
AUBERT&DUVAL



**TITANIUM FOR
DEMANDING
MARKETS**
from ingots
to finished parts



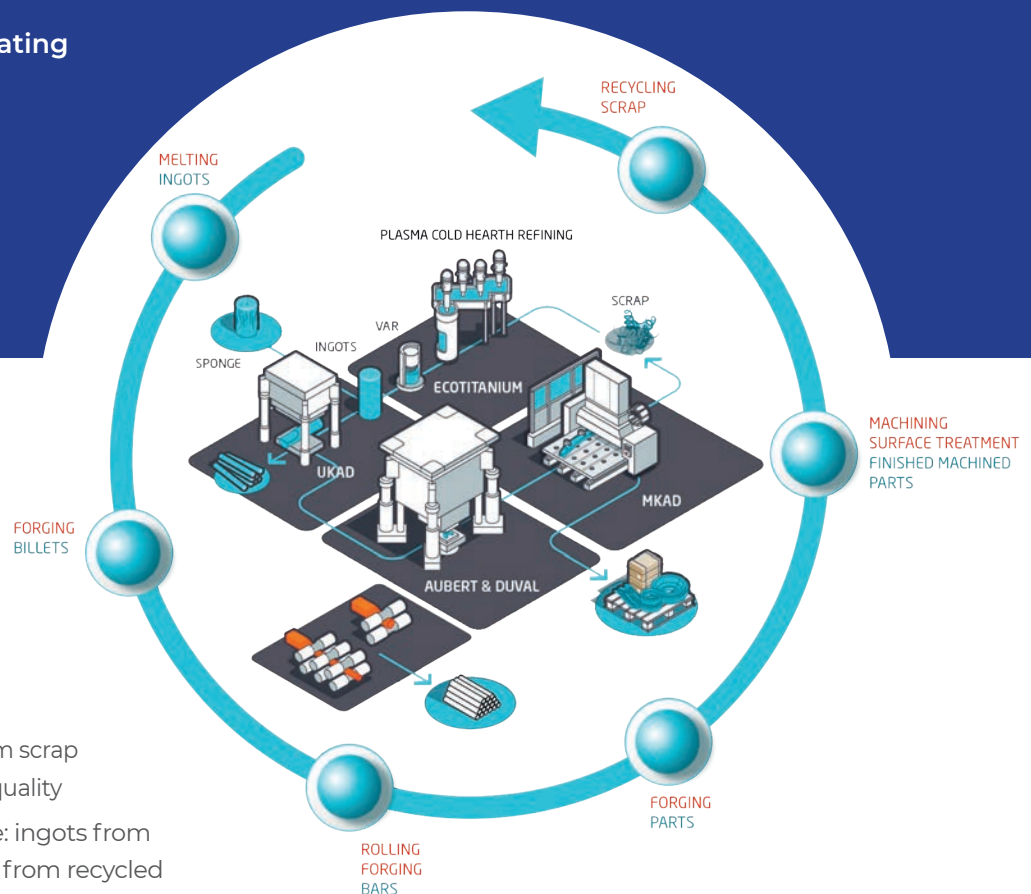
www.aubertduval.com

Expertise at the heart of the entire titanium value chain

From sponge through to various conversion processes, surface treatment and testing: by integrating the technical competences and capabilities into one titanium industrial stream we offer to our customers a large array of metallurgical solutions with an enhanced level of expertise and service.

Advantages of our integrated industrial solution for titanium:

- A simplified and controlled supply chain from sponge to finished and tested forgings
- An offer conforming high quality standards
- Circular economy from raw material through melting ingots, processing titanium, recovering & recycling titanium scrap into new titanium ingots of aerospace quality
- A double raw material provision route: ingots from original ilmenite ore and sponge and from recycled titanium scrap



We comply with the most stringent requirements in terms of high-quality sponge production, melting and grade composition, cleanliness and microstructural integrity, fatigue resistance and dimensional tolerances.

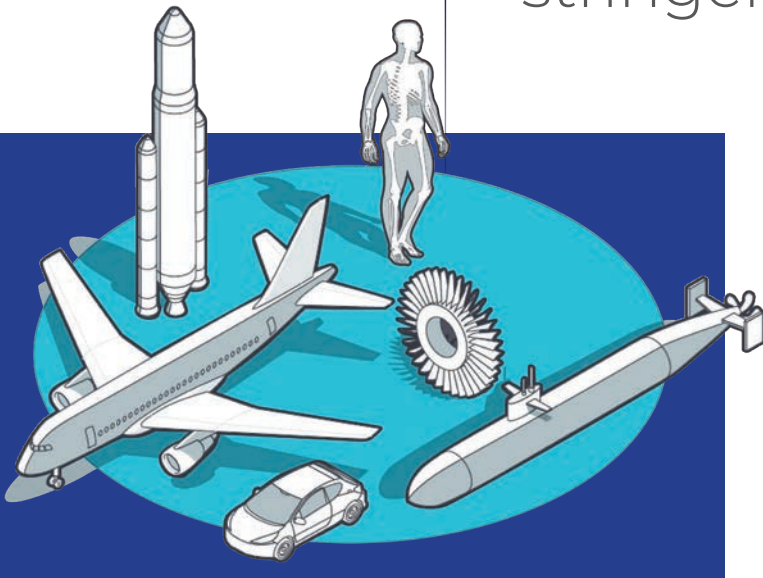
EcoTitanium

Created by UKAD, ADEME and Credit Agricole Centre France to manufacture high quality titanium ingots using titanium scrap as feedstock (minimum content 80%)

UKAD

Created by two world-class titanium specialists - Aubert & Duval and UKTMP - UKAD converts ingots coming from UKTMP and EcoTitanium into forged billets and bars

A full titanium offer for stringent markets



Titanium's extraordinary properties of strength, resistance to high temperature and to corrosion, light weight and low coefficient of thermal expansion contribute to higher efficiency with minimum surcharge in the number of critical aerospace, defense and motorsport applications. Thanks to its bio-compatibility combined with light weight and fracture resistance, titanium is used from head to toe in biomedical implants. It is difficult to imagine how current performance levels in the industries we serve could be achieved without titanium.

World leader in forging

For many decades Aubert & Duval has been providing titanium open and closed-die forged solutions, responding to most stringent requirements. Supported by the ingenuity of its people, using with skill the technical capabilities offered by its 22,000, 40,000 and 65,000 metric ton hydraulic presses, hammers and other processing means, Aubert & Duval tailors its processes to manufacture highly performing products, consistent with customers' needs.



Aubert & Duval's 40,000 metric ton closed die forging press



AUBERT & DUVAL
AD

Our company develops high-performance metallurgical solutions in titanium, aluminum, superalloy and high-performance steel grades for high-tech industries (aerospace, energy, space, medical, defense,...)



MKAD

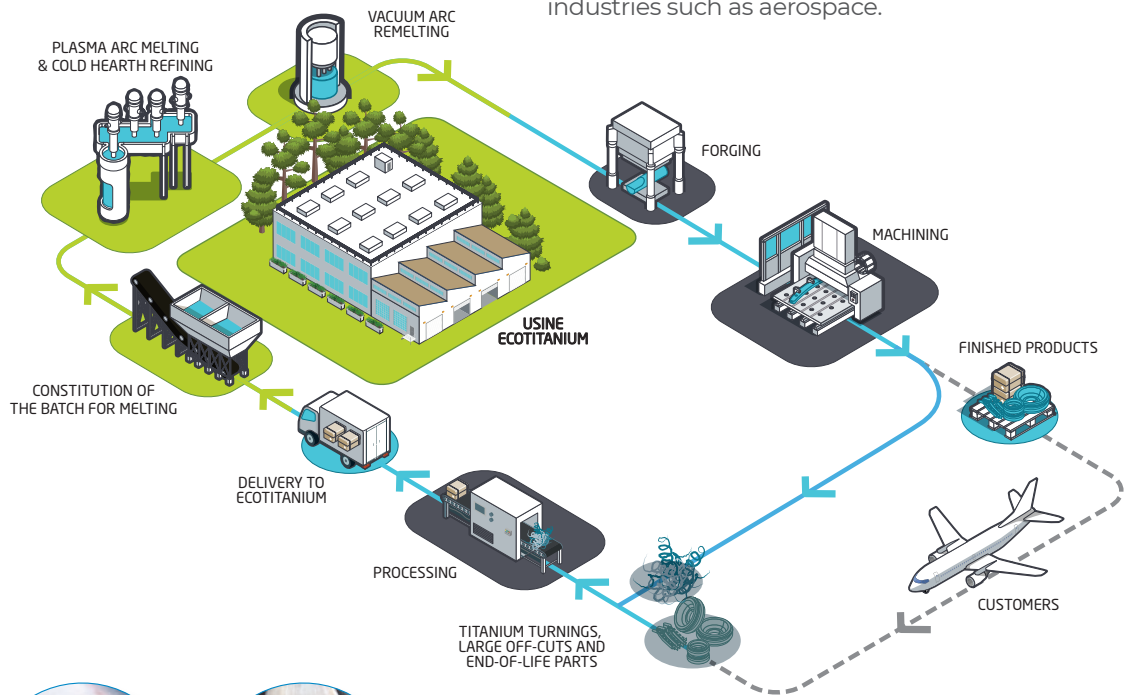
JV between Aubert & Duval and Mecachrome - a single place for aerostructure long-length components for all downstream operations from roughing to final machining and surface treatment

When environment, innovation and the industry of the future are summarized in one word

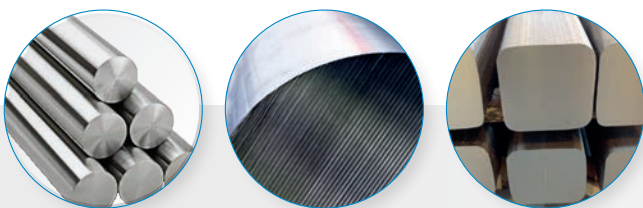


CO2 emissions reduced by 100,000 tons thanks to EcoTitanium's innovative process that consumes 4 times less than the primary melting route using titanium sponge.

At the forefront of technology, EcoTitanium is among the few to use Plasma Cold Hearth Refining to melt titanium ingots. This process allows the removal of a maximum amount of impurities in order to obtain premium quality ingots meeting requirements of the most critical industries such as aerospace.



80% recycled. This is the rate of titanium scrap used to produce EcoTitanium ingots.



Strength and reliability upstream

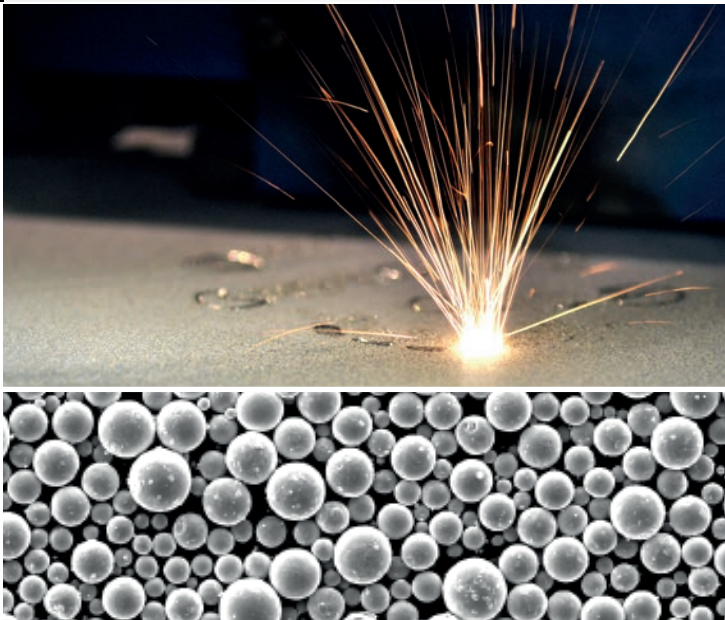
Many components in the aerospace, motorsport and medical industries are manufactured from titanium bars. The initial quality of material is therefore key in the final performance of the product. We offer a wide range of forged billets and bars to better fit our customers' requirements.



UKAD state-of-the-art facility with 4,500 ton forging press and lean manufacturing environment

New performances require new solutions

Applying its very thorough knowledge of titanium materials and their behavior in stringent conditions, Aubert & Duval offers its customers new solutions that match the industry of the future.



Titanium powders for additive manufacturing



Pearl®Micro Ti6Al4V powders are the fruit of a technical and commercial collaboration between Aubert & Duval and its Canadian partner PyroGenesis. Manufactured using the Wire Plasma Atomization Process invented by PyroGenesis, these titanium powders are chemically pure, with high flowability and offer different particle size distributions, suitable for various additive manufacturing processes such as LBM, EBM or LMD.

Advancing in technology and innovation

We support our customers in solving current and future industrial challenges and to improve yield, cost efficiency and material performance through new manufacturing processes, new technologies, new grades.

Our spheres of interest in titanium comprise:

- | Optimization of powder materials for additive manufacturing
- | Wire for directed energy deposition (DED)
- | Enhancement of properties of titanium grades
- | Hybrid forging-additive manufacturing technologies for airframe components
- | Titanium net-shape forging techniques



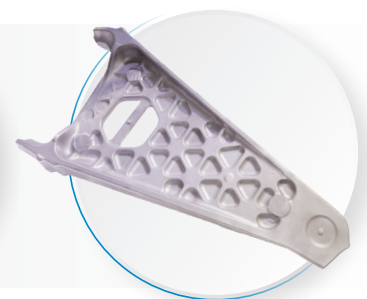
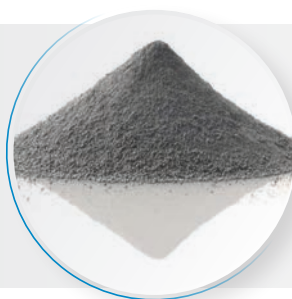
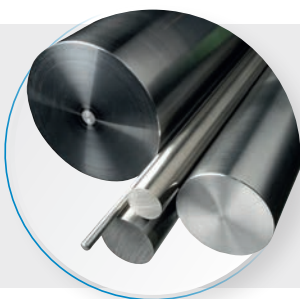
We work in collaboration with universities of applied sciences and research institutions on technological advancements in titanium processing. Our research & technology partners are IRT M2P, Metafensch, IRT Saint-Exupéry, AFRC, PPrime ...

A full and diverse titanium offer

From billets to forged or rolled bars and near net shape parts, we tailor our processes to satisfy your requirements. Whether it is the choice of the alloy, development of a new material, forging process design, study of grain flow or the method of non-destructive testing, our expertise covers the full scope of the alloys and their processing.

> Our titanium offer

Products	Dimensional range	Titanium grades	Applications
Billets and forged bars	Ø 150 – 430mm (6 – 17in)	TA6V, TA6V ELI, Ti1023, T40	aerospace, defense, marine, oil & gas, general engineering
Rolled bars	Ø 20 – 150mm (0.9 – 6in)	TA6V, TA6V ELI	aerospace, defense, marine, oil & gas, mechanical engineering, prosthetics, internal fixation and inner body device
Open-die forgings	Custom dimensions Weight up to 3t (6600lb)	TA6V, TA6V ELI, T40	marine, defense, petrochemical, oil & gas
Closed-die forged structural parts	Length up to 8000mm (314in) Weight up to 3t (6600lb)	TA6V, TA6V ELI, Ti5553, Ti6242, Ti1023	Fuselage, undercarriage, wings, spacecraft, helicopter transmission components, marine and defense
Closed-die forged rotating parts	Ø up to 2000mm (79in)	TA6V, TA6V ELI, Ti5553, Ti6242, Ti1023, Ti17, Ti6246	aeroengine, industrial turbine, helicopter
Finished machined parts	Length up to 6000mm (236in) Weight up to 1,700t (3748lb)	TA6V, TA6V ELI	Large airframe components
Powders for AM	20-53 µm 45-106 µm	Pearl®Micro Ti6Al4V ELI	LBM, EBM, LMD



Specialized in high performance materials and parts

Whether operating at temperatures from subzero to 600°C, or supporting stress up to 1200MPa, many aircraft, spacecraft and helicopter parts come from Aubert & Duval's forging shops. Aubert & Duval offers the full range of services, from definition of a forged part design and the appropriate manufacturing process to mechanical pre-machining of large-area forgings and support for post-processing operations



Aerostructure:

- | Fuselage parts
- | Wing box parts
- | Engine pylon parts

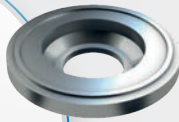
Spacecraft:

- | Engine parts
- | Propellant tanks
- | Helium pressurization tanks



Aeroengine:

- | Fan disks
- | Boosters
- | Compressor disks
- | Impellers



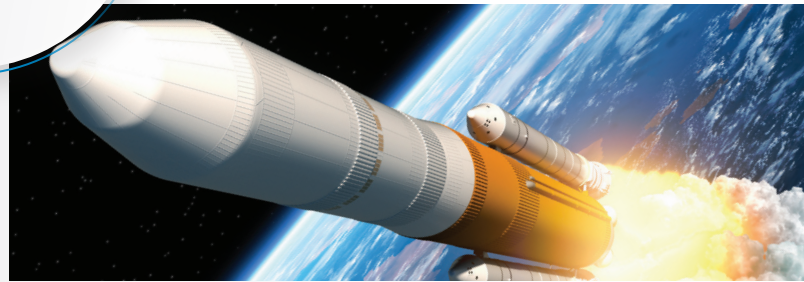
Landing gear:

- | Sliding tubes
- | Bogie beams
- | Arms
- | Torque links



Helicopter:

- | Engine parts
- | Rotor components
- | Main fittings





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