CARBONITRITING

Carbonitriding in an austenitic case gardening process similar to carburising , with the addition of nitrogen (via NH_3 gas) , used to increase wear resistance and surface hardness through the creation of a hardened surface layer.

- Benefits:
  Carbonitriding is applied primarily to produce a hard and wear resistant case. The carbonitriding process is particularly suited for clean mass production of small components .Due to the lower temperature required for the carbonitriding ,compared to carburising , distortion is reduced. Mild quenching speed reduces the risk of quench cracking.

- Application and Materials:
  Austenitic carbonitriding is successfully applied to generally mass produced components, and those of smaller dimensions , where great resi stance to wear is required and where the case depth requirements ranges from 0.1 to max 0.75 mm.
  Typical applications include :

- Gears and shafts
- Pistons
- Rollers and bearings
- Levers in hydraulic, pneumatic and mechanical actuated systems.

  A wide variety of steels can be carbonitrided from plain carbon steels to mild steels (with reduced aluminium content), low alloy steels with max. 0.25% carbon, free cutting steels, and sintered steel.

- Process details

(Austenitic) carbonitriding is a thermochemical treatment involving the incorporation of both carbon and nitrogen into the surface of the component , usually simultaneously . The process is carried out at lower temperatures, and generally for shorter times than carburising, and therefore components are less prone to distortion. The diffused nitrogen has a stabilising effect on austenite and lowers the critical quenching speed and,as a consequence , the hardenability of the steel.

Less severe quenching media like oil, instead of water quenching needed for mild steel,can be applied for reducing distortion.

Carbonitriding is usually carried out in a temperature range of 820-900 ° C in a gaseous atmosphere adding between 0.5 to 0.8 % carbon and 0.2-0.4 % (<5%) nitrogen to the surface of plain carbon steel or low alloy steel. After diffusion time the components are directly quenched in oil. The attained case hardened depth (CHD) is usually not greater than about 0.7 mm and depends not only on carbonitriding depths ,but also on the hardening temperature, the quench rate, the hardenability of the steel and the dimensions of the component. The heat treatment is completed by low temperature tempering between 150-200° C for the higher case depth range reducing brittleness and depending on tribological circumstances.

EFFECTIVE HARDENING THICKNESS AND CLASSES

EFFECTIVE HARDENING THICKNESS CLASSES	NOMINAL VALUES mm	Min: VALUE mm	Max VALUE mm
Cnt 1	0.10	0.05	0.15
Cnt 2	0.20	0.15	0.25
Cnt 3	0.30	0.25	0.40
Cnt 4	0.40	0.35	0.50
Cnt 5	0.50	0.40	0.60
Cnt 6	0.60	0.50	0.70
Cnt 7	0.70	0.55	0.85
Cnt 8	0.80	0.65	0.95

HEAT TREATMENTS

EFFECTIVE HARDENING THICKESS CLASSES	SURFACE HARDNESS CLASS	TOLLERANCE
Cnt 1	500 HV1	+100HV
	600HV1	+100HV
	700 HV1	+150 HV
Cnt 2- Cnt 3	500HV5	+100HV
	600HV5	+100HV
	700 HV5	+150 HV
	85 HR 15N	+3 HR 15N
	88 HR 15N	+2 HR 15N
	90 HR 15N	+2 HR 15N
Cnt 4- Cnt 6	75 HRA	+3 HRA
	78 HRA	+3 HRA
	81 HRA	+3 HRA
Cnt 7 —Cnt 8	52 HRC	+3 HRC
	53 HRC	+3 HRC
	54 HRC	+3 HRC
	55 HRC	+3 HRC
	56 HRC	+3 HRC
	57 HRC	+3 HRC
	58 HRC	+3 HRC
	59 HRC	+3 HRC
	60 HRC	+3 HRC
	61 HRC	+3 HRC
	62 HRC	+3 HRC