The aim of the research group is the development of innovative forming processes able to produce high added value components and goods. The main activities are the casting, forging and sheet metal forming of in-house developed alloys as well as in market available ingots, billets and coils. Typical projects cover material, microstructural and tribological characterization activities, process optimization using advanced FEM simulation, tool and mold design-manufacturing and final prototyping using available industrial facilities.
RESEARCH TOPICS

MATERIAL CHARACTERISATION
• Mechanical and thermo-physical properties characterisation for metal casting, forging and forming simulations

TRIBOLOGICAL CHARACTERISATION
• Tribological study of materials close to process condition
• Surface texturing for process optimization

SHEET METAL FORMING AND HOT STAMPING
• Process development for new alloys (3rd generation, AHSS, aluminium and superalloys) based on FEM
• Tool design and set-up, prototyping and final testing of components

FORGING AND THIXOFORMING
• Optimization of open and closed die hot forging
• Cold forging modelling and fracture detection
• Microstructural evolution prediction, die wear prediction and enhancement based on process modelling
• Thixoforging of light alloys and steel real components

HYDROFORMING AND GAS MEDIA FORMING
• Sheet and tube hydroforming of AHSS, Stainless steels and superalloys
• Super Plastic Forming of new aluminium and titanium alloys

METAL CASTING
• Sand and gravity die casting of components
• Pressure die casting of light alloys
• Investment casting of light and titanium alloys
• Vacuum Cold Crucible Melting of novel alloys for aeronautical and health applications

ROLLING AND ROLL LEVELLING
• Novel design of roll levelling machines
• Rolling and tempering of aluminium and steels
• Process chain simulation and study of rolling and levelling influence in subsequent forming processes
FACILITIES

SHEET METAL FORMING FACILITIES
- FAGOR 4000 kN servo-press
- GAMEI 1500 kN hydraulic press
- GAMEI 1500 kN mechanical press
- SCHMIDT 40 kN servo press
- Sheet and Tube Hydroforming (4000 bar)
- 100 kN punching machine
- 250 kN Biaxial testing machine
- Strip Drawing Test tribometer
- Duncal Shabel Test tribometer
- Nakajima ISO standard tester
- Hole Expansion ISO standard tester

FORGING AND THIXOFORGING FACILITIES
- 150 Kw EFD Induction Heating Furnace for billets
- KUKA KCR1 robot for parts handling

CASTING FACILITIES
- GAMEI 3000 kN HP die casting machine
- NABERTHERM 11KW melting furnace
- NABERTHERM furnaces for heat treatment
- EFD induction furnace for Fe
- EFD induction furnace for Al and Mg
- SECO/WARWICK Vacuum Cold Crucible Melting machine
- TM SD-3000 3D printer for rapid prototyping of moulds

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GENERAL
- CHARMILLES Wire EDM machine
- ONA Electrode EDM machine
- MITUTOYO 3D measurement machine
- PLM and ALICONA Confocal profilemeters
- ANTON PAAR MCR501 high temperature rheometer
- LINSEIS LFA 1000 Laser Flash thermal analyser
- LINSEIS L75VS1600C dilatometer
- NETZSCH high temperature DSC
- FEI (FE-SEM) Nova NanoSEM 450 microscope

PROJECTS

The research group projects are normally industry driven and aim at developing new goods and processes ready to be used in real industrial applications including basic research tasks. Signed long term research agreements with industrial partners (e.g. Fagor Arrasate, Batz, Matrici, Alfa) allow the recruitment of students and providing turnkey solutions and PhDs to the near companies increasing their technological knowledge.