

UNLEASH

YOUR WELDING POTENTIAL

ENGINEERING BETTER WELDS. BUILDING BETTER OPERATIONS.

ENGINEERING RESOURCE CENTER

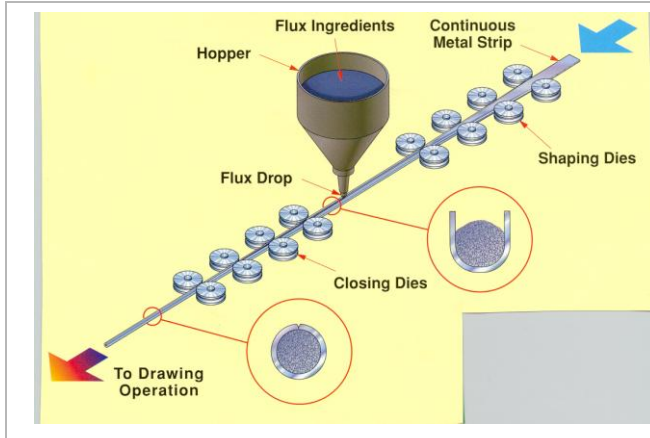
ER-002 | REV. 3

Metal-Cored Wire

Why It Behaves Differently - Where It Adds Value

PURPOSE Explain what metal-cored wire is, why its tubular construction produces higher current density, and where that difference can create measurable welding productivity.

1 | WHAT IS METAL-CORED WIRE?



A composite tubular wire consisting of a metal sheath surrounding a core of powdered materials. The source presentation notes first commercial production in 1973 and mechanical-property requirements comparable to standard solid-wire classifications such as ER70S-6 / E70C-6M.

KEY IDEA: The tubular construction changes how welding current is carried through the electrode. That electrical difference is the foundation for many of metal-core's productivity advantages.

2 | WHY METAL-CORE IS DIFFERENT: CURRENT DENSITY

SOLID WIRE

Current travels through the entire cross-section of the wire.

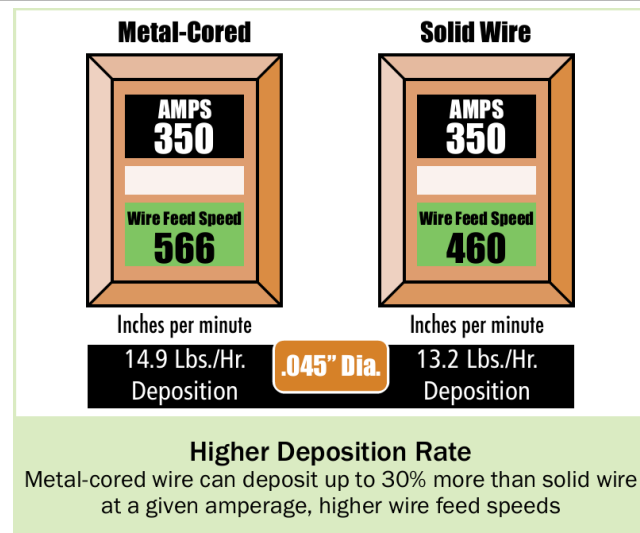
METAL-CORED WIRE

Current travels primarily through the outer metal sheath surrounding the powdered core.

ENGINEERING EFFECT

At equivalent amperage, concentrating current in the sheath produces higher current density. Higher current density allows more filler metal to be melted at the same amperage.

3 | WHAT HIGHER CURRENT DENSITY CAN DO



HIGHER DEPOSITION RATE

The PowerPoint example compares .045 in. wire at 350 A:

Metal-cored: 566 ipm - 14.9 lb/hr deposition

Solid wire: 460 ipm - 13.2 lb/hr deposition

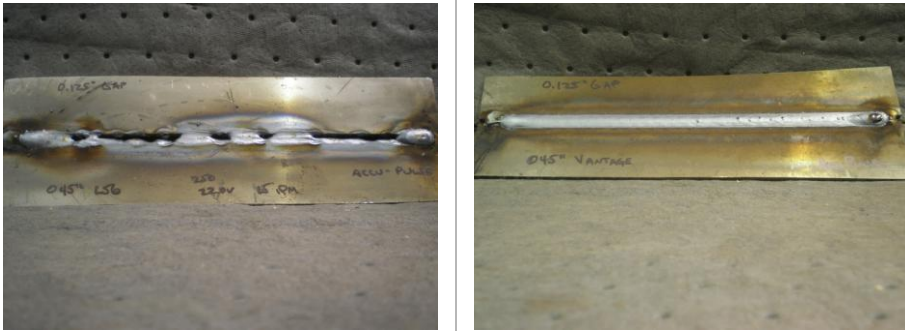
The benefit of metal-cored wire being capable of depositing up to 15-30% more than solid wire at a given amperage through higher wire-feed speeds.

Practical result: More deposited weld metal can create an opportunity for faster travel speeds and higher throughput when the application allows it. In a semi-automated application, welder skill level can be a limiting factor. However, with time and training, the majority of welders adapt and enjoy being more productive especially when pre or post welding activities(non-value add) are reduced or eliminated using metal core.

OTHER ADVANTAGES

1. Bridges part gaps – reduces fit up time and rework
2. Thin material with less burn-through risk. – Ease of use for lower skilled welders
3. Very low spatter with high-argon shielding gas – less grinding or scraping post welding
4. Wider operating ranges – Can be adopted into production environments with a broad skill labor force.
5. Greater tolerance to dirty/scale material – less pre weld time spent for joint prep
6. Higher deposition rates that can support faster travel speeds and reduced heat input/distortion – productivity gains

4 | PROCESS FORGIVENESS IN REAL APPLICATIONS

		GAP TOLERANCE Solid wire and metal-cored wire across a 0.125 in. gap using .045 in. wire at 250 ipm, 22.0 V and 15 ipm travel speed with Accu-Pulse. The metal-cored example shows a much more continuous bead across the gap. Why it matters: Greater gap tolerance can reduce sensitivity to normal fit-up variation.	
	SPATTER The metal-cored spray transfer produces finer droplets than solid wire. Smaller spatter carries less thermal energy and tends to adhere less to base material. ARC CHARACTERISTICS IS SOFT AND WELDER APPEALING.		DIRTY / COATED MATERIAL Greater tolerance to dirty, scale, coated, or painted material and shows a FabCOR F6 example joining 1/8 in. galvanized plate to 1/4 in. primed plate.

5 | WHERE TO LOOK FOR METAL-CORE OPPORTUNITIES

LONGER WELDS Welds greater than 6 in. in length.	AUTOMATION Robotic, fixed and linear automated welding.	JOINT / POSITION Fillet and lap welds in flat or horizontal positions.	PROCESS CONVERSIONS Evaluate solid wire or flux-cored applications where metal-core can add measurable value.
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6 | VALIDATE THE OPPORTUNITY WITH UYWP CALCULATORS

USE THE UYWP CALCULATORS TO QUANTIFY THE CHANGE @ www.unleashyourweldingpotential.com Compare the current process with the proposed metal-core process. Evaluate deposition rate, travel speed, heat input, arc-on productivity and potential cost impact to build a measurable before-and-after business case. Use the Fill Rate Matching Calculator and Welding Cost Analyzer when applicable.
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7 | THE ECONOMIC QUESTION

THINK TOTAL MANUFACTURING COST - NOT WIRE PRICE ALONE Metal-cored wire generally costs more than solid wire on a per lb basis, but labor is the largest welding cost. The business case is higher deposition, faster travel, reduced spatter/grinding, less burn-through/scrap and lower distortion reduce the total cost to produce the weld often without new capital equipment investments.

8 | ENGINEERING INSIGHT

METAL-CORE IS A PRODUCTIVITY TOOL, NOT AN AUTOMATIC REPLACEMENT FOR SOLID OR FLUX-CORED WIRE. Its strongest opportunities are applications where deposition rate, travel speed, fit-up tolerance, spatter reduction or automation can create measurable value.
