ALUMINIUM TECHNOLOGIES

CONTINUAL DEVELOPMENT FOR AUTOMOTIVE APPLICATIONS (PART11)

Continuing on from where we left off in the last issue, we will look to other attachment methods for aluminium structures - but before delving into some of these other emerging joining technologies, we need to understand some of the reasoning behind the ongoing requirement to develop advanced joining techniques.

Depending on what articles are researched , or who you listen to in the world of auto-body material specialties, the everyday vehicle auto body structure of the future is likely to be a mix of Advanced High Strength Steels (AHSS), Aluminium , magnesium, composites and plastics , rather than being all steel or aluminium intensive (a typical exception to this would be the all new Ford F150 pick-up in the North American market, which has the entire upper body made from aluminium - but that's another story !).

With this in mind, among the challenges that all automakers face, is the requirement to attach dissimilar materials together that do not compromise structural integrity, will enhance or assist in crash management and occupant safety , as well as meet the ongoing global requirements for fuel efficiency and tighter emissions.

Aluminium components make up around 10% of the kerb weight in the current vehicle fleet -both in North America and Europe, and 80% of those parts are castings (engine blocks, transmission cases etc) - this is expected to grow to around 14% by 2025 with the introduction of more aluminium closure panels (doors , bonnet, boot lid and front guard) as well as parts / sections of the "body in white" (apertures, A and B pillar structures etc).

By the numbers :-

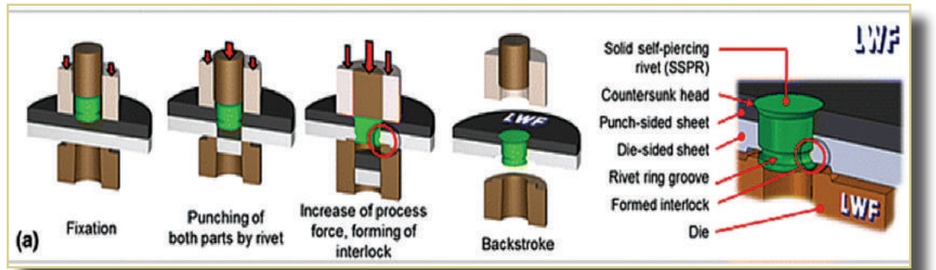
- Weight savings of other materials (in %) compared to conventional steel :-
  - AHSS 20%
  - Composites 25%
  - Aluminium 40%
  - Magnesium 50%
  - Carbon fibre 55 to 65%
- 93% of aluminium used in manufacturing auto body parts is recovered and put back into service.
- Like for like weight comparisons between steel and aluminium, reveal aluminium has twice the energy absorption of it steel counterpart.
- Using current OEM riveting methods to join components together on a vehicle body that incorporates different materials, adds around 45kg to overall weight.
- 70% of auto body repairs (steel or aluminium), undertaken on our current vehicle fleet are remove and replace activities.

I-CAR NEW ZEALAND TECHNICAL REPORT

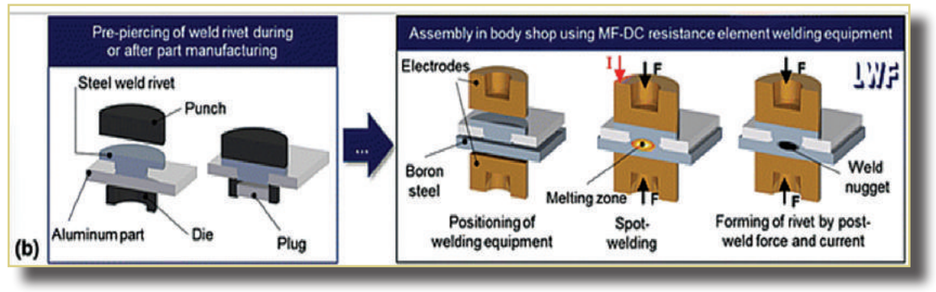
In summary, current thinking by vehicle makers would determine that the ***"right material should be chosen for the right part in the right place"*** and that's where joining methods become a whole lot more complex and challenging (or interesting, depending on which way you look at it !!)

In part I, we looked at Friction Stir Welding (FSW) as a way of joining dissimilar materials - in consideration of the above information, vehicle makers are looking to introduce other methods, which include :-

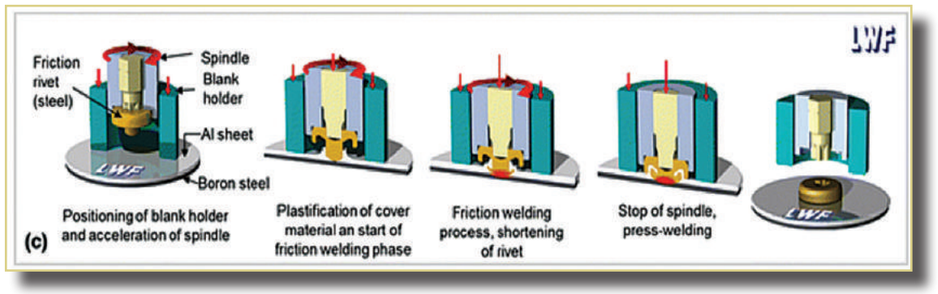
SSPR - Solid Self Piercing Rivet



REW - Resistance Element Welding



FEW - Friction Element Welding



In addition to these technologies (or perhaps in contrast to), GM is developing Squeeze Type Resistance Welding (STRSW) processes that will join steel and aluminium without the draw backs of temperature variation between metals (eg. Aluminium melting point of 6550 C V Steel at 15380 C).

In the mix of all this, is the basic requirement of all vehicle makers ,that any model / size and style of vehicle that they manufacture can be produced cost effectively and compete on the global pricing market.