NACHI

THERMOTECH

THERMOTECHNOLOGY GENERAL CATALOG

Contents

Enhance added value in heat treatments

EN-CARBO

Vacuum carburizing furnaces

What is carburizing

This heat treatment penetrates the surface of a metal with carbon to increase the carbon content before hardening to produce a hard surface and a moderate toughness inner.
It is widely used in auto parts, construction equipment parts, and parts for many other machines.

Features

■ High-performance carburizing process
Elevates added value to heat treatment by doing processes that are not possible with gas carburizing furnaces.

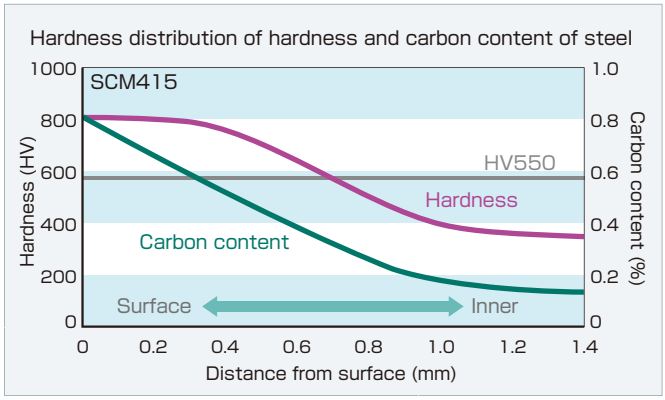
Super carburizing
Increase surface carbon content by more than 1.4%, aggressively dispersed carbides to increase product toughness and heat resistance.

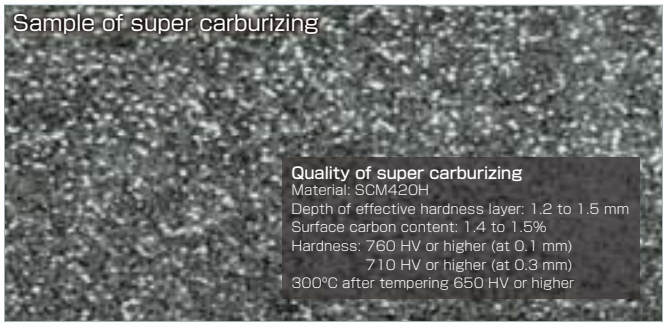
High-temperature carburizing
Possible to raise carburizing temperature up to 1050 °C with no metal parts in the furnace.
This can shorten the heat treatment cycle.

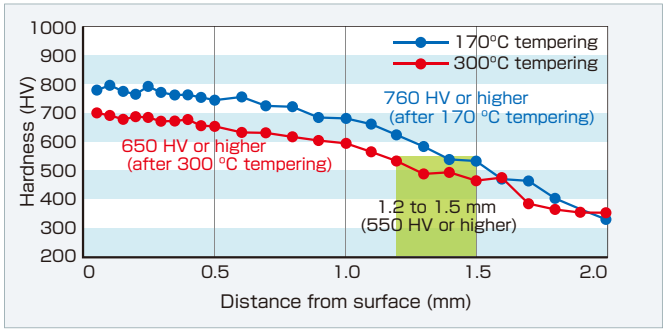
■ Safe and clean environment
Flameless structure.
Can really improve environment of heat treatment area by eliminating concern about fire.

■ Flexibility
Seasoning is not needed so start up and shut down of furnace is easy.

■ Lower running costs
Lower heat loss, compared to gas carburizing furnaces, due to insulation effect of vacuum.
Unmanned operation during night hours can greatly reduce labor costs.

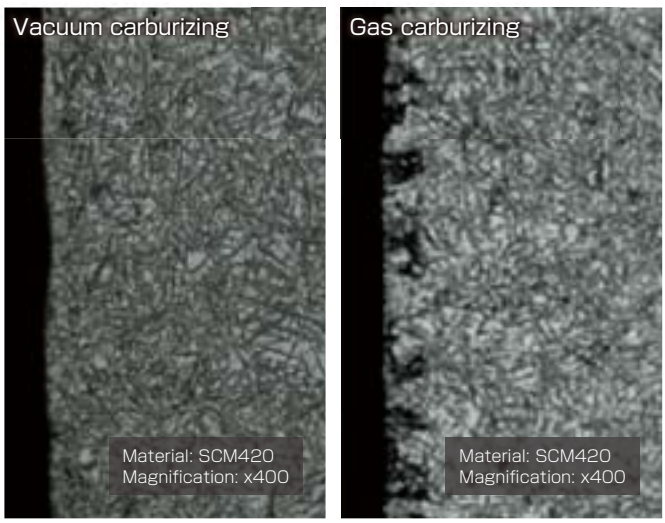






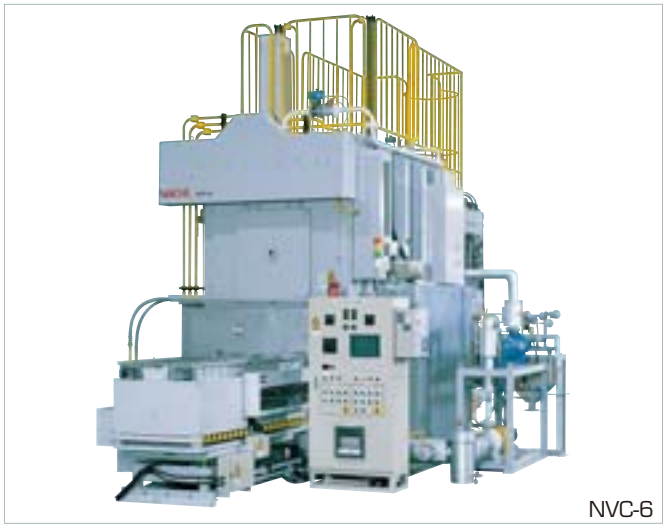
Examples of heat treated products

State of grain boundary oxidation



All-encompassing series


NVC-3


NVC-6

NVC-1/NVC-3

- Heating chamber and quenching oil tank has circular cross section in compact design with easy maintainability and hardenability
- Excellent as a test furnace and for multiple products in small-lot production

NVC-6/NVC-10

- Perfect for mass production facilities for carburizing and carbonitriding
- Oil tank design focused on hardening performance
- Extremely high reproducibility of heat treatment quality

Specifications

	NVC-1	NVC-3	NVC-6	NVC-10
Effective dimensions (W×L×H mm)	400×400×400	460×620×550	610×950×610	760×1220×760
Treatment capacity (kg/h)	100	300	600	1000
Electric capacity (kW)	35	45	100	160
Installation dimensions (W×L×H m)*1	2.7×3.5×2.9	3.5×5.1×2.9	4.8×6.2×3.1	4.8×6.7×3.4
Main unit weight (tons)*2	8	10	15	18
Quenching oil capacity (L)	1100	3500	8000	10000
Operating temperature (℃)	800～1050	800～1050	800～1050	800～1050

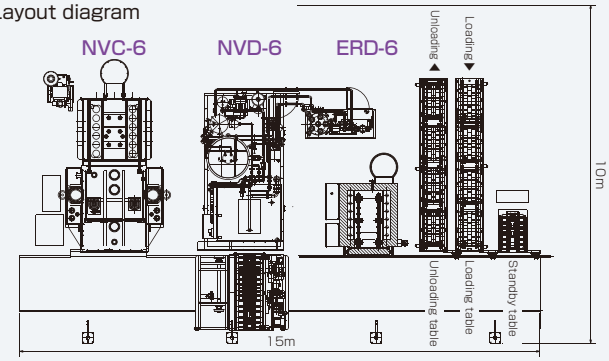
*1 Not including space for maintenance *2 Weight while dry

Options

Refining function	Used for super carburizing, high-temperature carburizing, and reheating.
Carbonitriding function	Function for generating a nitride layer on the carburizing structure.
Remote monitoring system	Function for diagnosing malfunctions via a telephone line.
Loading equipment	Equipment for loading and unloading work from tray in furnace and other equipment.
Automated system	A fully automated cycle can be configured by combining the carburizing furnace and degreasing equipment, tempering furnace and stock table.


NVC-6 line

Layout diagram



Producing surfaces without decarbonizing or oxidizing

Vacuum furnaces

Vacuum heat treatment furnaces

What is vacuum heat treatment

A workpiece is placed in a vacuum, normally of about 0.01 to 1 Pa (abs) and heated. By heating in a vacuum atmosphere, finished surfaces have absolutely no oxidizing or decarbonizing.
Also, bright heat treatment can be done easily because it is not necessary to adjust the atmosphere.
When heating is finished, there are two quenching methods: 1. Gas quenching and 2. Oil quenching.

1. To introduce and circulate inert gas (usually extremely pure nitrogen) for cooling after heating is finished.
2. Quenching in an oil tank in the vacuum.

Features

■ Supports a wide range of applications
Excellent for heat treatment for automotive parts and machinery parts. Excellent for quenching, tempering, brazing, annealing, solution treatment, and ageing processes.

■ Also possible to cool thick parts
Heat treating thick parts is possible because of high heat exchange performance and up to 500 kPa (abs) pressurized gas circulation.

■ Minimize distortion from heat treatment
The distortion from heat treatment is minimized by even heating and cooling.

■ Design prevents loss of material elements
Control of the vacuum pressure prevents loss of material elements.

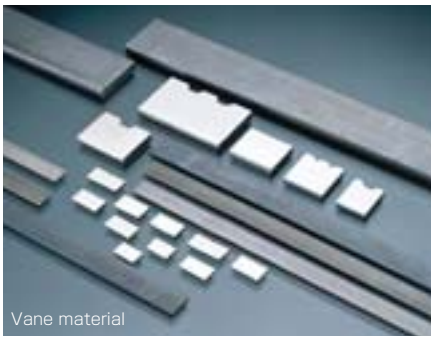
■ Maintenance is easy
Heating chamber is easy to load and unload, and maintenance is simple.

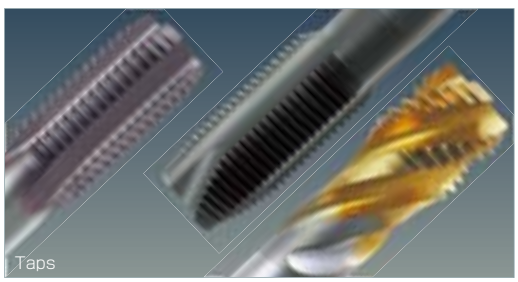
Other series

Target	Material	Model				Example application
		EVPF				
		EVVF	EVHO	EVHQ		
		EVHF		EVHP	EVBF	
Quenching/ solution treatment	SK Carbon tool steel					Clock parts, Jigs
	SKS Alloy tool steel		●			Die and molds
	SKD Alloy tool steel					Press molds and die cast molds
		●		●		Precision die and molds extraction
						Rollers for form rolling
	SKH High speed tool steel					Cutting tools, Die and molds
						Mold measuring gauge
		●		●		Machinery parts
						Jet engine bearings
	SUS Stainless steel					Turbine blades
						Miniature bearings
						Hydraulic equipment parts
		●	●			Computer parts
						Tapping screws
						Nuclear power equipment
						Medical equipment parts
	SUJ Bearing steel					Aerospace equipment parts
			●			Wheel parts
Annealing						Electron tube material, Mild steel
						Coils, Copper wire
		●			●	Capacitor material, Aluminum boxes
						Magnetic materials, Titanium products
Brazing	Stainless steel brazing metal					Heat exchangers
	Cu·Ag					Electric and electronic equipment
	Ni-Cr	●				Nuclear power equipment
	Aluminum					Heat exchangers
	Alloy88Al-12Si	●				Telecommunications equipment
	Beryllium					
Sintering						Electric contacts
		●				Machinery parts
						Magnetic materials

Examples of heat treatment products


Drills


Vane material


Taps

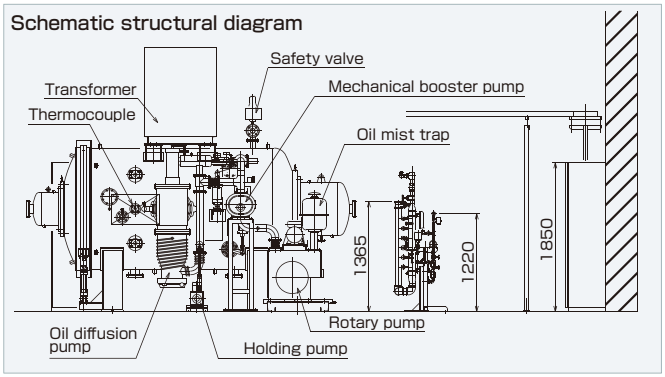

Punches


Forming racks

Horizontal single-chamber pressurized cooling vacuum furnace EVHC


Horizontal single-chamber pressurized cooling vacuum furnace EVHC

Schematic structural diagram



Specifications

- Temperature range: 550 to 1300°C
- Degree of vacuum: 0.4 Pa (abs) or less
- Exhaust time: Within 15 minutes (up to 6.7 Pa (abs) atmospheric pressure)
- Heating time: Within 45 minutes (empty furnace, from room temperature to 1100°C)
- Maximum cooling pressure: 500 kPa (abs)

Model: EVHC-	121609	182415	243618	243624	304824
Effective dimensions (W×L×H mm)	300×400×225	450×600×375	600×900×450	600×900×600	750×1200×600
Treatment capacity (kg/h)	60	220	450	500	800
Electric capacity (kW)	60	120	210	210	305
Installation dimensions (W×L×H m)*1	2.4×3.0×2.1	3.0×3.6×2.9	3.6×4.7×3.5	3.6×4.7×3.6	3.9×5.5×4.5
Main unit weight (tons)*2	5	8	10	13	17
Operating temperature (°C)	550～1300	550～1300	550～1300	550～1300	550～1300

*1 Not including space for maintenance *2 Weight while dry

Lineup by application

Model	Series model	Major features
Horizontal single chamber vacuum furnace	EVHF	Multi-functional furnace with even heating and cooling to reduce distortion from heat treatment.
Vertical single chamber vacuum furnace	EVPF	Multi-functional furnace that is easy to operate and requires little space.
Elevator type vacuum furnace	EVVF	Suitable for processing large volumes, no pit needed.
Horizontal dual chamber pressure cooling vacuum furnace	EVHP	Excellent cooling performance with gas circulation system pressurized in dual chambers.
Vacuum purge type triple chamber tempering furnace	EVHFD	Possible to do tempering efficiently by using vacuum purge and cooling chambers located before and after the heating chamber.

Horizontal dual chamber pressure cooling vacuum furnace

Elevator type vacuum furnace EVPF

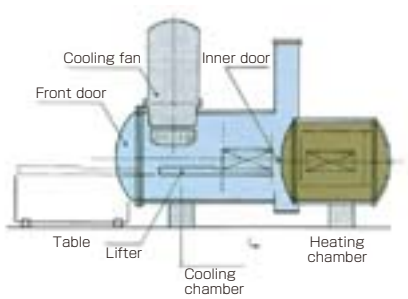
Horizontal single chamber vacuum furnace EVHF

Vacuum purge type triple chamber tempering furnace EVHFD

Advantages of horizontal dual chamber vacuum furnaces

Item	Dual chamber	Single chamber
Cooling speed	○	△
Process cycle	○	△
Energy savings	○	△
Productivity	○	△
Installation space	△	○
Running costs	○	△
Initial costs	△	○

Schematic structural diagram



NACHI FUJIKOSHI Corp.'s own atmosphere hardening furnace

High Bright Furnaces

Neutral atmosphere high-temperature hardening furnaces

NACHI FUJIKOSHI Corp.'s High Bright is a heat treatment furnace that makes neutral atmosphere hardening in a temperature range from low to high possible, and has a wide range of applications from hardening to sintering parts of various types of steel.
NACHI FUJIKOSHI Corp has applied the know-how from its respected work, covering industrial, heat treatment and other types of furnaces, for developments that eliminate the flaws in conventional vacuum furnaces, atmosphere furnaces, salt bath furnaces, and more to achieve heat treatments of high quality at low costs.
Maintenance and handling are easy, plus they are safe and non-polluting.
High Bright is a high temperature atmosphere hardening furnace that improves productivity and conserves nitrogen.

Applications

- **Hardening** High-speed tool steel, Die and molds steel, Stainless steel, Heat resistant steel, Bearing steel, Construction steel, etc.
- **Brazing** Steel, Brass brazing, etc.
- **Sintering** Machinery parts, Electric parts, etc.

Features

Double the productivity of vacuum furnaces
The cycle of High Bright furnaces is half that of vacuum furnaces for high productivity.

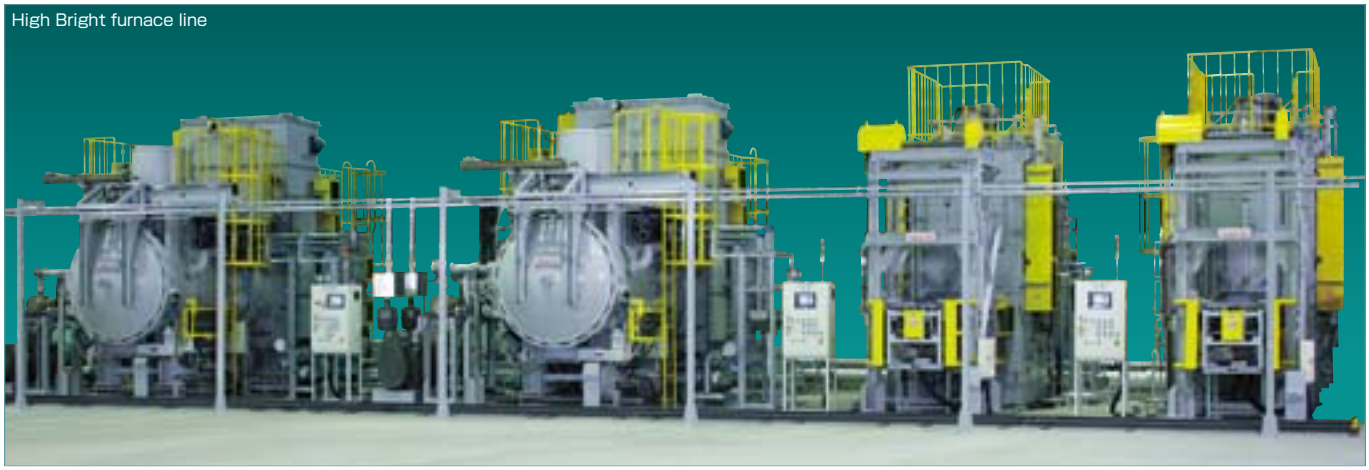
Automation
Program controller makes it possible to preset all processing conditions, so automatic processing with high reproducibility is possible with just the touch of a button.

Installation cost is relatively low
Costs are lower because generators are unnecessary as the atmosphere, containing nitrogen gas to which micro amounts of organic liquids are added, is admitted directly into the furnace.

Processed surfaces are bright
Processed surfaces are bright without heating deviations because a consistent neutral atmosphere can be attained from low to high temperature ranges as atmosphere adjustments are easy.

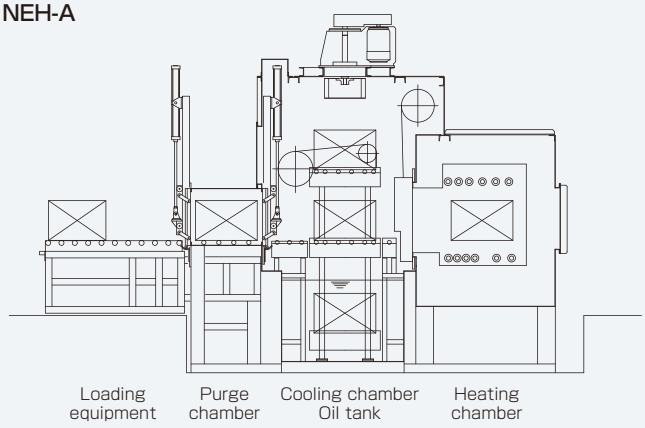
Extremely safe
There is no risk of the atmosphere igniting or exploding, and no special skills are needed.

Improved work environment
The construction is sealed so no hot jets, fumes, or flames are generated making the work environment very good.
Maintenance and handling are extremely simple.

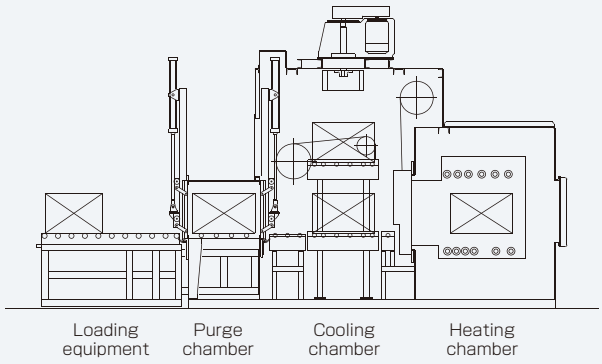

High Bright furnace line

Model

NEH-A



NEH-B

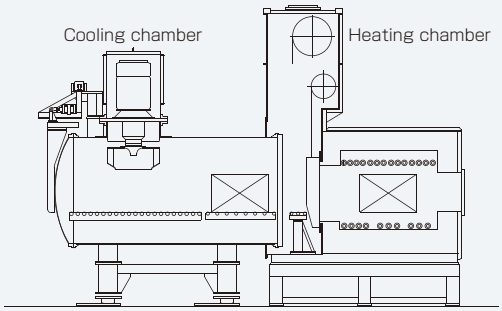


	NEH-3	NEH-6	NEH-10
Effective dimensions (W×L×H mm)	460×620×550	610×950×610	760×1220×760
Treatment capacity (kg/h)	150(75)*3	300(150)*3	500(300)*3
Electric Capacity (kW)	45	80	120
Installation dimensions (W×L×H m)*1	2.1×6.4×3.9	2.3×7.3×4.4	2.5×8.3×4.9
Main unit weight (tons)*2	10	12	15
Quenching oil capacity (L)	2000	3000	5000
Operating temperature (ºC)	850～1250	850～1250	850～1250

*1 Not including space for maintenance *2 Weight while dry *3 Values in ( ) are for high-speed tool steel
●NEH-3A [A and B indicate cooling method. A: Oil or atmosphere cooling. B: Atmosphere cooling.]

Pressure cooling High Bright furnace

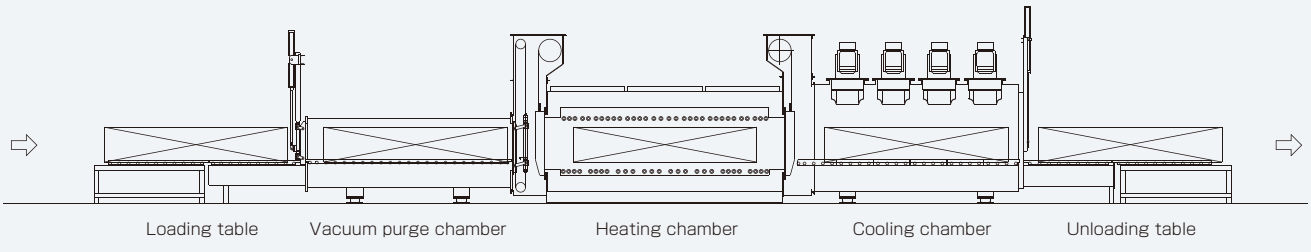
EHB-VC



	EHB-3VC	EHB-6VC	EHB-10VC
Effective dimensions (W×L×H mm)	460×620×550	610×950×610	760×1220×760
Treatment capacity (kg/h)	150(75)*3	300(150)*3	500(300)*3
Electric Capacity (kW)	45	80	120
Installation dimensions (W×L×H m)*1	5.0×6.0×3.5	5.5×7.0×3.8	6.0×8.0×4.0
Main unit weight (tons)*2	13	15	18
Operating temperature (ºC)	850～1250	850～1250	850～1250

*1 Not including space for maintenance *2 Weight while dry *3 Values in ( ) are for high-speed tool steel

Specialized specifications for long type High Bright furnace



Many heat treatment applications possible with one furnace

Quick Master

Drip-type multi-purpose atmosphere furnaces

The Quick Master's heating chamber is a muffle furnace construction, so the atmosphere in the furnace can be created very quickly. This make changing the atmosphere easy and it supports many various heat treatment processes.
One special feature is that it can do L-TEQ processing (low temperature hardening processing), which is suitable for machine parts for which minimizing distortion deformation is important.
This furnace is very useful because one installation can do a variety of heat treatment processes.

What is L-TEQ processing (low-temperature and low distortion hardening)

Creating an alloy of steel and nitrogen on the surface of carbon steel reduces the transformation temperature.
This makes it possible to reduce the hardening temperature, so low-temperature low-distortion heat processing is possible.

Merits of L-TEQ processing

- Reduction in heat treatment distortion
- Improved variance in depth of surface hardened layer
- Increase depth of hardened layer to increase wear resistance and surface durability
- Reduce costs by switching from alloy steel to carbon steel
- Shorten processing time

Features

■ Many heat treatment applications possible with one furnace

1. Carburizing
2. Carbonitriding
3. Bright hardening
4. Gas nitrocarburizing
5. L-TEQ processing

■ Gas not needed

Initial costs are reduced because gas generator is not needed.

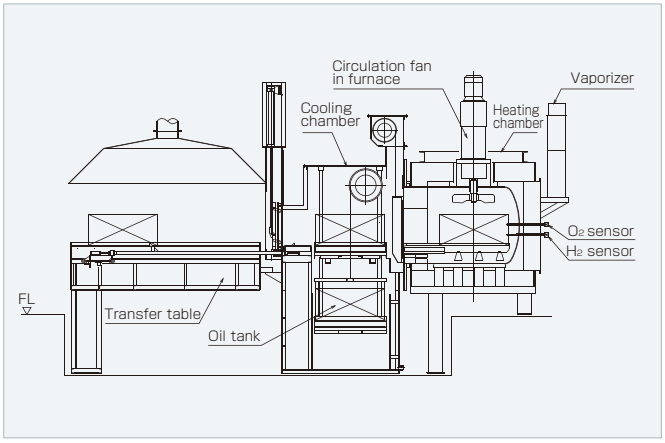
■ Atmosphere control system

High precision control of atmosphere is possible by constructing atmosphere control system with H_2 sensor combined with atmosphere control using conventional CP measurements or O_2 sensors.

■ Adjustment of atmosphere in furnace is easy

Using an alloy muffle even eliminates the need for seasoning as in intermittent operation. Little time is lost because the atmosphere quickly stabilizes even after a long work stoppage. This makes multiple jobs possible because switching between various uses of the furnace is fast.

Construction

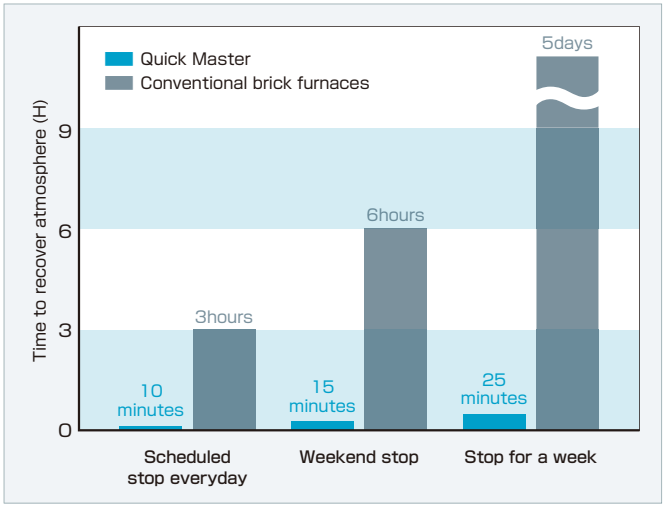


Specifications

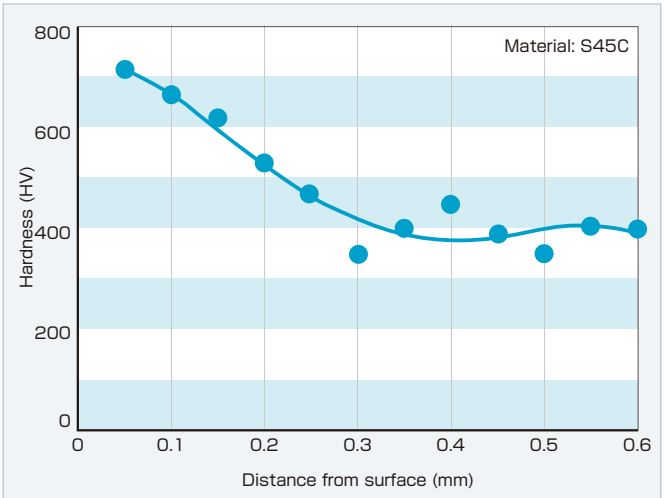
	EQ-3	EQ-6	EQ-9
Effective dimensions (W×L×H mm)	450×600×375	600×900×450	650×1000×475
Treatment capacity (kg/h)	150	350	500
Electric capacity (kW)	48	90	90
Installation dimensions (W×L×H m)*1	1.8×4.7×3.5	2.2×5.3×3.7	2.7×6.8×3.7
Main unit weight (tons)*2	10	15	19
Quenching oil capacity (L)	1900	3400	5400
Operating temperature (°C)	500~900	500~900	500~900

*1 Not including space for maintenance *2 Weight while dry

Graph showing recovery of atmosphere



L-TEQ process Hardness distribution from surface



L-TEQ process Performance data

Heat treatment distortion from L-TEQ
Sewing machine parts

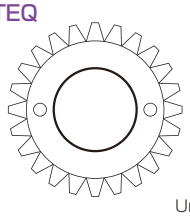
Specifications
Material: SPC
Depth of effective hardness layer: 0.24mm

Unit: mm

	x			σ		
	Before	After	Distortion	Before	After	Distortion
Radial runout	0.0106	0.108	0.002	0.0106	0.108	0.002

Heat treatment distortion from L-TEQ
Sprocket

Specifications of Sprocket
Inner diameter: 37.0mmϕ
Root diameter: 69.7mmϕ
Plate thickness: 4.2mm
Material: SPC
Depth of effective hardness layer: 0.15mm



Unit: mm

	x			σ		
	Before	After	Distortion	Before	After	Distortion
Hole diameter	37.010	37.019	+0.009	0.0026	0.0032	+0.0006
Root diameter	69.750	69.774	+0.024	0.0035	0.0032	+0.0016
Surface distortion	0.047	0.038	+0.009	0.0129	0.0140	+0.0011
Roundness	0.028	0.048	+0.020	0.0079	0.0079	0

Corrosion resistance with L-TEQ

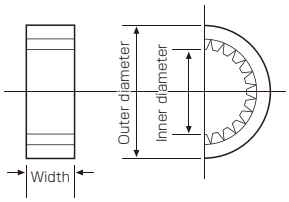
Processing method	Tempering temperature (°C)	4 days after start of test		16 days after start of test	
		Rust status	Change in weight (mg)	Rust status	Change in weight (mg)
L-TEQ	As quenched	No rust	+1.2	No rust	+0.2
	150	No rust	+1.3	No rust	+0.4
	200	No rust	+1.4	Several points of rust	+0.6
	300	No rust	+1.7	No rust	+0.7
Carburizing/ quenching	As quenched	Several points of rust	+1.9	1/3 rusty	+1.7
	150	Several points of rust	+1.6	2/3 rusty	+1.7
	200	3/4 rusty	+1.4	Almost entire surface rusty	+1.9
	300	Points of rust on entire surface	+1.7	Entire surface rusty	+3.3

Humidity of atmosphere Temperature 15 ±1°C Humidity 95%

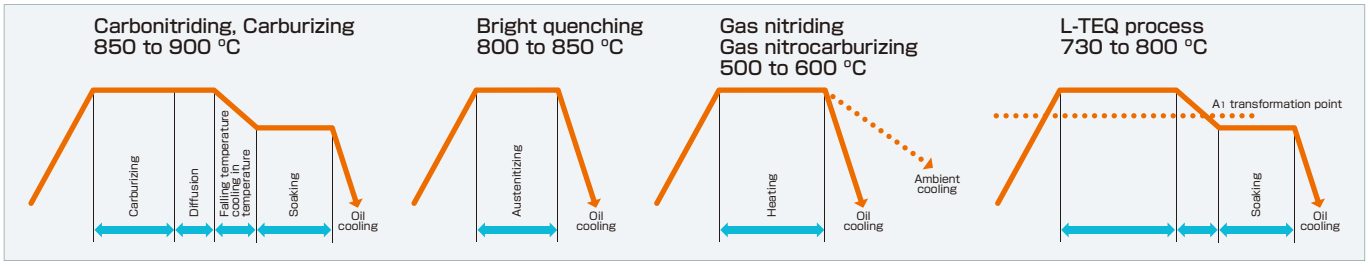
Heat treatment distortion from L-TEQ
Gear

Specifications of Gear
Module: 2.75
Tooth count: 20
Over pin diameter: 48.5
Material: S45C
Depth of effective hardness layer: 0.15mm

	Nominal dimensions (mm)	Heat treatment distortion (μ)
Outer diameter	72.0	-1～+2
Inner diameter	50.75	-10～+10
Width	26.0	-2～+11
Over pin diameter	48.50	-11～-24



Heat treatment cycle



Continuous processing of heating, quenching, washing, and tempering

Mesh belt type continuous furnace

Continuous heat treatment furnaces

What is Mesh belt type continuous furnace

Items being processed travel on a stainless steel mesh conveyor belt so heat processing procedures can be done continuously with this equipment.

Applications

- Bright quenching process
- Carburizing/quenching process
- Carbonitriding/quenching process

Features

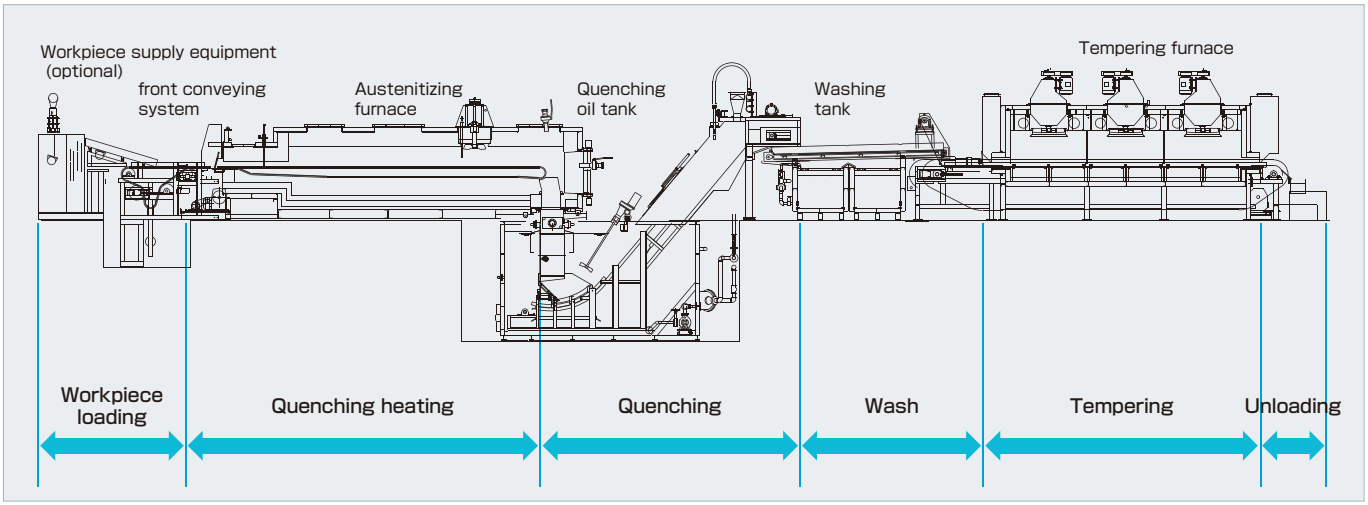
Austenitizing furnace
Mesh belt uses a roller house construction for a long service life
Construction matches purpose of process for diverse atmosphere control.

Quenching oil tank
Oil curtain reduces degradation of oil for easier maintenance
Prevents oil smoke from entering heating chamber.

Washing tank
Dual tank construction (hot and cold) and laminar flow nozzle give high washing performance.

Installation photo

System flow



Mesh belt standard specifications

Facilities	Standard A type	Standard B type	Remarks
Effective dimensions (W×L×H mm)	800×5000×100	900×5400×100	Heating furnace
Treatment capacity (kg/h)	400	450	For bright quenching
Electric capacity (kW)	330	449	Complete facility
Installation dimensions (W×L×H m)*1	7×30×5	8×30×5	H is from bottom of oil tank pit to top of equipment
Main unit weight (tons)*2	37	45	Complete facility
Quenching oil capacity (L)	14,500	18,000	
Operating temperature (°C)	800~900	800~900	Heating furnace
System to supply workpieces automatically	Robot to supply workpieces	Robot automatically supplies workpieces to workpiece supply equipment from the basket.	
	Equipment to supply workpieces	They are fed automatically to the mesh belt according to the set processing volume (kg/h).	
Supports carbonitriding processes	Ammonia is injected and circulation fan is added to heating furnace.		
Smoke collector	Frame is mounted on top of washing tank, and oil smoke mist generated by quenching oil tank is collected.		

*1 Not including space for maintenance *2 Weight while dry

Industrial furnace lineup

Vacuum purge type triple chamber tempering furnace EVHFD

Nitrogen purge atmosphere tempering furnace

Tempering furnace

Large size annealing furnace

Aluminum solution treatment furnace

Pit type nitriding furnace

Bogie furnace

Optimum washing before and after heat treatment

Clean Master

Vacuum degreasing machines

Features

■ Simple
Everything completed in a single chamber, from washing to drying, with no moving parts.
Compact designing and high durability.

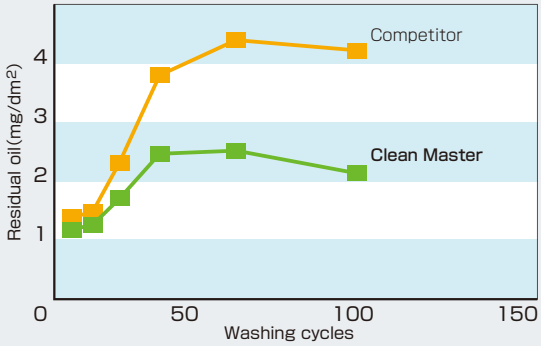
■ Safe
Front door uses double lock construction and pneumatic valves, solvent is moved with a pressurized control from vacuum + nitrogen, vacuum (air and cutoff) and thermal oil use intermediate heating.

■ Energy savings
Equipped with a high-efficiency distillation recycler so highly pure solvent can be reused.
Low solvent costs because of high recovery rate in a fully closed system.

■ Low environmental impact
Hydrocarbon solvent is used.
(exempt from air pollution laws, soil pollution laws, water pollution laws, and PRTR laws and regulations.)

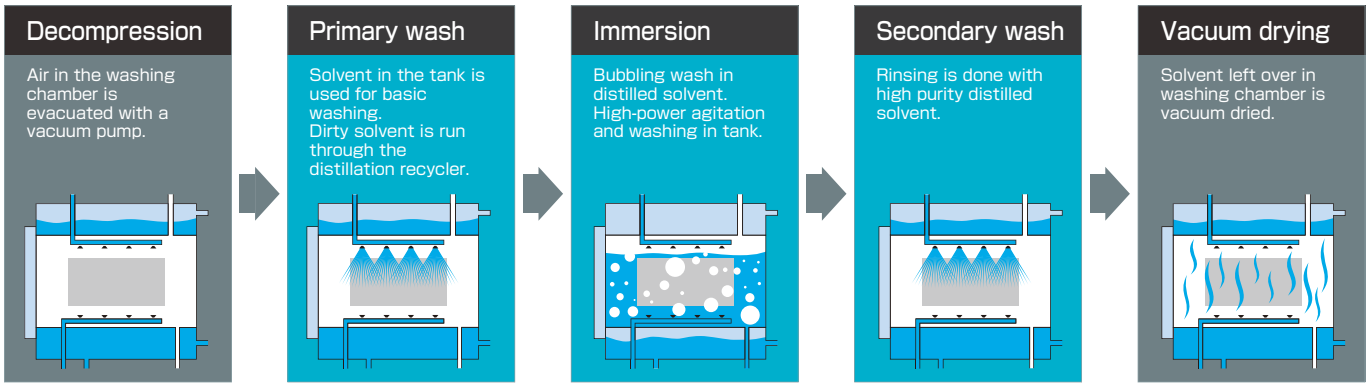
■ Easy to install
System has many possible layouts because of modular design of functions.
Meets short delivery time and low cost targets, saving space when updating existing facilities.

Changes in washing cycles and residual oil



■Test equipment: NVD-10
■Load volume: 500kg/N.C
■Solvent temperature: 110℃
■Solvent used: Semi-hot quenching oil
■Load volume: 3.0 L/cycle 1 → 85 ch

Superior washing functions for various products in triple wash and high-power degreasing



Washed items

Series lineup

In & Out Types NVD-3, NVD-6, and NVD-10

Through types NVD-6T, and NVD-10T

In & Out Large Types NVD-15, and NVD-30

SNVD-6LT for short cycle continuous lines

Specifications

	NVD-3	NVD-6(T)	NVD-10(T)	NVD-15	NVD-30	SNVD-6LT
Effective dimensions (W×L×H mm)	460×620×550	610×950×610	760×1220×760	920×1220×920	920×1800×920	660×1220×650
Treatment capacity (kg/h)	300	600	1000	1500	2700	600
Normal wash time (min/ch)	30	30	30	40	50	20
Electric capacity (kW)	55	70	70	120	120	95
Installation dimensions (W×L×H m)*1	2.1×5.5×2.8	2.2×6.2×3.0	2.2×6.2×3.0	2.6×7.5×3.3	2.6×8.5×3.3	5.0×7.0×3.8
Main unit weight (tons)*2	8	11	11	13	15	14
Solvent volume (L)	900	1900	1900	2500	3700	1600
Thermal oil (L)	400	600	600	900	900	700

*1 Not including space for maintenance *2 Weight while dry

Proprietary solvent circulation system and four wash cycles minimize solvent volume

Clean Master J

Vacuum degreasing equipment

Features

Save energy and reduce environmental impact

■Solvent is efficiently recovered through high performance distillation recycler, mist trap, after cooler, and condenser. Reduce consumption of solvent.
■Less than 1 Nm^3 nitrogen per charge consumption.
■Energy saver mode reduces power consumed in standby.
■Low noise design uses screw type dry vacuum pump.

Prevent re-adherence of particulate foreign matter

Saving installation space

■Installation possible in 55% of space required for NVD-10E (including maintenance space).
■All-in-one design for easy transport and installation so upgrading existing facilities is simple.

High-performance distillation recycling system reduces running costs

■Distillation recycler performance is 170 l/hr
■Recycling purity is over 99%
■Solvent consumption is about 150 cc/charge

Uses less than 1/5 the solvent of conventional systems

Exempt from fire safety regulations because proprietary solvent circulation recycling system (patent pending) reduces solvent volume to less than 280 liters, 1/5 of conventional systems.

No need to apply to store low volumes of hazardous materials

Four cleaning functions

■Jet　High-pressure high-speed nozzles wash with pounding force
■Spray　High-pressure mist washes with micro droplets
■Shower　High-volume overhead shower bath
■Vapor　Solvent is vaporized to wash intricate areas


Jet (movable nozzles)


Spray

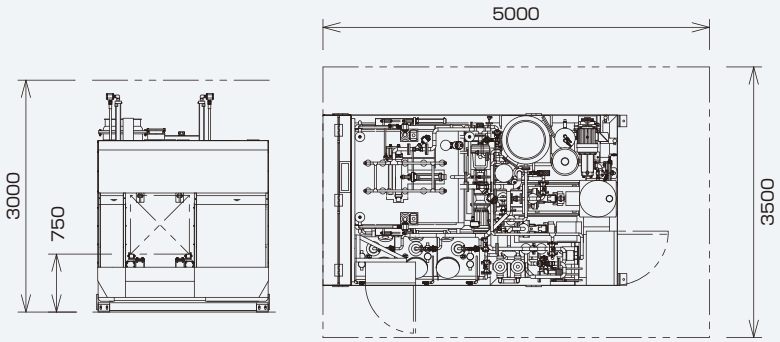

Shower


Vapor

Specifications

JNVD-10		H	HM	HL	L
Washing method	Shower	●	●	●	●
	Jet	●	●		
	Spray	●		●	
	Vapor	●		●	
Effective dimensions (W×L×H mm)		760×1220×760			
Treatment capacity (kg/g.c.)		1000			
Normal wash time (min/ch)		30~45			
Electric capacity (kW)		75			
Installation dimensions (W×L×H/m)*1		2.2×3.8×2.8			
Main unit weight (tons)*2		10			
Solvent volume (L)		280			
Thermal oil (L)		340			

*1 Not including space for maintenance　*2 Weight while dry



Customized specifications supported

Top charge type

4-tray washing and large volume through type

Options

Thermal oil boiler
(13 A LPG butane)

Solvent neutralizer feeder
(to prevent oxidation of solvent and handle corrosion of equipment)

Large volume wash chamber filter

Conveyor systems

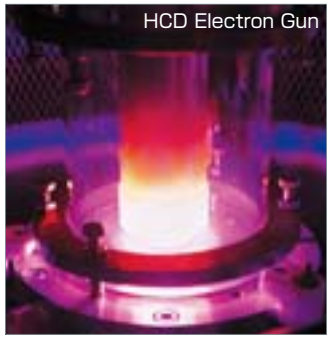
High-density plasma electron beam generates fine coatings

HCD ion plating equipment

PVD coating equipment

Features

- Fast coating formation speed (TiN: 2 to 5 μm/h)
- Excellent quality coating performance with melting method
- Low running cost (100% of vaporized materials used)
- Wide range of software for coating provided
- DLC coating process is possible (options required)
- Nitriding + coating can be done continuously (options required)



SS-2-8N

SQ-3-8N

Specifications

Type	SS-2-8N	SQ-3-8N
Installation dimensions (m)	4.0×5.4 (including space for maintenance)	5.0×5.5 (including space for maintenance)
Supported types of coatings	TiN, TiCN, CrN	TiN, TiCN, CrN
Processable size	φ150×270H×8spindles	φ220×400H×8spindles
Processing volume	Rotating 8 kg/spindle (maximum 15 kg)	Rotating 15 kg/spindle (maximum 40 kg)
Processing temperature	400～500℃	400～500℃

Options

HCD hybrid ion plating equipment SH-4-8

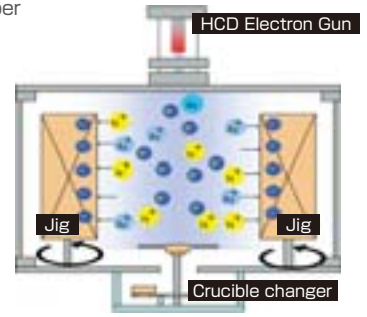
Process flow

Plasma ignition → Heating → Bombardment → Plasma nitriding → Coating → Leak check → Cooling

Features

- Plasma nitriding and coating can be done consecutively
- Types of supported coatings
  TiN, TiCN, CrN, Nitride + TiN, Nitride + TiCN, DLC, VC
- Layering of coatings is possible with crucible changer (3 mounted)

Coating chamber construction



Excellent for coating mass produced parts

Sputtering equipment

PVD coating equipment

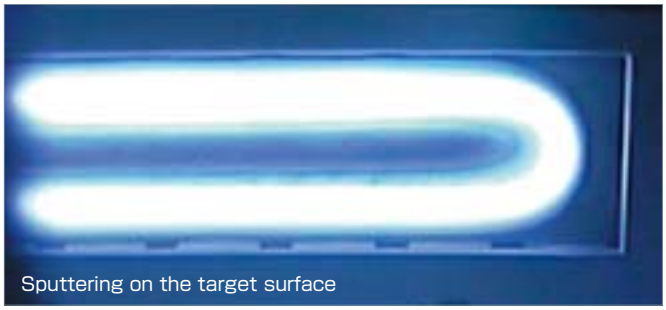
Features

- Four angled target magnetrons
- Booster magnet coils used
- Excellent quality coatings can be generated
- Low temperature processing supported
- Alloy targets not needed
  (different metals set up as counter targets)
- Low running costs

SP-6090

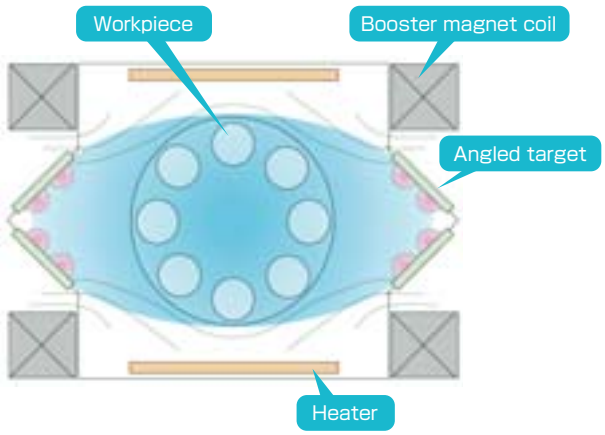
Specifications

Type	SP-6090
Installation dimensions (m)	4.0×6.0 (including space for maintenance)
Supported types of coatings	DLC, CrN
Processable size (mm)	ϕ600×900H
Processing volume	Rotating 300 kg
Processing temperature	180~500℃



Sputtering on the target surface

Coating chamber construction



Auxiliary equipment

Low reciprocating pressure ultrasonic cleaner

Hole punch for measuring thickness of coating

Demagnetizer

Capable of testing individual parts or large lots

Heat treatment experimentation service

Heat treatment testing and processing services

Supported processes

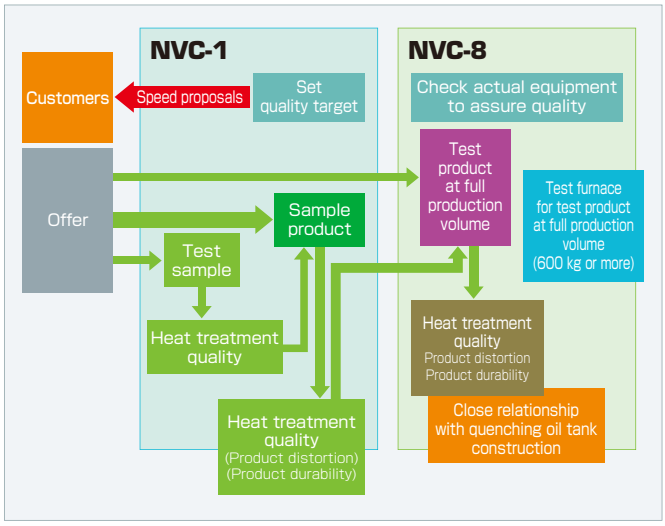
Vacuum hardening	Vacuum carburizing/ quenching	Vacuum carbonitriding	Super carburizing	Vacuum water quenching	Vacuum carburizing/ water quenching

*Contact us about processes not shown here.


NVC-1 supports multiple products in small lots


NVC-8 supports mass production

Test run at full production volumes + back up

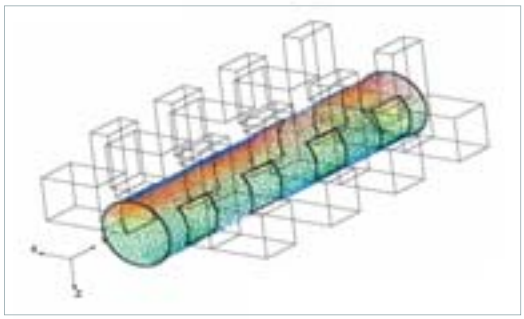


Material examination
(hardness, metallic micro structure, component analysis, EPMA)


Inspecting materials used for product being heat treated.

Consultations about heat treating technologies

Heat treatment simulation (fluid, temperature, transformation)


Fluidic simulation of distribution of heat in furece.
This can be very helpful in basic heat treatment designs.

Sales of easy-to-use metal analyzers

Easy to check
for foreign elements
or measure carburizing depth.

Increase productivity and improve quality

Consignment coating services

Consignment coating services

Increase productivity and improve quality.
Fujikoshi's coating service provides total service, including hardware, software, and consignment work, to meet demands from across the industrial sector.
Coating improves the tribilogical (friction, abrasion, lubrication) properties of parts and tools to get superior characteristics for both product life and the environment.
NACHI FUJIKOSHI Corp. can provide total coating services because we know materials and coating equipment.
We promise certain results and the production of many added values.

In the die and molds and punches fields

■ Improved mold release characteristics
Ceramic coating improves mold release, characteristics.
■ Achieve high hardness
Increase wear resistance and extend service life.
■ Contamination prevention
Control contamination (deposits) and improve yield.

In the automotive parts and machinery parts fields

■ Improve friction characteristics
Reduce energy loss by reducing friction.
■ Improved adhesion resistance
Ceramic coating can prevent seizing.
■ Improved durability
Increase wear resistance and get longer service life.

Examples of TiN applications


Injection molding screw parts
■Improved wear resistance


Liquid chemical extraction needles
■Improved wear resistance


Mold for cold forging (bevel gear mold)
■Improved wear resistance

Examples of TiCN applications


Mold for cold forging
■Improved wear resistance


Punch
■Improved wear resistance


Mold for cold forging
■Improved wear resistance

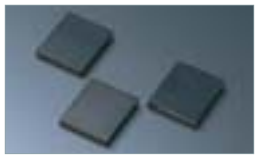
Examples of CrN applications


Parts for automobile engines
■Improved wear resistance
■Abrasion resistance


Punch for tablets (pestle)
■Improved wear resistance
■Improved mold release


Inner plate
■Improved corrosion resistance
■More stable power transmission
■Improved wear resistance

Examples of DLC applications


Vanes for compressors
■Improved wear resistance
■Abrasion resistance


Tips for machining
■Prevents adhesion

Example of VC/C applications


Punch for screws
■Improved wear resistance
■Improved adhesion resistance

Types of coatings and applicable fields

Type of coating	Basic characteristics					Features	Applications											
							Die and molds					Sliding parts			Cutting tools			
															Steel		Nonferrous iron	
	Standard coating thickness (μm)	Hardness of coating (HV)	Coefficient of friction	Upper temperature limit (°C)	Removable		Cold forging	Hot forging	Injection molding	Aluminum	Other	Light load	Medium load	Heavy load	Dry	Wet	Dry	Wet
CrN	2~4	1100~2000	0.5	700	○	Heat resistance/Anti-adhesion	○	○	◎	△		○	○	◎				△
DLC	2~4	1000~3000	0.1	300	×	Low friction/Anti-adhesion			○	◎		○	△				◎	○
TiN	2~4	2400	0.6	600	○	Wear resistance/Extensive applicability	◎	△	○	△	○	○	○	○		◎		△
TiCN	2~4	2700	0.6	400	○	Wear resistance	◎	△		△	○					◎		△
TiAlN	2~4	2600	0.7	850	○	Wear resistance/Heat resistance									◎	○		
VC	2~10	2800	0.6	400	○	Wear resistance	◎	○	△									
VC/C	2~6	2300	0.2~0.4	300	○	Wear resistance/Low friction	◎	○	△									

NACHI

NACHI-FUJIKOSHI CORP.

www.nachi-fujikoshi.co.jp

THERMOTECH DIVISION

176-12 Ogake, Namerikawa-shi, Toyama 936-0802
Tel:076-471-2981　Fax:076-471-2988

Tokyo Head Office
Shiodome Sumitomo Bldg.17F, 1-9-2 Higashi-Shinbashi, Minato-ku, Tokyo 105-0021
Tel:03-5568-5240　Fax:03-5568-5206

Toyama Head Office
1-1-1 Fujikoshi-Honmachi, Toyama 930-8511
Tel:076-423-5111　Fax:076-493-5211

Eastern Japan Main Branch	Tel:03-5568-5291
Central Japan Main Branch	Tel:052-769-6823
Western Japan Main Branch	Tel:06-7178-5107
Tokai Branch	Tel:053-454-4160

CATALOG NO.	5001E

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