

# Gears and Shafts

## Case Carburising



High loaded gears and shafts are generally produced from low carbon steel that is suitable for case carburising by the addition of alloying elements. Case carburizing is used when the application should resist wear, be able to withstand high surface loads combined with excellent fatigue properties and at the same time have a good toughness. The objective is to use a material that will carburise in a cost effective way to give good surface properties coupled with an effective base material.

The oldest and most well known UK specification is En 32 now called 080M15 and other

alternative include EN 36, EN 39, EN 351, SAE 8620, 16MnCr5, 17CrMo6, 21NiCr2.

Where 'clean steel' is a pre-requisite then the most commonly used material is S82 or S156. Other grades are available where companies have developed specifications to overcome specific problems associated with either mechanical properties or processing. OvaX 200 is our advanced material to meet this need for a super clean material.

## OvaX 200

Today at Ovako we have designed a modern alloy steel alternative specifically developed for case carburising. OvaX 200 is a perfect steel for conventional carburising and when processed in a vacuum furnace can offer an interesting economic solution.

The material has been designed to give:

- High Cleanliness
- Slow Air Cooling
- Very Low Distortion
- Reduced Grinding and Finishing
- Temper Resistance
- High Operating Temperature

### Chemical composition

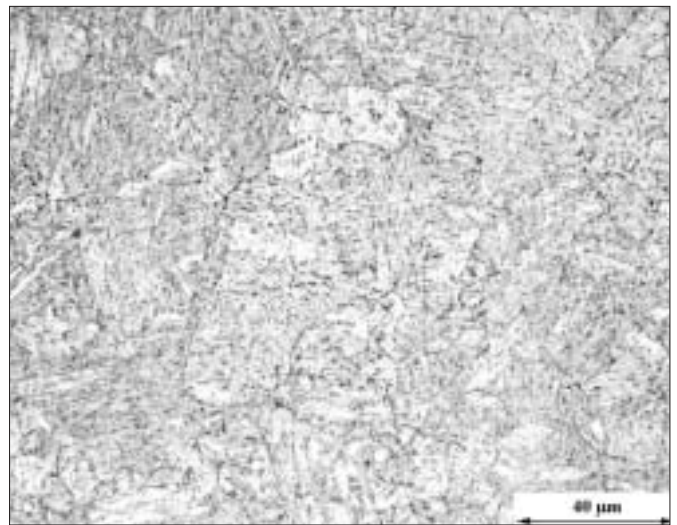
Element	C	Si	Mn	P	S	Cr	Ni	Mo	V	O	Ti
Min.	0.14		1.20			2.10	0.45	0.45	0.15		
Max.	0.17	0.15	1.40	0.020	0.003	2.30	0.55	0.55	0.25	9 ppm	30 ppm

### Delivery Condition & Machining

We do not normally recommend that the material be delivered with a conventional hardness of between 190-220 HB. While the material will be very suitable for cold or warm forging the structure will be too tough for normal machining since it will have an impact strength of 240 J.

The material is naturally produced with a hardness of approximately 350 HB. The material is in an air quenched & self-tempered condition with a martensitic structure but is capable of being machined directly with standard coated carbide cutting tools.

The steel can easily be tempered back to a hardness of between 270-300 HB and can be machined with conventional tooling quite easily at this hardness due to its good structure.



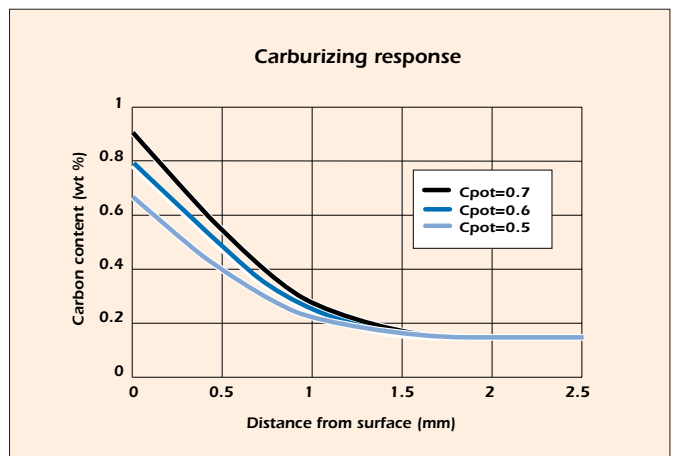
Tough tempered OvaX 200.

### Carburising Processing

Essentially the carburising process is used on OvaX 200 to give a surface hardness of about 60-62 HRC and will give core hardness levels of between 350-400 HB if slow cooling in air undertaken.

If the components are quenched in oil or polymer the base properties will be increased but the impact strength will be reduced slightly. The time taken is entirely dependant of the depth of case needed for the application, the type of furnace used and carbon potential of the gas or medium used.

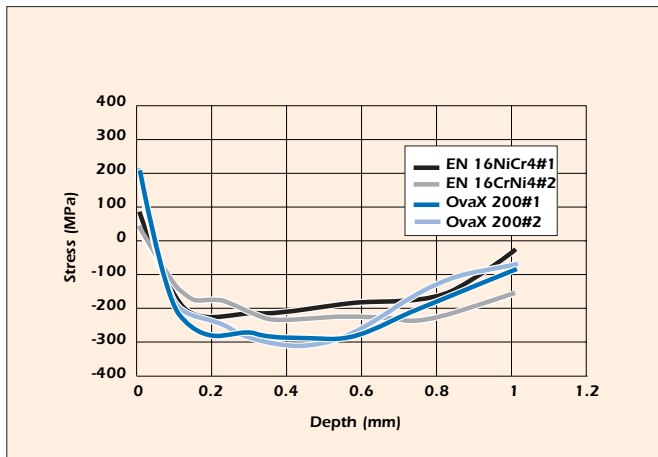
It is important is to use a lower carbon potential than with ordinary case carburizing steels and 0.7%C will be ideal. A higher carbon potential will



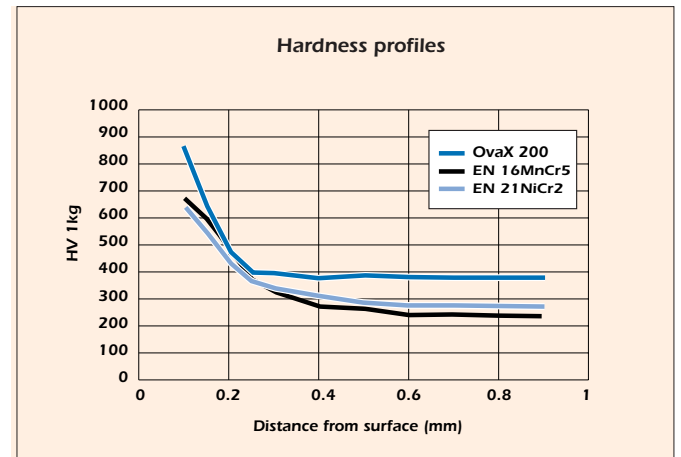
result in an over carburised surface with unwanted carbide formations.

Carburised components are often shot peened to increase the compressive stress levels in the sur-

face to increase fatigue strength and component life.



Residual stress distribution in slow cooled OvaX 200 and an oil quenched conventional steel.



Hardness profiles after gas nitriding of OvaX 200 and two conventional carburising steels.

OvaX 200 is a superior steel well suited to the demands of carburised components where high cleanliness is an integral element in the performance profile. In addition the control of distortion offers excellent processing properties and the material gives improved high temperature operation.

**Disclaimer**

The information contained on this data sheet is provided without any warranty by Ovako of the accuracy of the information or the suitability of any product for any particular use. While Ovako believes that it has taken care to assemble the information, the information is furnished "as is". Ovako warns readers of the data sheet that they should not rely upon the information without separate written confirmation from Ovako, and Ovako therefore excludes any liability, including for negligence and other allegedly tortuous conduct, based upon the information set forth.

**Smiths High Performance**

Unit O, Stratton Business Park  
London Road  
Bigglesworth, Beds. SG18 8QB  
Tel.: 01767 60 4708  
Fax: 01767 31 2885  
E-mail: [info@smithshp.com](mailto:info@smithshp.com)  
[www.smithshp.com](http://www.smithshp.com)

**Ovako Ltd.**

Unit 2, Britannia Park  
Tident Drive, Wednesbury  
West Midlands WS10 7XA  
Tel.: 0121-502 1010  
Fax: 0121-505 0019

[www.ovako.com](http://www.ovako.com)