

FABDIS

MECHANICAL AND
BIOMECHANICAL
COMPONENT
MANUFACTURING
AND DESIGN
TECHNOLOGY
GROUP



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R E S E A R C H G R O U P S





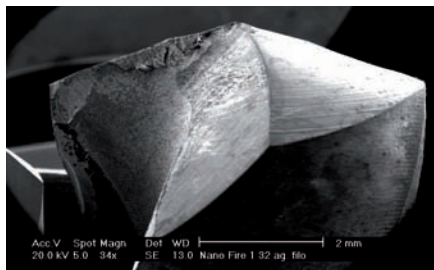
Machining center in operation

The Mechanical and Biomechanical Component Manufacturing and Design Technology Group (FABDIS), led by Dr. M^a Henar Miguélez Garrido, is formed by a team of 13 researchers educated and trained in industrial engineering. Its main interests are focused on manufacturing systems and processes, as well as on the design of mechanical components and the detection of defects (health monitoring) and biomechanics.

• LINES OF RESEARCH AND SCIENTIFIC-TECHNICAL SERVICES •

» Machining

- Numerical modeling of machining processes
- Process definition and optimization
- Machinability tests
- Machining of prototypes
- Study on the machining of special materials
- Ecological machining



Electron microscope image of the tip of a worn twist drill

» Manufacture-oriented design

» Processes for shaping by plastic deformation

- Numerical modeling of plastic deformation processes
- Process definition and optimization
- High-temperature folding

» Computer-assisted design, manufacturing and engineering: CAD, CAM, CAE.

» Application of heuristic techniques for the modeling of manufacturing processes and design of mechanical components

- Neural networks
- Genetic algorithms

» Detection of defects in mechanical systems (health monitoring)

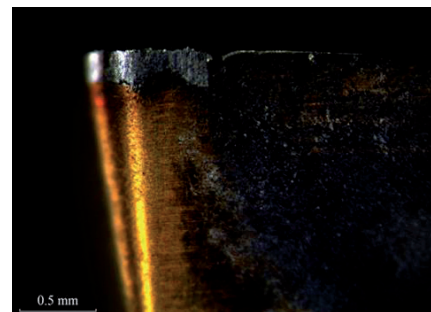
» Application of mechanical component simulation techniques

» Inverse problems in mechanical engineering

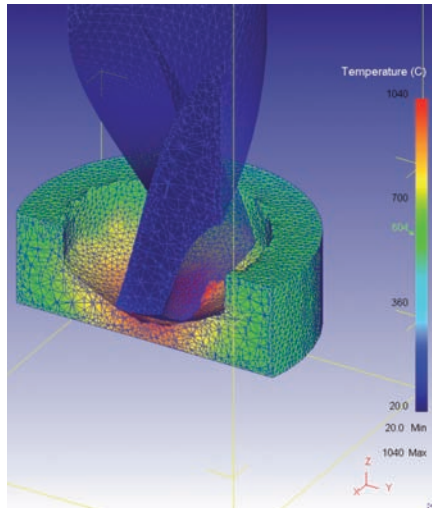
» Design of biomechanical components

» Statistical analysis of manufacturing processes

- Statistical control of processes
- Statistical simulation of defects
- Capacity analysis
- Statistical design of tolerances



Flank wear in cutting plate



Drill simulation

• OUTSTANDING COLLABORATIONS AND R&D&I PROJECTS •

The main partners and collaborators of the group include the Paul Verlaine University in Metz (France), in numerical high-speed process modeling issues and the School of Mechanical, Aerospace and Civil Engineering of the University of Manchester, in defect detection issues.

Some of the most relevant R&D&I projects of the group are:

- Numerical modeling and surface integrity in the dry turning of Inconel 718.
Funding entity: Interministerial Commission for Science and Technology. Date: 2009-2011
- Dry drilling of the Ti6Al4V alloy: Analysis of the thermal damage and wear of tools by means of experimental and numerical simulation techniques.

Funding entity: Community of Madrid/Universidad Carlos III de Madrid. Date: 2009.

- Propagation of fatigue cracks in rotating shafts.

Funding entity: Interministerial Commission for Science and Technology. Date: 2009

- Numerical simulation of orthogonal cuts: residual stresses and tool wear.

Funding entity: Community of Madrid/Universidad Carlos III de Madrid. Date: 2008

- Numerical modeling of machining and experimental validation processes.

Funding entity: Community of Madrid/Universidad Carlos III de Madrid. Date: 2006

- Detection and identification of fatigue cracks in rotating shafts by means of genetic algorithms.

Funding entity: Interministerial Commission for Science and Technology. Date: 2006

- Development and behavior under machining of new HSS base binder cermet type cutting materials.

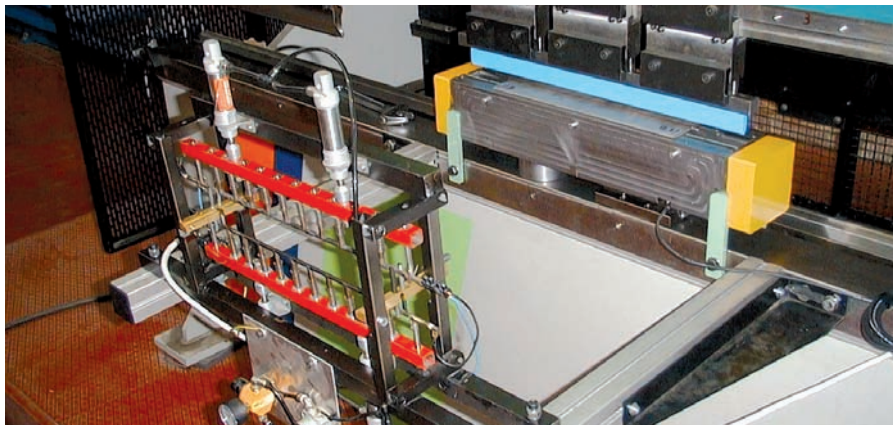
Funding entity: Interministerial Commission for Science and Technology. Date: 2005-2008

• INNOVATIVE TECHNOLOGICAL SOLUTIONS •

- Technologies for manufacturing components for the aeronautical industry.
- Techniques for detecting defects in mechanical systems.
- Experimental techniques for studying the behavior of mechanical systems.

• TECHNOLOGICAL EQUIPMENT •

- Workstations and PCs with finite element numerical simulation software (ABAQUS)
- Machining center
- Numerical control lathe
- Extensometer equipment
- Data acquisition systems with different sampling ranges
- Surface analysis equipment
- Systems for measuring forces, displacements and deformations
- Testing device for rotating mechanical elements



Die-heater assembly

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IMAGE OF COVER: *Test room*
UC3M photographic files