

The role of technology centres in overcoming challenges to additive manufacturing adoption

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Responsible for WAAM Technology, Industry & Transport Division



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About us

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TECNALIA is the largest applied research and technological development centre in Spain, a European benchmark and member of the Basque Research and Technology Alliance.





Headquarters

- Basque Country
- Branches Cádiz
 Madrid
 Zaragoza

China Colombia Ecuador France

Branches Abroad

ItalyMexicoSerbia

About us

- TECNALIA in Spain
 CEA in France
 FRAUNHOFER in Germany
- TNO in the Netherlands
 SINTEF in Norway
 VTT in Finland



SUPPLY-DEMAND INTERMEDIARIES

People are behind technology. Generating impact through applied research is only possible if you attract, retain and train the best talent.

We believe in the value of people



Results that generate economic impact

We offer technological solutions that generate high impact opportunities and we are committed to our clients' results.

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Multi-technological Excellence

We have a multi-disciplinary team to anticipate the needs of today and of the future through technological hybridisation.

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Proximity to the market

Our objective is to be the **technological partner of all companies**, regardless of their size and R&D and innovation needs.

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TECNALIA Additive Manufacturing Value Proposal

At TECNALIA we develop new additive manufacturing technological solutions to respond to the main industrial sectors, such as aeronautics, automotive, machine tooling, among others, innovating in processes, materials and machines, covering the COMPLETE CYCLE to obtain parts according to the specifications of each market.





Who we are

- March 2017 (established)
- Outcome of business cooperation between two main machine tool manufacturers- (2014-2017)



Industrial Partner

ONA

MAHER HOLDING

Technology Partner



MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Public Investment









ΛDDILŃN

- **Pioneers** The first in offering WAAM Technology Comercial solution
- **Experts** in HDR Additive Manufacturing
- Disruptive
- Strong commitment to Coolaboration





WAAM Technology (Wire Arc Additive Manufacturing)

How it works



Wire is melted using an arc welding process to create a bead.

Beads are overlapped to create layers.

2.

3.	

The piece is created layer by layer.

VDDILVN



Additive Manufacturing

Technologies for Metals Manufacturing



POWDER BED

DIRECT ENERGY DEPOSITION

	EBM/SLM	Laser+Powder	EBAM	WAAM
Source	Laser	Laser	Electron Beam	Arc Welding
Material	Powder	Powder	Wire	Wire
Max. Deposition Rate	100 cm ³ /h	250 cm ³ /h	2000 cm ³ /h	1000 cm³/h
Shape Complexity	Very High	Medium-High	Low-Medium	Low-Medium
Part Size	Small	Unlimited*	Unlimited*	Unlimited*
Equipment Cost	High	High	Very High	Medium
Material Efficiency	>75%	30-80%	>90%	>90%
Material Cost	Very High	Very High	Medium	Medium
Part Performance	Medium	Medium	Very High	High
Versatility	Very Low	High	Low	Medium



& TECHNOLOGY ALLIANCE

CHALLENGES IN WAAM TECHNOLOGY



ADDILAN SERIE: ARCLAN P1200-4X

- Dimensions: 2850x3100x3550mm
- Maximum part size: 1200X900X500mm
- Maximum part weight: 300 kg
- TILT axis. Addition in both sides of the part
- PLASMA Technology.
- Inert atmosphere chamber (Ar, He or mixtures)
- Load/unload system for preserving inert atmosphere
- Deposition rates:

Steels: up to 5 kg/h Ti6Al4V: up to 3 kg/h Inconel® 718: up to 4 kg/h Aluminum: up to 2 kg/h

VDDIL VN







ADDILAN SERIE: ARCLAN-5X

- 3Axis o 5 Axis Machine. Flexible mechanical solutions
- Different Arc Technologies available
- Inert atmosphere chamber (Ar, He or mixtures)
- CNC Control Specific for WAAM Technology
 - · Touch probe cycles
 - · Layer growth
 - · Interpass temperature
 - · Part traceability
- Technology Database:
 - Low carbon steel. Up to 5kg/h,
 - Stainless steel. Up to 5 kg/h,
 - Special Steels (Invar). Up to 5 kg/h,
 - Inconel. Up to 3 kg/h

VDDILVN







NDDILKN



Material Characterization

✓ Microstructures obtained in materials manufactured by WAAM

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✓ Tensile test results obtained in materials manufactured by WAAM

WAAM vs conventional methods		Rm (MPa)		
		WAAM average H	Conventional	
		and V	methods	
Superalloys	Ti6Al4V	953	>=931	
	Inconel 718	787	1276	
Steels	ER120 Steel	1164	770-940	
	INOX316 Steel	558	500-700	
	ER70 Steel	538	520-620	
Aluminium	A1 4043	126	130	
	Al 5356	271	270	







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Inconel

SS 316L

Acero

NEW DEVELOPMENTS

- ✓ Multimaterial parts
- Different materials inside the same part
 Hybridization of material



Specific Software

 \checkmark

✓ Monitoring & Control System







Examples of Components





Tooling AI 5356 Height:1200 mm



Invar tooling



Steel component



Fixturing







StainlessSteel



Impeller SS316L





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