



INNOVATION IN POLYMER ENGINEERING

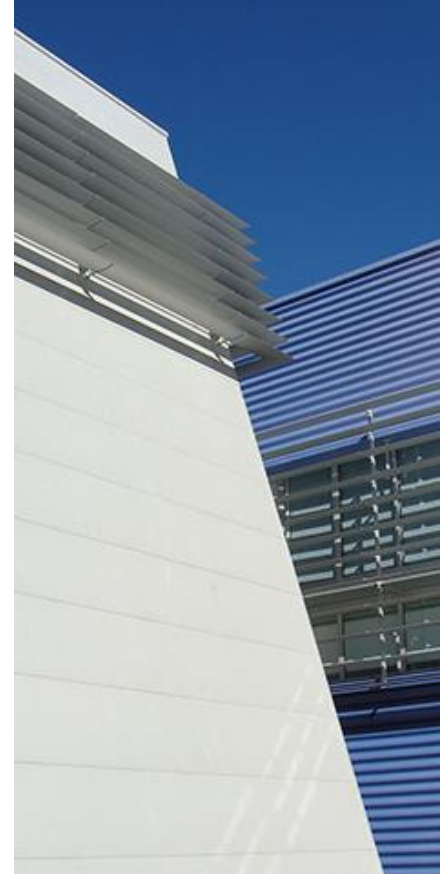
TESTING * MATERIALS * PRODUCT DEVELOPMENT * PROCESSING TECHNOLOGIES

PIEP | INNOVATION IN POLYMER ENGINEERING

Private entity dedicated to research and development, based at the Minho University in Guimarães

Created in 2001 through the initiative of industry in collaboration with the University of Minho and the National Government

Capacity to support national and international industry in terms of material development, product engineering, production processes and testing



PIEP | COMMITMENT TO INDUSTRY



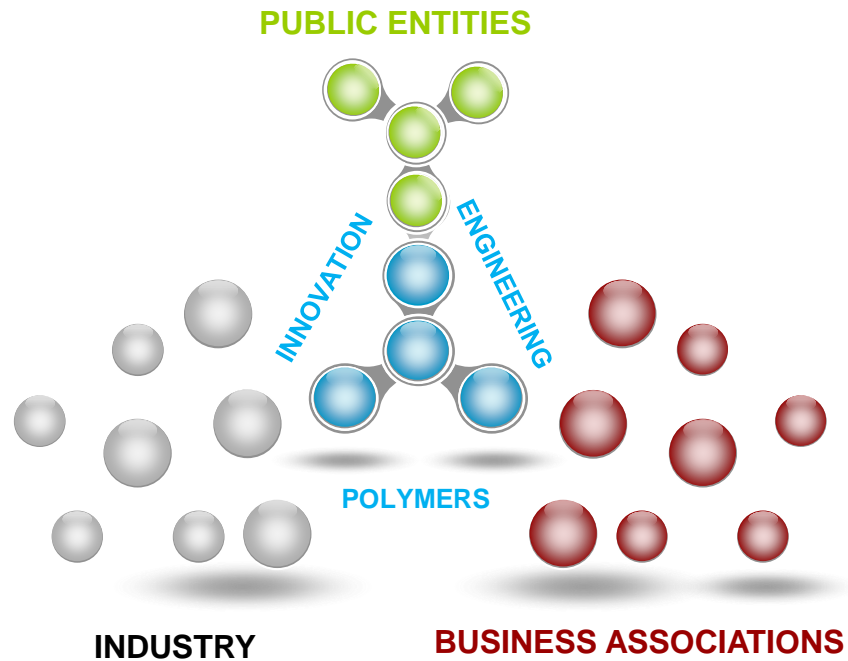
To be an innovation in polymer engineering reference entity, ensuring a timely response to the R&D+i needs of its associates and clients, based on differentiated knowledge in the strategic technological domains, materializing the vocation of converting ideas into products.

PIEP | ASSOCIATIVE STRUCTURE

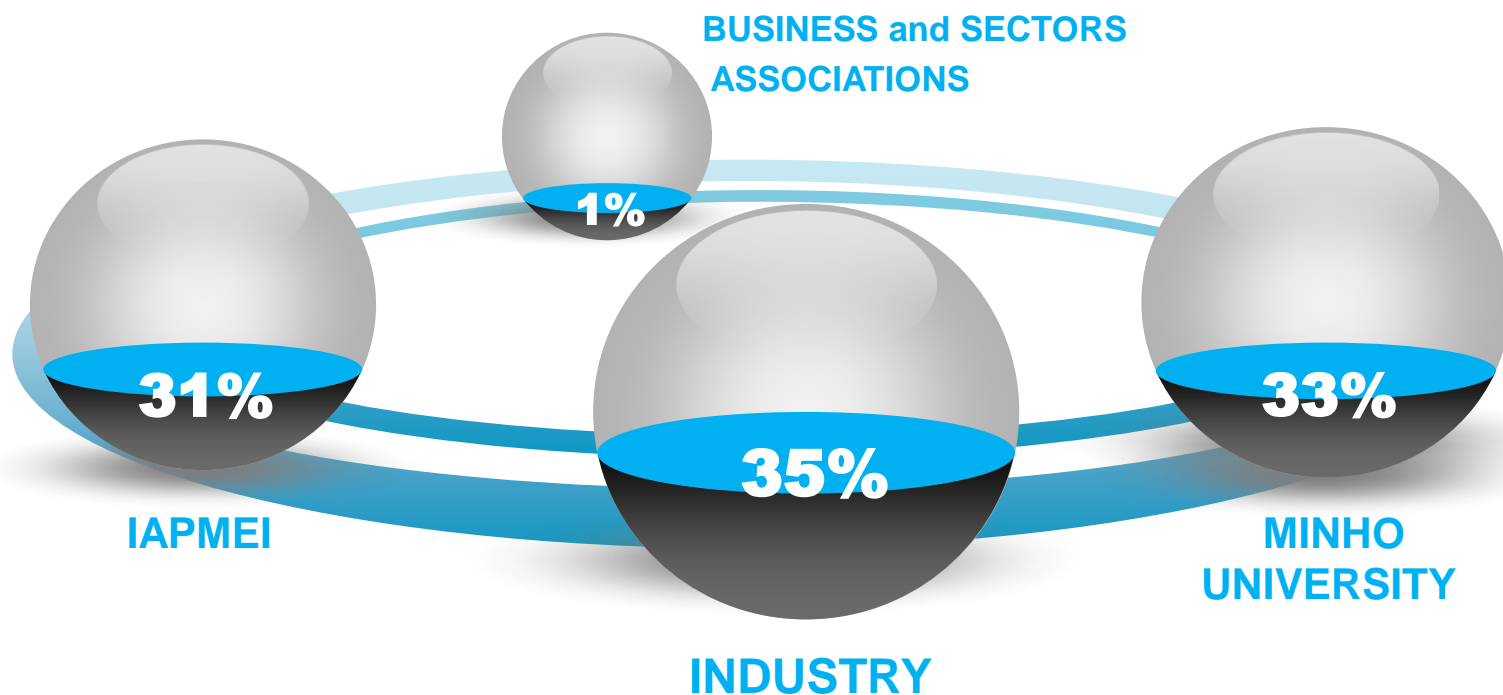
The associative structure of PIEP defines a tripartite representation: Industry | Business Associations | Public Entities

50
ASSOCIATES

1 842
K EUROS
Share Capital



PIEP | ASSOCIATIVE STRUCTURE



PIEP | KEY FIGURES

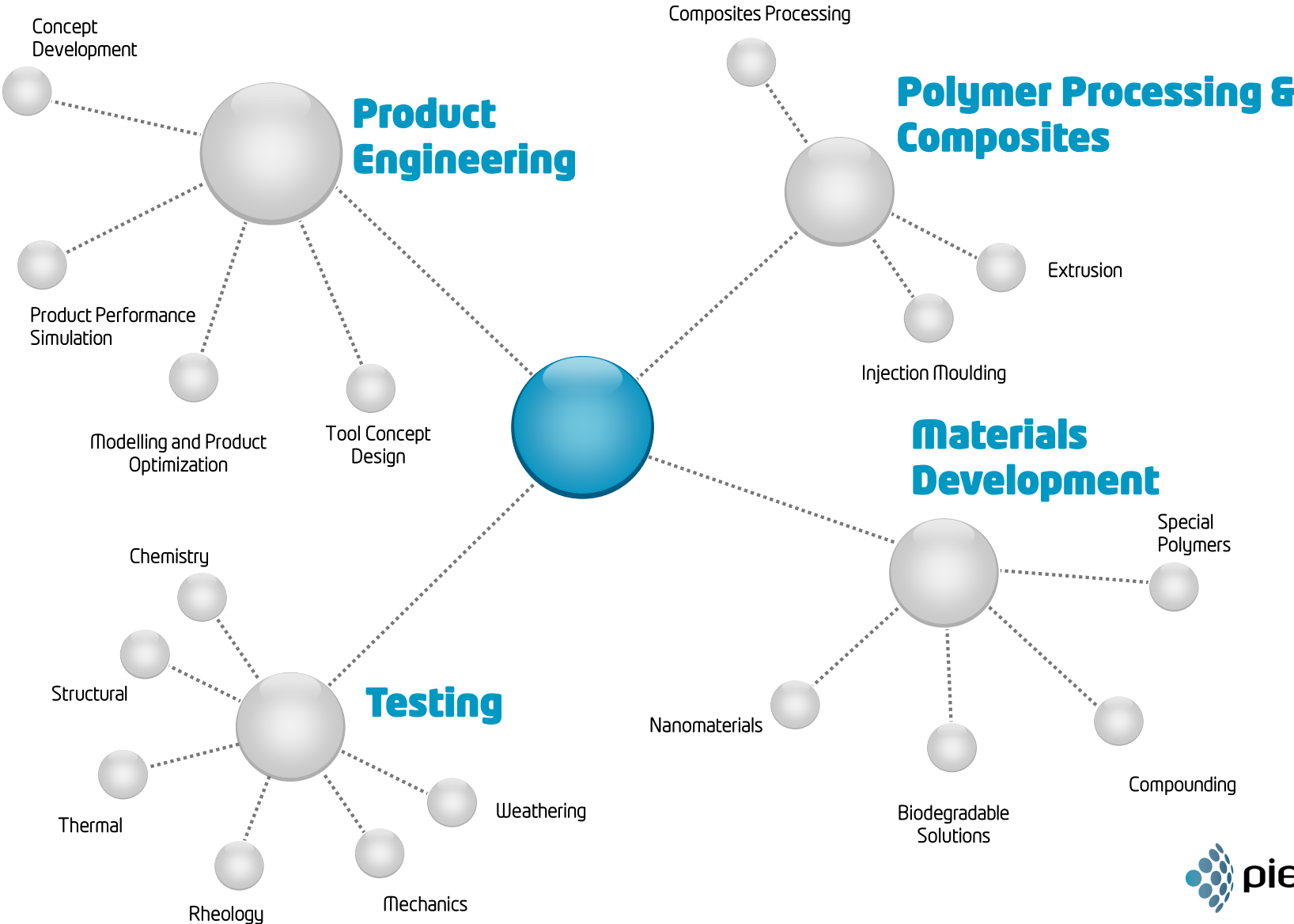
295 industrial R&D projects (2008-2016)

10% average annual growth (2008-2016)

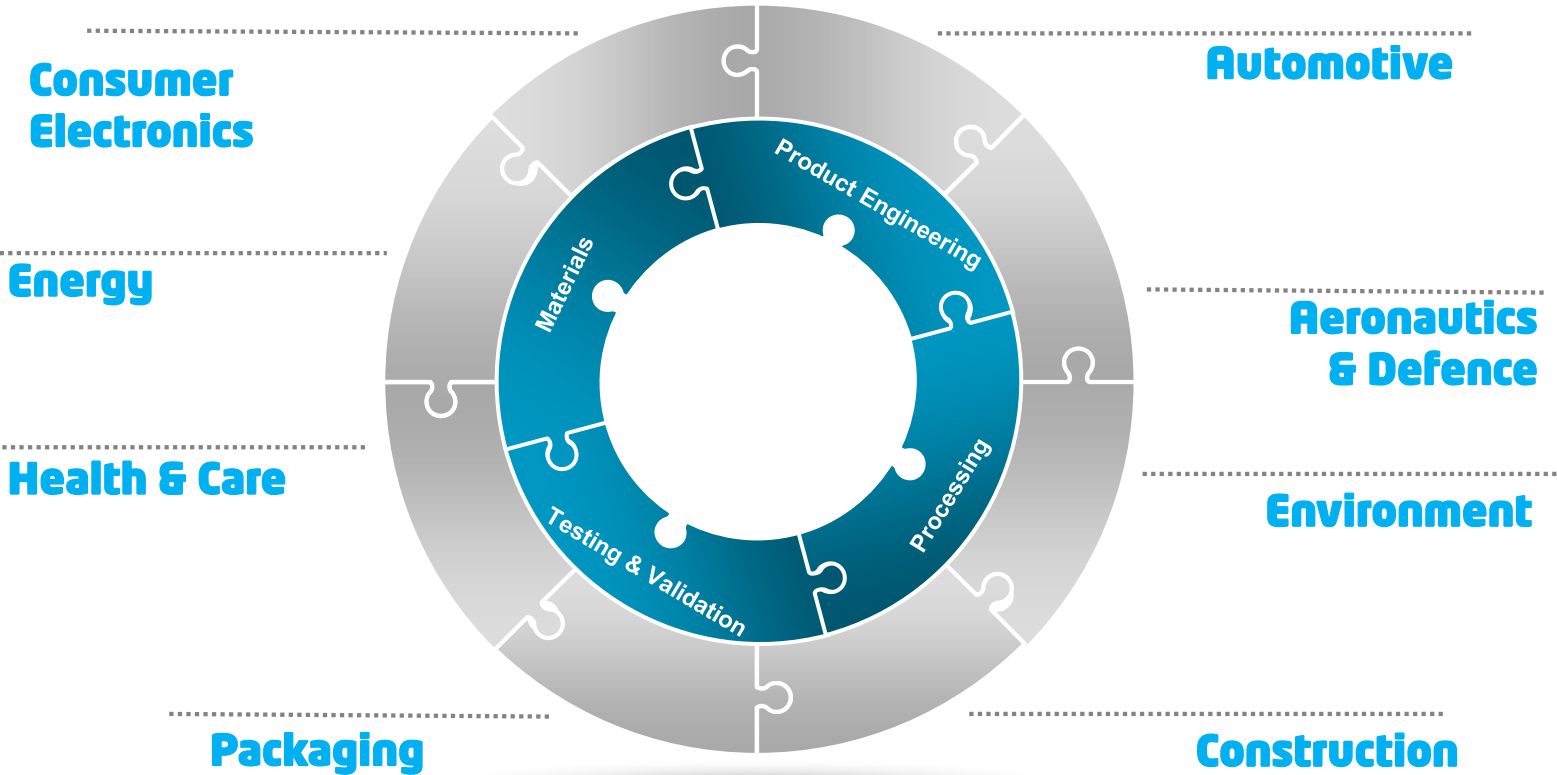
25 qualified human resources (2016)



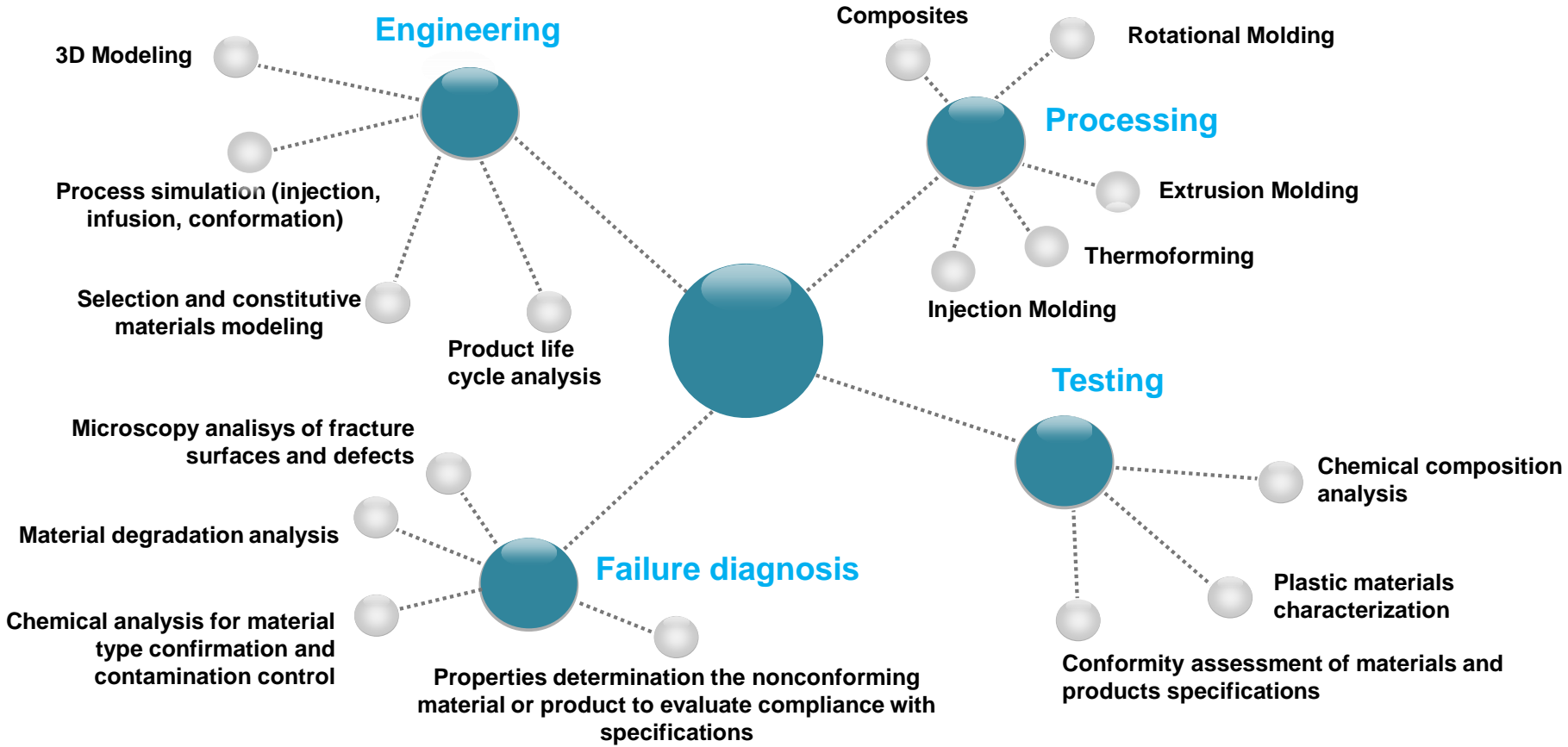
PIEP | SPECIALIZATION AREAS



PIEP | COMPETENCIES & BUSINESS AREAS



PIEP | SPECIALIZED SERVICES TO COMPANIES



PIEP | INSTITUTIONAL PARTNERSHIPS



Universidade do Minho



Health Cluster Portugal

Pólo de Competitividade da Saúde



PIEP | NATIONAL & INTERNATIONAL CLIENTS

ACECIA
AGERE
ALQUÍMICA
AMORIM CORK COMPOSITES
AMTROL-ALFA, METALOMECÂNICA
ANCAL PLÁSTICOS
ATLANTA AUGUSTO GUIMARÃES & IRMÃO
BAHCO OBERG FERRAMENTAS
BRISA
CABELAUTO
CADILHE & SANTOS
CAPAVENTURE
CASO
CEIIA
CELOPLÁS
CELULA 3PP
CENTIMFE
CENTRO TECNOLÓGICO DO CALÇADO
CIMIANTO
CLEAN COMPOUNDS
COFICAB PORTUGAL
CIRES
CORDENET
CORDEX
CORTICEIRA AMORIM
CARLOS VIEIRA PINTO
COLLEPCCL
DFAS-LI
DIEHL ENCO
DUOFIL

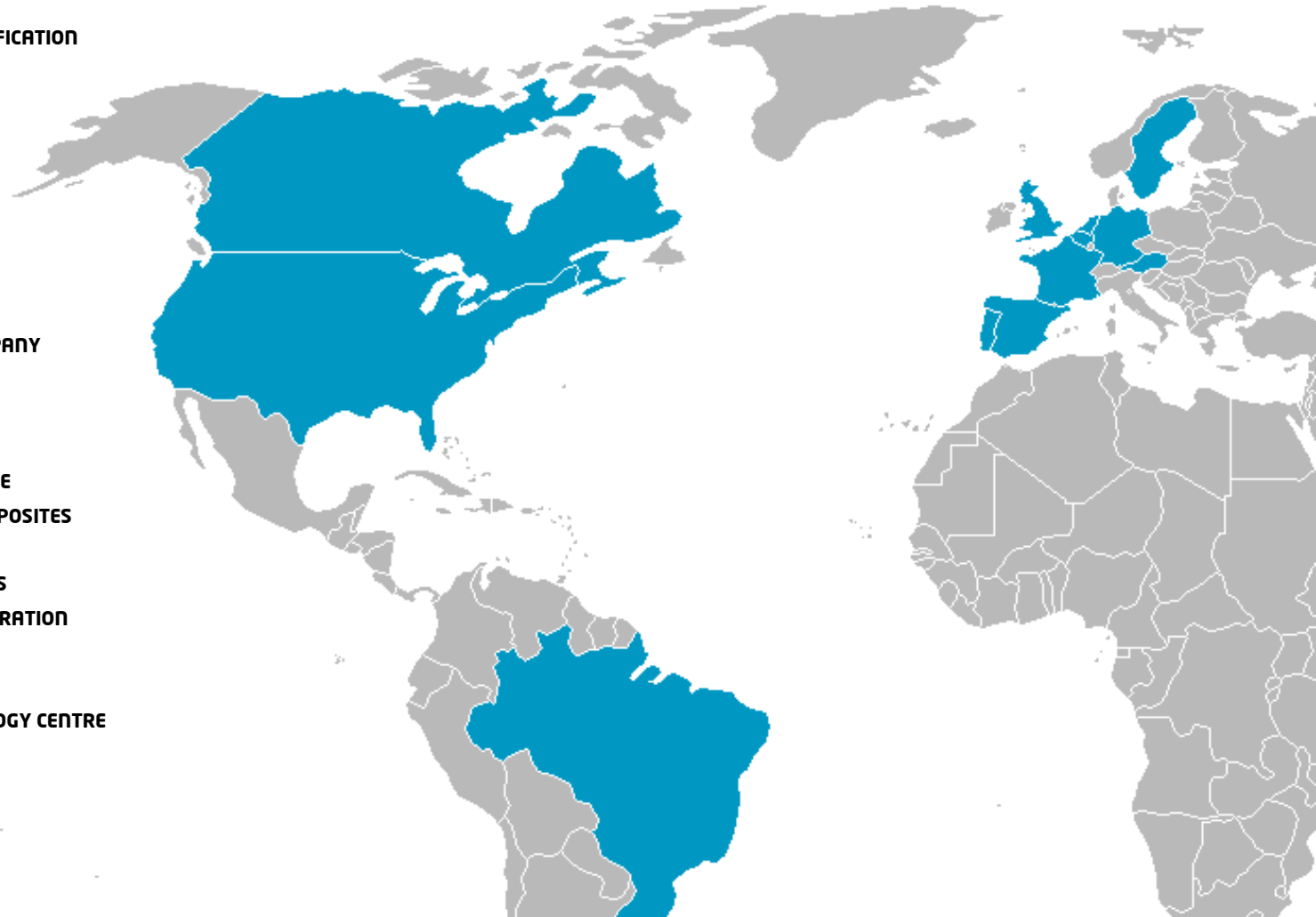
EDIVAL PORTUGAL
EFAPEL
ELNOR
EPOLI
FEHST COMPONENTES
FIBOPE PORTUGUESA
FLEXACO
FRIGOCON
FICO CABLES
FLOW SYSTEMS
GLOBALMOLDE
IBEL
IBER-OLLEF
IBERFIBRAN
IBEROALPLA PORTUGAL
IDITE MINHO
IFDR
INAMOL
INCONS
INESC PORTO
INPLÁS
INSTITUTO SUPERIOR TÉCNICO
INTELI
INTEPLÁSTICO
IPE
ISAR RAKOLL,
ISOLTUBE
ISQ
INTRAPLÁS
JOALPE
JOSÉ JÚLIO JORDÃO

JOUTIL
KEY PLASTICS PORTUGAL
LABOPLASTE
LEICA
LISMOLDE
LAMOLDES
LOGOPLASTE
LOGOPLASTE TECHNOLOGY
LUSOFANE
MANUEL RODRIGUES OLIVEIRA SÁ
MAPISERV
MARTIM
MASTER BLANK
MAXIPLÁS
MECANARTE
MONTE-MEÃO
MOSTEIRÔ
MOULDMAN
MADALENO
NEOPLÁSTICA
NEUTROPLAST
NUNO MARTINS LIMA
NVE
OLESA
OLIVEIRA & IRMÃO
PATRÍCIOS
PERIPLAST
PLASDAN
PLASFIL
PLASMERIZ
PLASTAZE
PLASTIDOM

POLIPOLI
POLISPORT
POLIVERSAL
PREVINIL
PROBOS
PROCALÇADO
POLIARTE
QUIZCAMP
QUIMONDA PORTUGAL
SELENIS
SET
SICOR
SIM TEJO
SIMALA
SIMOLDES PLÁSTICOS ENGINEERING
SIMOLDES PLÁSTICOS
SISTAVAC
SIVAL 2
SNA Europe
SOCIEDADE PONTO VERDE
SOMAPLA
SONAE
SOPREFA-COMPONENTES INDUSTRIAIS
SCHERING-PLOUGH PHARMA
TECNOCRETE
UNICER BEBIDAS
UNICER ÁGUAS
UNIVERSIDADE DO MINHO
URCAPLÁS
VIDROPOL
VIEIRA ARAÚJO
YAZAKI SALTANO

PIEP | NATIONAL & INTERNATIONAL CLIENTS

ALCOA
AIRCRAFT DESIGN & CERTIFICATION
ANTON PAAR
APPLIED SCIENCES
ARKEMA FRANCE
BATTENFELD EXTRUSION
BASF
BILLION
BOREALIS POLYOLEFINE
BRASKEM
CENTRAL PRODUCTS COMPANY
COPERION
FERROMATIK MILACRON
FRESENIUS
HEINZ INNOVATION CENTRE
HIGH PERFORMANCE COMPOSITES
JOHNSON & JOHNSON
LIGHTWEIGHT STRUCTURES
LOCKHEED MARTIN CORPORATION
LUZENAC EUROPE
MARTIN VAN DUIN
NESTLE PRODUCT TECHNOLOGY CENTRE
NOVAMONT
OBERG
PIOVAN
PRINTHEADS & PAPER
REPSOL YPF
SABIC
SHELL GLOBAL SOLUTIONS



PIEP | INFRASTRUCTURE



PIEP | LABORATORIES



Engineering



Conditioning and
Flammability



Structural Characterization



Composites



Rheology



Injection Molding



Mechanical properties



Extrusion

PIEP | LABORATORIES | ENGINEERING



PIEP | LABORATORIES | ENGINEERING

3D modeling, product design (constructive solutions) and 3D mesh generation (CAD models discretization)

Simulation and **optimization** of **static, thermo-mechanical, dynamic** behavior, **FSI**

Simulation and optimization of thermoplastic **injection molding**

RTM and Vacuum infusion production process simulations

Filament winding **paths simulation**

Constitutive material **modeling**

Thermoplastic matrix **composites conformation simulation**









Materials Selection using GRANTA database (CES Selector)

Integration of injection process simulations with **structural** simulations

Product and process **life cycle and cost** prediction (**LCA / LCC**)

PIEP | LABORATORIES | ENGINEERING

MATERIALS SELECTION	LCC / LCA	3D MODELING	
GRANTA CES Selector	SIMAPRO	SIEMENS NX	SIMULIA SOLIDWORKS
			

COMPUTATIONAL ANALYSIS		
SIMULIA ABAQUS	X-STREAM DIGIMAT	ANSYS FLUENT
		
AUTODESK MOLDFLOW	ESI PAM-RTM PAM-	HYPERWORKS
		
MOLDEX3D	DELCAM POWERMILL	CADWIND
		

PIEP | LABORATORIES | STRUCTURAL CHARACTERIZATION

Differential scanning calorimeter (DSC)

Infrared spectrophotometer (FTIR)

VICAT/HDT

Stress cracking

Moisture Determination (Karl Fisher)

Thermogravimetric (TGA) with interface connection to FTIR



Capillary rheometer

Oscillating rheometer

MFI

Rotary Viscometer

Viscometer Ubbelohde



PIEP | LABORATORIES | MECHANICAL PROPERTIES

Instrumented dart drop impact testing

Instrumented pendulum impact testing

Universal testing machine 50kN

Universal testing machine 300kN

Rotary abrasion tester

Instrumentation / actuators / data acquisition



PIEP | LABORATORIES | CONDITIONING AND FLAMMABILITY

Xenotest chamber for accelated weathering tests

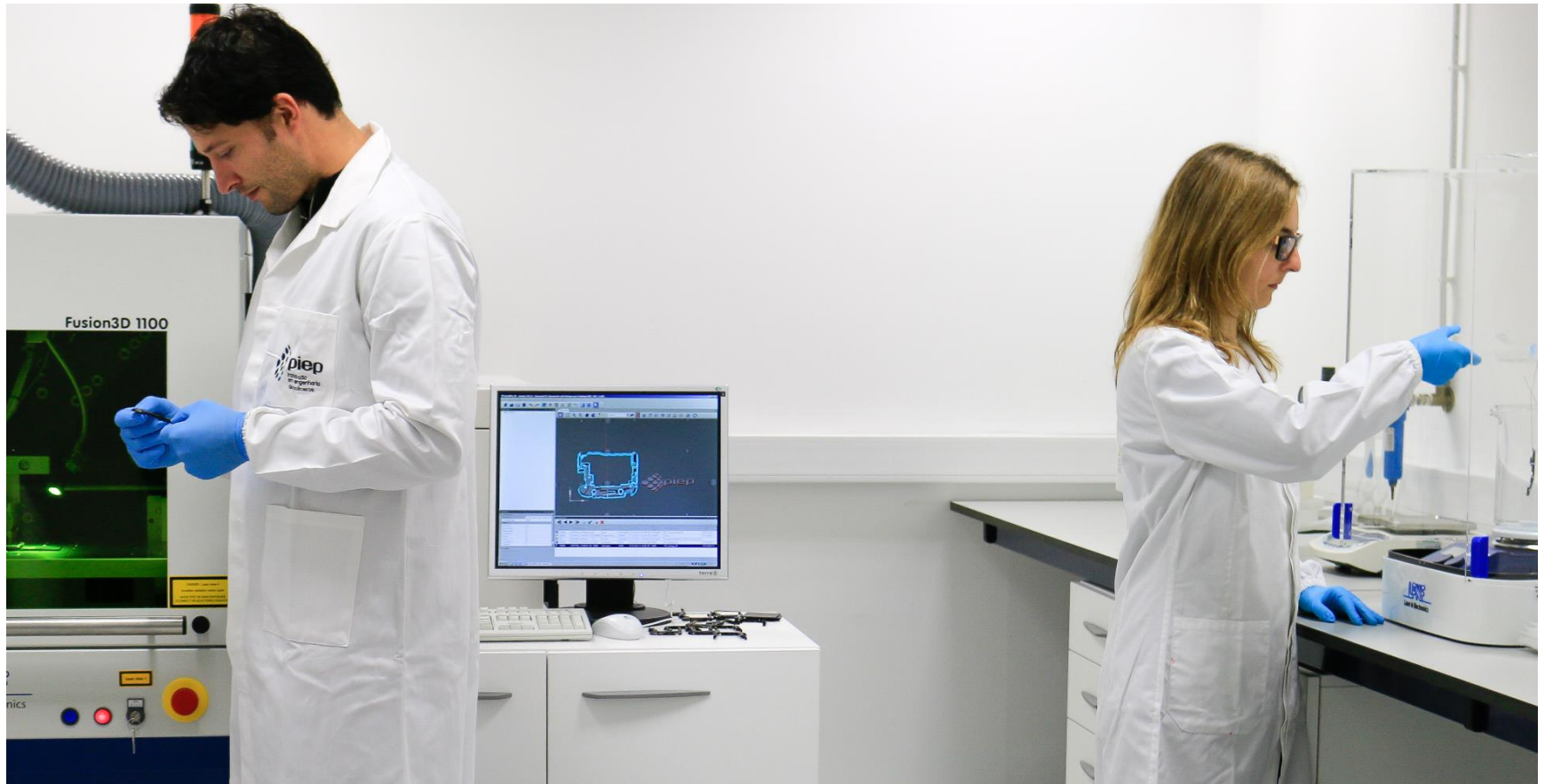
Temperature and Climatic chamber

Horizontal flammability chamber

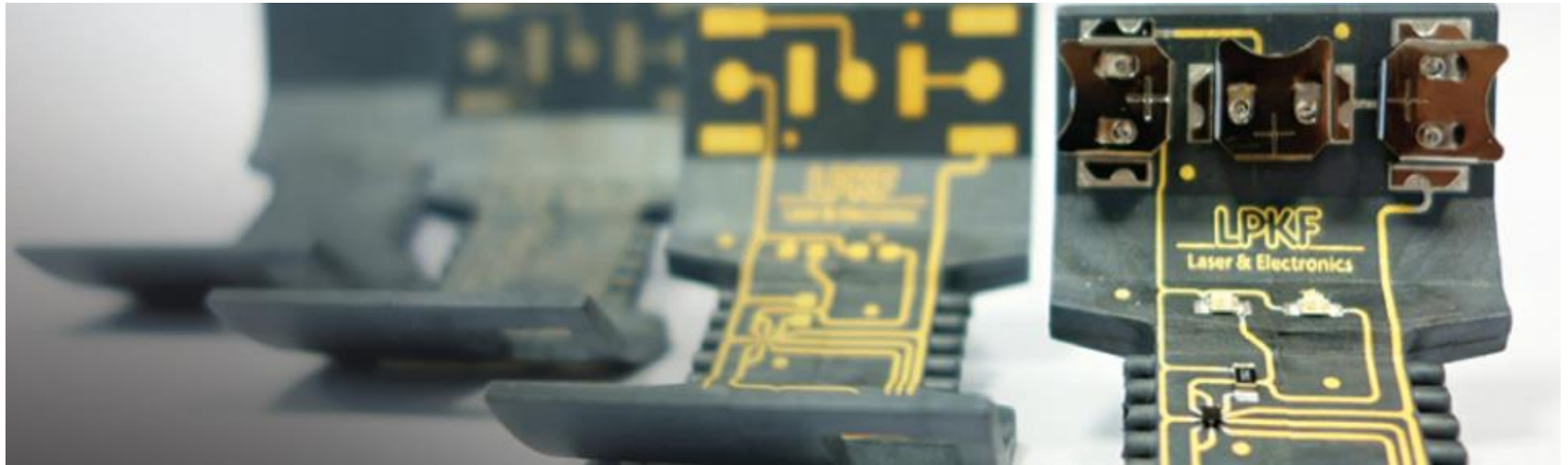
Horizontal and vertical flammability chamber



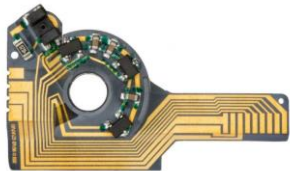
LDS LAB @ PIEP | FUTURE INTEGRATED TECHNOLOGIES



LDS LAB @ PIEP | FUTURE INTEGRATED TECHNOLOGIES



Integration of electronic functionalities into injection moulded parts



HARTING (speed control module)



Steering wheel controls (Manufacturer: TRW Automotive for BMW)



Robert Bosch GmbH pressure sensor)

PIEP | LABORATORIES | PROCESSING HALL



PIEP | LABORATORIES | EXTRUSION PROCESSING

PVC extrusion line (double counter-rotating screw extruder)

PO extrusion line (single screw extruder)

Co-Extruder

Compounding modular extrusion line (co-rotating twin screw extruder)

Feeders



PIEP | LABORATORIES | INJECTION MOLDING PROCESSING

Multi-material injection cell | 200T

Injection cell | 110T

Injection cell | 45T

CIM

Thermographic camera

IML / IMD



PIEP | LABORATORIES | COMPOSITE PROCESSING

Vacuum infusion

RTM (Resin Transfer Molding)

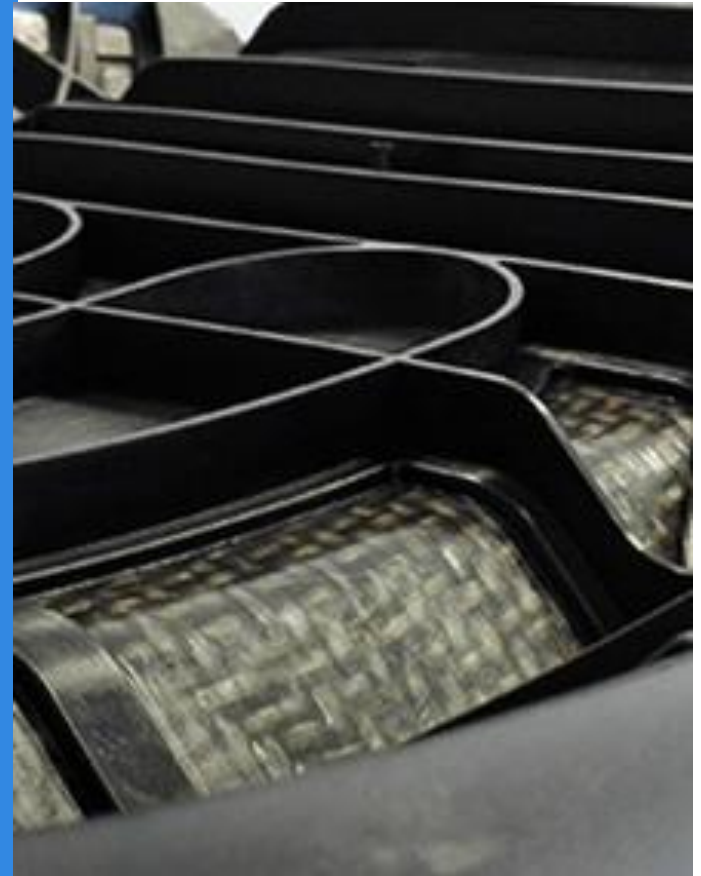
Filament winding

Pre-impregnated OOA processing

Molds and prototype components production

Thermoplastic composites

Thermoforming machine



PIEP | LABORATORIES | COMPOSITE PROCESSING

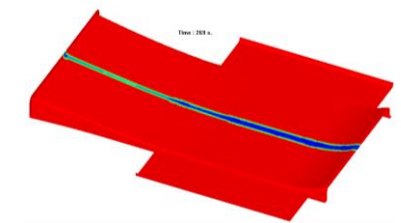
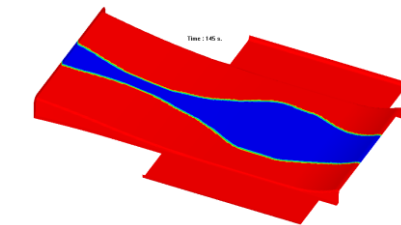
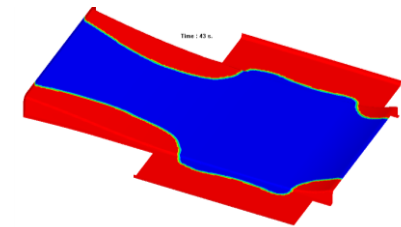
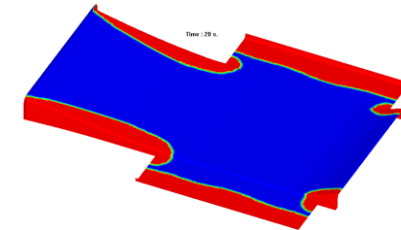
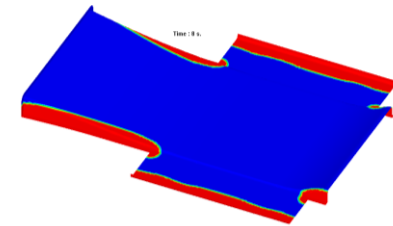
RTM and Vacuum infusion production process simulations

Setup definition

- The injection/infusion strategy
- The injection pressure or flow rate
- The molding temperature
- The location of injection gates, vents and vacuum ports
- The flow media

Available means

- The filling time
- The degree of curing and the curing time
- The risk of dry spots-appearance
- The risk of fiber washing
- The flow front velocity
- The pressure applied to the mold
- The porosity level



PIEP | LABORATORIES | COMPOSITE PROCESSING

RTM and Vacuum infusion production

Production process definition

Production process optimization

Mold design

Mold Manufacturing

Prototyping

Small series production



PIEP | AERONAUTICAL, SPACE AND DEFENSE PROJECTS



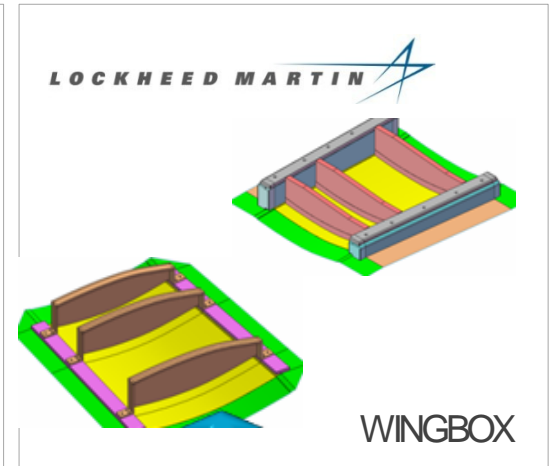
AEROCORK



IMPERIO™ UAS

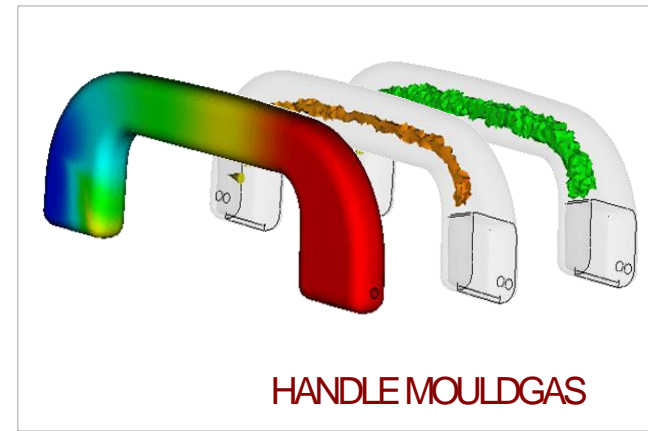
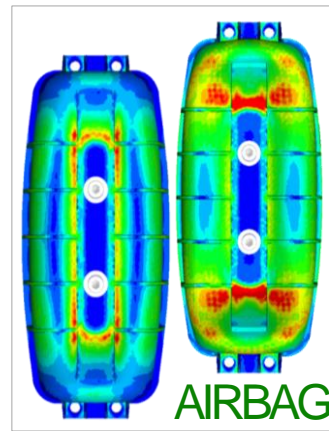
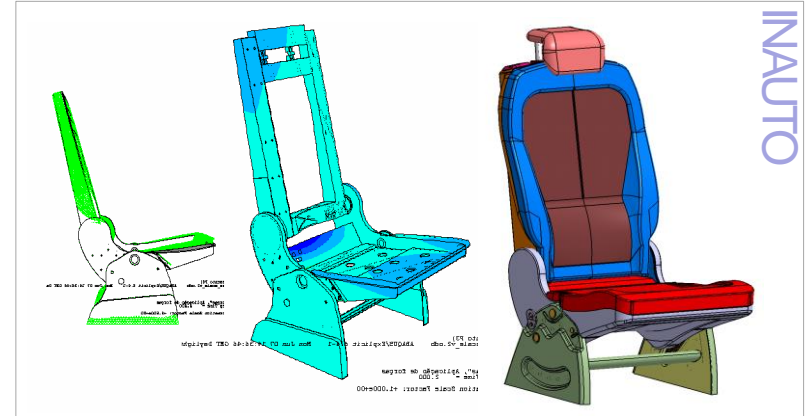
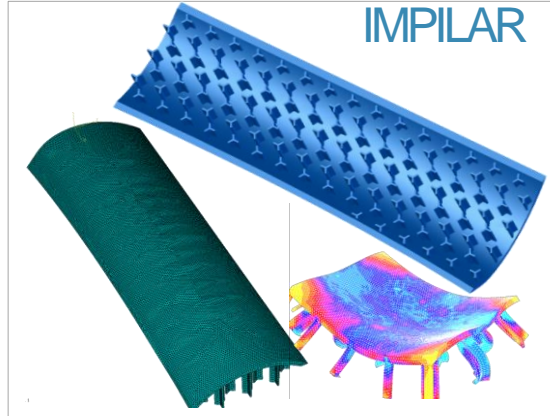


X AEROSTRUCTURES

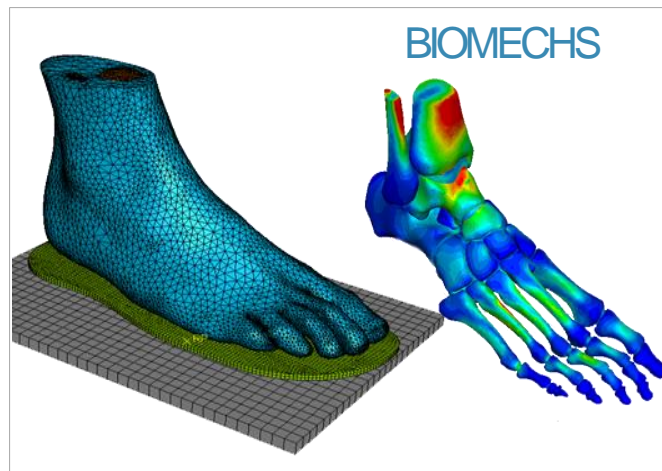


WINGBOX

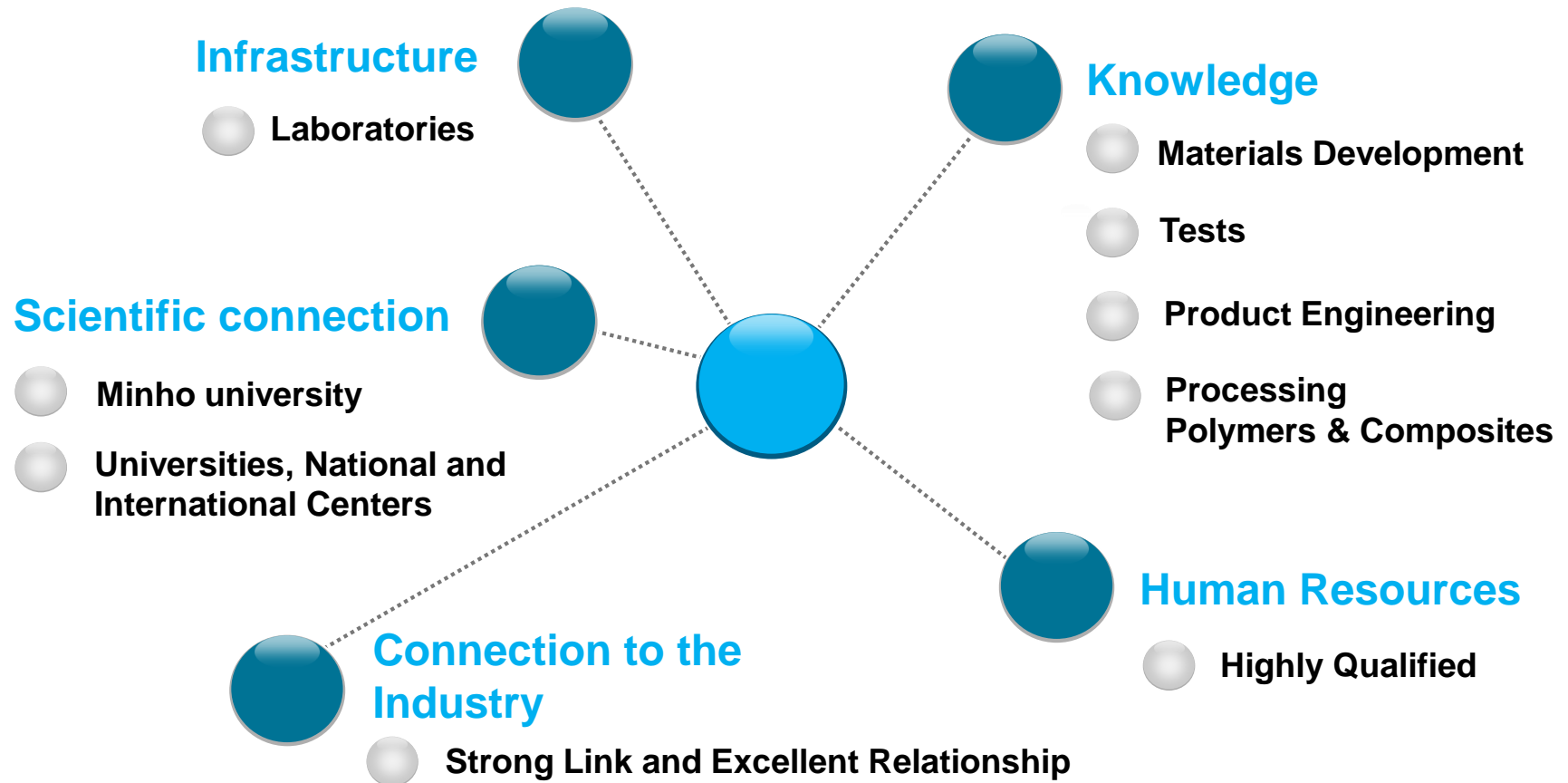
PIEP | AUTOMOTIVE PROJECTS



PIEP | PROJECTS RAIL | BIOMATERIALS | OTHERS



PIEP | INDUSTRY INNOVATION PARTNER



PIEP | INNOVATION IN POLYMER ENGINEERING

**YOUR PARTNER FOR
INNOVATION and
TECHNOLOGICAL DEVELOPMENT**



piep

inovação
em engenharia
de polímeros

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