DONGBO
Thermal&Technology

Compared to traditional atmosphere carburizing, what are the main advantages of low-pressure vacuum carburizing?

Main Comparison Items	Low-Pressure Vacuum Carburizing Furnace	Traditional Controlled Atmosphere Carburizing Furnace
Flexibility of Heat Treatment Process	Excellent (No need to adjust carbon potential; can treat parts with surface carbon >1.3%)	Limited (Long adjustment time for different carbon levels; cannot treat parts with surface carbon >1.3%)
Startup/Shutdown	Flexible and fast (Heating: ~40 min; Cooling: ~2 hrs)	Time-consuming (Heating: ⩾24 hrs; Cooling: ⩾48 hrs)
Process Versatility	Carburizing + quenching, tool steel quenching, brazing	Carburizing + quenching only
Utilization Rate	>95%	<90%
Part Quality	Excellent – No intergranular oxidation, silver-white surface, precise control of carbides and retained austenite (easily meets Grade 1)	Average – Intergranular oxidation present, gray surface, long diffusion time needed for high-quality control
Carburizing Time	Very Short (30–40% faster): 0.35 mm: ~1 hr; 1.10 mm: ~4.5 hrs; 5.10 mm: ~72 hrs	Very Long: 0.35 mm: ~4 hrs; 1.10 mm: ~10.5 hrs; 5.10 mm: ~102 hrs
Atmosphere Consumption	Very Low	Very High – Large volumes used to establish carbon potential
Low Production/Weekends/Holidays	Can shut down, saving power and atmosphere	Cannot shut down – Must remain at temperature
Labor Requirement	1 person – High automation	⩾2 persons
Maintenance	Can shut down on weekends for maintenance	Only 2 weeks/year – otherwise affects productivity
Cleanliness	Good – Vacuum technology	Poor – Exhaust gases pollute environment
Hazardous Substances	None	Yes – Produces heavy smoke
Fire Risk	None – Fire hazard eliminated	Yes – Requires holiday staffing for fire watch
Explosion Risk	None	Yes – Explosions have occurred at some facilities
Heat Radiation	None – Cold-wall vacuum furnace	Yes – Furnace shell runs hot
Smoke Emission	None	Yes
Fire-Curtain Door	None	Yes