

ALUMINIUM TECHNOLOGIES

CONTINUAL DEVELOPMENT FOR AUTOMOTIVE APPLICATIONS (PART1)

In this issue we will look at one of the latest advancements in aluminium technologies that are finding their way into our current auto body fleet - perhaps not for everyday applications, but as a pre-cursor of what is to come.

Recent attachment method advances

- Friction Stir Welding (FSW): -

Invented by Wayne Thomas of TWI Ltd in 1991, this process was primarily used for the joining of aluminium materials, but is also used for copper, steels (including UHSS, Usibor steels etc), titanium and other metals -

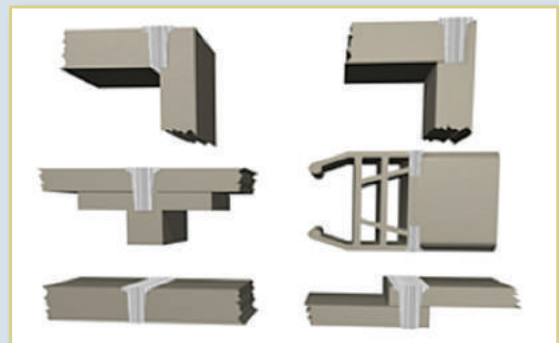
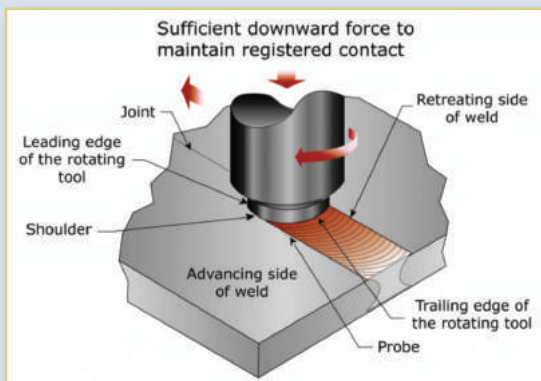
In simplified terms, this joining process involves the use of heat, mechanical movement and pressure, to fuse materials together without the weld becoming molten at the weld site - rather the materials become "plasticized" and fuse together. Therefore, the Heat Affected Zone (HAZ) is much smaller, resulting in much lower distortion rates, less porosity and lower rates of cracking / splitting of the welded parts.

Arguably, the most important feature of this process is the fact that *dissimilar* materials can be joined together without the joint(s) being compromised by cross contamination and incompatibility etc. (Aluminium to steel / steel to brass etc).

Applications for FSW include the aerospace industry (rocket fuselages etc), ship-building, robotics, computers, high speed trains and nuclear waste encapsulation, to name a few.



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Typical joint designs

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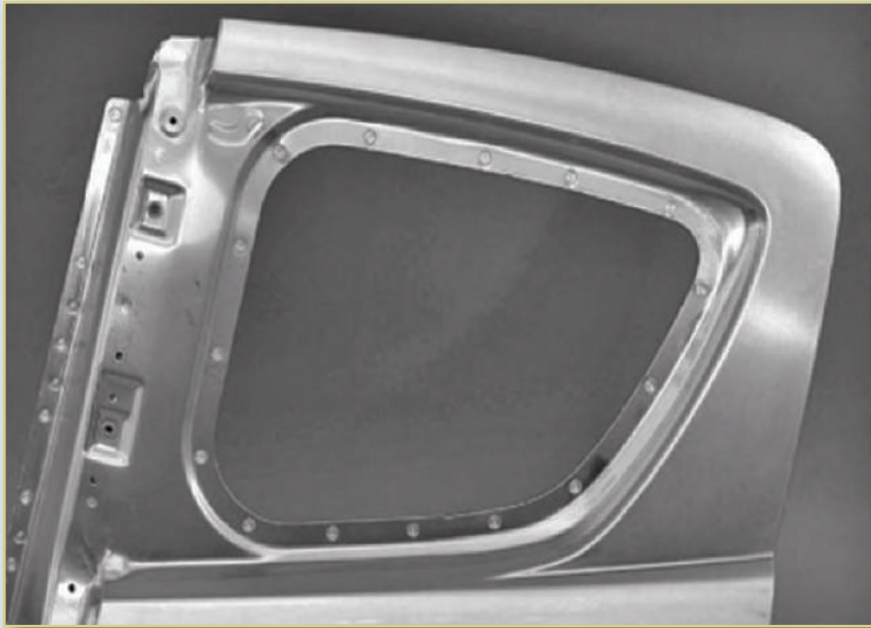
WHEN PERFECTION IS EXPECTED

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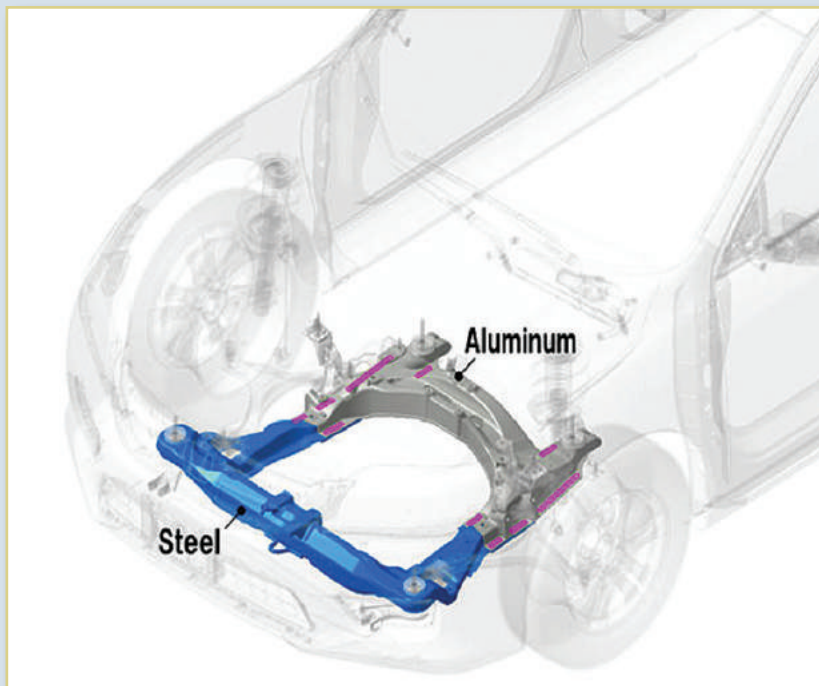
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The auto industry has also embraced this technology - manufacturer examples include Mazda - MX-5 boot lid (Alloy sheets to steel brackets), RX-8 bonnet and rear doors (FSW Spot welding), Toyota Prius (tailgate), Audi R8 (B pillar), Suspension struts at Showa Denko

in Japan, Alloy wheels at Simmons wheels and Honda with the new Accord (front sub frame). Other more exotic examples include the Ford GT (centre tunnel extrusions that are FSW welded to a bent alloy sheet that houses the fuel cell).



Mazda RX-8 rear door shell - FSSW (Friction Stir Spot Welding).



Honda Accord

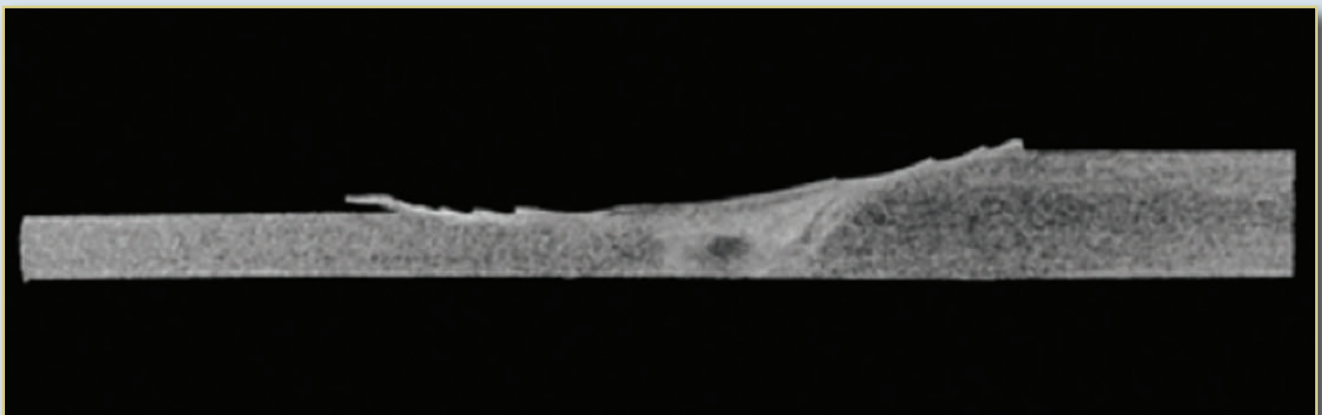
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Tailor welded blanks - that is, different thicknesses and / or types of metals that are laser welded together- typically

in steel applications, also benefit from FSW when aluminium alloys are being used (e.g. Audi B pillar structure).



Tailor - welded blank

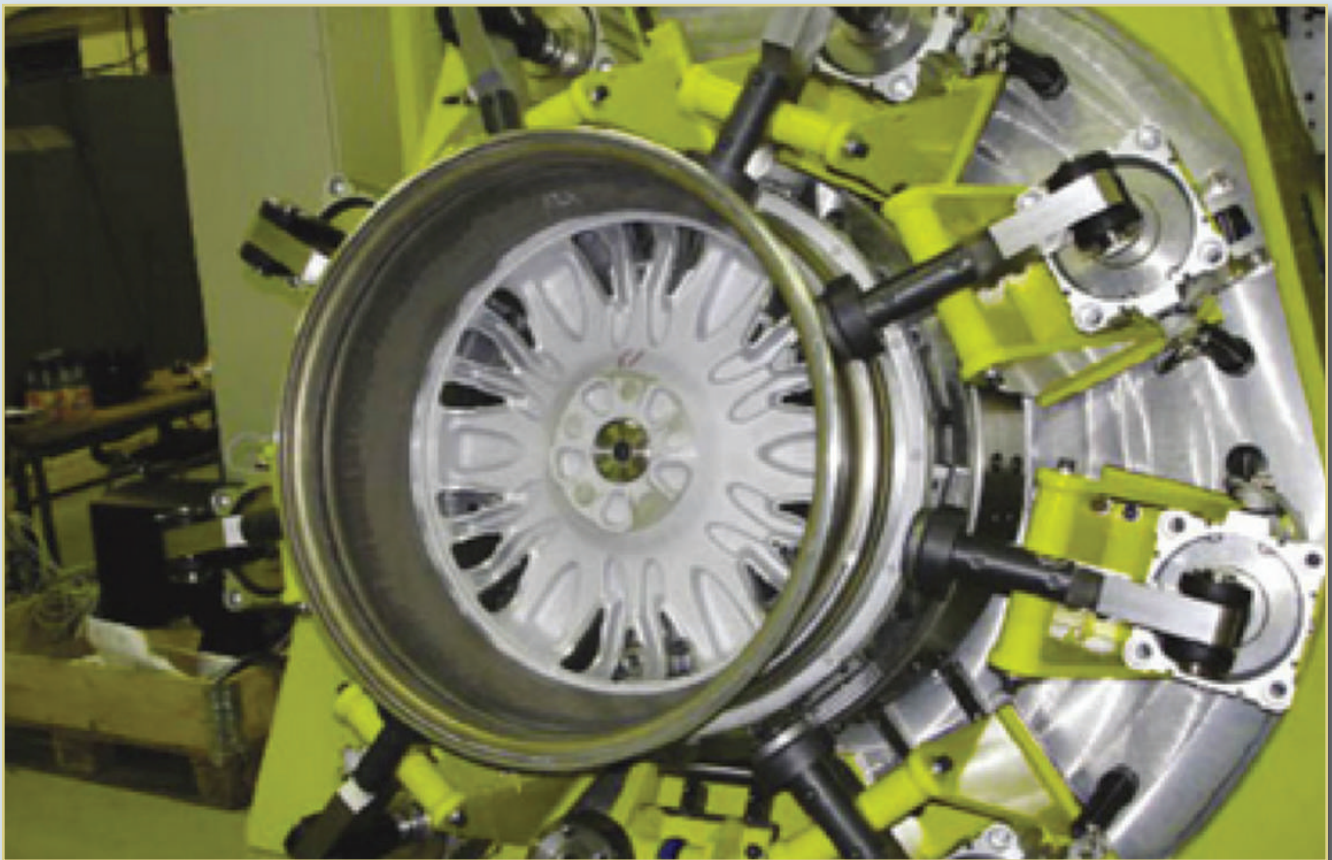
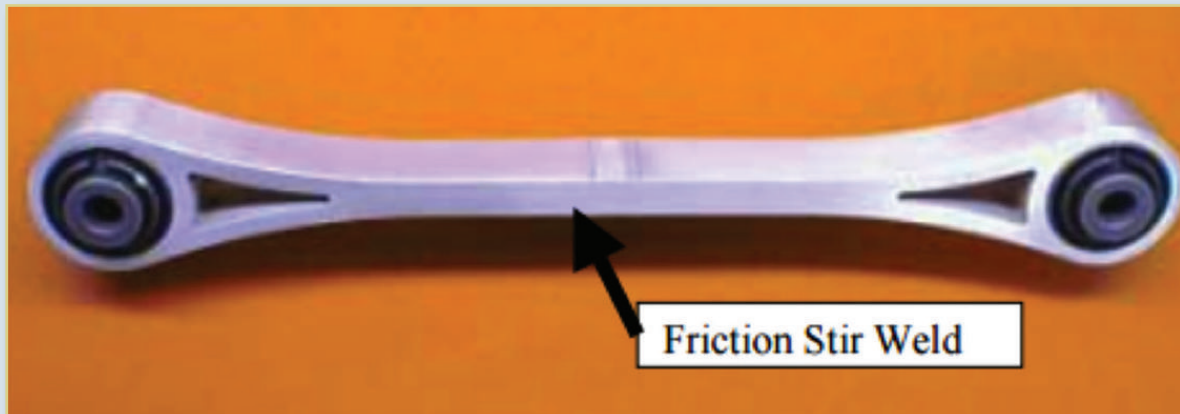


Cross section : 1mm to 2mm 6111 - T4 alloy - Dissimilar thickness FSW weld

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It is also a highly suitable attachment / joining method for aluminium extrusions, as shown in this vehicle link arm

example - Fabricated from Friction Stir Welded extrusions



Alloy wheel manufacture

FSW provides extremely durable joints with up to 3 times the fatigue resistance of traditional joining technologies like fusion welding or riveting. Other advantages also include being more environmentally friendly with no

sparking, noise or fumes being produced in the process - and that there are no consumables (filler / welding materials, fluxes etc.).