

## Material choices for Screw Element & Kneading Disk

- 1) The famous material **CPM-9V** which is made by the Crucible Particle Metallurgy is one choice, but it is really very expensive, and it usually would take element maker longer time to get. Besides the cost of this material is much higher, and also hard to be machined, so its price is much higher than normal material;
- 2) For the high-wear resistant screw elements, the material we usually made by is **HSS** (high speed steel), Chinese name is W6Mo5Cr4V2, American name is AISI: M2. A copy of **【Steel name antitheses for Twin or Single screw extruder】**is attached for your reference. HSS is one kind of alloy toolsteel, its main component is W, Mo,Cr, V, Si, Mn, all the alloy element is up to around 10~25%, after vacuum hardening, its HRC is over 60 even it is working at 500°C. It is used to manufacture wear-resistant tool, die and segment elements, e.g. high grade trimming die, screw die, hob, saw blade and etc.,
- 3) For manufacture ellipse ovalliner which inside the segment barrel, We are using **PM-HIP** technology way. Its material is all according to W&P Company (In Germany) requirement and its hardness is HRC 58~64. PM-HIP technology, that is in order to process high-alloy in powder metallurgy(PM) techniques way into high-density composite materials by hot isostatic pressing(HIP). PM-HIP material is very similar to CPM material, its hardness and main elements as below:

Alloy	Base	HRC	Wear resistance	Corrosion resistance	Thermal expansion	Alloy elements (Weight: %)		
						Cr	V	C
Alpha 101A	Fe	58~64	★★★★★	★	12.1	Cr:20	V:8	C:2.5
Alpha 201A	Co	52~54	★★	★★★★★	11.9	Cr:29	W:13	C:2.2
Alpha 301A	Co	58~60	★★★	★★★★★	10.5	Cr:33	W:18	C:2.5

- 4) Compare with contact wear ration between two kinds of metal, generally say the elements made by same metal, this contact wear ratio is the worst. Such as if to use CPM segment elements match to our alpha 101A ovalliner, then its service life is not longer than in this case that HSS segment elements match to our Alpha 101A ovalliner. A try will convince you!
- 5) For corrosion resistant screw element, we could choose the material such as **00Cr17Ni14Mo2**, also named as 316L in USA. For our quotation of OD 30 screw element, every mm in length is about Euro 9.20. But the total weight of raw material for making this spec product in one order should be over 200kg;
- 6) There are three corrosion resistant ways to be chosen, one is to get **TiN (Titanium Nitride) plating layer**, its color is golden brown, hardness is about HV 2000~2300, thickness is 1.2~1.5 μm and its friction coefficient is about 0.55; Another way is to get **ZrN (Zirconium Nitride) plating layer**, its color is blue-green and all other data is the same as above. But we believe if to get **nanometer ceramics compound coating** which we are researching now and some samples are trying on customer's machines, would be the best choice.

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