Joining with a workpiece that looks like a center pillar

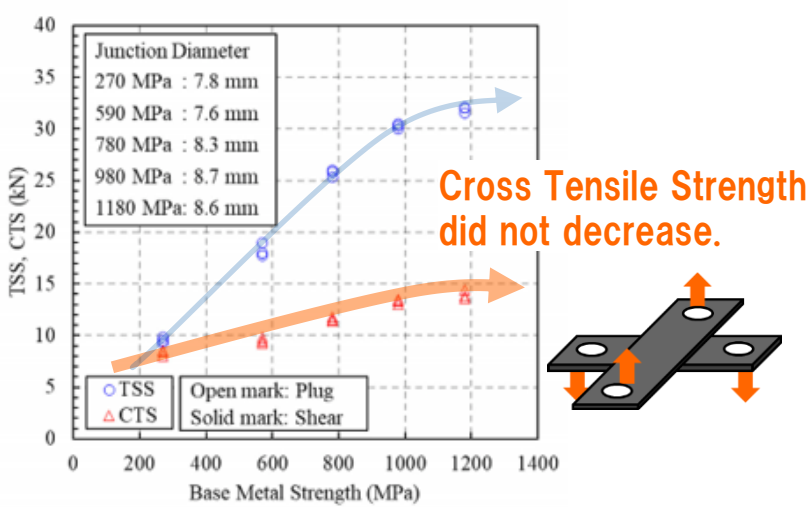


material	1200 MPa class UHSS
joint	Lap joints
thickness	1.4 mm

Reduction of Environmental Impact

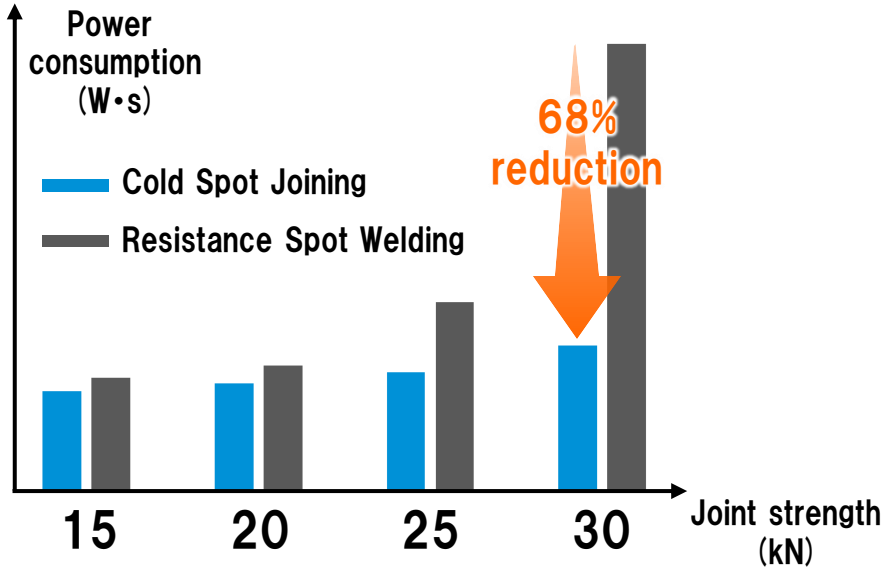
Joining at low temperatures reduces not only spatter but also deterioration of material properties and shortens energization time.

▶Minimizes degradation of material properties



Takumi Aihara, Masayoshi Kamai, Hidetoshi Fujii: Suppression of embrittlement of high tensile steel plate joints
by solid-phase resistive spot joining, 142nd Research Committee on Light Structure Joining and Processing

▶Comparison of power consumption



Weight reduction of structures by expanding the application of UHSS & Energy saving in production processes


DAIHEN