

Innovation & Technology

AIMEN, 2015

Joining Sub-Platform General Assembly

MANUFUTURE

Brussels, 20/11/2015



We are an **Innovation and Technology Centre** specialized in **research** and in providing advanced **technological services** in the fields of **joining technologies, materials and laser technologies applied to materials processing.**

Our VISION is to become a strategic technology partner for each and every one of our associates and customers, contributing to improving their technological capabilities.

+600
R&D&i Projects
In the last 10 years

15
Patents
In the last 5 years

+750
Clients
Annual average 2009-2014

+200
Staff employed
23 doctors
60% men/40% women

11,1 M€
Gross Income
Annual average 2009-2013

+246.000
Technical Reports
As of 31/12/2014

1967
Founding of AIMEN

1995
Opening of the Armando Priegue building in O Porriño

1998
Official recognition as a Innovation and Technology Centre

2002
Creation of a Pilot Joining Technology Plant

2004
Comissioning of the Laser Technologies Research Plant

2014
Opening of the Laser Applications Centre

H2020-FoF12-2015: ComMUnion

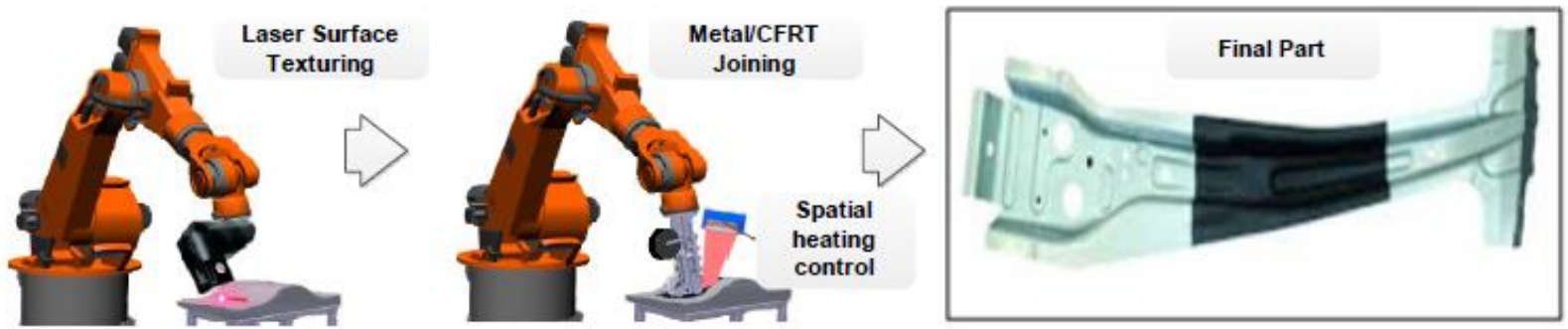
Net-shape joining technology to manufacture 3D multi-materials components based on metal alloys and **thermoplastic composites**



MAIN OBJECTIVE

ComMUnion enables productive and cost effective manufacturing of **3D metal/CFRTs multi-material components**. A**utomatic tape placement of CFRTs** with controlled **laser-assisted heating**, **high-speed laser texturing and cleaning**, **on-line monitoring and inspection, and computational multi-scale modeling** will be combined in a **multi-stage robot solution for joining** to provide the greatest performance joints. Tools for **quality diagnosis and decision support** will be also implemented under a cognitive approach

MULTI-STAGE COMMUNION PROCESS APROACH



CFRT/CFRTs: carbon fibre reinforced thermoplastic

TECHNICAL GOALS

O1: Developing a new **multistage joining robotic solution**

O2: High efficient and flexible surface condition solution

O3: Developing a **multi-scale modelling system**

O4: Implementing an **embedded flexible control of the laser-assisted heating profile**

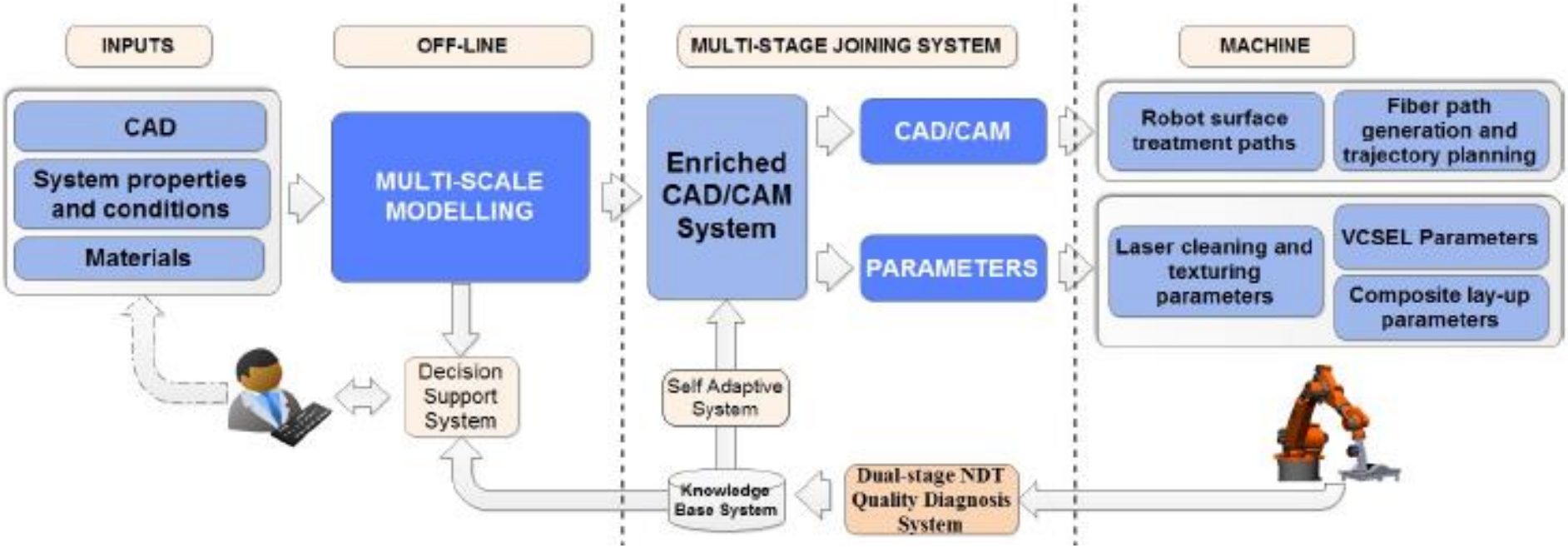
O5: Developing **QDS, Quality Diagnosis System, in a multi-stage manufacturing** approach based on **active imaging techniques.**

O6: Self-adjustment of process parameters

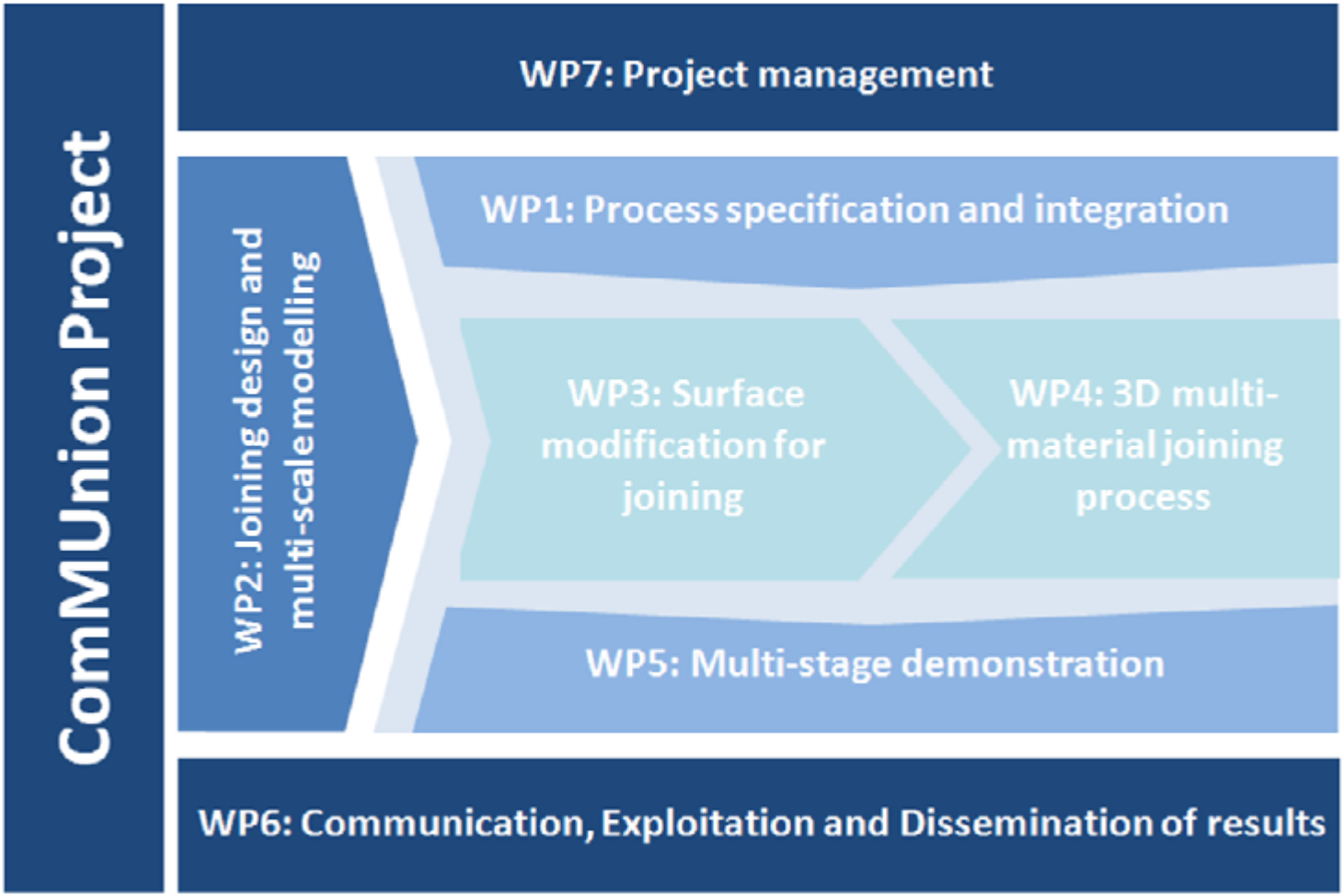
O7: Demonstration of **recycling/reuse by direct heating of the metal**

O8: Demonstration of a **fully automated 3D joining multimaterial technology** applied to **automotive and aeronautics**

CoMUnion CONCEPT

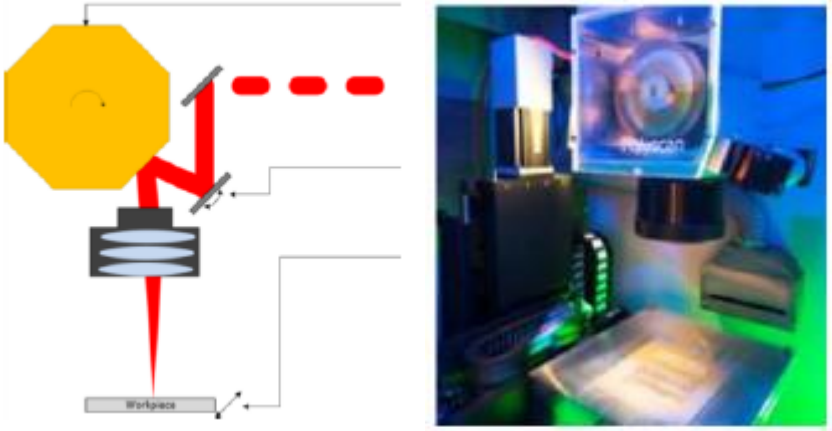


WORK PACKAGES AND INTERDEPENDENCES

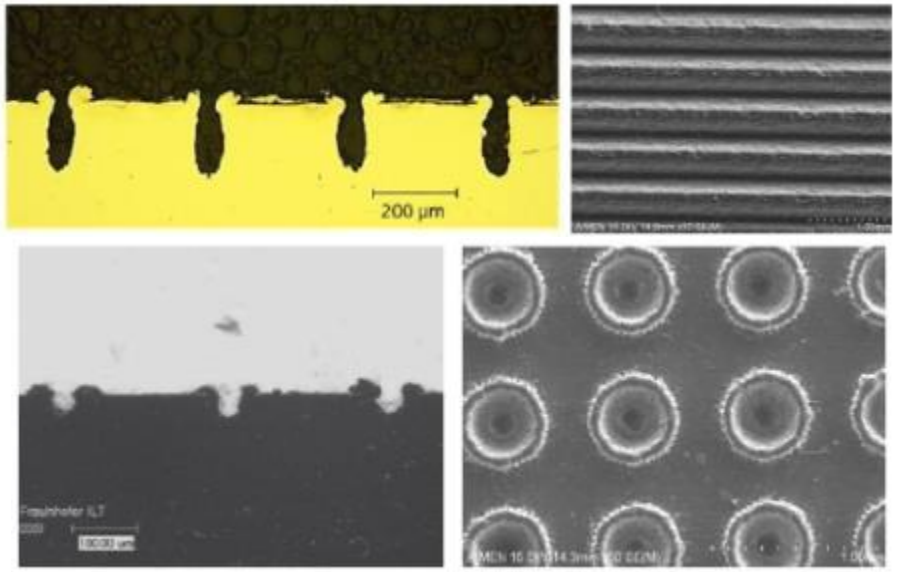


LASER TEXTURING AND CLEANING OF SURFACES

ELIMINATION OF UNDESIRED SUBSTANCES AND CREATION OF CONTROLLED STRUCTURES ON THE METAL SURFACE FOR THE ANCHORAGE OF THE POLYMER MATRIX OF THE COMPOSITE.



polygon scan laser (*Source: FhG-ILT*)



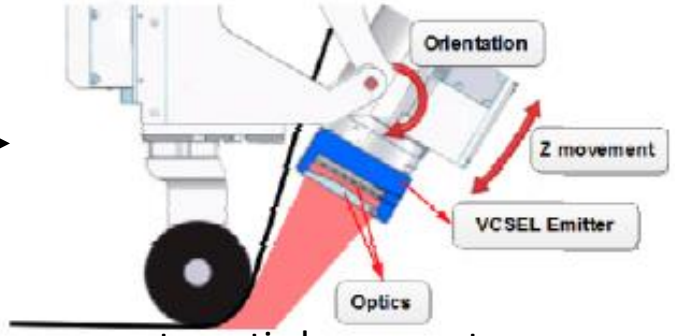
Texturized surfaces details (*Source: FhG-ILT & AIMEN*)

IMPROVED WETTABILITY AND MECHANICAL INTERACTION COMPOSITE-ADHESIVE/METAL INCREASED

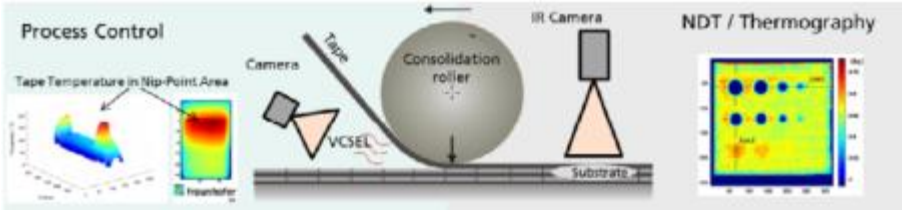
LASER ASSISTED SYSTEM TO HEAT LARGE WIDTH THERMOPLASTIC COMPOSITES/ FLEXIBLE HEAD FOR METAL-COMPOSITE JOINING FOR COMPLEX SHAPES



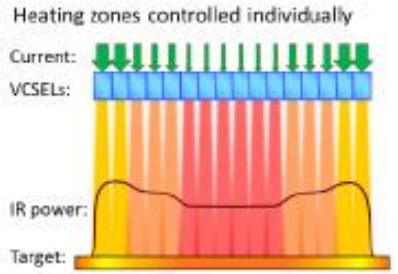
VCSEL heating system *(Source: Philips)*



automatic lay-up system *(Source: FhG-IPT & AIMEN)*



process control *(Source: FhG-IPT & AIMEN)*



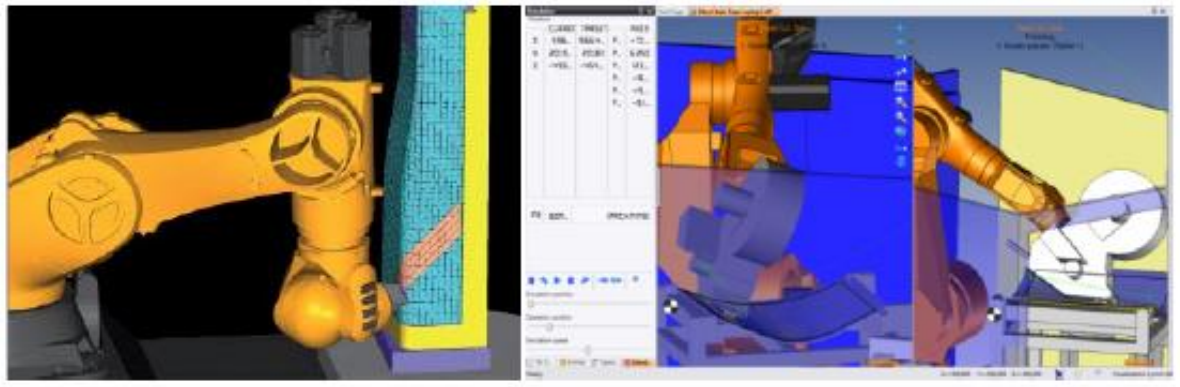
adjustable heating profile *(Source: Philips)*

PARAMETERIZED ENRICHED CAD/CAM SYSTEM

DESIGN AND MULTI-SCALE SIMULATION

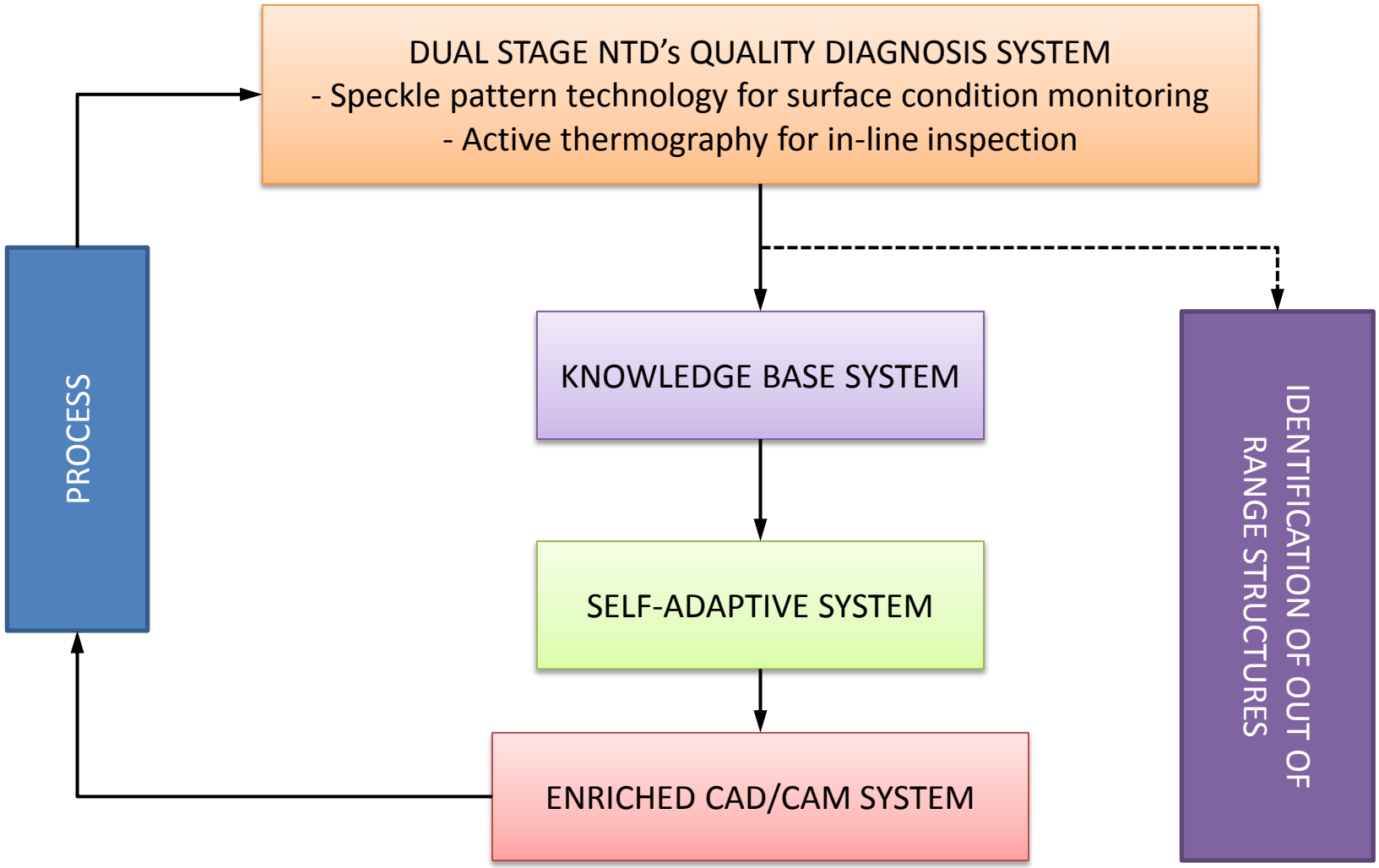
ENRICHED CAD
- geometry information.
- laminate information.
- process parameters

SELF-ADAPTIVE SYSTEM



CAD/CAM robot planning system applied to tape-laying
(*Source: http://www.fibrechain.eu/publication/index.jsp*)

ON-LINE QUALITY DIAGNOSIS SYSTEM BASED ON NDT's



IMPACT

✓ At least 20% decrease in the consumption of high cost and critical materials.

	Reference	Material	Weight (kg)	Cost: material (€)
	Traditional bearing rib	Ti6Al4V	100 (ref. value)	6000 (considering ref. weight)
	ComMUnion bearing rib	Ti6Al4V /PPS-CFRT	50+15 (titanium+CFRT)	4500

✓ At least 30% improvement of product performance.

✓ High level of automation and lower production times compared to current technologies.

Joining metal/CFRs components		Material	Fabrication	Joining technol.	Surface modification	NDT	Control
Currently Manual		Metal/ TSC	Separately: TSC are manufactured by hand lay-up, infusion	TS adhesives	Manual or automated, little innovative (sand blasting, primer)	Offline	No
ComMUnion approach		Metal/ CFRT	Direct joining: CFRTs are joined to metal surface by laser assisted automated tape placement (with TP adhesive at interface)		Innovative high speed laser texturing and cleaning	Online	Online control of joining parameters

CONSORTIUM

No	Name	Short Name	Country
1	ASOCIACION DE INVESTIGACION METALURGICA DEL NOROESTE	AIMEN	Spain
2	AUTOTECH ENGINEERING, AIE	GESTAMP	Spain
3	AFPT GMBH	AFPT	Germany
4	NEW INFRARED TECHNOLOGIES SL	NIT	Spain
5	TECNATOM S.A.	TECNATOM	Spain
6	Motofil Robotics, S.A.	MOTOFIL	Portugal
7	Philips GmbH	PHILIPS	Germany
8	FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV	FhG	Germany
9	UNIVERSITY OF PATRAS	LMS	Greece
10	UNIVERSIDADE DE COIMBRA	UCOM	Portugal
11	Missler Software	MISSLER	France
12	ACITURRI ENGINEERING SL	ACIENG	Spain
13	SYM VOULOI KAI PROIONTA LOGISMIKOU AE	CASP	Greece
14	LUNOVU GMBH	LUNOVU	Germany
15	ESI GROUP	ESI	France



COMMUNION

JOINING OF 3D TPC/METAL MULTIMATERIAL COMPONENTS

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The dissemination of results herein reflects only the author's view and the European Commission is not responsible for any use that may be made of the information it contains

aimen
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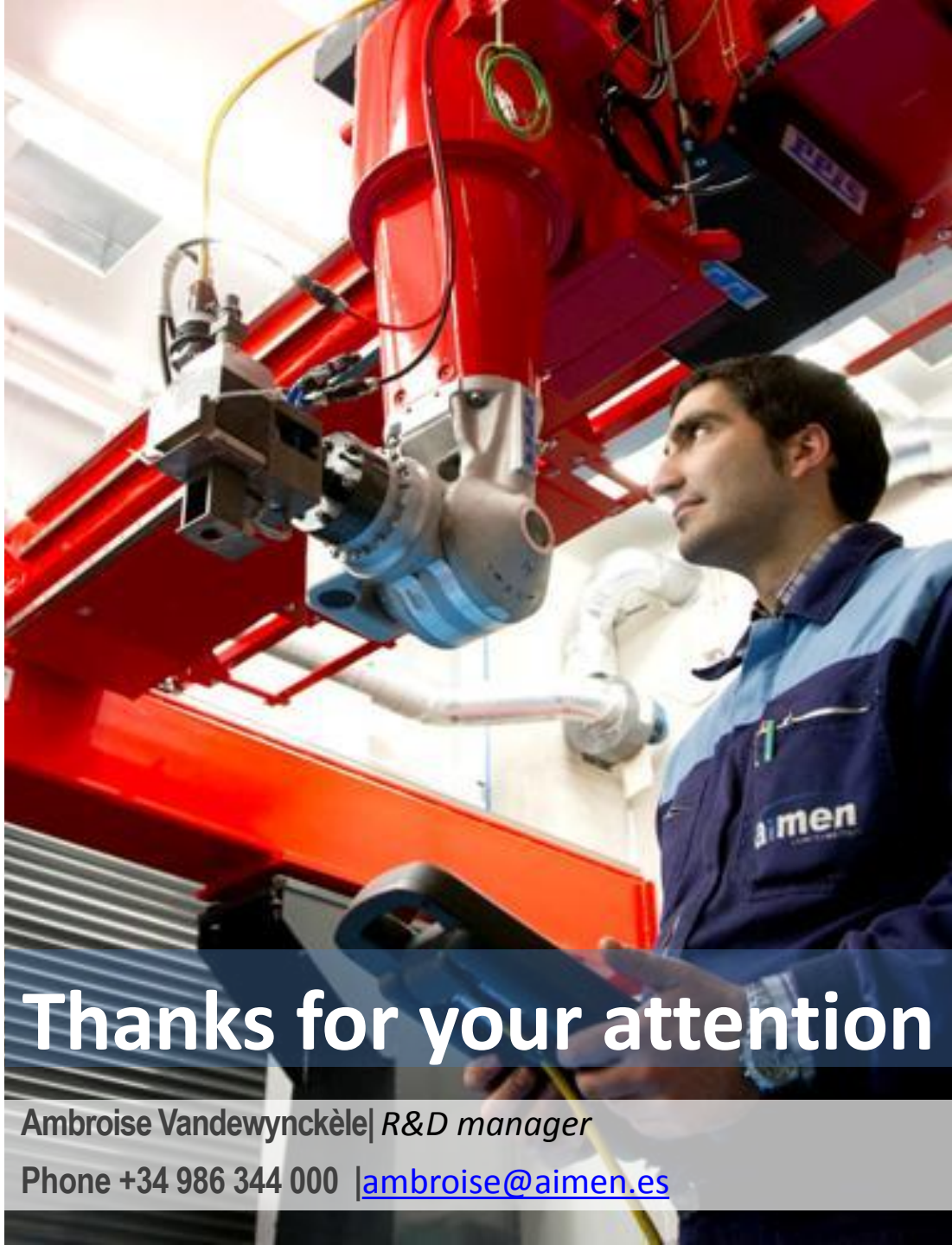
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Thanks for your attention

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