CANNULATED BAR TECHNOLOGY

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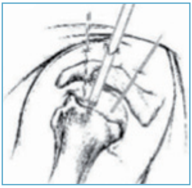
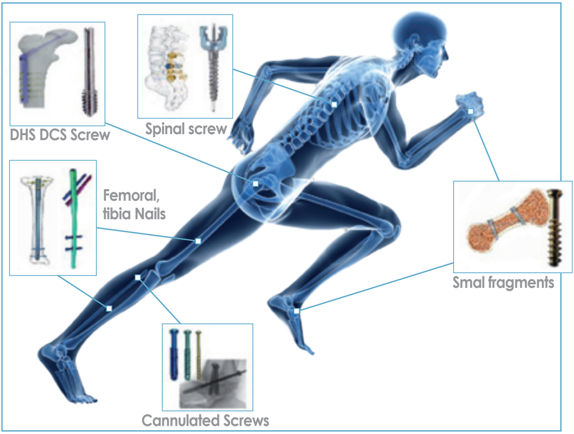
Kirschner Wire technology



- Cannulated technology was introduced by Dr Kirschner in 1985, as orthopaedic surgeons began using this breakthrough surgical technique for fracture fixation with aiming devices. Since then, it is widely used in trauma, small fragment & spinal surgeries.
- The technique consists in inserting a K-wire with dia. from 0.6 to 3.2mm dependent on the size of the implant, to check the positioning and to perform the drilling, tapping, reaming operation over the guide, and to insert the screw with a driver to proper screw in the fixation.



Cannulated Implants & Instruments

Screws and IM nails are usually machined from bars on bar feeders and CNC turning.

For cannulated implants, technologies are currently available on the market:

Two technologies for cannulated Implants and Instruments:

- deep hole drilling technology,
- thick wall Tubing, later called cannulated bars.

Tubing vs cannulated bars

Conventional tubes, thin or medium thick wall, are produced according to the following steps. A billet is drilled through, heated to forging temperature and extruded. A needle inserted from the ram to the nose of the billet creates a tube hollow as the material flows between the needle and the die.

Then several drawing techniques are combined and applied on the tube hollows as shown.

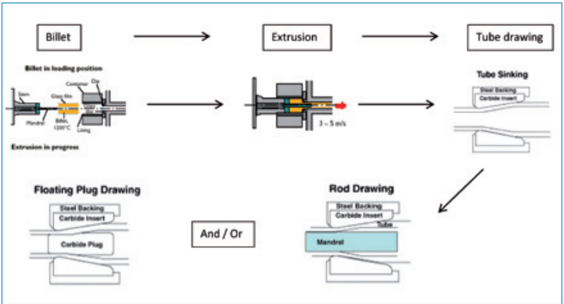


FIGURE 1: Process Tube

The limitations are the surface geometry from the sinking process and the potential risk of capturing lubricant with the carbide plug or hard mandrel process. As annealing steps are necessary to reduce the section, left over lubricant traces can become intergranular corrosion.

This tube making make it difficult as ID gets smaller and wall thicker.

Breakthrough technology

To cope with above mentioned problems, a special process has been designed to process material as a solid, by plugging inserts in the starting material as shown in the following processing route.

Properties of this process are as follows:

- conservation of homotetical ratio,
- no sinking during tube drawing avoiding surface defect,
- no contamination risk by lubricant during annealing or heat treatments,
- no limitation in ID sizing to fit smallest K-wires like 0.6 mm or 0.8 mm.

FIGURE 2: 1310 tons horizontal press LOEWY + 3 cells x 350 kW BANYARD induction heating

FIGURE 3: Extrusion operation

FIGURE 4: Hot extrusion press

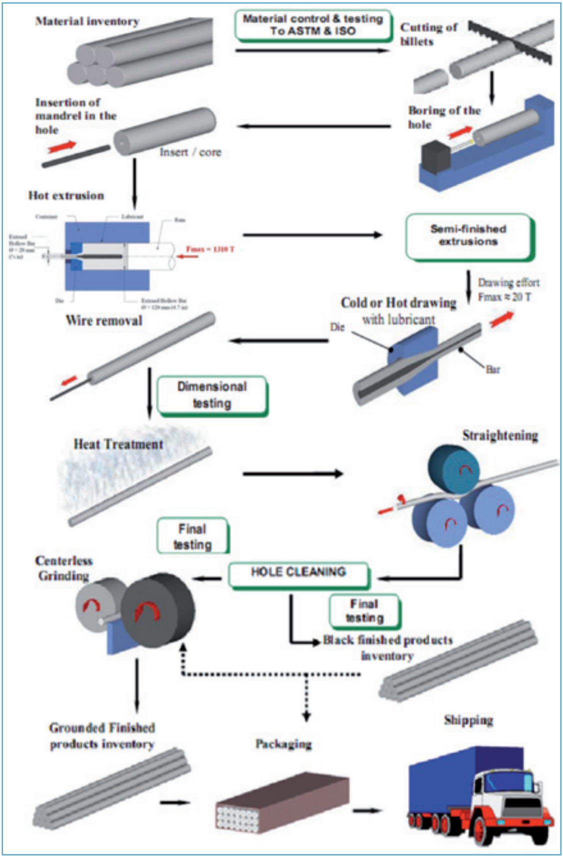


FIGURE 5: Process from materials to shipping

Cannulated bars

- Grade(Implant):
  - Ti 6-4 and family: 6-7Nb, Ti 13-13, Ti -Mo15,
  - austenitic stainless steels, nitrogen enriched, Nickel free,
  - ß titanium,
  - shape memory alloy.

- Grade (Instrument): Martensitic, Age and precipitation hardening type: 420, 431, 440, 455, 465, 475, 630, 13-8Mo, etc.
- Minimum Processing Quantity: 1-2 billets equivalent to 35 to 100 meters.

Ti6Al4V eli (ASTM F136)

Micrographic ISO and ASTM specifications:

- free of visible micro inclusion (x 200),
- α+ß equiaxed structure, according to ETTC2 A1-A9 reference pictures,
- free of α case (hole surface and OD),
- free of α network and α platelets.

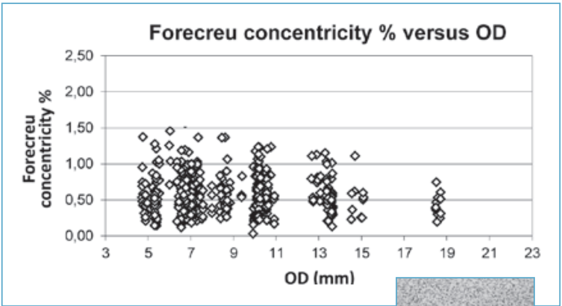


FIGURE 6: Ti 6-4 ELI

X200 Forecreu typical

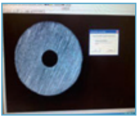
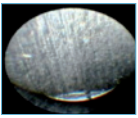
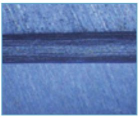


Image Capture (NOESIS)

Roughness Control (MITUTOYO)



Fibroscopic (CESYCO)



BINOCULAR Image x15

Partner

Forécreu Biometal designs, manufactures and distributes cannulated stainless steels & titanium alloys for the manufacture of orthopaedic instruments and implants such as osteosynthese screws and IM nails.

Production sites are located in the center of France incorporating extrusion & drawing, as well as a strong R&D department. Worldwide sales are conducted through affiliated stocking/distribution companies in USA, Japan, Germany & China with a central inventory in France. Available stock for each region is provided online 24/7.

The company is ISO 9001 and pending ISO13485.

www.forecreu.com

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