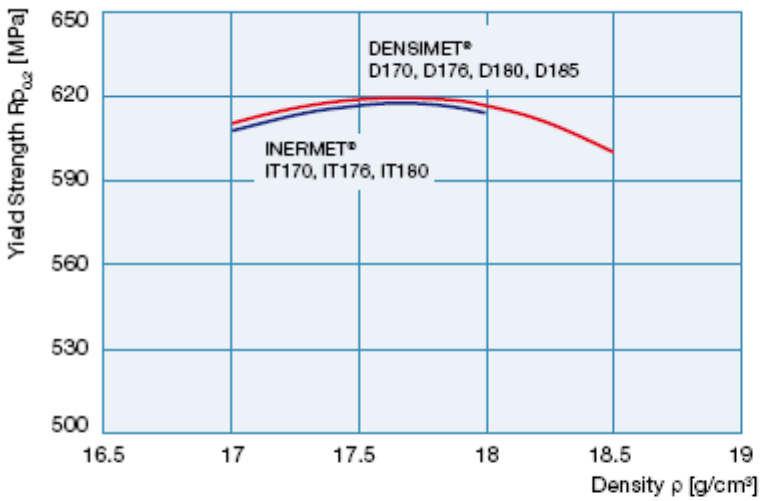
Considerations about tungsten grades after the visit of the Plansee French site

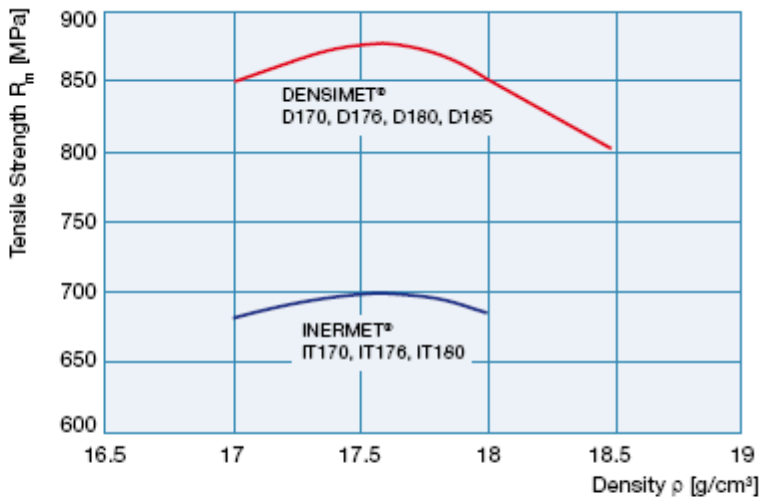
Forget about pure tungsten

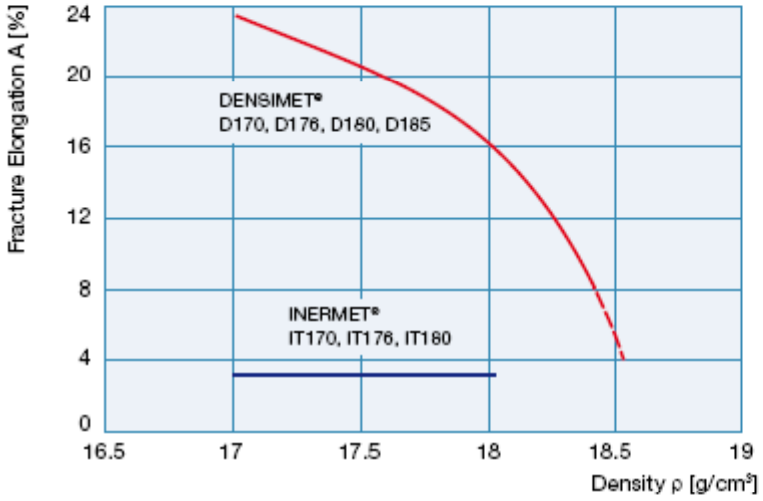
The Cime Bocouse (Plansee) firm

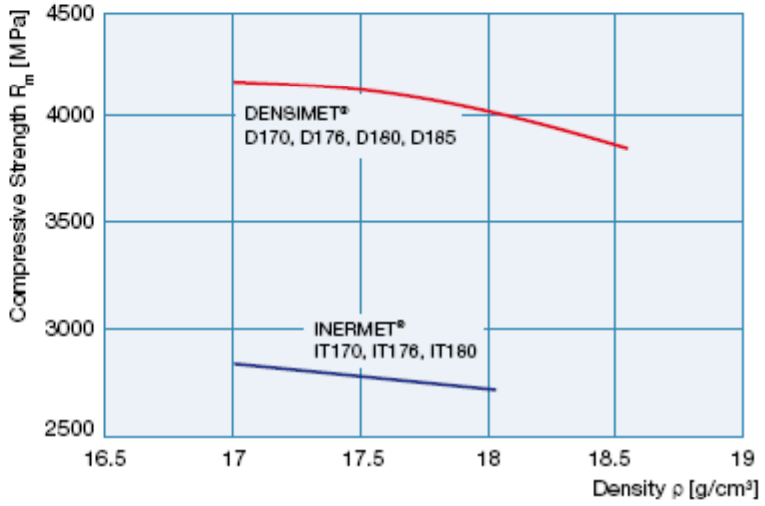
- About 70 employees.
- 10% of budget and personnel working in R&D.
- They have the complete production cycle in the house. From powder mixing to final machining.

So it is not a commercial office re-selling tungsten manufactured elsewhere.









Tungsten is brittle. The plastic behavior comes from the CuNi and more from NiFe.

Maximum size

- Today a reasonable maximum size is about 1 tonne of product.
- In case of 10 – mm - thick plates the size is about 400 (500) mm x 600 (800) mm after cutting and machining.
- Rolling is complicate: hard phase (tungsten) mixed with ductile phase (CuNi). Brittleness increases!

A promising technique - extrusion

- Powder is mixed with a polyimide (nylon or similar).
- The mixture is extruded.
- First pre-sintering process (~800^{o}C).
- Final sintering.
- Option – rolling to straighten the plates – not to change thickness.

Size: from 0.5 to 5 mm thickness
now 200 mm x 600 mm (could be longer).

Good mechanical properties but tried only with Densimet (NiFe).
Next step: try it with Inermet (CuNi).

Next steps for them and for us

- Plansee will test the extrusion of Inermet.
- Plansee will send us samples of different grades to measure the magnetic properties.

- We have to pre-design and compute possible structures in order to evaluate stress levels and acceptable configurations. After this Plansee can have a better understanding of what we need.

- And then we can think to possible prototypes or construction tests …