



## SUCCESS STORIES

**ARCELORMITTAL**

ArcelorMittal is the main world producer of iron and steel. Asturias is home to the only iron and steel plant in Spain, where the entire steel production process is undertaken. Each year it produces approximately a fourth of the steel produced in Spain.

It manufactures flat iron and steel products (thick sheets, tinplate, galvanised iron and galvanised painted iron) and long products (tracks and rods).

**ASTURIANA DE ZINC**

This company belongs to the multinational Glencore Xstrata International, a world leader in zinc production. Asturiana de Zinc is the largest electrolytic zinc plant in the world (productive capacity of 510,000 tonnes each year, 47.4% from the Glencore group) and one of the most efficient on a world scale thanks to the development of its own technology.

**DUPONT**

DuPont Asturias boasts the most modern company production and service facilities in Europe. The Company currently focuses its activity over 3 fields: agriculture and nutrition, industrial biosciences and advanced materials.

**PASEK ESPAÑA**

Main iron and steel refractory assembly plant in Spain. It is a well-established company in the field of manufacturing and positioning of refractory products, exploitation and marketing of Magnesium Silicate (Dunite). It also offers integral maintenance services.

**NANOKER RESEARCH**

Technology-based Company which produces and markets high-performance ceramic components based on advanced ceramics, nano-ceramics and nano-composites for use in industry and biomedicine.

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ADVANCED MATERIALS AND NANO-TECNOLOGY

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 the green & kind land



## THE ADVANCED MATERIALS AND NANO-TECHNOLOGY SECTOR IN ASTURIAS

The MATERIALS sector includes the extraction and refining of metals, manufacturers of chemical products, wood, forestry products, non-metallic mineral products and metallurgy. NANO-TECHNOLOGY is an activity that encompasses a wide range of scientific-technical disciplines with the aim of studying materials, particles and structures which entail the creation or presence of elements with dimensions of at least below 100 nm, a nanometre representing a millionth of a millimetre.

The RIS3 Research and Innovation Smart Specialization Strategy of Asturias, approved in 2014, defines its priority areas as ADVANCED AND SUSTAINABLE MATERIALS and NEW PRODUCTION MODELS.

The materials sector has the greatest weight and tradition in the region, bringing together large industrial groups both internationally (steel, aluminium, zinc, glass, chemical), and nationally (extraction, cement, refractory, waste).

Asturias has an important primary industry which it uses in its extremely high temperature furnace processes, at which only refractory materials can operate. This is why it has developed a hugely powerful local refractory industry, which includes local companies as well as large multinationals in the sector.

**673** Companies  
**17,874** Jobs  
**4,399** Million € turnover

19% of industrial companies.  
 The industrial weight of this sector in Asturias is considerably higher than that recorded in Spain in terms of employment and turnover.

**35%** Industrial turnover figure  
**41%** Large industrial companies  
**64%** Asturian exports

Significantly higher than figures recorded nationally.

Source: INE, IDEPA, 2016.

## Main branches of activity by turnover

CNAE	No. of companies	Employment	Turnover (thous.€)	Largest companies
Metallurgy, manufacture of iron, steel products	40	7,839	2,879,046	ArcelorMittal AZSA Alcoa
Manufacturing of other non-metallic mineral products	146	2,285	522,647	Saint-Gobain Cristalería Tudela Veguín Pasek España
Chemical industry	43	1,629	498,347	IQN DuPont
Paper industry	15	458	326,501	ENCE Navia
Waste collection, treatment and disposal activities; materials recovery	46	1,710	150,165	COGERSA
Manufacturing of rubber and plastic products	50	872	139,045	Specialized Technology Resources (STR) Linpac Packaging Pravia

Source: INE, DIRCE, 2016.

## FEATURES OF THE SECTOR

- Deep-rooted industrial culture, a result of the region's history in mining and iron and steel works.
- Solid local base of goods and service providers for industrial activities (engineering, assembly, maintenance, sub-contracting).
- Spain's main iron, steel and metal works area.
- Low work-force rotation and higher than national average productivity.
- Highly qualified HR available: 1,100 new graduates in different higher and technical engineering and 1,500 new graduates in Vocational Training technical studies each year.
- 14,000 engineering students and technical degree students registered at the University of Oviedo and in Vocational Training.
- Over 600 university students take advantage of an Erasmus grant each year, and over 1,000 international students are received each year.
- Industrial ports of Gijón and Aviles. Ports specialised in iron and steel works and energy transportation, handling solid bulk and merchandise in general, in containers, conventional vessels as well with Ro-Ro services.
- Internationally acclaimed R&D institutions and agencies for materials and industrial design.
- Ideal geographical location for access to the European market.
- Industrial land availability.

# INNOVATION & TECHNOLOGY

TECHNOLOGY CENTRES, R&D&I INSTITUTIONS, CLUSTERS

IUTA. UNIVERSITY INSTITUTE OF INDUSTRIAL TECHNOLOGY OF ASTURIAS  
UNIVERSITY OF OVIEDO

Research Centre of the University of Oviedo which develops **R&D&I activities** in the following fields:

- Mechanical design and manufacturing
- Materials technology and structural calculation
- Environment and energy
- Organisation of companies, economics and statistics
- Electric, electronic and control systems
- Information and Telecommunication Technologies

SCTS. SCIENTIFIC-TECHNICAL SERVICES FOR RESEARCH INTO NANOTECHNOLOGY AND ADVANCED MATERIALS. UNIVERSITY OF OVIEDO

SCTs are accessible to research centres and the general public (companies and private individuals). Among those most related to the field of advanced materials and nanotechnology are the Nanotechnology unit, Nuclear Magnetic Resonance, Mass Spectrometry, Electron Microscopy and X-Ray Diffraction.

INCAR. OVIEDO NATIONAL COAL INSTITUTE. CENTRE OF THE SCIENTIFIC RESEARCH COUNCIL

INCAR upholds its leading position in the field of coal and the science and technology of coal and carbon-based materials. Its scientific activity focuses on a cleaner and more efficient use of coal and its derivative, including new technological developments.

CLUSTER METAINDUSTRY4

FEMETAL launches the Cluster of Advanced Manufacturing of the Metal Industry of Asturias, aligned with the smart specialisation strategy of Asturias and oriented towards companies and global value chains related to advanced manufacturing. MetalIndustry4 groups scientific-technological, logistical and entrepreneurial agents of Asturias.

ITMA FOUNDATION. TECHNOLOGICAL INSTITUTE OF MATERIALS

**Technology centre specialising in research and development projects in Advanced Materials** for high-added value products and technological laboratory services and conformity assessment.

Its fields of specialisation are steel and metallic materials, plastics, nano-materials, ceramic, refractory and raw and photonic materials.

STEEL INNOVATION CLUSTER

**Entrepreneurship Association that promotes a high level of RDI** in a localized environment, including a very important part of the entire value chain of different sectors (railway, capital assets, nuclear, petro-chemical, scientific infrastructures, offshore wind power).

CINN. NANOMATERIALS AND NANOTECHNOLOGY RESEARCH CENTRE

The CINN is a mixed research centre created through an institutional initiative between the Scientific Research Council (CSIC), the Government of the Principality of Asturias and the University of Oviedo.

**CINN research is based around a line called “Controlled Design of Multifunctional Materials on a Multi-scale”, and aims to develop, characterise and understand the behaviour of new multifunctional materials on a nano, micro and macro scale with the objective of overcoming current limits posed by material and processes.**

REFRACTORY CLUSTER

Coordinated by the ITMA Foundation, the cluster integrates the complete value chain: raw materials providers, refractory manufacturers and major users.



PRODINTEC. TECHNOLOGY CENTRE OF INDUSTRIAL DESIGN AND PRODUCTION

Technology centre specialising in industrial design and production. Its main line of research, in which the organisation focuses its competencies, is the **design and development of Pilot Lines for the advanced manufacturing of high-added value products**. For this reason it consolidates its interest in Future Factory technologies.

CETEMAS. WOODTECHNOLOGY CENTRE

The aim of CETEMAS is to promote research, development and innovation in the Mountain-Industry value chain. Its areas of work are Sustainable Forestry Development, Wood Technology and Structural Wood and Construction.

BARREDO FOUNDATION

**Entity dedicated to the promotion and development of R&D&I activities and training related to extractive industries, and more generally, to underground activities.**

The Barredo Foundation is a European benchmark in underground activity (mining and civil works) steel cables and virtual reality for internal machinery (miners and drilling rigs).

IQPA CLUSTER

Chemical and Process Industries Cluster of Asturias, aimed at developing projects in the fields of innovation, sustainability and cooperation.

ASMADERA. ASTURIAN ASSOCIATION OF WOOD AND FORESTRY COMPANIES

Entity representing the interests of the main wood sectors: forestry exploitation, biomass, primary transformation, storage and secondary transformation.

COGERSA. CONSORTIUM FOR SOLID WASTE MANAGEMENT IN ASTURIAS

COGERSA provides services related to Asturian waste treatment. It has modern centralised facilities and has undertaken considerable investment in studies and research linked to optimising waste management. It is an entity that has been added to the Campus of International Excellence at the University of Oviedo.

# EDUCATION

The University of Oviedo offers new degrees adapted to the European Area for higher education with qualifications that cover most areas of knowledge. Some 30 % of its more than 21,500 registered students are following technical courses (Geology, Chemistry, Physics, Mathematics, Mining and Energy Resource Engineering, Forestry Engineering and the Natural Environment etc.).

The following Degrees from the University of Oviedo related to the development of the sector of Advanced Materials and Nano-technology are noteworthy:

**International Master's Degree in Analytical and Bio-analytical Sciences**

**International Master's Degree in Theoretical Chemistry and Computational Modelling**

**Master's Degree in Integrity and Durability of Materials, Components and Structures**

**Master's Degree in Mathematical Modelling, Statistics and Computing**

**Master's Degree in Chemistry and Sustainable Development**

**Master's Degree in Geological Resources and Geological Engineering**

**Master's Degree in Science and Materials Technology**

**Master's Degree in Chemical Engineering**

Approved Vocational Training with 14,800 registered students, more than the 35 % in technical degrees, completes the technical qualification of the Asturian workforce, combining theoretical training with work experience in companies.

**✱ The National Coal Institute (INCAR-CSIC) has patented a technology developed in Asturias which allows graphene to be obtained from products deriving from coal and petroleum, coke. INCAR is currently coordinating an EU project to create graphene-based material.**

# UNIQUE INFRASTRUCTURES

ITMA FOUNDATION. TECHNOLOGICAL INSTITUTE OF MATERIALS

**The nano-technology area has specialised equipment** which includes, among other aspects, a **pilot plant** for the production of conductive layers and silver nanostructured coatings by spray, as well as a marking **laser** for surface texturing, serial interconnection, manufacturing of shadow masks and welding nanostructures.

The thin-film laboratory is outstanding, equipped with chemical deposition and vapour-phase physics systems, laser station and laminator. It covers the entire manufacturing of thin-film photovoltaic solar cells reproducing the industrial process. It also allows for the synthesis of graphene and high-quality nano-tubes. In both cases, they are unique processes in Asturias with two similar laboratories nationally.

PEREDA POWER THERMAL PLANT

**An atmospheric circulating fluidised bed plant. Its aim is to produce electricity by burning very low quality coals, rubble waste and waste wood.** The Pereda Thermal Centre has supported numerous research and development projects in technologies related to the diversification of fuels, exploiting waste and reducing green-house gases.

ARCELORMITTAL

In Asturias this company has an acclaimed R&D Centre generator of unique technologies, which have been used in 53 operations internationally. **The centre currently investigates efficient solutions to waste disposal, reusing water and developing new technology for the future railway.** To do so it has 13 pilot plants in which it is able to reproduce different basic operations and parts of the productive process.

IQN. INDUSTRIAL QUÍMICA DEL NALÓN

IQN has a pilot plant for the manufacturing of the precursors to advanced carbonaceous materials and an experimental plant for the synthesis of nanoparticles, preferably oxides and mixed oxides.

CINN. NANOMATERIALS AND NANOTECHNOLOGY RESEARCH CENTRE

The CINN has incorporated the only facility in the world to have a large-scale sintering furnace (13 metres high), designed to manufacture so-called “ultra-materials”. These products offer exceptional properties in terms of strength, lightness or resistance to heat in small-sized pieces.

# SUB-SECTORS

EXTRACTIVE INDUSTRIES

Coal and its derivate are the energy sources with the greatest weight in Asturias, with the main consumption in the industrial sector. The most demanded energy sources in 2014 were coke with 25.7 % and soft coal with 39.4 %.

Note in this section the production activity of quarries, clay, limestone, dolomite, sand and gravel. With regards to non-metallic minerals, activity is focused around the production of fluorspar, quartz and kaolin.

WOOD AND CORK INDUSTRY

Some 72 % of the total land area of Asturias is mountainous, one of the highest percentages in Spain. In 2014, the area of felling in Asturias was over 900,000 m<sup>2</sup>, of which 74 % was of eucalyptus, 22 % pine, and 3 % chestnut.

PAPER INDUSTRY

The paper industry in Asturias is dominated by the presence of the ENCE Navia company, the mill with the largest production capacity of the Ence Group. The mill's current production capacity is 500,000 tn/year of high-quality ECF eucalyptus pulp (Elementary Chlorine Free-).

COKE PLANTS

The Asturias-based company Industria Química del Nalón (IQN) stands out in the field of coke production, as well as for its contribution to the carbo-chemical sector with other products such as pitch, naphthalene and technical oils. It has a production capacity of 130,000 tm/year constituting the principal coke and foundry producer in Spain and one of the main European manufacturers.

CHEMICAL INDUSTRY, PHARMACEUTICS AND PLASTIC PRODUCTS

DuPont Asturias has the most modern production and services facilities in Europe. The company currently focuses its activity around three fields: agriculture and nutrition, industrial biosciences (in the field of energy and materials) and advanced materials.

Regarding the fertiliser sector, Asturias is home to one of FertiBeria's 7 productive units in Spain, which meets the demand of nitrates and complexes in north-east Spain.

Pharmaceutical industry: the most noteworthy is the Bayer HealthCare plant in Asturias, the world's largest production centre for acetylsalicylic acid, the only active component of ASPIRINA® and ADIRO®.

Linpac Packaging is a sector leader for packaging in terms of the development and production of innovative solutions.

Linpac in Asturias manufactures paper bags, opaque expanded polystyrene trays for food and transparent tubs with lids.

MANUFACTURE OF OTHER NON-METALLIC MINERAL PRODUCTS

Glass industry: the French group Saint-Gobain has an industrial centre in Asturias, where it develops activities of glass for construction (Saint-Gobain Glass) and glass for automotive purposes (Saint-Gobain Sekurit).

The company has a Research Centre (Aviles R&D Centre) which has worked on highly innovative projects such as the development of glass for solar energy or glass fusion procedures.

Refractory industry: its main areas of application are steel, aluminium, cement and zinc, which correspond to the basic industrial sectors of the regional economy. Representative companies in this sector in Asturias include: Pasek España, RHI Refractories and Vesuvius Ibérica.

In terms of cement manufacturing, the Asturian benchmark is the Tudela Veguin company, from the Masaveu Group, with industrial facilities for the production of grey and white cement.

METALLURGY

Iron and steel works have been and still are one of the region's trademark characteristics. Its production includes steel, in particular the ArcelorMittal establishment in Asturias, which belongs to one of the largest iron and steel work groups in the world.

After metal and steel works, the most highly represented element of Asturian Metallurgy industry is its production of aluminium and zinc, activities represented by:

- Alcoa Inespal. The Alcoa Group is a world leader in the production of primary and manufactured aluminium, as well as constituting the world's largest bauxite mining company and aluminium refinery.

- Asturiana de Zinc. Owned by one of the main leaders in zinc production on an international level, it is currently the largest industrial complex in Asturias and one of the most efficient in the zinc sector on a world scale.

WASTE COLLECTION, TREATMENT AND ELIMINATION

The public company COGERSA offers a centralised solution to waste management in Asturias. COGERSA performs recycling processes on 24 % of the waste the facilities receive.