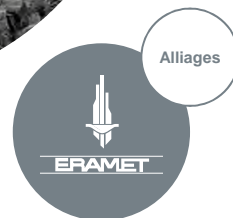


1 TITANIUM STREAM



- Over the 2012/2020 period, **global titanium demand** is set to grow by more than **50% to total 100 Kt of ingots**, mainly to meet the needs of the **industry and aviation sectors**.
- The **aeronautic market** but also the **medical, energy and defense** markets should grow by **5%** per year.

2011



ERAMET Group, its subsidiary Aubert & Duval and its partner UKTMP inaugurated **UKAD** forging plant



2016



MECACHROME and Aubert & Duval inaugurated **MKAD**, a joint venture specialised in machining and finishing aeronautical-grade titanium parts



2017



UKAD, ADEME and Crédit Agricole Centre France inaugurated **EcoTitanium**, the first plant in Europe to produce aeronautical-grade titanium by recycling



SHAREHOLDERS committed in UKAD and EcoTitanium



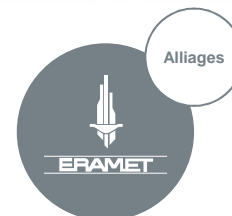
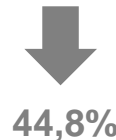
Aubert & Duval, an ERAMET Group subsidiary, specialized in high value added metallurgy is a world leader in high performance steels, superalloys, titanium and aluminum.

Aubert & Duval designs and makes cutting-edge metallurgical solutions for aerospace, energy, motor racing, nuclear and medical sectors.



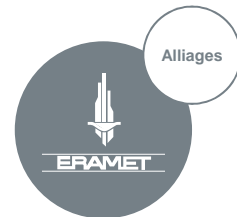
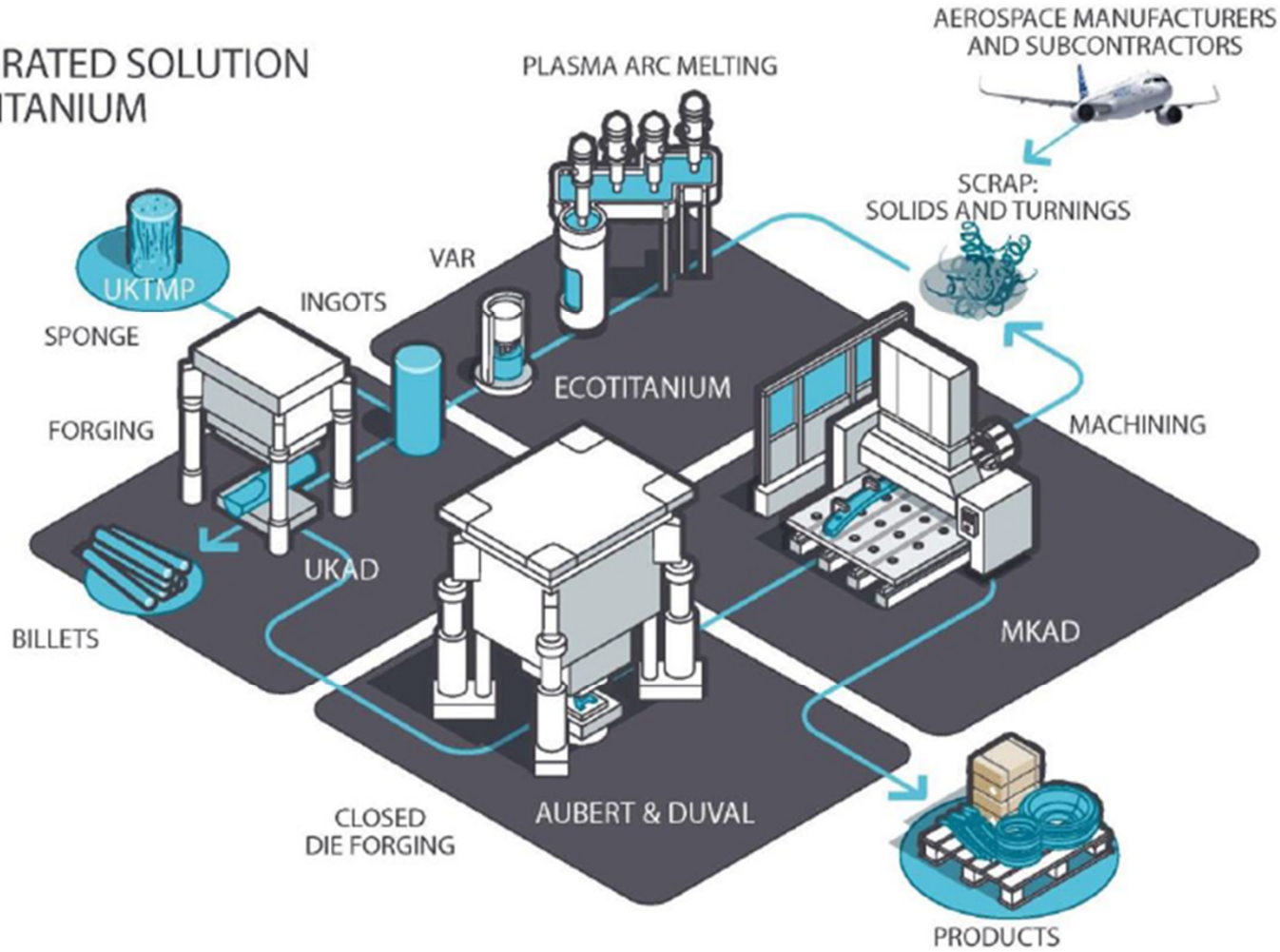
UKTMP is listed on the Kazakhstan stock market. UKTMP produces high quality Titanium sponge from Kroll process and Titanium ingots using VAR furnaces since 2010.

It's one of the world leaders in titanium sponge production.

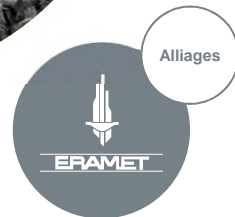


TITANIUM STREAM

INTEGRATED SOLUTION FOR TITANIUM



2 UKAD

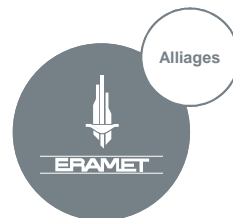
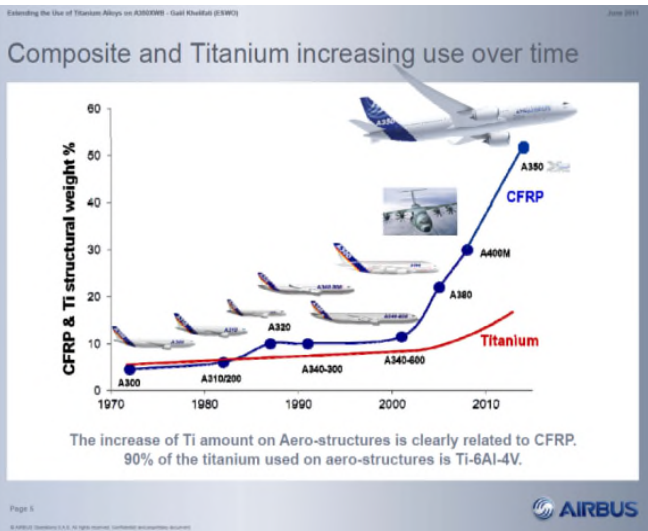


• The Raison d'Etre of UKAD



The creation of UKAD was driven by :

- The increase of Ti material in airplane structures
- The UKTMP strategy with Ti downstream development,
- The Aubert et Duval strategy with Ti upstream development,
- The support of Airbus with a 10 years sales agreement,
- The French local authorities support,



• The Foundation of UKAD



UKAD is a joint-venture which combines, in the titanium market, the strengths of 2 companies :

➤ Aubert & Duval



➤ UKTMP

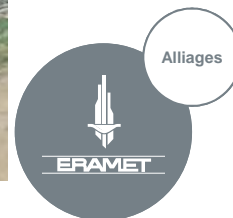


UKTMP is a Kazakh registered company. Well known for its high level of Titanium sponge quality :

- Ilmenite mining operation
- Titanium slag production
- Titanium tetrachloride and magnesium production
- Titanium sponge production
- Titanium melting facility



UKTMP plant in Kazakhstan

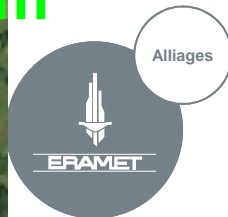
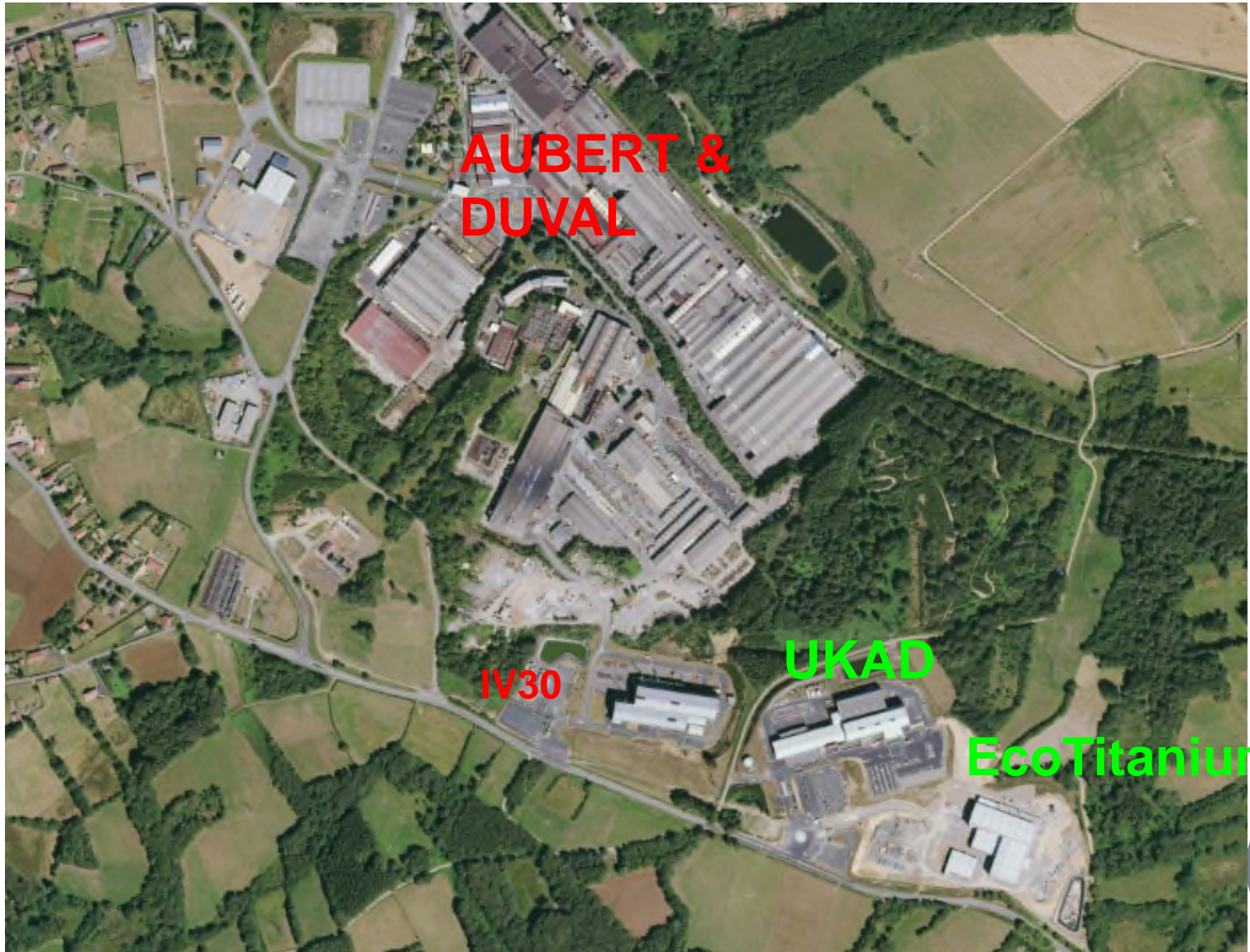


• UKTMP in pictures



Alliages

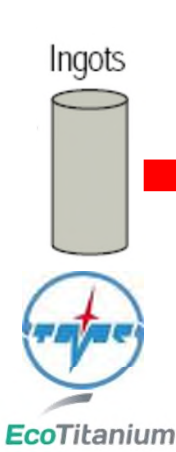
- **Location**



• The Process of UKAD



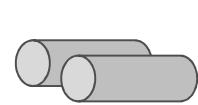
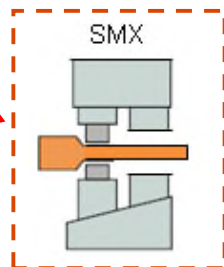
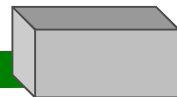
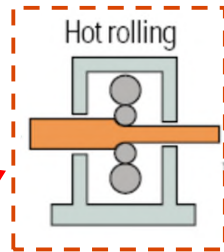
Lingots



→ UKAD



forging press
4,500 t.



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Operations subcontracted to Aubert & Duval

- Ingots from 7 (titanium) to 18 t
- Blooms and billets (round) from 85 to 450 mm in Ø and 4 to 6 m long, rectangular bars.
- Bars below 80 mm in 2019, allowed by new investment in Aubert et Duval.
- Rectangular shapes with Erasteel Champagne plant.



Worldwide Aeronautical Market



CUSTOMERS

UKTMP

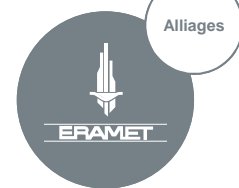


Ti Alloy Ingot

Billets



Confidential



• Fasteners and Medical Market

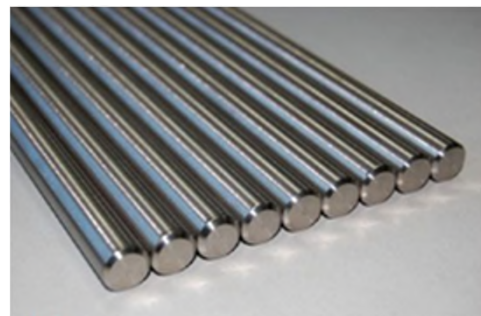


UKTMP

Ingot → Blooms → Bars



Ti Alloy Ingot



CUSTOMERS

Aeronautical fastening market



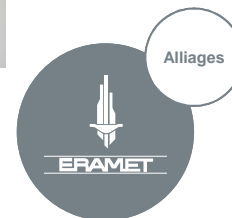
Orthopedic Implants



Knee



Hip



• Oil and Gas, Industrial Market



UKTMP

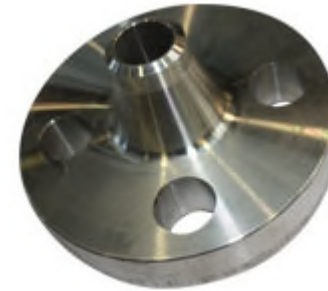


Ti CP or Ti Alloy Ingot

Ingot → Blooms, Billettes



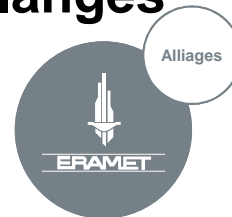
CUSTOMERS



Welding Neck



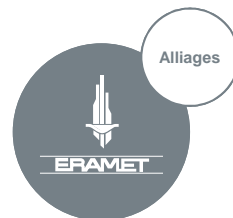
Covers and flanges



• UKAD certifications



- ISO 9001 and AS 9100, last approval Dec 2018
- ISO 14 001 and OHSAS 18001, last approval Dec 2018
- Ultra Sonic Nadcap Certification in Dec 2014, confirmed in 2015, 2016 and in April 2018.
- **Airbus :**
 - IPCA Jan 2013 « C » → IPCA+ 28 Jan 2016 « B »
- **UKAD** delivers billets and bars in accordance with **AMS 4928** and Ultra Sonic tested in accordance with **AMS 2631**.



• UKAD Awards



For three years running, UKAD was awarded by Airbus :

Best Improver Award 2014, 2015, 2018.

Best Improver Award

UKAD

For demonstrated improvement of performance in 2015,
Strong continuous improvement and customer-oriented approach,
In line with Airbus targets and expectations.

Klaus RICHTER
Chief Procurement
Officer AIRBUS Group
& AIRBUS

Olivier CAUQUIL
Senior VP,
Head of Material and
Parts Procurement
Chairman of the Airbus
Group Material board

Thomas MOIK
Senior VP,
Head of Procurement
Operations

Thierry VUILLEQUEZ
VP Supply
Chain & Quality
Procurement Operations
Material & Parts



3 EcoTitanium



• Why EcoTitanium

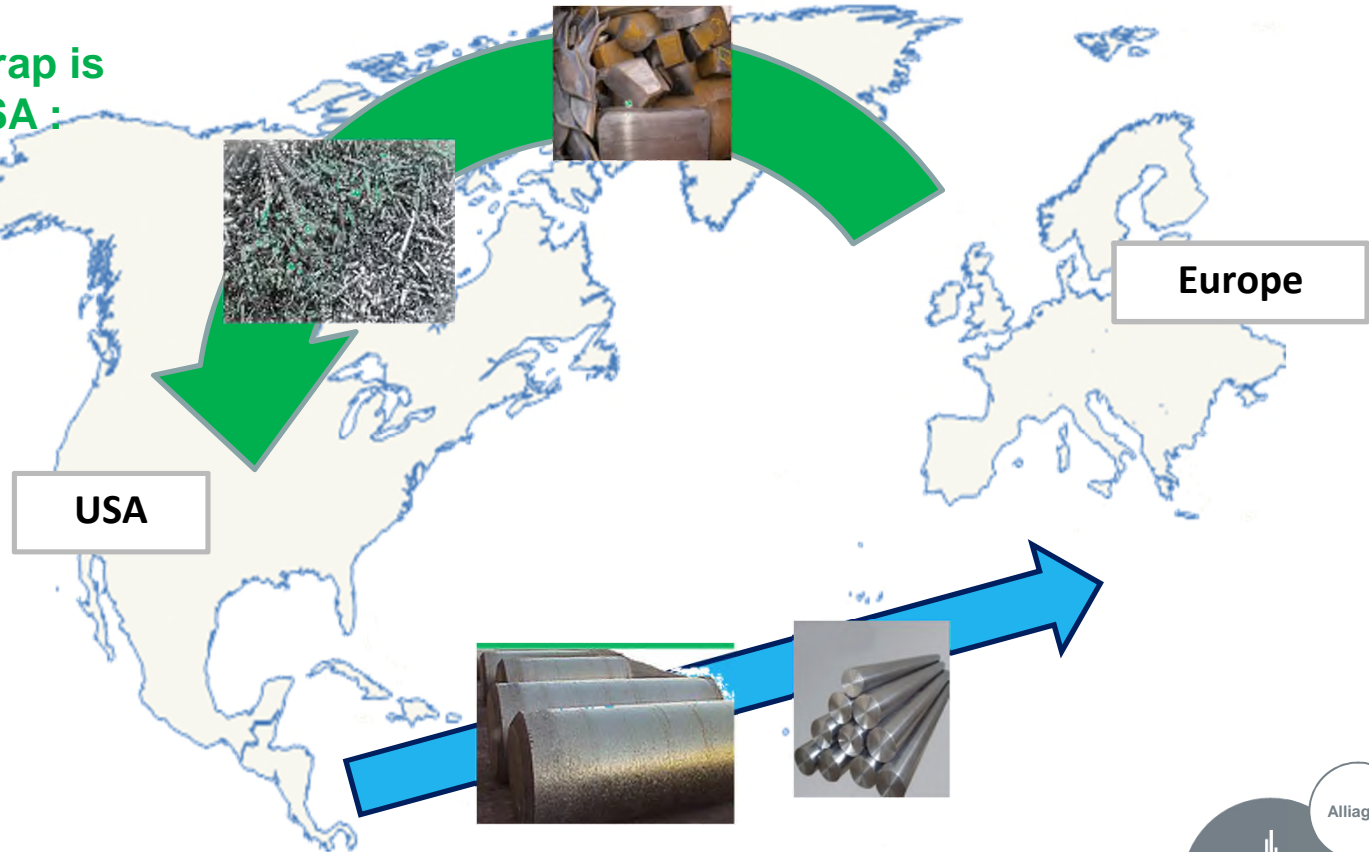


□ Scrap generated in Europe is a key for competitiveness of US titanium melters:

European titanium scrap is mainly exported to USA :

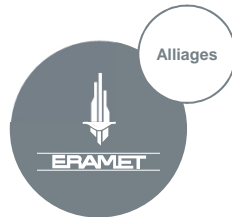
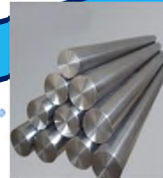
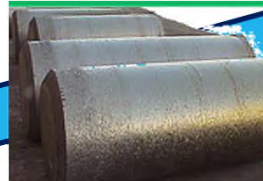
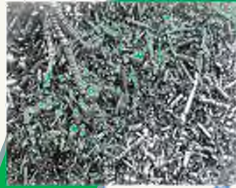
* 10500 tons en 2016

* 15300 tons en 2017.



USA

Europe



US ingots are mainly produced from titanium scrap, which represents more than 60 % of the total consumption Scrap + Sponge.

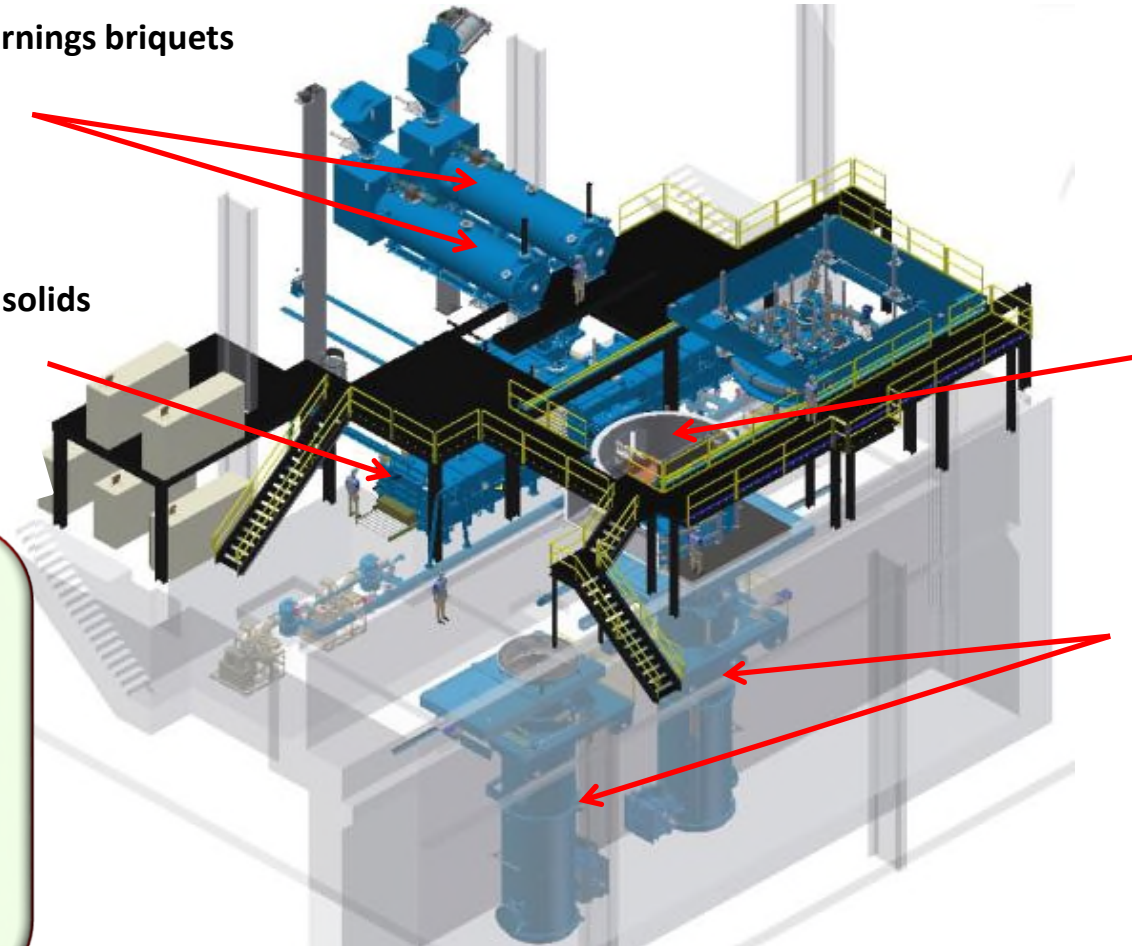
• Main Equipment : PAM-CHR



Plasma Arc Melting Furnace with Cold Hearth Refining System

Loading system for turnings briquets

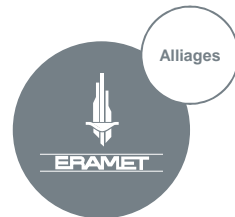
Loading system for solids



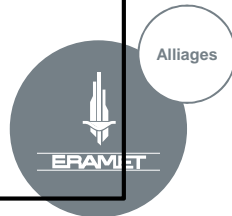
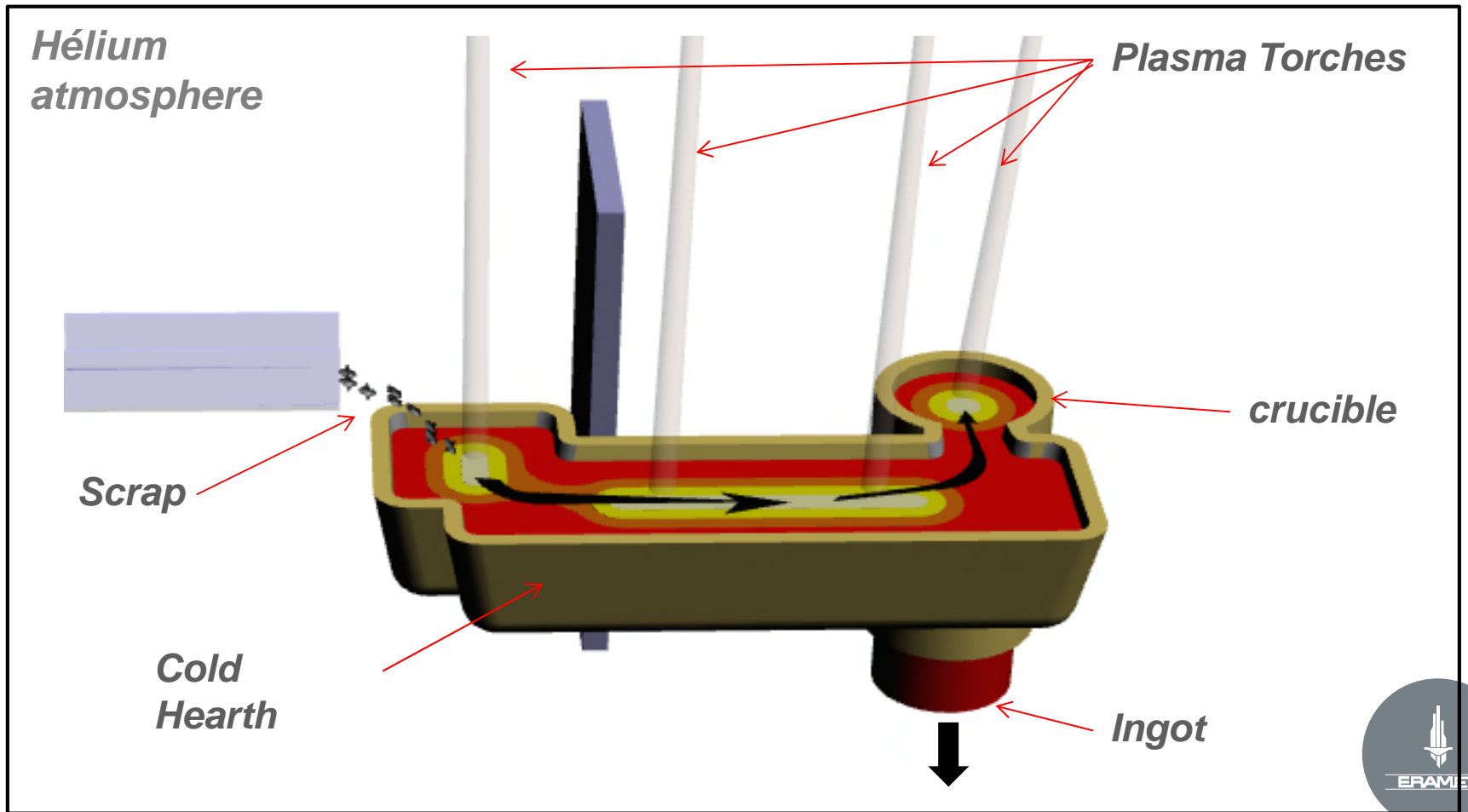
Melting Chamber

Electrodes erection chamber

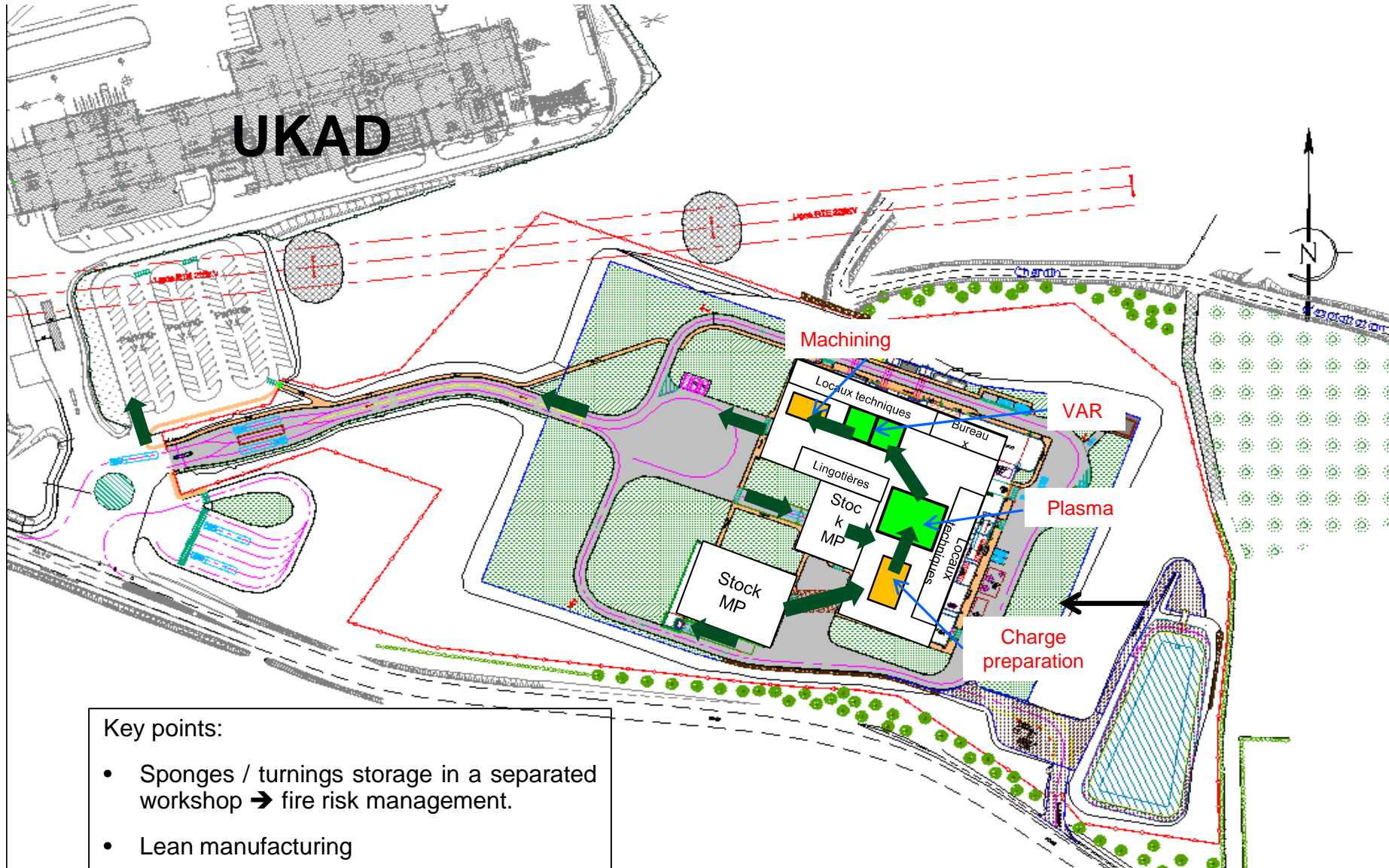
- Plasma melting is followed by VAR remelting in EcoTitanium facility.
- All equipment available in Ecotitanium for preparation of melting and remelting, and sample collection for chemical analysis.



• PAM – CHR Principle



Layout & flow process

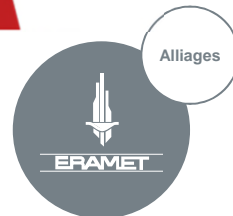
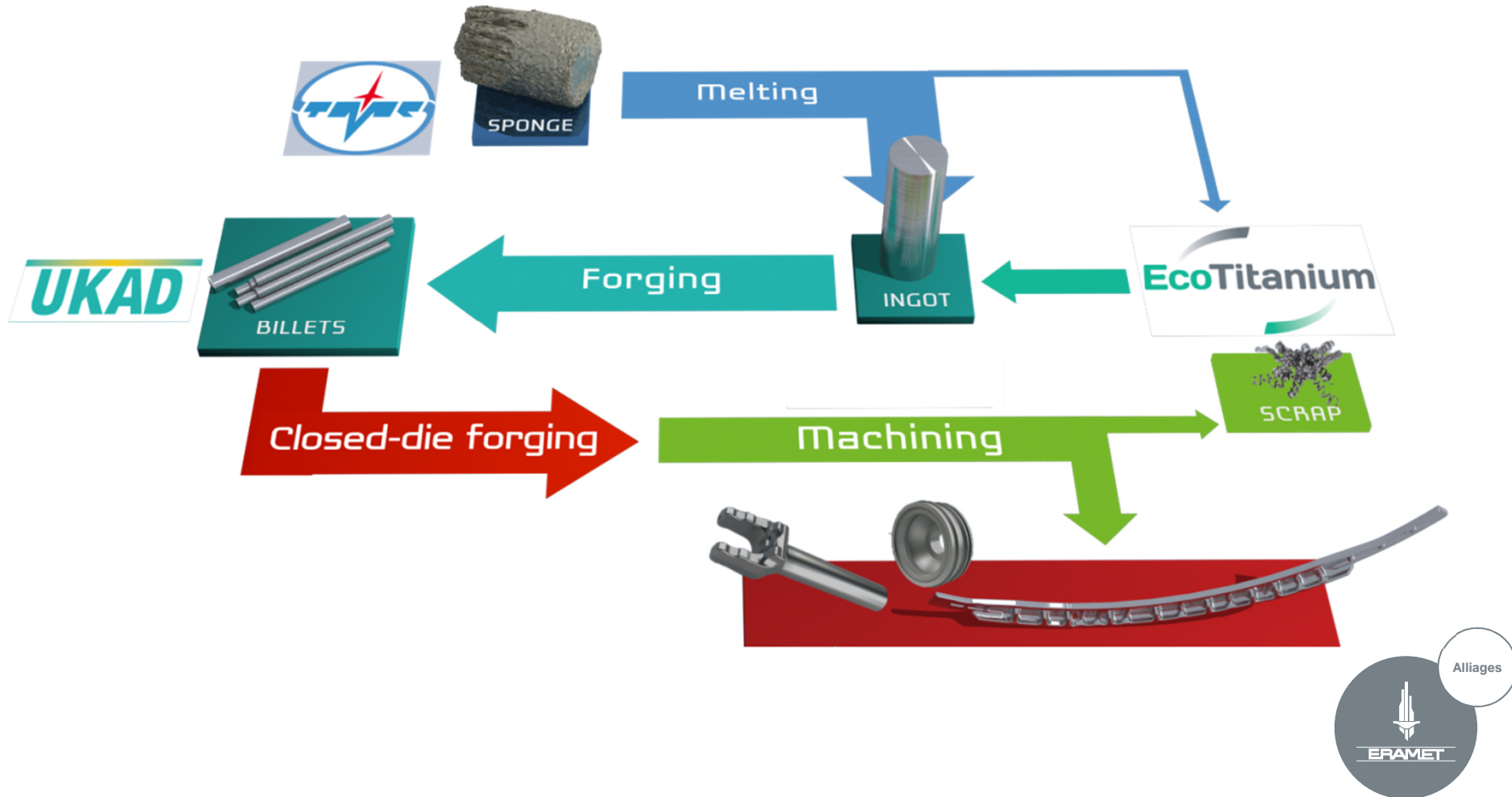


- Key points:
- Sponges / turnings storage in a separated workshop → fire risk management.
 - Lean manufacturing

• Integrated solution for titanium



- An open Solution for all UKAD Customers: The revert loop will be available for all UKAD's customers (forgers, extruders), based on circular Economy.



• General roadmap

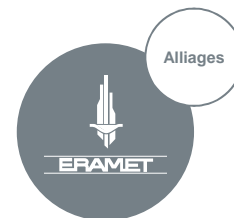


2010:
Reflection and
project
structuring.

2015:
Building
construction.

2017:
Production
and
qualification
start-up.

2022:
Full maturity.





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