

# The management of welded aluminium fabrication – Part I

Recipient of the SAIW's 2009 Gold Medal Award Dr Tony Paterson, is the man to talk to about welded aluminium fabrication. In this two-part article, which will continue in the November issue of *African Fusion*, he discusses welded fabrication in the transport sector.

In our efforts to extend the market, to sell metal, we may well have oversold the ease of welding, thus undermining the development of a sustainable market. That it can be done is mirrored in the development of aluminium fuel tankers as reliable carriers of a hazardous substance.

Ideally, conceptually, products would be made from a single homogeneous material. This does not happen for many reasons, sometimes because desired local stress and strain characteristics differ in different areas; but mainly because of the scale of production machinery, semi-fabricated products and, more simply, limits to sizes that can be handled and transported. Welding is a method of permanently joining one part to the other, where required. The tacit assumption made by many is that the welded joints formed are homogenous with the parent material.

## The reality of welding aluminium

When we sell aluminium welding, we say it is not more difficult than steel, only different. Simply, while there are steels which would fit this description, mild steel is far more welding friendly, for four reasons.

The first is that it requires very little preparation for welding; the second that it changes colour with increasing temperature – an indicator used by welders; thirdly, it is far less sensitive to fit-up; and finally, the weld bead and the adjacent area are not significantly affected from a strength point of view.

Finally and not directly related to welding, the stress strain characteristic of steels is different to aluminium. In particular, unlike steels, aluminium does not reach a stress level where plastic deformation without increase in stress. Consequently some design details based on steel practice are

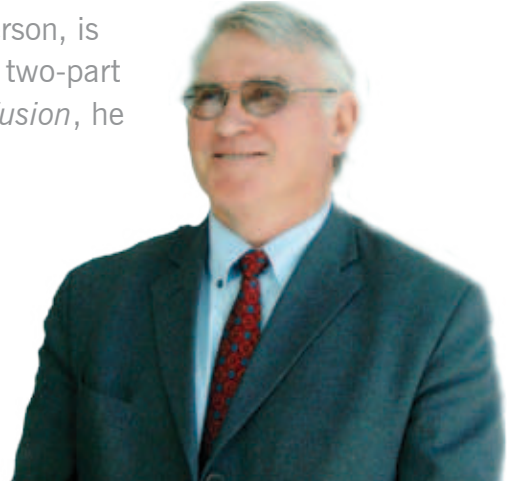
inappropriate to aluminium. Equally, because the Young's Modulus is three times lower than steels, stiffness is a consideration.

Possibly we believe our marketing message without a clear understanding of the differences between the welding disciplines.

This combination places specific challenges to welded aluminium fabrication. The first is in design.

The positioning of welded joints is more sensitive as a result of the heat affected zone that affects the area 25 mm on either side of the joint. The other three factors noted above, affect fabrication. The management of welded aluminium fabrication requires a very different approach to workshop management. More care and attention to detail is required.

But it can be done. Successful examples include the fuel tankers. In this case, care is required both to ensure a competent structural joint and one that does not leak. Fuel tankers are common on the road, and are all fabricated from welded aluminium.



'Mr Aluminium' Dr Tony Paterson.

## What needs to be managed?

The first level of detail is an understanding of the significance of individual welded joints. Not all are equally stressed. There are a few joints which, in general, and specifically in fabrications, are subject to dynamic loading as joints where particular attention to detail is required. This enables the allocation of better welders, welding machines and the development of procedures for the more critical joints.

In *African Fusion's* November issue, Dr Paterson will look at the welding of aluminium at workshop management and fabrication level together with the challenges faced by the welder.



Fuel tankers are all fabricated from welded aluminium.