CWA UpDate

Canadian Welding Association | Association canadienne de soudage

Issue 3- Decemberr 6th (2017/2018 season) Hamilton and Region Chapter

Please plan to attend our next seminar

Wednesday December 6, 2017

Holiday Inn Burlington Hotel & Conference Centre"

Located at 3063 South Service Road, Burlington. Attitude adjustment: 5:30 p.m. Dinner: 6:00 (Sharp) Seminar 7:00 pm Dinner entrance fees for this meeting are: $20 for students, $35.00 (members and $40 for non-members

Note: "*First year"* basic membership is free (*at present*)

You **must** reserve for Dinner.

Topic

Welding Advanced High Strength Steels in the Auto Industry

By: Elliot Biro

With increasing regulatory pressures on the automotive industries to increase fuel economy while also increasing vehicle safety, automobile manufacturers are using advanced high strength steels (AHSS) in their current designs. Increasing AHSS usage allows car companies to use thinner materials for parts in the body-in-white and other load bearing areas of the vehicle, which decrease overall vehicle weight, without sacrificing part strength. However, increasing material strength increases the complexity of joining. The high strength and formability of AHSS come from their complex microstructures, which is developed through specialized steel processing and higher amounts of alloying additions than used in conventional steels. This results in highly hardenable materials with metastable phases which may temper when heated. Therefore, when these steels are subjected to the temperature cycles of welding, the mechanical properties across the joint can be very highly heterogeneous; affecting the overall properties of the weldment. However, if the materials being used are understood, and the welding process is designed well, then then the property changes that occur during welding may be accommodated. This presentation discusses several families of AHSS and details both how they develop their strength characteristics through their unique microstructures, and what maybe expected when welding them.

Elliot Biro is a Principal Researcher at ArcelorMittal Global R&D - Hamilton (Dofasco R&D) where he spent 15 years focusing on welding of steels. During his work at ArcelorMittal he has worked in many areas of sheet steel weldability ranging from welding of new steels in HF tube mills to spot weld failures in automotive welding to metallurgical transformations during welding to welding new steels in steel operation processes. His main interest is understanding how the welding process affects the post-welded properties and performance of joints. Elliot holds a Bachelor's and a Master's degree from the University of Waterloo and a PhD from McMaster University and is the author of over 50 journal and conference papers.

Mark on your Calendar

Next meeting: Wednesday February 7/2018

Topic: Topic to be announced

Contact any Hamilton Chapter Board Member for Tickets.

Note! You must reserve in advance

Please register by contacting **Franco Piccoli**

(905) 317-6543

by Friday December 1, 2017

Alternate Contact:

Don Hutt (905) 548-7200 (ext.3079)

Educational Information:

Extracted from CWB module 20 (page 51)

This equation is plotted in Fig. 61 and we can draw some interesting conclusions from it. First, the melting efficiency is very low (a high value of M) for slow welding speeds, very narrow welds and metals with high thermal diffusivity. Second, as $vd/4\alpha$ increases, the value of M drops to a value of about 2 but no further. This means that even the most efficient weld will need at least twice the heat to melt a given width in a plate than would be needed to melt that width on its own.

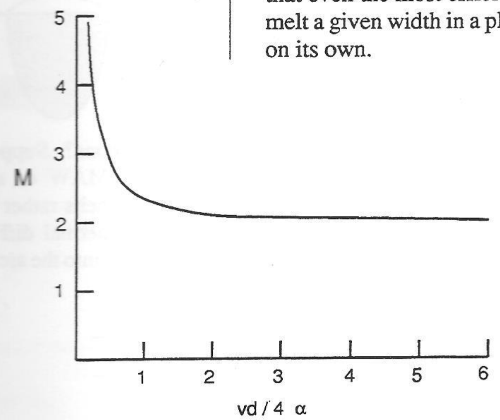

Figure 61. Variation of the melting efficiency with welding parameters. The value of M tends to a constant value of 2 representing a 50% melting efficiency.

Effect of welding parameters

Let us see what welding conditions are needed to achieve maximum efficiency in various metals. For maximum efficiency the value of $vd/4\alpha$ from the graph would have to be at least 1. If we consider a bead width of 10 mm then the minimum welding speeds can be calculated with a knowledge of the thermal diffusivity. Table 11 shows some results for four common metals. For mild steel and stainless steel the minimum speeds are below those commonly employed in welding these metals, and we can conclude that the efficiency is at its highest. For copper and aluminum, however, the normal welding speeds are well below the minimum speeds calculated for maximum efficiency, and therefore melting efficiency in these materials is likely to be quite low.

Table 11. Welding conditions required to achieve maximum melting efficiency.

Metal	Thermal diffusivity m^2/s X 10^{-6}	in.^{2}/s	Minimum welding speed for maximum efficiency mm/s	ipm
Aluminum	85.0	0.13	34.0	80.0
Copper	115.0	0.18	46.0	109.0
Mild steel	14.2	0.022	5.7	13.5
304 Stainless	4.0	0.0062	1.6	3.8
Titanium	2.8	0.0043	1.1	2.6

(for more information see page 51 CWB module 20 *“Structure and Properties of Metals”*)

How to contact us
Canadian Welding Association
Administration Office
8260 Park Hill Drive
Milton, ON L9T-5V7

Toll Free
1-800-844-6790, ext. 256
Fax: 905-542-1318
E-Mail:
Hamilton@cwa-acs.org
Web site:
www.cwa-acs.org

Former Chair: **Don Gemmell** Niagara College (905) 735-2211 (7371)
Secretary: **Jonas Sykula** jsykula@hwdsb.on.ca
Treasurer: **Franco Piccoli** of:
Lawson Products Inc-Cronatron/Certanium Divisions (905) 317-6543
Publicity Chair: **Don Hutt** Arcelormittal Dofasco (905) 548-7200 (3079)
Welding Journal Chair: **Kevin Moulton** Lincoln Electric (289) 439 4556
Membership Chair: **Martin Balah** Air Liquide (289) 260-7187