

Subject: Comparative evaluation between Deep Cryogenic, Cryogenic and subzero treatment

Respected Sir,

With respect to the discussion I had with you, I would like to present the comparative evaluation between cryogenic and subzero treatment.

	Deep Cryogenic Treatment	Cryogenic treatment at -110°C	Sub Zero
Temp	-193°C	-110°C	-80° C max,
Martensite Conversion	99.8% of the structure is converted to martensite. RA less than 0.2% to 0.3%	More conversion than at -80°C	Max. 5 % more than initial martensite level
Time taken	80 – 100 hours	12 – 20 hours	5 – 6 hours
Improvement in wear resistance	100% to 500%	30% - 40%	20% max
Stress Relief	Complete stress relief of all stresses like thermal, residual, mechanical, grinding	Some stress relief	No stress relief
Carbide Precipitation	Increases eta carbide precipitation by 3 times	No such effect	No such effect
Grain Structure	Refines grain structure	Slight improvement in grain structure	No such effect
When to do the process	Any time after heat treatment	After 1 tempering carried out at +150C	Within 1 hour of quenching.

I hope you find the matter presented convincing.

Awaiting your reply and assuring you of our best services at all times

Thanking You
Yours truly,
For **Kryospace**

Yousuf A. Bootwala