TECNALIA offers its expertise in materials conducting services like Materials Selection Characterisation, In Service Behavior, Failure Analysis, Residual Life Prediction and Life Extension.
TECNALIA Research & Innovation is the first privately funded applied research centre in Spain and one of the leading such centres in Europe. A combination of technology, tenacity, efficiency, courage and imagination.

We identify and develop business opportunities through applied research. Inspiring Business is a different, unique vision: we visualise ideas that generate value and provide creative technological solutions to produce real results.
At TECNALIA we are organised in 6 fully interconnected Business Divisions. Cooperation works thanks to the transversality of teams, projects and clients collaborating with each other, combining expertise and commitment. Our best asset is our team, made up of more than 1,500 experts who work to transform technology into GDP in order to improve people’s quality of life by generating business opportunities for companies.

We are committed to the future, society, our planet and our environment. This responsibility provides focus to our values and reinforces our activities.

"TECNALIA transforms Technology into GDP to improve people's quality of life by generating business opportunities for Companies"
Materials Engineering | Technological Services

We are experts in materials, focused on technical consulting, advanced studies, analysis and evaluations of materials. **More than 60 years experience in materials**, knowledge and talent to be effective, close and decisive.

TECNALIA deploys all its technological potential to meet the demand of many industrial sectors. We rely on our **multidisciplinary laboratories** to respond our customers demands.

100% customer-oriented mindset. An attitude and a way of working oriented to results, because customers concerns are also our concerns.

**FIELDS**

01. Testing and Evaluation

02. Fitness for Service

03. Welding
More than 60 years of experience in materials, knowledge, talent to be effective, close and decisive.
Testing and Evaluation

Testing and Materials Evaluation are essentials tools in Materials Engineering. Materials characterisation studies materials microstructure, their properties and relationship with their composition and thermomechanical history. The knowledge of properties, behavior and fitness in different service conditions of materials is the basis of multiple fields, from quality control to new product development, through condition monitoring and evaluation or residual useful life.

- Mechanical testing.
- Chemical analysis.
- Materialographic / Metallographic Analysis.
- Corrosion testing.
- Non Destructive Testing (NDT).
Metallic materials (steels, foundries, aluminum alloys, copper, nickel, titanium...), Plastics, Composites, Ceramics, Paintings and Coatings, Weldments.

- Renewable Energy.
- Oil & Gas.
- Foundry and Steelsemaking.
- Metalworking and Welding Industry.
- Aeronautics, Railway and Automotive.
- Shipping and Offshore Industry.
- Biomaterials Industry.
- ...
SERVICES

TECNALIA has a large network of accredited laboratories and qualified staff with extensive experience in the field of testing and characterisation of materials and parts. This capacity and knowledge allows TECNALIA to offer a wide range of services (testing, assessment, diagnosis, consulting...) in the different areas related to material and parts properties (mechanical, chemical, etc.).

- Testing and Analysis acc. to standards or particular specifications.
- Analysis and Diagnosis of Non-Conformities.
- Quality Control / Compliance Evaluation.
- Characterisation and Reverse Engineering.
- Positive Material Identification (PMI).
- Tests and Experiments design.
- Review and design of product and process specifications.

Our laboratories are accredited according to national and international quality standards and feature multiple authorisations.
Study and knowledge of behavior in service of materials and systems is key point at different stages of the life cycle of a part. Materials are critical during design stages as during manufacturing and assembly stages and useful life. Knowledge of materials and their properties is crucial in redesign, failure analysis and prevention, condition assessment, prediction and useful life extension, flaw assessment and structural integrity. In a word, it is crucial all over the cycle life of the component, in terms of efficiency, durability, and integrity and safety.

Experts in Service Behavior of materials and parts (selection of materials, failure analysis, residual life prediction, flaw assessment...) in the different possible areas (mechanics, corrosion, friction, high temperature, etc.).
SERVICES

- Failure Analysis and Prevention (RCA).
- Selection of materials, processes and Protection Systems.
- Condition Assessment and Residual Useful Life Prediction.
- Flaw Assessment (FA, ECA, FFS-FFP).
- Structural Integrity.
- Monitoring and Life Extension (Predictive Maintenance).
- Product development.
- Product validation.

TECNALIA has wide experience in materials, their properties and degradation mechanisms and failure. This knowledge enables TECNALIA to offer services related to materials and parts in service behavior (selection of materials, failure analysis, residual life prediction, flaw assessment...) in the different possible areas (mechanics, corrosion, friction, high temperature, etc.).
Welding

Welding is a fundamental process in the industrial world. It is present in manufacturing, assembly and even in maintenance and recovery of many parts and assemblies. Welding application is wide, not only for parts union purpose, but also in order to confer specific properties against corrosion, wear, etc.

This area is in constant evolution in order to respond to the market needs and to new requirements and regulations more and more demanding with regard to welding procedures.

Our welding engineers have a deep knowledge and experience of welding processes, including regulatory and industrial requirements, but also in the behavior of these welded materials and parts in service.

CUSTOMERS

• Metalworking and Welding Industry.
• Energy and Oil & Gas.
• Aeronautics, Railway and Automotive.
• Construction Companies
• Unique Big Constructions
• Foundry and Steelmaking.

Our services are based on welding processes knowledge in full extent. This includes joint design, welding parameters, preheating temperatures, etc., applied to a wide range of metal alloys and applications.
Technical consultancy on industrial welding (processes, certification, control and testing) and onsite quality control of welds.

SERVICES

- Welding workshop layout.
- Prototypes manufacturing collaboration.
- Welding Procedure Specification (WPS) and Welder Qualification.
- Weldments characterisation, analysis, of results and corrective actions.
- Customised Technical training.
- Analysis of methods and improvement actions.

Steels, light alloys, nickel alloys, copper alloys, etc.

- Analysis and reporting about construction project.
- Solutions in unique singular structures construction.
- Contractual specifications analyse and implementation in productive plants.
- Consultancy on quality systems according to UNE-EN-ISO3834, EN 1090, EN 15085, etc.
- Consultancy on welding according to Norsok, ASME, Daewoo, etc.
- Consultancy and coordination on new processes and productivity improvements.
Laboratories

MECHANICAL TESTING LAB

Mechanical testing lab is accredited to perform static and dynamic tests according to UNE-EN ISO / IEC 17025 standard, either at room or high and low temperature (tensile, fatigue, compression, hardness, impact Charpy tests, fracture mechanics...).

We can also perform singular tests, such as residual stresses testing, creep tests or instrumented/monitored tests.

The laboratory has its own workshop to machine devices and test specimens. This machining capacity is highly appreciated by customers and inspectors, for traceability and quality guaranty, as for shortening delivery time, while reduced deadlines delivery.

Tests /

- Tensile and compression tests at room temperature, in environmental chambers (from -70 °C to +300 °C) and in furnaces (up to 1100 °C).
- Brinell, Rockwell and Shore hardness tests.
- Bend and Flexure Tests (from -70°C to +300°C).
- Fracture Mechanics (CTOD, $K_I$, $J$, $G_I$...).
- Axial Fatigue Tests, HCF, LCF (from -70°C to 900°C, depending on the type of test) and crack growth da/dN.
- Multiaxial Fatigue Rig with actuators up to 10kN, 50kN and 100kN.
- High Frequency Axial Fatigue (up to 250Hz).
- Rotating bending fatigue.
- Creep Tests
- Charpy Impact Tests (from -90°C to 300°C, and at -196°C)
- Extensometry. Strain and Stress measurement by means of extensometric gauges.
- Residual Stress Testing (RX and Hole Drilling)

Equipment /

- Own machining workshop for devices and specimens.
- Static and dynamic universal testing machines for tensile and compression testing.
- Rockwell, Brinell and Shore Durometers.
- Charpy pendulums for impact/resilience testing.
- Environmental chambers (-70°C to +300°C).
- Furnaces for universal testing machines (up to 1100°C).
- Rotating Bending fatigue machines.
- Battery of machines for creep testing.
- Multiaxial Rig for dynamic testing.
The chemical laboratory of TECNALIA performs chemical analyses of different nature and origin materials (ferrous, light alloys, inorganic waste...).

It also has the knowledge and experience to set up analytical procedures according to new regulations or specific customers needs (waste recovery, raw materials, drugs, special alloys...).

Chemical characterisation:
- Raw materials: molding sands, carbon/ coke, dolomites, magnesites, direct reduced iron, briquettes, ferroalloys, etc.
- Waste from foundry processes (slag, EAF dust, sands, etc.).

Chemical control:
- Baths for surface treatments (aeronautics): alkaline cleaning, TSA anodizing, chemical conversion, passivation, acid stripping, etc.

Equipment /
- Automatic analysers for C, S, N, O and H.
- Spark Optical Emission Spectrometers for Fe, Al, Ni, Cu and Co alloys.
- Plasma Optical Emission Spectrometer plasma (ICP-OES).
- Automatic titrator.
- High frequency remelt furnace with vacuum system.

Analyses /
Chemical analysis of metals in wide range of metallic materials:
- Ferrous materials: medium and low alloy steels, stainless steels, foundries, manganese steels, tool steels and free machining steels.
- Non-ferrous materials: Aluminum, Cobalt, Copper, Magnesium, Zinc, Nickel, Lead, Tin, Titanium... pure metals and alloys.
The materiallography lab of TECNALIA is accredited according to UNE-EN ISO / IEC 17025 standard for many tests and analyses, and has a wide know-how in the analyse of materials and systems of different nature.

Experience is not limited to metallic materials and welds. Analyses of polymers, ceramics and composites is also covered. For this reason is the lab called materiallographic and not only metallographic.

Tests /
- Macrographic examination (magnification up to 50x).
- Analysis of all type of materials (microstructure, grain size, non-metallic inclusions, treatment and coating thickness...) by means of light microscopy (magnification up to 1,000x).
- Scanning Electron Microscopy (SEM) (magnification up to 200,000x). Identification of constituent elements by Energy Dispersive X-Ray Spectrometry (EDS).
- Identification of phases, residual stress measurement, textures, layer measurement by X-ray Diffraction (XRD).
- Vickers microhardness tests. Surface treatment depth determination.
- Phase/particles quantifying by means of image analysis.
- Metallographic replicas.
- Characterisation of welded joints.
- Micro-sectional analysis of electronic components welds.

Equipment /
- Light microscopes with incorporated digital cameras.
- Metallographic replicas and residual useful life.
- Digital images processing software.
- Portable equipment for non-destructive metallographic preparation and analysis.
- Scanning Electron Microscope (SEM) with EDX and WDS micro-analyser.
- X-Ray Diffraction Equipment (XRD).
Corrosion lab performs corrosion and ageing tests on materials and protection systems, according to customers specifications on national and international standards. The lab is accredited according to UNE-EN ISO/IEC 17025 standard.

The lab also offers consultancy on definition and set up of corrosion tests, condition evaluation and residual life prediction.

Tests /
- Material corrosion tests according to standards (DIN, ASTM, NACE, ISO...).
- Painting and Coating Characterisation (thickness, adherence, impact, abrasion, hardness, flexibility, brightness, colour...).
- Pressure and Temperature Corrosion Tests (300 bar/300 ºC).
- Stress Corrosion Tests using the SSRT Technique.
- Material Ageing Tests (metals, polymers, paints, composites...).
- Electrochemical measurements (corrosion and pitting potential, resistance to polarisation, electrochemical impedance).

Equipment /
- Salt Spray Chambers.
- Kesternich.
- Climatic Chambers (with humidity control).
- UV Chambers.
- Tensile Machines for the SSRT technique.
- Dynamometric Rings for stress-corrosion tests.
- Autoclaves for high pressure and temperature testing.
Non Destructive Testing (NDT) lab of TECNALIA provides quality control tests and supports analysis and studies that require the location, orientation and size of defects, anomalies or damage.

Tests /
- Volumetric tests. Ultrasonic Testing (UT).
- Semi-volumetric tests. Magnetic Particle Inspection (MPI).
- Surface Tests. Dye Penetrant Inspection (DPI) and Visual Inspection (VT).
- Other Tests: Residual Stress measurement by means of the blind hole method (extensometry).

Equipment /
- Portable ultrasound apparatus.
- Impulse Echo Technique using straight, bicrystal and angular probes.
- Ultrasound immersion equipment (C-SCAN).
- Impulse-Echo or Transmission Technique.

- Magnetic Particle Equipment.
- Magnetic Yoke.
- Rig.
- Ultrasonic thickness measurement equipment.
ACCREDITATIONS AND AUTHORISATIONS

- Management systems certification UNE-EN 9100:2010 for quality in the aeronautical/space/defence (ASD) industry.
- ISO 14001 environmental management certification.
- Authorized by AIRBUS Laboratory Control for Testing Baths Surface Treatment and Metallic Materials.
- Approved laboratory by the ESA (European Space Agency) for “SMT Microsectioning” acc. to ECSS-Q-ST-70-38.
- NADCAP Accreditation for Chemical Processing.
- NADCAP Accreditation for Materials Testings.
We are experts in materials, focused on technical consulting, advanced studies, failure analysis, assessments and investigation of materials.
### Customers

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