

Quality Heat Treatment of Tool Steels

THERMONITESM

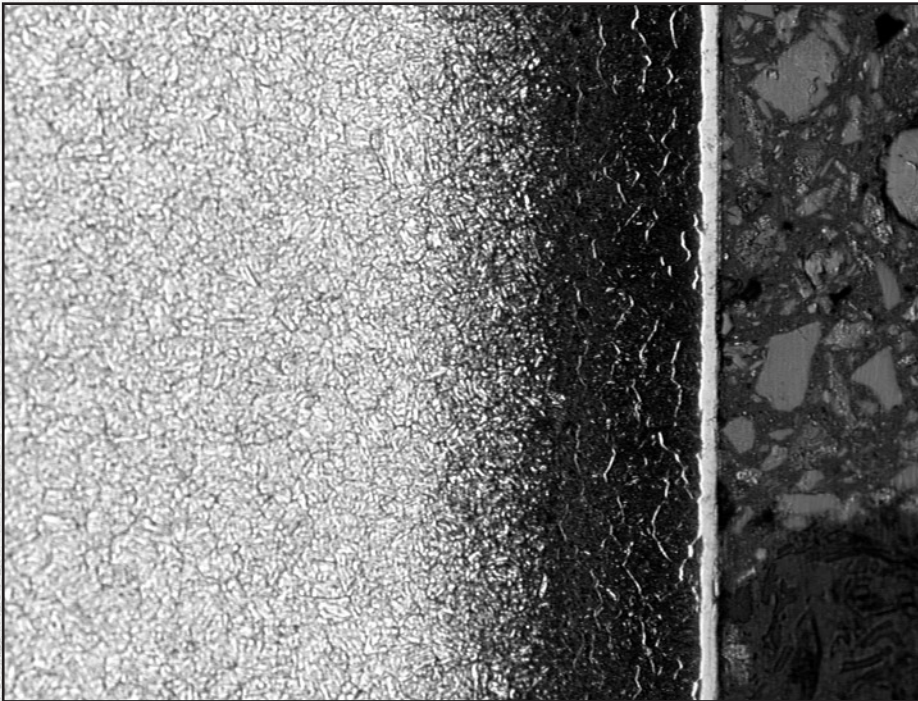
For:

- Abrasive and erosive wear solutions***
- High surface hardness***
- Increased resistance to thermal fatigue***
- Surface lubricity***
- Higher contact fatigue strength in machine parts applications***
- Increased resistance to atmospheric corrosion***



The THERMONITESM Process

Bohler-Uddeholm Thermo-Tech has added a unique Nitro-carburizing surface treatment (THERMONITESM) to answer the needs of hot work and cold work tool manufacturers. THERMONITESM is a perfect compliment to the Vacuum Heat Treatment services available from the World's Leading Tool Steel company.



THERMONITESM imparts high wear resistance to ferrous alloys (iron and steels), and is suitable for parts requiring high surface hardness, wear/erosion resistance and resistance to atmospheric corrosion. The parts are heated to a suitable temperature between 1000-1070°F in a vacuum chamber. Upon reaching the specified temperature a balanced mixture of nitriding and carburizing gases, are injected into the chamber for a specified period of time under a completely automatic computerized control system. Since, the parts never come into contact with air at high temperatures, no oxidation or scaling takes place during this process.

Tools can be additionally processed to produce dark-blue or black finish to further enhance the surface properties and aesthetics.

Structure

THERMONITESM is a low temperature process creating a minimal risk of distortion or loss of vital engineering properties. As in regular gas nitriding the THERMONITESM surface consists of a white layer, which is referred to as a compound layer or a diffusion zone in alloy steels. What makes THERMONITESM a preferred process over nitriding is the structure of the surface layer, which is composed of monolithic epsilon phase as compared to the brittle mixture of epsilon and gamma-prime.

SURFACE HARDNESS OF THERMONITE SM TREATED MATERIALS			
Material	Hardness before FNC, HR15N	Surface hardness after FNC, HR15N	White layer Hardness, HKN
H-13	82.8 (45HRC)	91-92*	1100-1300
P-20	74.3 (~29HRC)	88-90**	“
4140	73.7 (~28HRC)	88-90	“
Mild Steel	61.3	81-82***	“

• Equivalent to *=61-64HRC, **=55-60HRC, ***=41-43HRC

Structure Cont'd.

The white layer possesses a high hardness (approximately 70 HRC) and ranges from 0.0002" to 0.0008" where a total case depth of 0.004" to 0.010" can be achieved in Cr-Mo alloyed steels. Multi stage processes can be developed for special applications.

Properties

- ✔ High surface hardness
- ✔ High resistance to wear, erosion and thermal fatigue
- ✔ Lower co-efficient of friction, higher lubricity, ability to retain lubricants
- ✔ Increased corrosion resistance
- ✔ Tremendous increases in strength to weight ratio for stamped metal parts
- ✔ Resists sticking of liquid metal on tool surfaces
- ✔ Aesthetically appealing surface finish, combines resistance to chipping, galling, wear and scuffing in cold working tools

Quality Assurance & Process Control

THERMONITESM processing is carried out in state of the art, fully automated vacuum sealed electric furnaces with minimum operator intervention which provides excellent repeatability. Each run is verified through microstructure examination and mechanical testing.

Bohler-Uddeholm Metallurgical Services

- ❑ Our ISO 9002/QS 9000 registered metallurgical laboratory caters to your product and process development needs.
 - ❑ At Bohler-Uddeholm we adopt a problem solving approach rather than fact finding alone. When you trust us with your inquiry we seek to understand your problem and work hard to find optimum tailored solutions.
 - ❑ Experience counts and Bohler-Uddeholm has that experience working with tool steels all over the world
- Put our experience to work for you!**

Applications

- ❑ **Hot forging dies, Extrusion tooling (requiring shallow nitrided cases).**
- ❑ **Plastic molds made from P-20 and high strength structural steels (Cr, Ni, Mo alloyed steels).**
- ❑ **Machine parts such as Hydraulic Cylinders, Gears, Shafts, Bushings, Pinions and Rack assemblies.**
- ❑ **Cold work tool steel applications where chipping of the nitrided surface has been identified such as in A-2, D-2, S-7 etc.**
- ❑ **Thin gauge stampings which are made from low strength steels because of ease of forming, attain higher strength to mass ratio and gain very high over all strength and structural rigidity.**
- ❑ **Parts made from low carbon/alloy steel requiring better sliding wear resistance and resistance to ordinary atmospheric corrosion with aesthetically enhanced surface appearance.**
- ❑ **Can be used as a high hardness substrate in multi layer coatings**

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