



« PLASTIC » CAPS ON THE TIPS OF THE ANCHORS

Steel alloys (Aisi 310, 304 ...) used for manufacturing anchors have a thermal expansion which is much greater than refractory castables (average: 1.5 mm per meter per 100°C).

Metallic anchors are within the castable structure, they expand more than the castable, this creates stress in the castable. The stress can generate cracks, which in turn can produce scaling.

Longer is the anchor, the greater the difference in thermal expansion will be and the higher the stress inside the castable layer will be. The way to manage the thermal expansion difference is to put on the tip of the anchors a so called "plastic" cap, which will melt at about 150°C, and will then give a small space into which the higher thermal expansion of the steel alloy can move without creating stress with in the castable.

Most of the time, the caps are made of PVC, they are easy to procure and cheap.

C of PVC is chlorine, which is not good for the castable and steel alloy, but the quantity of chlorine is little and most customers use PVC caps

A much better solution is to use POLYETHYLENE caps, they are chlorine free, but a little bit more expensive, they are not available from stock.

If you want polyethylene caps, please note that delivery time will be longer.

PVC caps are in stock at ANCHORS. If you don't mention the quality of caps, we will supply PVC ones.

Please mention PE caps if you need polyethylene ones.

The color of the caps in PVC corresponds to the alloy grade.

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STUD WELDING – ALUMINIUM BALL - FERRULES



Stud welding technique is used in some industries for new constructions (mainly on new steel casings)

NB- some industries don't accept that method of welding.

The shape of the anchor has to be adapted to the stud welding technique.

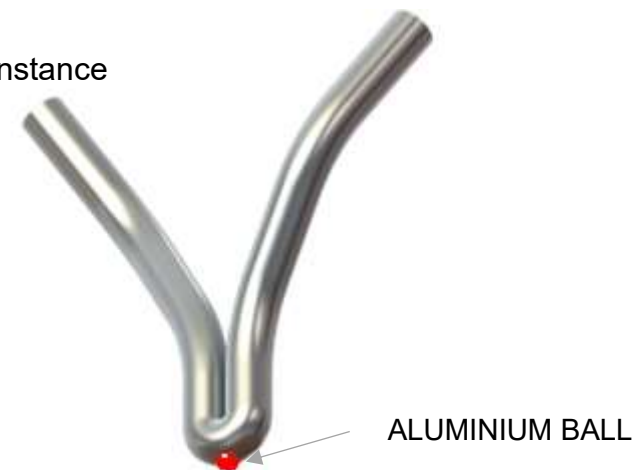
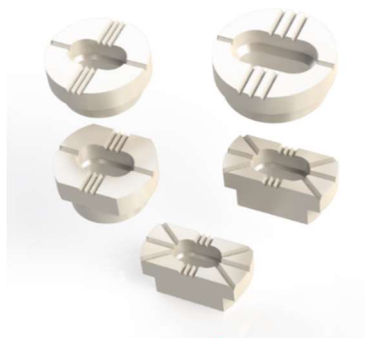
An aluminium ball is fixed at the bottom of the anchor. The melting temperature of the alu ball is very low (+/- 600°C), it acts as a catalyst of the melting of the steel alloy (much higher melting point).

That aluminium ball makes the welding much easier. For very small cross sections (for instance a single dia 5.25mm of a DRS-RT-6), aluminium ball is not always required.

Stud welding for very big diameters is not easy, sometimes critical.

Stud welding of anchors fixing heavy refractory linings is also sometimes critical.

Ceramic ferrules are required for stud welding



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DEFINITION/SPECIFICATION OF REFRACTORY ANCHORS (proposal)

A detailed drawing has to be attached to the specification ; the alloy has to be mentioned.

Refractory anchors will be manufactured from a cold drawn wire, DIN 671 , EN 10278,h9.

That means the tolerance on diameter 6 : +0-0.030 mm

On diameter 8 : +0-0.036 mm

Anchors are submitted to normal manufacturing tolerances. In general, the dimensional tolerances average is :

1.+/- 5° on angle

2.+/- 2 mm for height <200 mm

3.+/- 5 mm for height >200 mm

The wire will have a smooth, shiny surface.

Any other type of wire won't be accepted(for instance wire rod).

Tensile strength of the wire will be between 650 and 850 N/square mm.

Anchors will be formed according to a soft bending technique, by robotic machines, in order to minimize the stress, the bending marks and to avoid micro cracks through which corrosion penetrates faster.

Using mechanical presses for the anchors forming is not accepted.

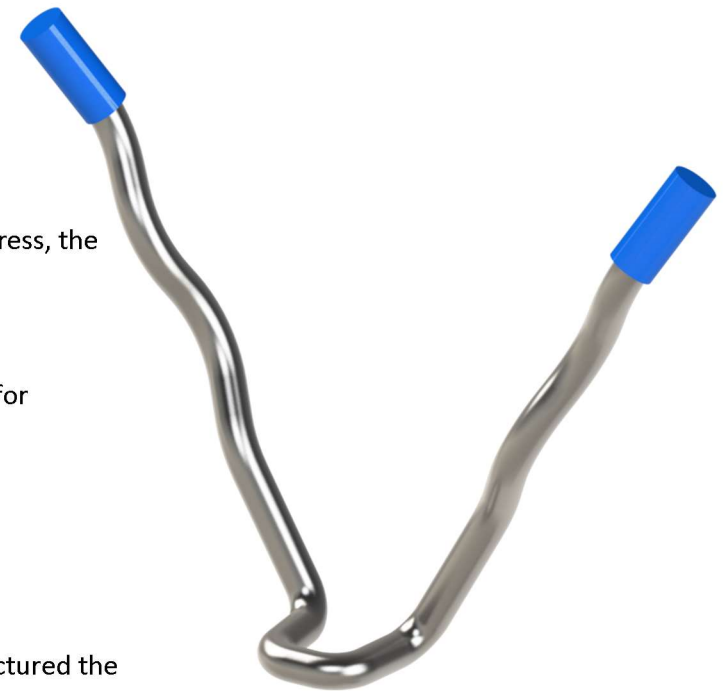
Possible bending marks will not be deeper than 0.15 mm for diameter 6 mm,0.20 for diameter 8 mm and 0.25 for diameter 10mm.

If caps are used on top of anchors, they will be in polyethylene.

Most manufacturers use PVC caps(softer, faster to install and cheaper).

C of PVC is chlorine, which is aggressive on the refractory castable and steel alloys

The anchor supplier will give to its customer the mill certificate 3.1.B issued by the steel plant who has manufactured the wire used for manufacturing the refractory anchor.



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SOLUTION ANNEALING AFTER FORMING OF REFRACTORY ANCHORS

Our anchors manufactured in round sections(wire in coils) are made from wires which are solution annealed in the stainless steel plants.

After annealing, the wires are cold drawn.

Sometimes (rarely), some customers ask for anchors **solution annealed after forming.**

The target of that annealing is to relieve the stress generated by the forming of the anchor.

Indeed, if the anchors manufacturer is not using the right high quality wire and is forming the anchor with mechanical tools or presses(both are very usual in China and India,quite common in the western world), micro cracks,weak areas ,unhomogeneity of physical properties of anchors will be encountered.

We make round anchors with robots, using hydraulic processes,operating at low speed, doing what we call the « soft bending ».

Because of :

- The type of wire we are using
- The process of forming

We generate very low stress when we form anchors and the solution annealing after forming is not required for our anchors made from wire.

Nevertheless, If your specification does require the solution annealing, you have 2 options :



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STANDARD SOLUTION ANNEALING

Anchors are heated in a furnace with a traditional oxydising atmosphere.

The anchors, clean and shiny before the annealing, will become black, looking dirty (oxydes layer on the steel alloy)



Before annealing



After annealing

This annealing is the most common one, the cost is not high.

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BRIGHT SOLUTION ANNEALING

SOLUTION ANNEALING UNDER VACUUM OR UNDER SPECIAL ATMOSPHERE

Some customers don't like the black dirty aspect of the anchors after traditional oxydising annealing.

They ask for « bright annealing »

This is done either :

-in a furnace operating under vacuum, having no air, no oxygen,there is no oxydation.

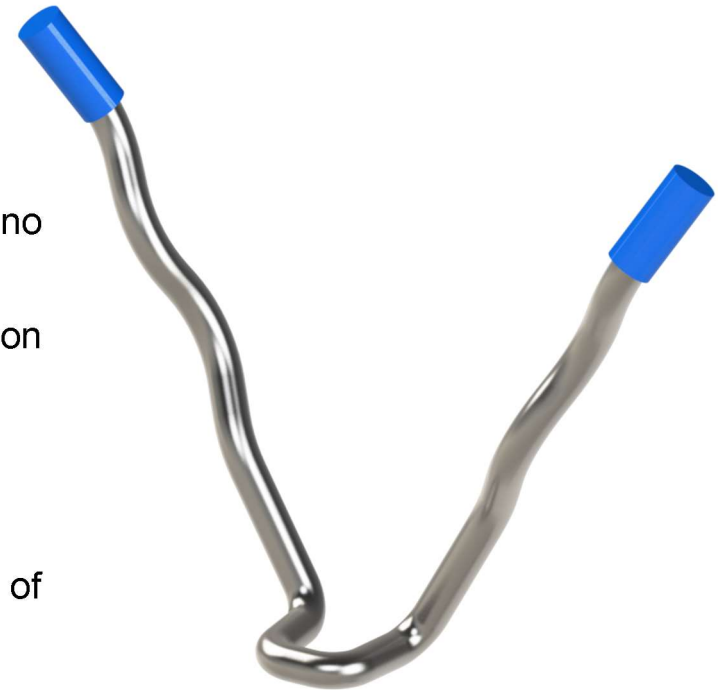
-in a furnace operating under a special atmosphere which is a combination of :

-nitrogen,neutral/protecting gaz

-Hydrogen,reducing gaz

Once again, no air, no oxygen, then no oxydation and the reducing effect of hydrogen, dissociating oxydes.

NB- This annealing is more expensive than the standard solution annealing.



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