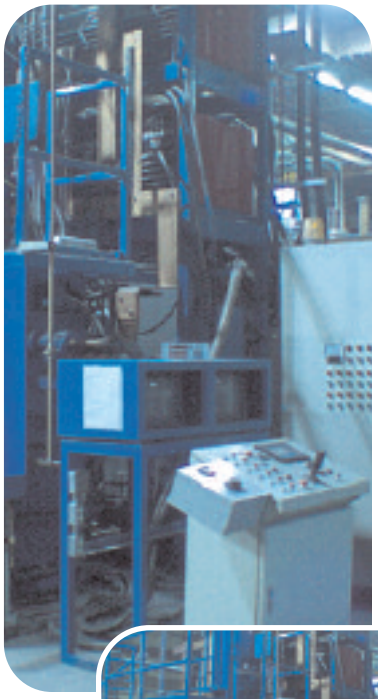
TITANIUM



HISTORIC REMINDER :

Titanium is an element which the market views very differently from other industrial materials. Its use involves state-of-the-art technology, unequalled purity, rarity, quality, and solidity.

In 1791, the English amateur mineralogist Gregor discovers the titanium element in iron. Titanium is ranked fourth for the element abundantly found in nature. In 1795, the German chemist Klaproth discovers rutile, a new element baptised titanium. It's only 120 years later that titanium was discovered, by the American chemist Hunter, in 1910.

Through the first decades of our century, titanium made its debut into chemical compounds and was being added to alloys. Because of new materials requirements, more specifically in the aerospace industry and the production of nuclear energy, the industrial production of titanium ductile is introduced at the beginning of the fifties.

Those two industries have allowed the development of the first functions for the titanium and made them evolve. Thus, the needs of these industries were such that forged titanium had no difficulties to be accepted, and this, despite the high cost of production.

The effect of the economic crisis in the early eighties forced equipment suppliers to search for lightweight materials with a high mechanical resistance.

The aerospace and automobile industries wanted to exploit this material in order to save money and increase the distance with the same quantity of fuel. The obstacle that held up the high demand of production is its cost.

A few technologies have been polished and new approaches on the transformation of the titanium have recently appeared. More specifically, high speed tooling, sand casting, and casting by the lost wax process have contributed to the development of new applications.

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TITANIUM'S CHARACTERISTICS AND CURRENT APPLICATIONS :

Titanium is a high-tech industrial material with remarkable properties. More specifically :

- High density
- High mechanical resistance
- Good fatigue resistance
- Excellent properties at low temperature
- Excellent resistance to creeping
- Excellent resistance to marine, chemical and atmospheric corrosion
- Excellent resistance to oxidation
- High coefficient of thermal transfer
- Good resistance to erosion and to "cavitation"
- Good transmission of ultrasonic energy
- Low coefficient of thermal expansion
- Non magnetic

The research project aims at developing a process by the lost wax process allowing the production of thin wall and high structural integrity titanium parts. Liquid titanium is very reactive vis-à-vis carbon, gas and refractory materials. This voracity to oxygen, in contact with the mould, leads to a superficial contamination of the piece (called alpha case) by carbon, oxygen and other elements.

The main technical objectives of the research and development project are of two orders :

- The choice for the fusion method (VIM or VAR)
- The choice of material for the shell.

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