

A welder wearing a blue protective suit and a red and black Spider-Man helmet is working on a large, curved metal structure. Bright sparks are flying from the welding point, illuminating the scene with a blue light. The welder is positioned in the upper right quadrant of the image, leaning over the structure. The background is dark, with some red and blue elements visible.

**Increase productivity using
HYPERFILL®**

Increase productivity using HYPERFILL®



AGENDA

HyperFill

- Process description
- Benefits
- Equipment and accessories
- Value Proposition
- Applications

Document Cost Reduction (DCR)

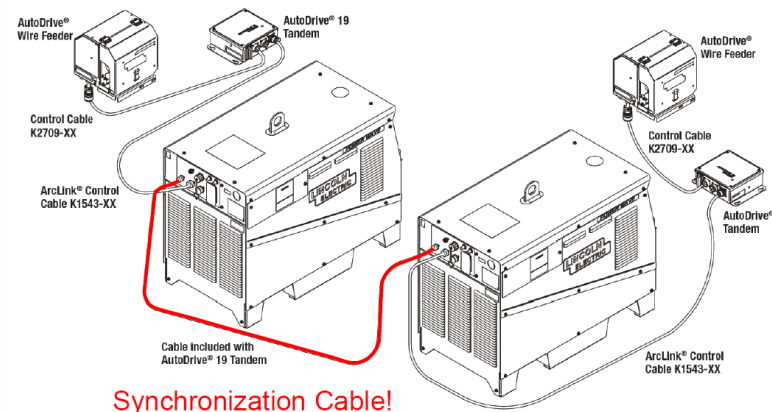
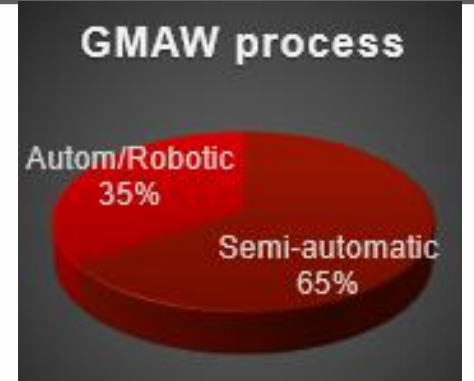
- Basics and methodology

Questions?

Process description

Why HYPERFILL?

- ▶ HyperFill came as the answer to the request of productivity increasing in GMAW semi-automatic process
- ▶ Finds large use in automatic / robotic applications, as low complexity solution against Tandem process



Process description

What is HYPERFILL?

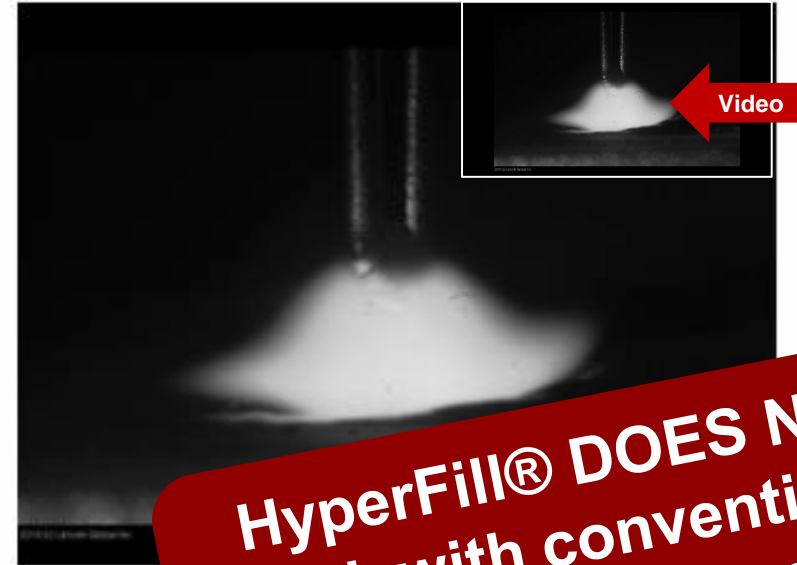
- ▶ HYPERFILL™ is a GMAW twin-arc welding process that utilizes two wires, but:
 - **A single power source**
 - **A single feeder**
 - **A single gun**
 - **A single liner and tip**



Process description

How does HYPERFILL® work?

- ▶ Under the effect of current, a "liquid bridge" is formed between the two wires. It generates large drops that arrive to the molten puddle through a single arc column.
- **Proprietary licensed Waveform, pulsed form type available only with Power Wave S500,S700 and PipeFab**
- **In combination with Premium Lincoln Electric Wires**



HyperFill® DOES NOT work with conventional CV MIG equipment

Process description

Does wire position influence the weld profile?



Benefits

Easy welding

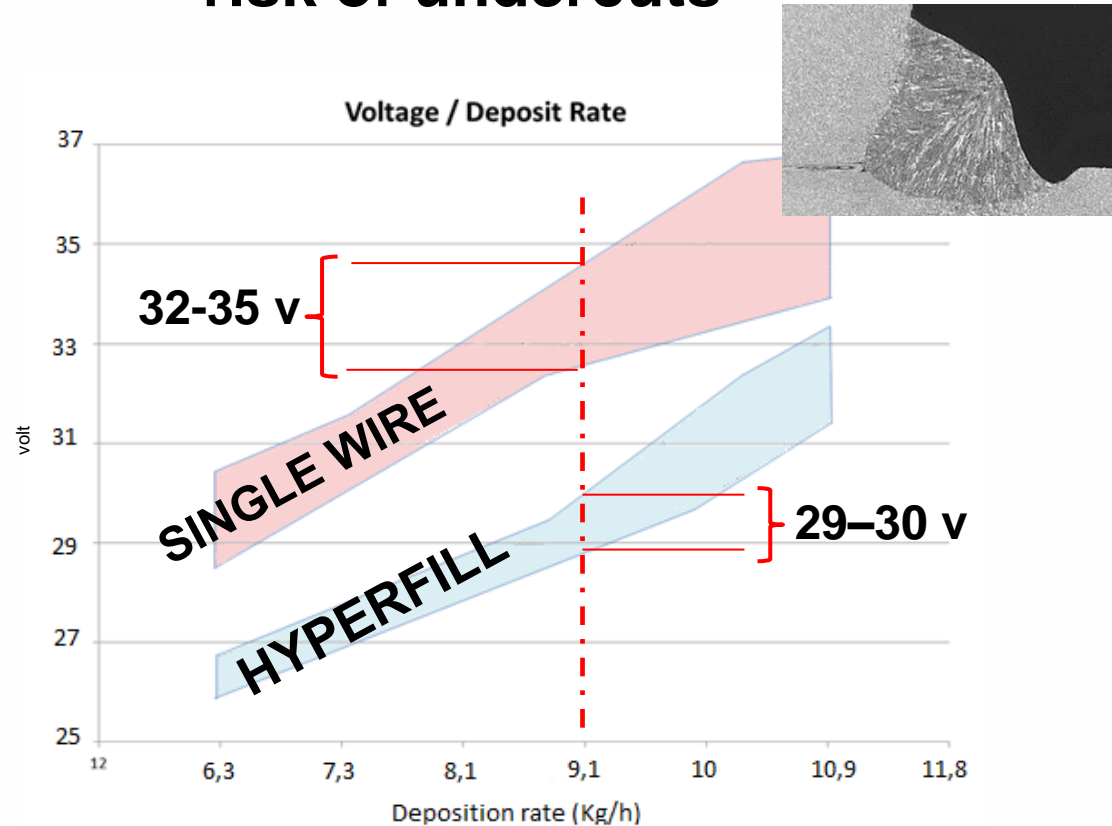


HYPERFILL® produces larger “arc cones” that ease the molten puddle control

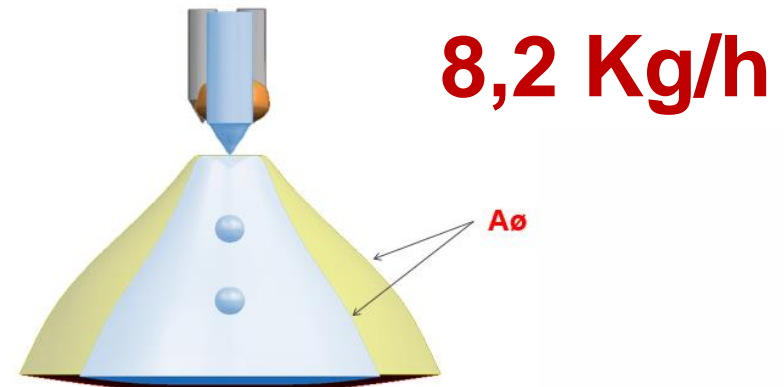
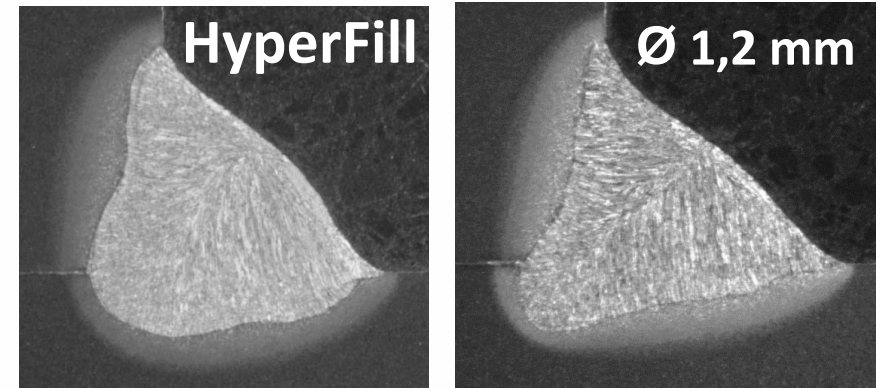
Benefits

Weldability improvement in large beads with HyperFill

Lower voltage reduces the risk of undercuts



More robust bead profile



HYPERFILL FCAW


Benefit using HyperFill FCAW

- Maggiore deposito
- Riempimento più rapido
- Possibilità di saldare in tutte le posizioni
- Flessibilità nell'uso di miscela 100% CO2 o Mix Ar-CO2



HYPERFILL FCAW



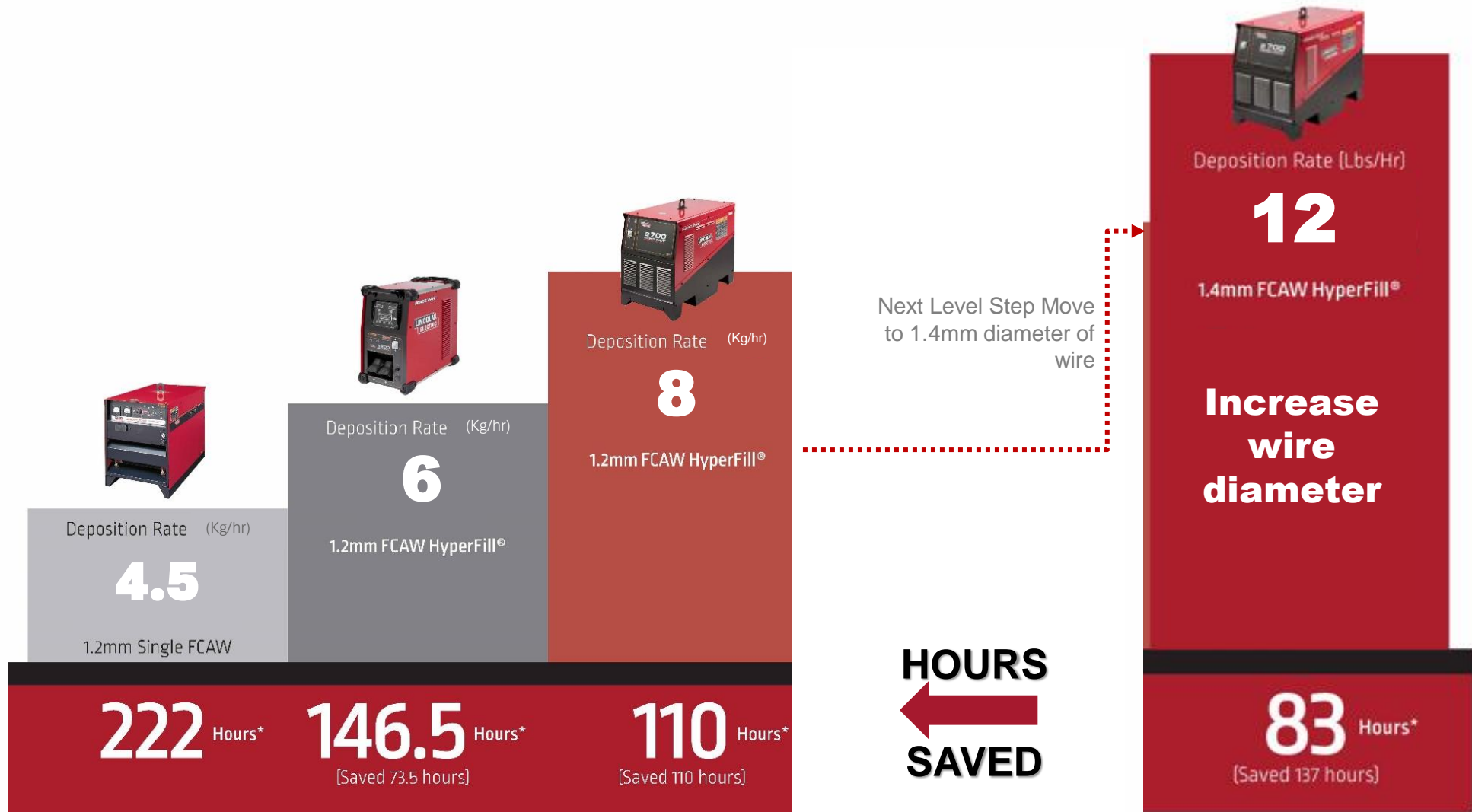
 **+42%**
Speed
in PC/ 2G



 **+25%**
Speed
in PF/ 3G



HYPERFILL FCAW



LINCOLN[®]
ELECTRIC



Equipment and accessories

Equipment and accessories

Wire diameter / equipment

2xØ1.0mm

2xØ1.0mm - 1.2mm

S500



R450



S700



Coolarc 50

Semi-automatic & diam 1,0



Coolwave 20S

Robotic & diam.1,2 mm



Semi - Automatic

Automation



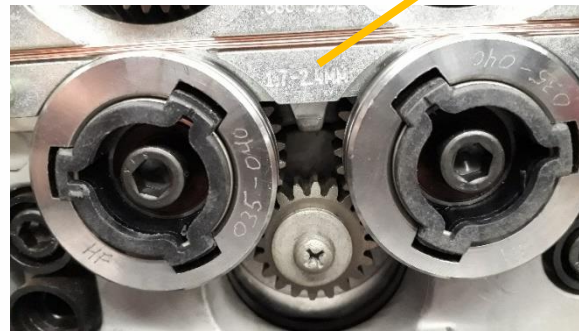
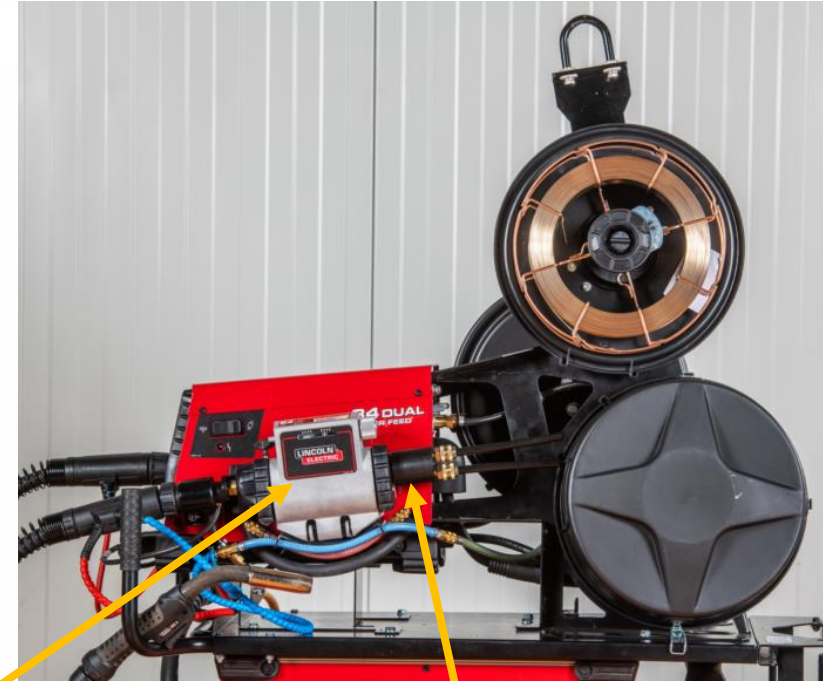
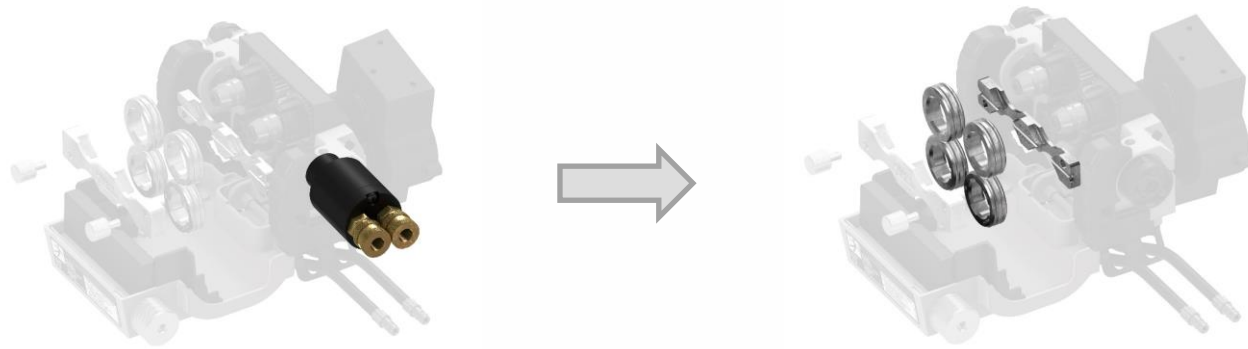
Minor adjustments against a traditional PowerWave configuration



#	Description
1	Single / Dual feeder
2	Dedicated spool holder
3	Magnum Pro 500W - gun
4	HyperFill rollers kit and wire guide

Equipment and accessories

HYPERFILL rollers kit



The wires run in the same groove and enter in the same liner

Wires enter separately in to the inlet and exit together

Equipment and accessories

▶ NEW 2024 – Dual-Cam Contact tips

- ▶ Improved performance and consistency
- ▶ Benefit of Dual-Cam Contact tips:
 - **Better resistance from bending:** the symmetrical Dual Cam profile minimizes bending in the diffuser by pulling the tip face evenly against the diffuser face
 - **Contact tip stay cooler:** two points of contact through tip cams provides more even electrical contact to decrease resistive heating.
 - **Improved consistency:** more secure tip seating maintains a consistent wire placement through tip life cycle.
 - **Increased durability**

Existing Design (Single-Cam)



KP4482 Series
Standard
HyperFill
Contact Tip

New HD Design (Dual-Cam)



KP5344 Series
Figure-Eight
HyperFill
Contact Tip

Equipment and accessories



Item Number K4522-2-FM-45
(45°- 4,5m)

Item Number: K4879-2-10-564
(60°+ longer tube- 4,5m)

Magnum® PRO 500A

Water Cooled Semi-Auto Torch

- Multiple length options (Up to 8m)
- Extended necks available (+75mm)
- Barrel Style with trigger on top (shoulder type handling)



Magnum® PRO 500A

Water Cooled Mechanization and Automation Torch

- 4.6m or 7.6m Length
- Straight torch Body

Item Number:
K52293-15 (4,5m)
K52293-25 (7,5m)



Trolley for HyperFill

- Power Feed 84 or 84 Dual

Item Number: K14331-1

Premium Wires

Filler metal for mild steel material



SupraMig® HD

- Stabilized arc
- **High deposition**
- Low silicates

SupraMig Ultra® HD

- Stabilized arc
- **High deposition**
- Low silicates
- Higher strength

SupraMig® HD

CLASSIFICATION

AWS A5.18 ER70S-6
EN ISO 14341-A G 46 4 M 3Si1 / G 42 3 C 3Si1

SupraMig Ultra® HD

CLASSIFICATION

AWS A5.18 ER70S-6
EN ISO 14341-A G 50 5 M 4Si1 / G 46 3 C 4Si1

The wire is the most critical variable to realize quality weld at right cost

Premium Wires

Wire rod selection to grant wire constancy

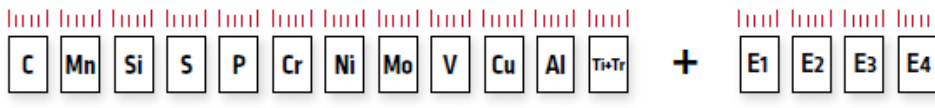
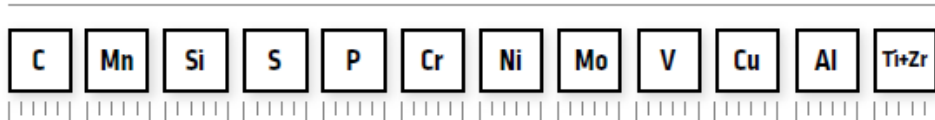
- Only from selected European steel makers
- Dedicated purchasing specification
 - Chemistry
 - Rod features (mechanical /surface)



Highly controlled chemistry

- Narrower elements variability than AWS / EN standards
- More elements controlled

EN ISO RANGES



LINCOLN ELECTRIC RANGES

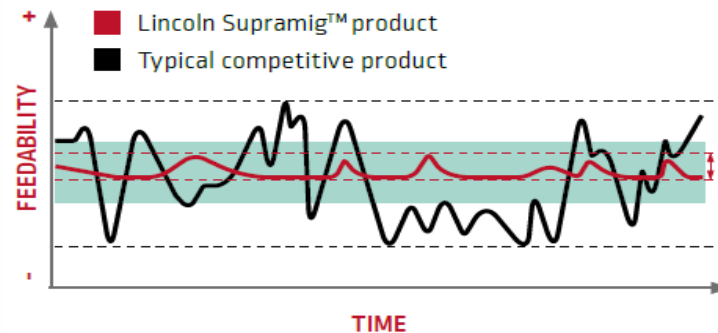
Specific additional elements control

Create a unique product that improves arc stability and reduces costs

- Dry drawing process
- Engineered surface treatment enables:
 - Faster arc establishment
 - Entering in spray-arc at lower voltage
 - High speed feeding
 - Reduced contact tip wear
 - Long distance feeding



5 TIMES FASTER
FULLY ESTABLISHED ARC



60% LESS
INSTABILITY IN WIRE FEEDING

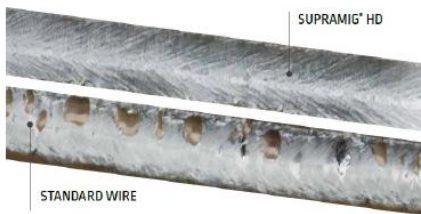
Premium Wires

Minimal silicate islands

AREA OF SILICATE ISLANDS



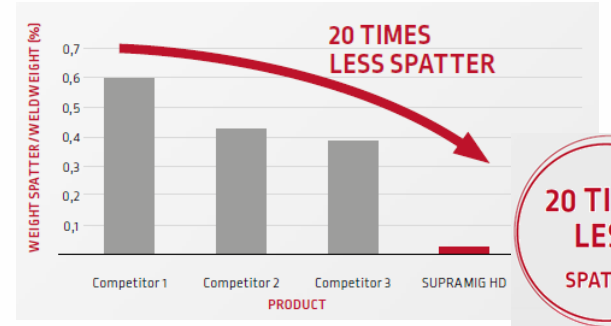
4 TIMES LESS SILICATE ISLANDS



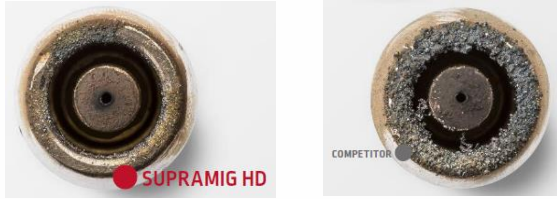
- Welds ready for painting
- Little / no rework

Low spatter level

- Reduce change over/ nozzle cleaning
- Improved contact tip life

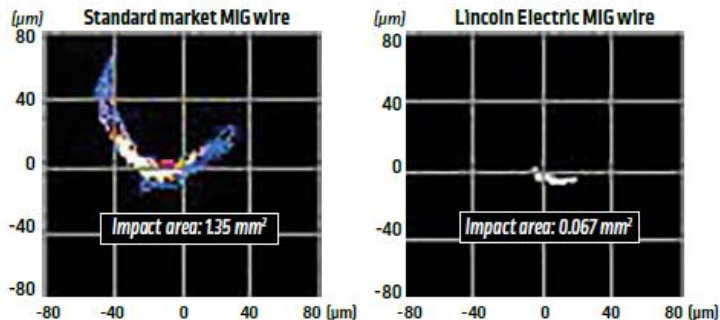


20 TIMES LESS SPATTER



Precision spooling and dedicated packaging for an optimal wire placement

Wire Placement Accuracy Test*



*Test measuring the wire placement area during 10 min of welding.

Example of bad wire placement



Example of good wire placement



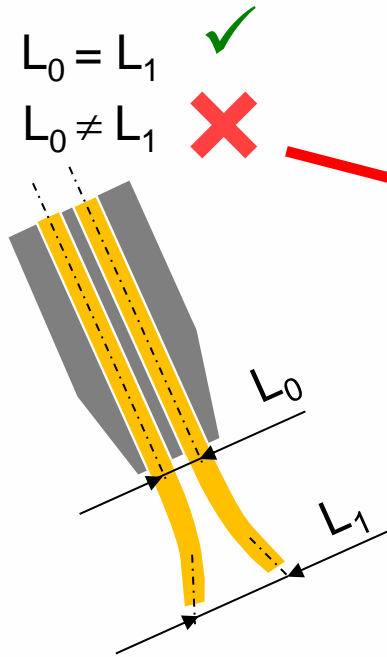
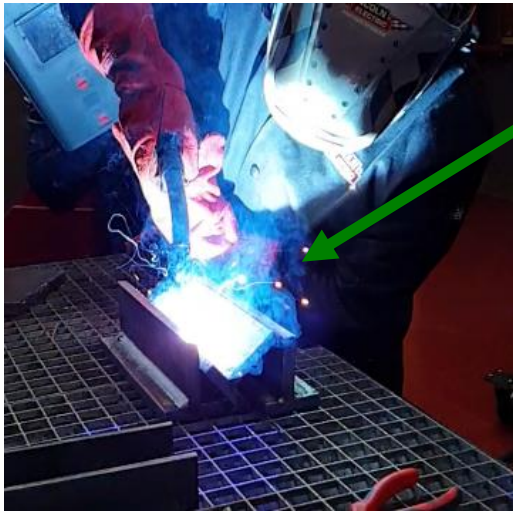
5 TIMES LESS DEVIATION IN WIRE PLACEMENT



- No defects due to poor wire placement

Premium Wire: SupraMig[®] HD

New wire geometry



- ▶ HF grade available for both Supramig and Supramig Ultra
- ▶ Precise wire geometry and consistency in both spools and drums to ensure stable arc



Wire geometry inconsistency results in unstable electrical arc with important generation of spatter

FCAW Wire: Fluxofil 464M

Starting market situation

- ▶ Range of LE rutilic wires

Product name		Core Type	Gas	AWS	EN ISO
FLUXOFIL 14 HD	-30	R	M/C	E71T1-M21A2-CS1-H4	T 46 3 P M 1 H5
FLUXOFIL 20 HD	-40	R	M	E81T12-M21A4-Ni1-H4	T 46 4 1Ni P M 1 H5

- ▶ Excelent reputation of Fluxofil 14HD for carpentry.
- ▶ New requests for a «-40°C» wire economically advantageous, without Ni due to base material costs.

- ▶ **NEW PRODUCT:**

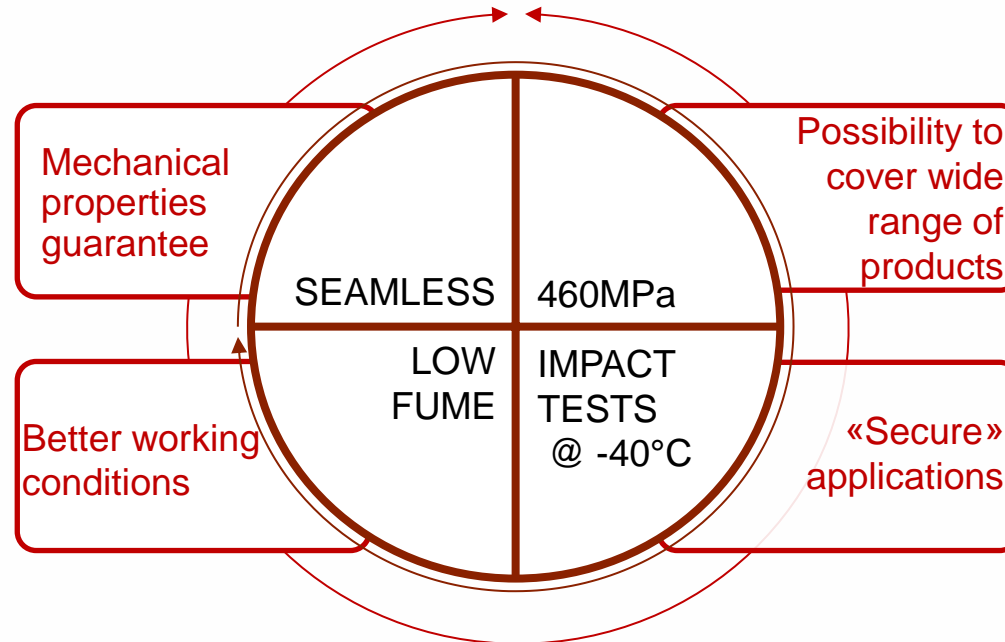
- ▶ Seamless technology, better guarantee of mechanical properties
- ▶ NO Ni, weaker chemical composition, good weldability in all positions
- ▶ $R_y = 460\text{MPa}$ for S355 e S460
- ▶ Impact test at -40°C
- ▶ Reduction of welding fumes to improve the working conditions of welders



FCAW Wire: Fluxofil 464M

► Name of product explain to us its characteristics

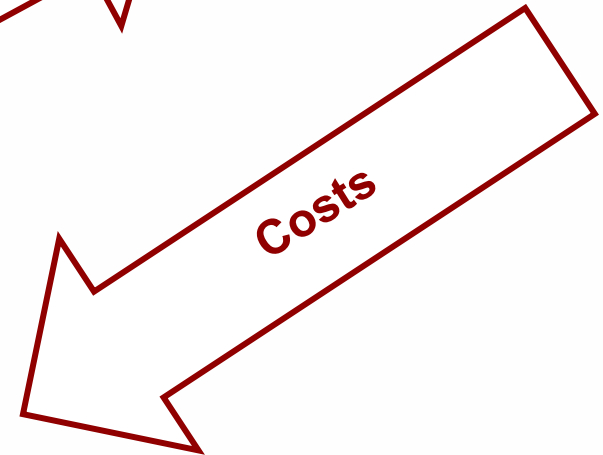
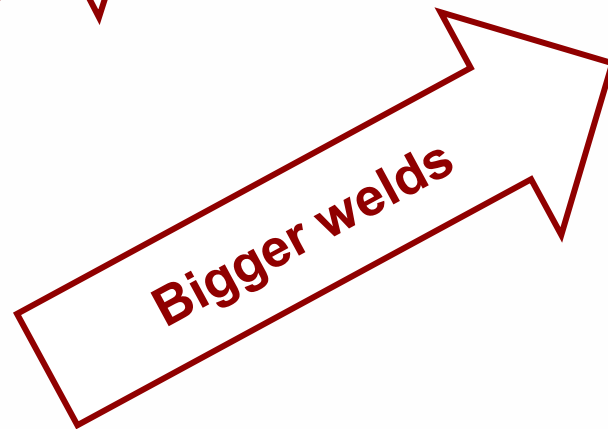
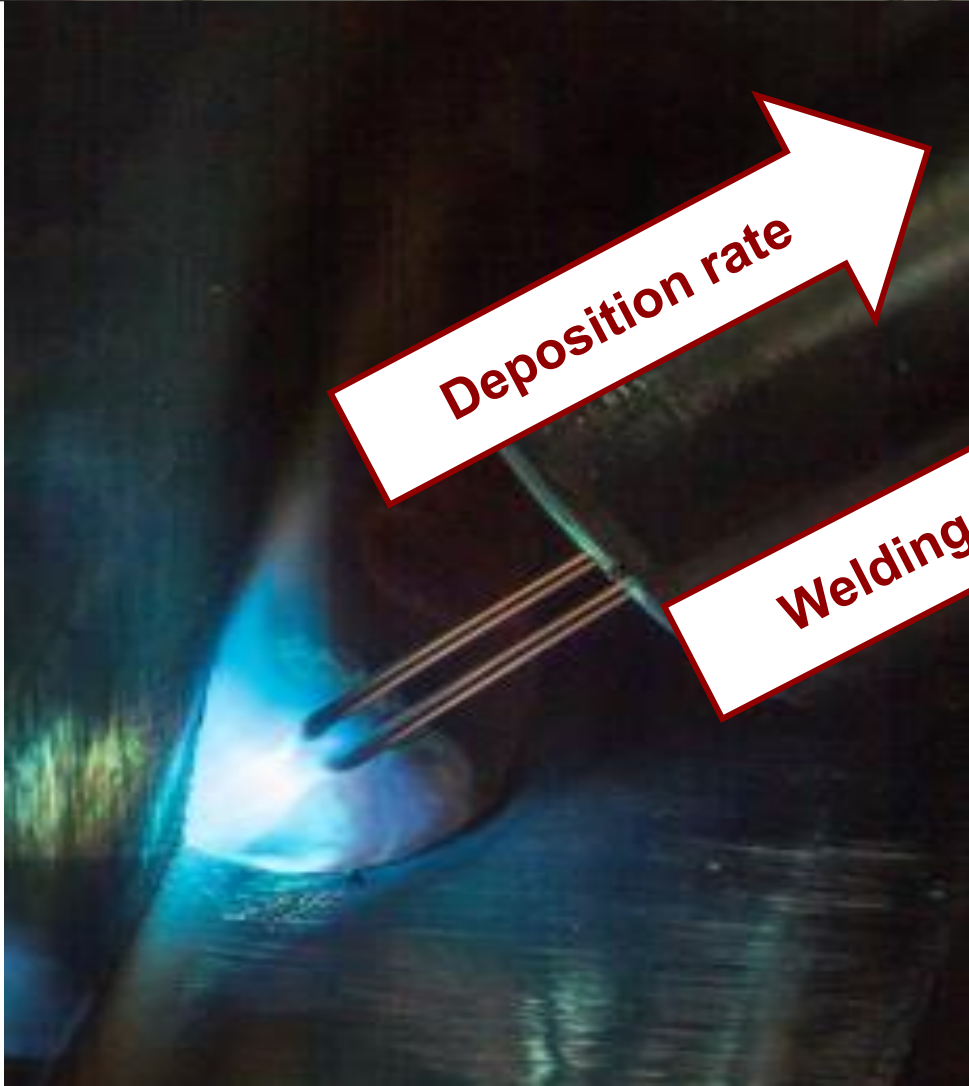
Product name		Core Type	Gas	AWS	EN ISO
FLUXOFIL 14 HD	-30	R	M/C	E71T1-M21A2-CS1-H4	T 46 3 P M 1 H5
FLUXOFIL 464M	-40	R	M	E71T1-M21A4-CS1-H4	T 46 4 P M 1 H5
FLUXOFIL 20 HD	-40	R	M	E81T12-M21A4-Ni1-H4	T 46 4 1Ni P M 1 H5





Value proposition

How HyperFill could improve your competitiveness?

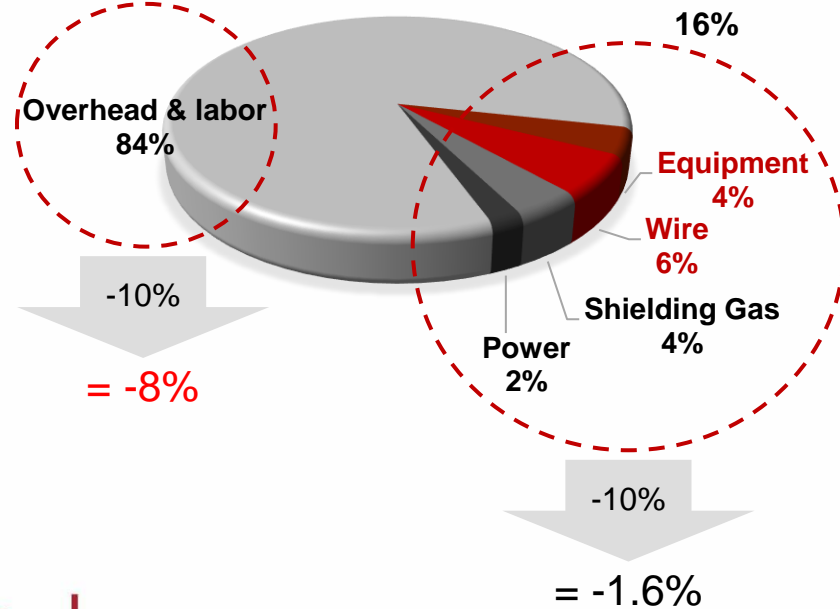


Productivity and production costs

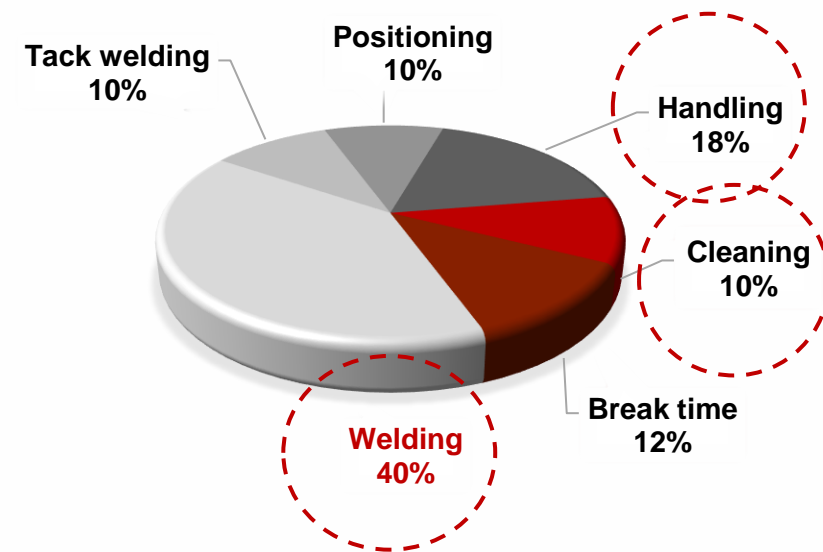
Increase productivity using the right solution

- ▶ What production cost is composed of?
- ▶ A reduction of 10% in labour cost is more effective than same reduction in material cost
- ▶ Check your operation split in detail
- ▶ Welding represents roughly 40%(*) of a typical production hour

PRODUCTION COST



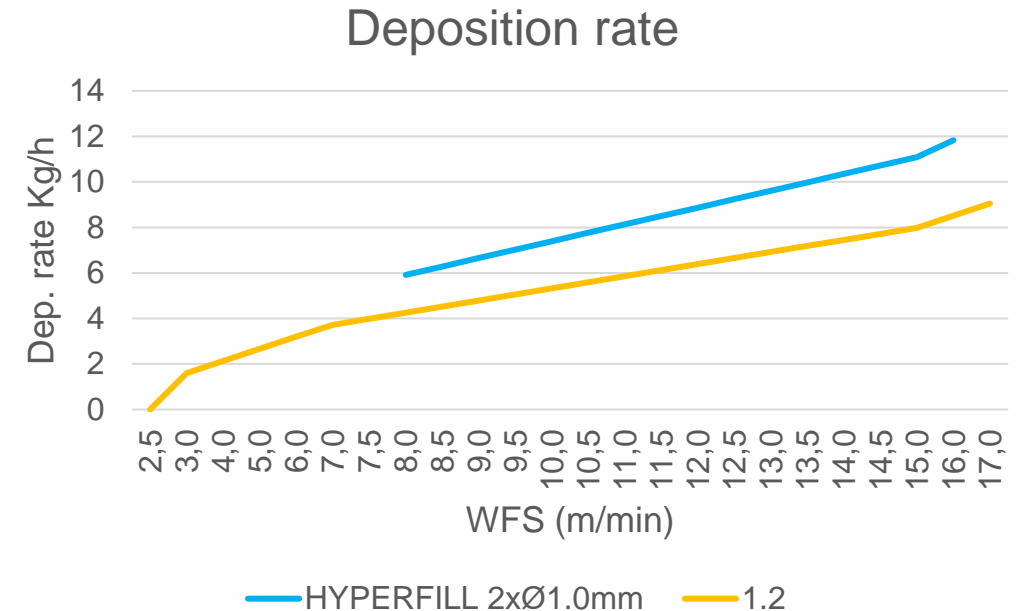
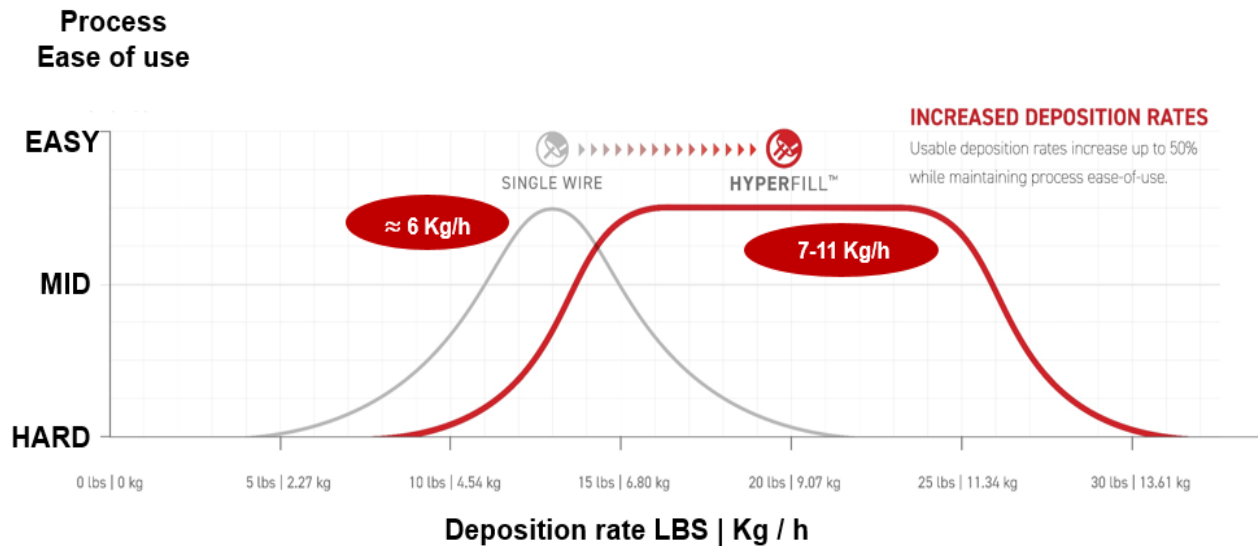
WORKING TIME



(*) as average amongst different types of processes)

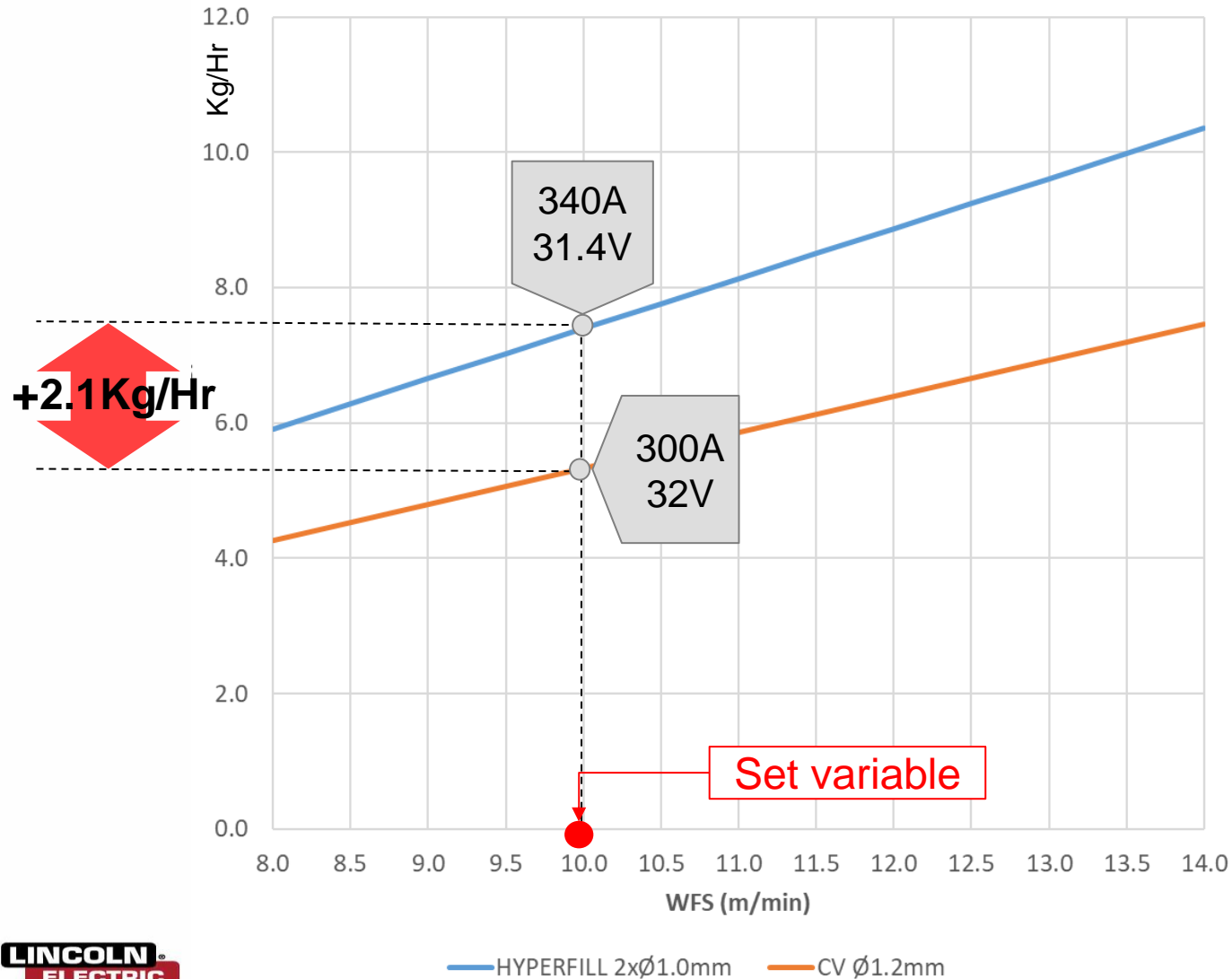
Deposition rate

- ▶ HyperFill allows to get up to 8,1 Kg/hr of deposition rate (> 11Kg/Hr robotically with PowerWave S700 and 2xØ1.2mm wire)

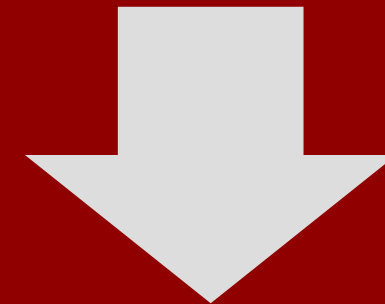


Means of improving Productivity

Keeping the same WFS



At the same WFS
True Energy slightly increase (10%)
Heat input lower

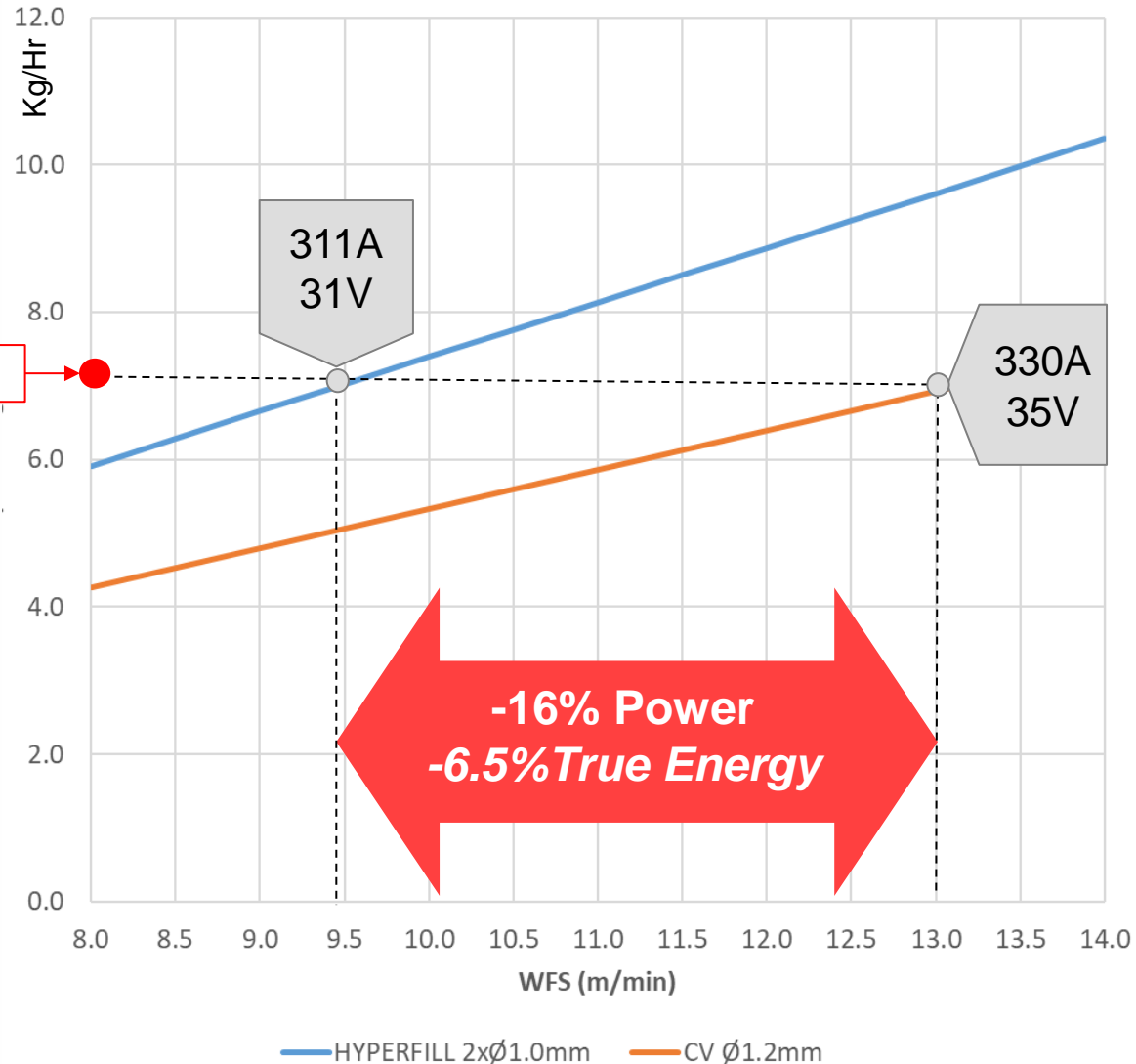


+40% Increase deposition rate

At 10 m/min WFS: From 5.3Kg/Hr to 7.4Kg/Hr

Means of improving Productivity

Keeping the same Deposition Rate



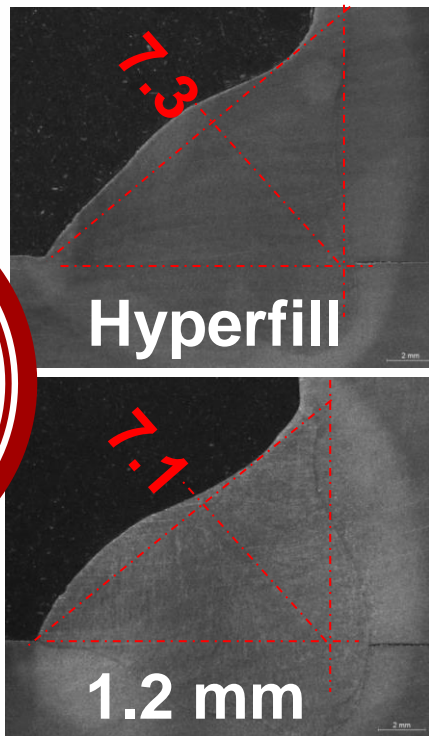
At the same Deposition Rate
Easier for welders
Easy control of molten Pool

-16% Power (Watts)

Reduced energy cost / per Kg of
welding wire deposited

Fillet weld made faster and bigger

**Better
Bead
Shape**



+ 35%
Travel Speed
For similar Q

>7 mm
throat size
in PB
position

Hyperfill 1,0

→ Travel Speed 30 cm/min / Q=2.1 kJ/mm

1,2 mm CV

→ Travel Speed 22 cm/min / Q=2,3 kJ/mm



Manual and Mechanized Applications

Mechanized

**WELDYCAR 2.0
PRO**



**WELDYRAIL 2.0
PRO**



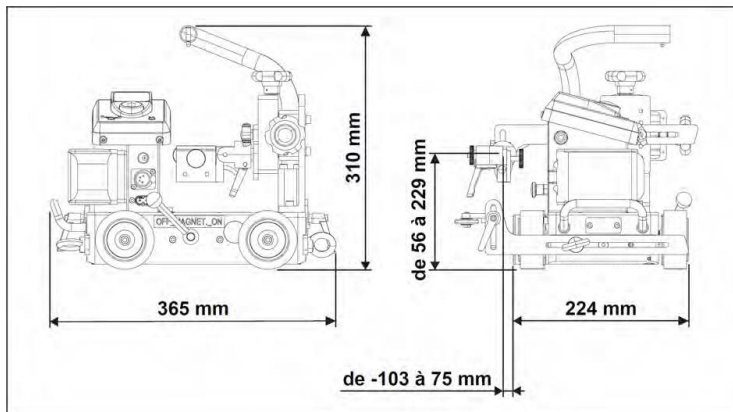
BENEFITS:

- Constant quality in welding
- Increased productivity
- Operating factor 50%
- Simple using
- Comfort for welding operator
- Less effort
- Little investment
- Light and robust
- Strengthen battery

Market Segment



Mechanized



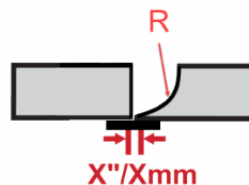
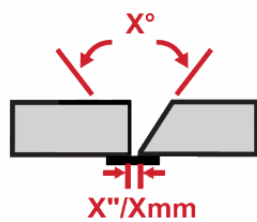
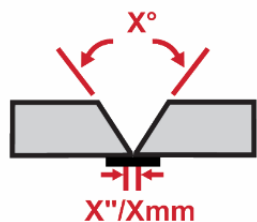
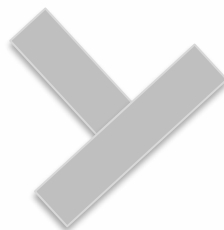
	WELDYPAR 2.0 PRO
Weight	9 Kg
Power supply	Battery 18V - Li-Ion 5Ah
Battery life	20h - 8h
Guiding	Crabbing rollers
Magnetic force	28 Kg
Programming	YES
Torch holder with arc sensing	Universal quick attachment
Carriage speed	1 to 180 cm/min
Overall dimension (L x W x h)	365 x 260 x 310mm

Applications

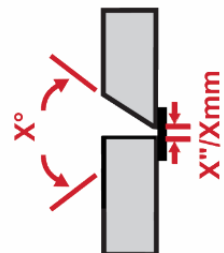
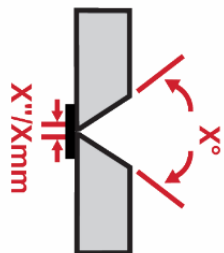
Joint types and welding positions

Mild steel type S235-S460 EN 10025

PA



PB/PC

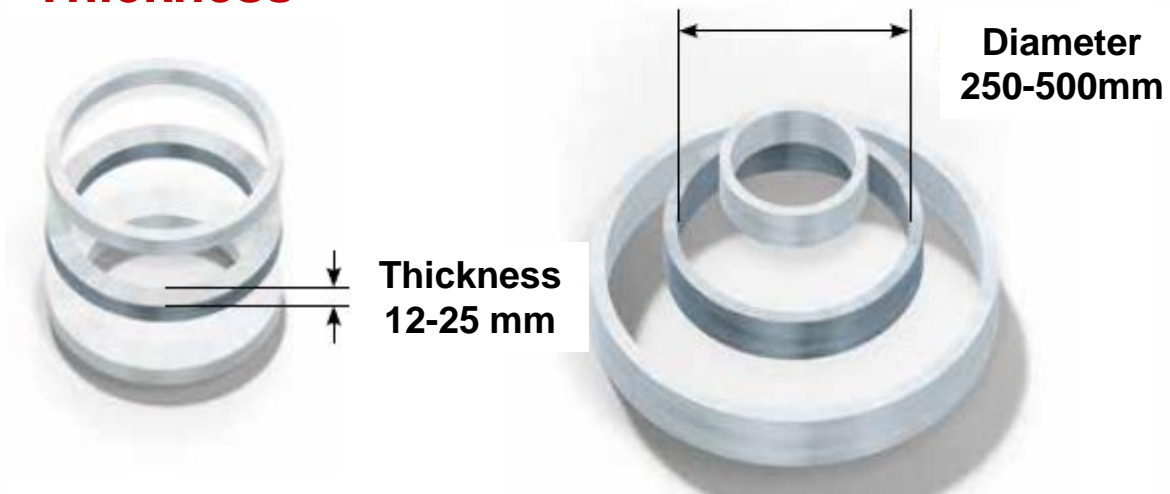


Applications

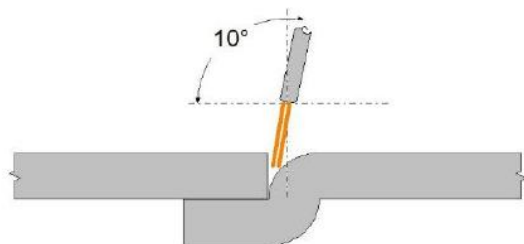
Pipe welding 1G rotating

Thickness

Pipe diameter



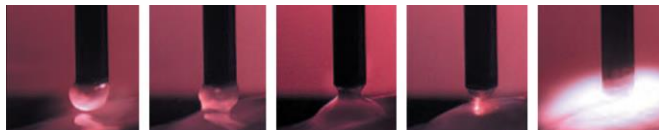
LPG tank welding



Welding speed: 2-3 m/min
(may vary according to
thickness and tank diameter)

Applications

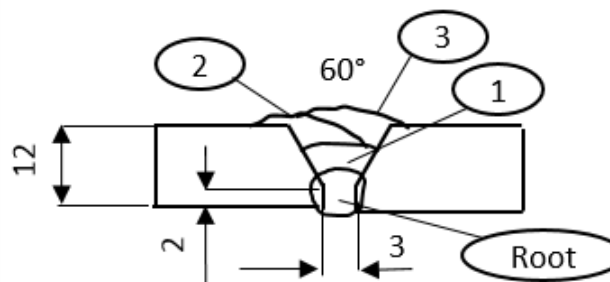
Combinaition STT + HyperFill®



#	Diam (mm)	V	A	Vel (cm/min)	Dep. (Kg/h)
Root	1,2	15,8	200	28	2,4



#	Diam (mm)	V	A	Vel (cm/min)	Dep. (Kg/h)
1-3	1,0	31,5	330	40	8,2





Robotic applications

Robotic / Automatic solutions

Power sources

Power Wave R450:
For diam. 1,0 mm



Power Wave S700:
For diam. 1,0 & 1,2



Coolwave 20S
Cooler



Autodrive 4R220
wire drive

Gun

Magnum PRO Robotic Gun
- 600 A @ 100% in Mix gas
- **Configuration: through arm**
- available for

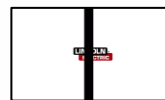


ABB
FANUC
KUKA
YASKAWA

- Other on demand

PRODUCT SPECIFICATIONS

Product Name	Product Number	Robot Arm	Torch Type	Cable	Breakaway Disk	Amperage Rating (with 90/10 Ar/CO ₂)	Wire Diameter Range, in. (mm)
Magnum PRO Water-Cooled Robotic Torch	K3593-1	Fanuc 100IC/6L	Standard	K4399-1	KP2920-4	100% @ 525A	.035 - 5/64 in. (0.9 - 2.0 mm)
	K3593-1A		Air Blast				
	K3593-2	Fanuc 120IC/10L	Standard	KP3499-2			
	K3593-2A		Air Blast				
	K3593-3	Fanuc 100IC	Standard	KP3499-3			
	K3593-3A		Air Blast				
	K3593-4	Fanuc 100IC/8L	Standard	KP3499-4			
	K3593-4A		Air Blast				
	K3593-5	Fanuc 120IC	Standard	KP3499-5			
	K3593-5A		Air Blast				
	K3593-7	Fanuc 100ID	Standard	KP3499-7	KP2920-9		
	K3593-7A		Air Blast				
	K3593-8	Fanuc 100ID/10L	Standard	KP3499-8			
	K3593-8A		Air Blast				





DCR
DOCUMENTED COST
REDUCTION

Examples of
potential saving
achievable with
HyperFill[®]

DCR- Example

			135-GMAW	HyperFill®	
Electrode / Flux Name – Class. Number			ER70S-6	Supramig HD G3Si HF	
Electrode Diameter – Shielding Gas			1,2 mm – M21 80% CO ₂ / 20% Ar	1,0 mm – M21 80% CO ₂ / 20% Ar	
WFS / Amps / Volts			10 / 300A / 32V	11 / 370A / 32V	
Polarity			DC+	DC+	
Deposition Rate @ 100%		(kg/h)	5,3	8,1	
Operating Factor			30%	30%	
			(kg/h)	1,6	2,4
			(h/kg)	0,6	0,4
LABOUR AND OVERHEAD	Labour & OH Rate	(€/h)	40,00	40,00	
MATERIAL DATA	Electrode Cost	(€/kg)	1,30	1,80	
Gas Flow Rate		(l/min)	18 000	30 000	
Total Material Costs		(€/kg)	3,38	4,08	
Grand Total Costs		(€/kg)	28,54	20,54	
SAVINGS*		(€/kg)		8,00	

* estimates

HyperFill's effect on welding cost reduction

Comparison with spray-arc process, delivered by conventional CV power sources and welding parameters commonly used with mild steel solid wire 1,2 mm diameter

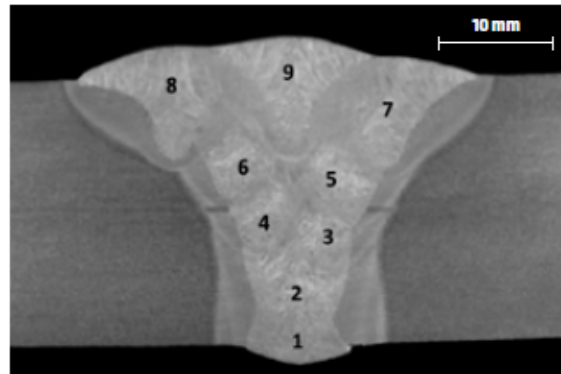
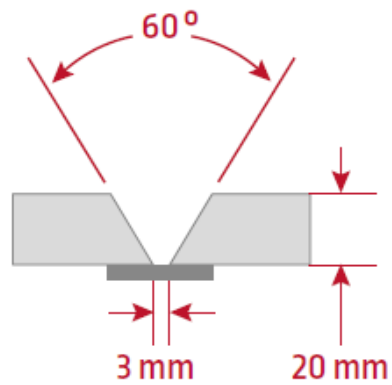
UP TO
+50%
DEPOSITION
RATE

UP TO
35%
TIME REDUCTION
TO DEPOSIT 1KG
OF MATERIAL

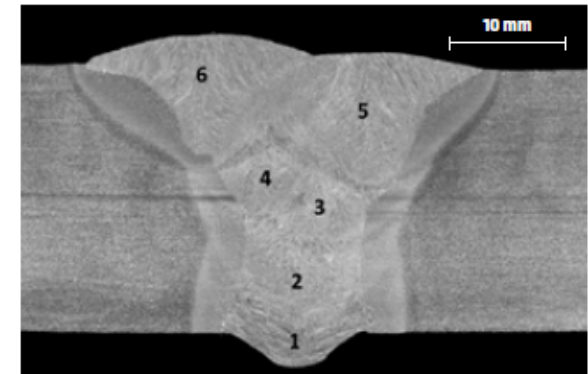
UP TO
30%
COST REDUCTION
PER KG OF
WELDING

DCR – V Groove

Welding conditions in semi-automatic mode									
Process	Run n°	Wire diam. (mm)	WFS (m/min)	Voltage (V)	Current (A)	Travel speed (mm/min)	Gas flow (l/min)	Heat input EN1011-1 (kJ/mm)	Welding time (min/m)
135 GMAW	1-2	1,2	9	28,5	280	250	20	1,53	8,00
	3-8				275-290	300		1,25-1,32	20,00
	9				285	350		1,11	2,86
Total welding time @100%OF									30,86
Welding time @30% OF									102,86
HyperFill® – 135 GMAW-P	1-2	1	11	32	375-385	300	30	1,92-1,97	6,67
	3-6				355-390	390		1,40-1,54	10,26
Total welding time @100%OF									16,92
Welding time @30% OF									56,41



Macrographic section of the butt joint realized with GMAW



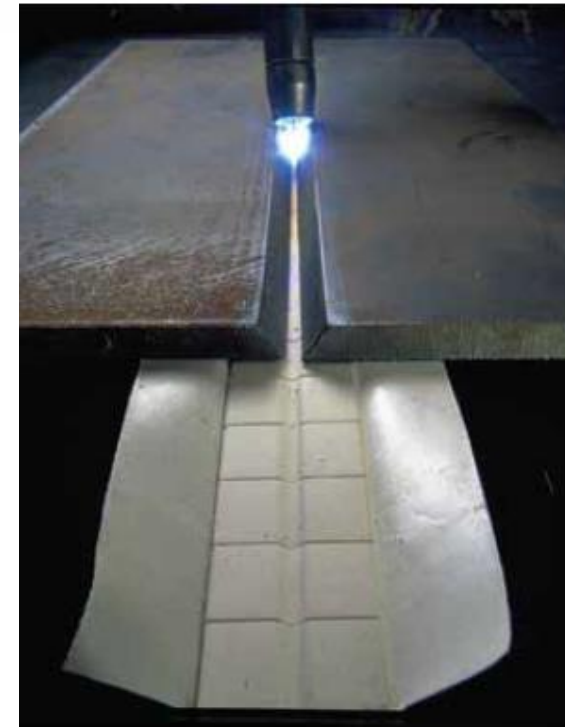
Macrographic section of the butt joint realized with HyperFill®

DCR – V Groove

Economical parameters

Labour cost and OH rate	€/h	40
ER 70S-6 diam 1,2 mm cost	€/kg	1,5
Supramig HD G3Si1 diam 1,0 mm	€/kg	1,8
Operating Factor OF	%	30

Process		135-GMAW	HyperFill®
Wire diameter	mm	1,2	2 x 1,0
Deposition rate	kg/h	4,8	8,1
Welding time @30 % OF	min/m	102,9	56,4
Labour cost & OH rate	€/m	68,6	37,6
Material	kg/m	2,5	2,3
Material cost	€/m	3,8	4,3
TOTAL WELDING COST	€/m	72,4	41,9



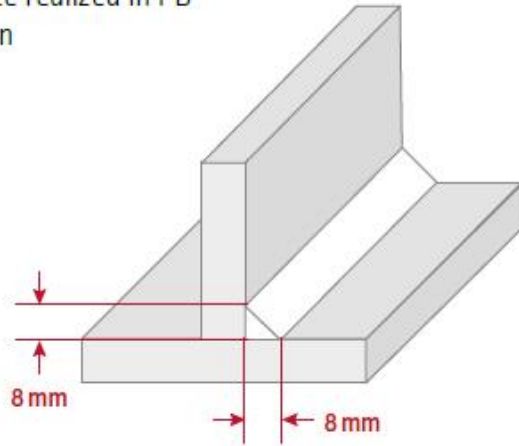
**UP TO
30,5 €/m
SAVINGS**

DCR – T Joint

Welding conditions in semi-automatic mode

Process	Run n°	Wire diam. (mm)	WFS (m/min)	Voltage (V)	Current (A)	T.Speed (mm/min)	Gas flow (l/min)	H.Input EN1011-1 (kJ/mm)
135 GMAW	1	1,2	9	28,5	275	250	20	1,5
HyperFill® – 135 GMAW-P	1	2 x 1,0	11	32	370	380	30	1,5

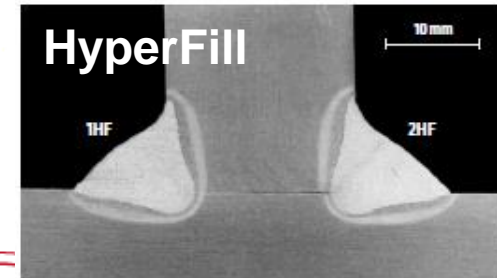
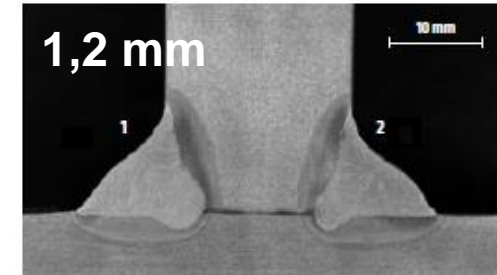
Fillet weld 8 x 8 mm
legs size realized in PB
position



Economical parameters

Labour cost and OH rate	€/h	40
ER 70S-6 diam 1,2 mm cost	€/kg	1,5
Supramlg HD G3Si1 diam 1,0 mm	€/kg	1,8
Operating Factor OF	%	30

Process		135-GMAW	HyperFill®
Wire diameter	mm	1,2	2 x 1,0
Travel speed	cm/min	25	38
Deposition rate	kg/h	4,8	8,1
Deposition rate @ 30 % OF	kg/h	1,44	2,44
	kg/m	0,32	0,36
Labour cost per Kg of weld	€/kg	27,8	16,4
Price of welding electrode	€/kg	1,5	1,8
TOTAL WELDING COST	€/kg	31,6	20,5
	€/m	10,1	7,3



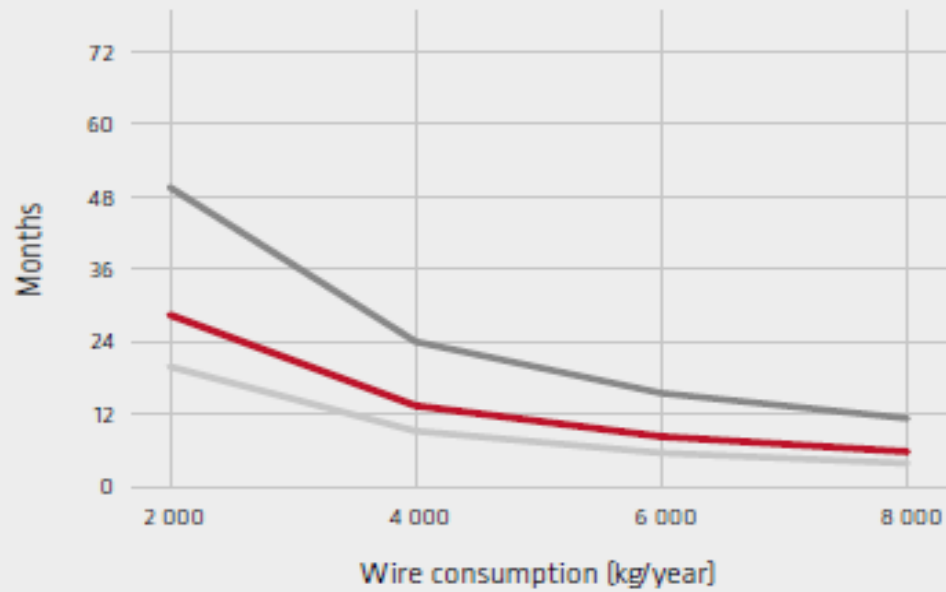
UP TO
11,1 €/kg
2,8 €/m
SAVINGS

GMAW		HyperFill®	
Section 1	Section 2	Section 1HF	Section 1HF
6,2 mm	6 mm	6,4 mm	6,45 mm

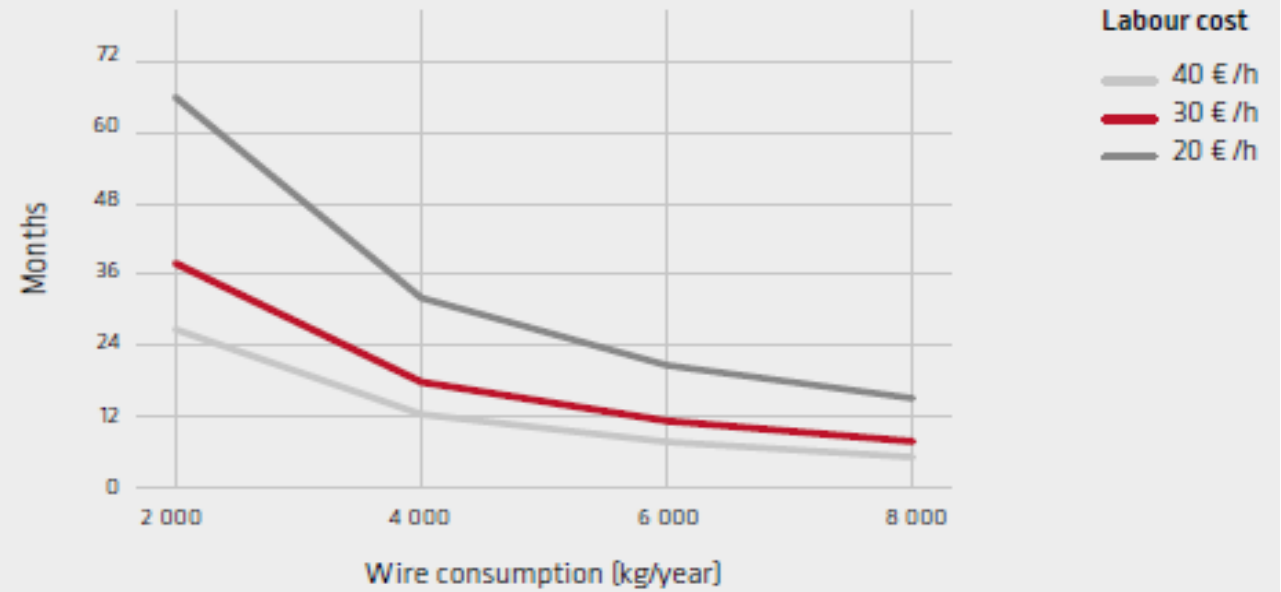
Throat thickness of the fillet weld

DCR- Analysis summary

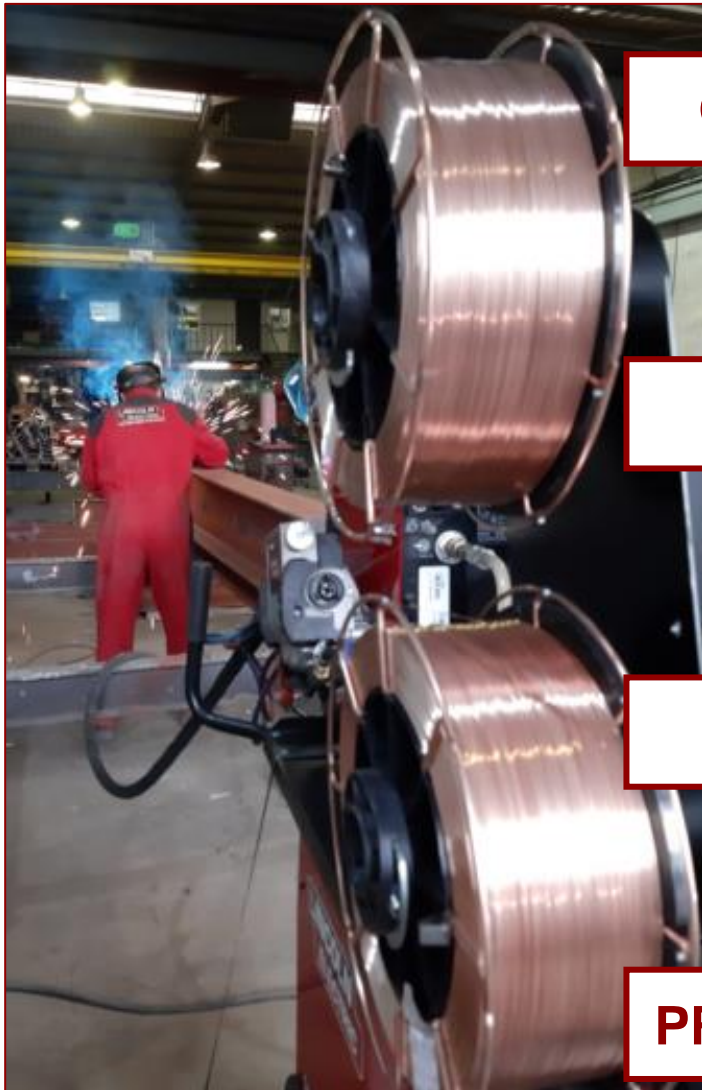
Payback for an Investment of 15 k€



Payback for an Investment of 20 k€



Summary



QUALITY

Best penetration profile and less prone to undercut

SIMPLE

Welding parameters regulation is extremely simple – just wire feed speed

EASY

Managing large molten puddle is definitively easy for the welder.
Comes ready to weld in minutes

PRODUCTIVE

HyperFill allows to increase the deposition rate making the process highly productive

Questions?





STRUCTURAL



HYPERFILL SOLUTIONS

INCREASED PRODUCTION