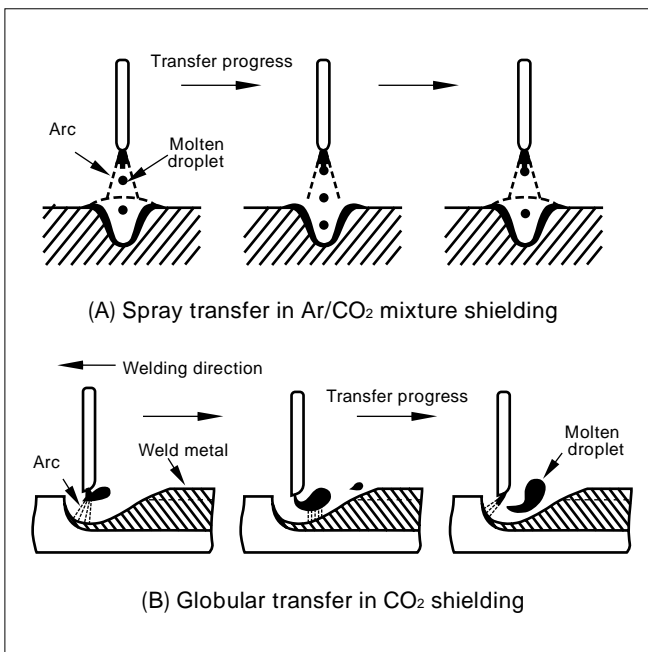


## The ABC's of Arc Welding

### What the Ar/CO<sub>2</sub> - Mixture Shielding Offers

In gas metal arc welding of mild steel and 490N/mm<sup>2</sup> high strength steel Ar/CO<sub>2</sub> mixtures are often used for gas shielding besides CO<sub>2</sub>. The choice of shielding gas varies country by country and user by user. In Europe Ar/CO<sub>2</sub> mixtures are more popular, whereas in Japan CO<sub>2</sub> is the favorite. Machinery fabricators often use Ar/CO<sub>2</sub> mixtures, whereas steel structure fabricators prefer CO<sub>2</sub>. The rest of this article discusses the characteristics of Ar/CO<sub>2</sub>-mixture shielding in comparison with CO<sub>2</sub> shielding.

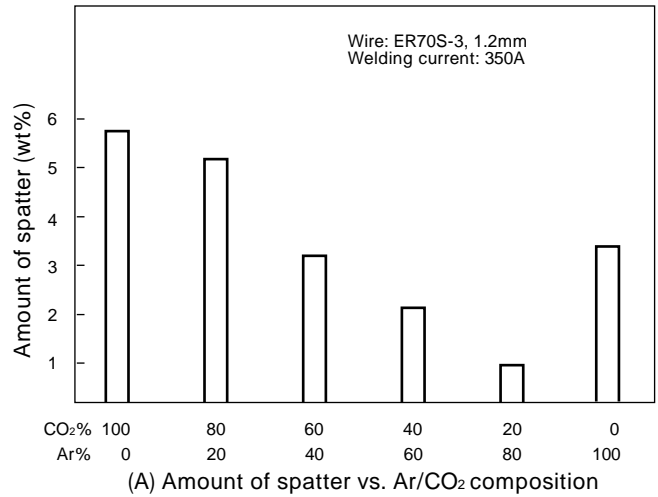
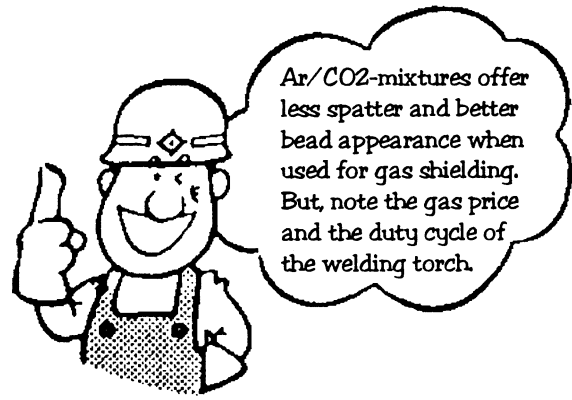
The most important useful characteristic of Ar/CO<sub>2</sub> mixtures, typically 80%Ar+20%CO<sub>2</sub>, is their unique molten metal transfer mechanism. The Ar/CO<sub>2</sub>-mixture shielding allows the molten metal transfer to occur through "spray transfer" at high welding currents. With CO<sub>2</sub> shielding, on the other hand, molten metal transfer at high welding currents occurs through "globular transfer" in the case of solid wires. Fig. 1 shows the difference between the two.



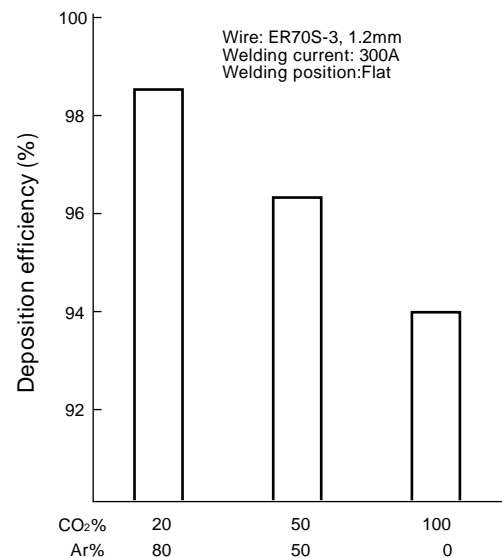
**Fig. 1 - A comparison between Ar/CO<sub>2</sub> mixtures and CO<sub>2</sub> on the molten metal transfer mode in gas metal arc welding with solid wires**

Generally speaking, spray transfer reduces spatter, as a result, increases deposition efficiency (Fig. 2), and improves bead appearance and notch toughness of the weld metal.

In the case of flux-cored wires the type of molten



(A) Amount of spatter vs. Ar/CO<sub>2</sub> composition



(B) Deposition efficiency vs. Ar/CO<sub>2</sub> composition

**Fig. 2 - Effects of Ar/CO<sub>2</sub> composition on amount of spatter and deposition efficiency of solid wires**

metal transfer also depends, on any scale, on the characteristics of cored fluxes, though Ar/CO<sub>2</sub>-mixture shielding provides smoother molten metal transfer through "spray transfer."

Ar/CO<sub>2</sub>-mixture shielding, however, causes a lower duty cycle of the welding torch because of more arc radiation heat than CO<sub>2</sub> shielding. And Ar/CO<sub>2</sub>-mixtures may be more expensive.