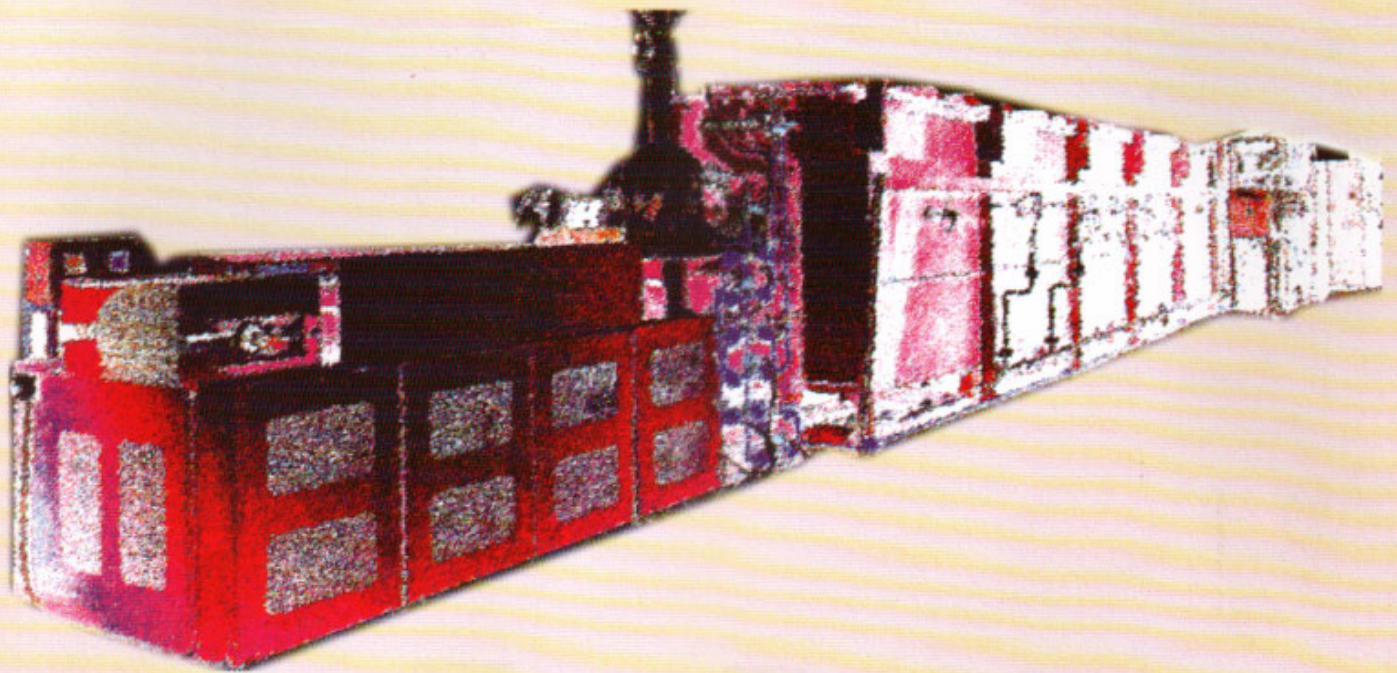


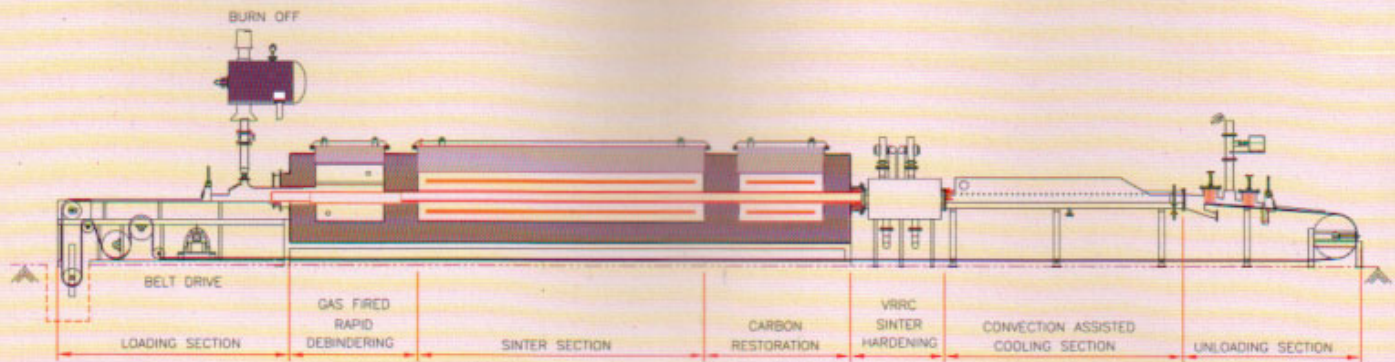
# Furnaces for Powder Metallurgy

Sintering  
Powder Annealing  
Steam Treatment  
Heat Treatment



  
**FLUIDTHERM**  
Technology

## MESH BELT FURNACES FOR PRECISION SINTERING (FW SERIES)



Manufactured by a highly skilled workforce with decades of experience, the FW series sintering furnaces are designed specifically for very high uptime. Several installations have been in continuous operation for years on end with production interrupted only for a (hot) belt change. The furnaces are generously instrumented and the SCADA visualisation and control system monitors, controls and reports all process and production information.

### EQUIPMENT FEATURES & OPTIONS

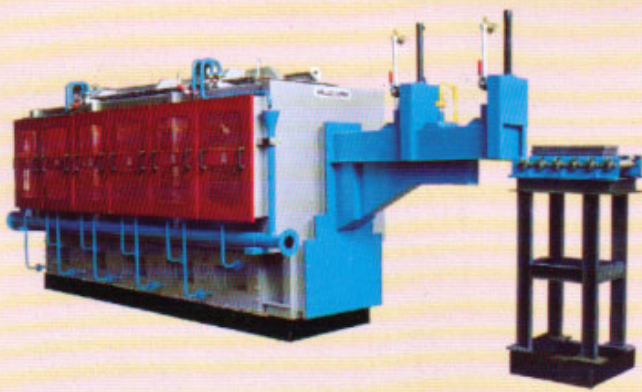
- ✓ Gas tight shell and sealed ports.
- ✓ Built-in structure for roof lifting & moving.
- ✓ Computer generated insulation profile with microporous panels for genuinely low wall loss.
- ✓ A ceramic muffle that retains its shape and helps extend belt life. Metal alloy muffles on request.
- ✓ Muffle is fully supported by SiC tiles upon dense pier bricks.
- ✓ Side extraction low watt density heaters, SCR connected, in parallel.
- ✓ Ni80/Cr20 wire elements on high alumina tubes. SiC heaters on request.
- ✓ Generous number of control zones.
- ✓ Independent control of heaters above & below the muffle.
- ✓ Suitable for use with  $N_2+H_2$  as well as endogas.
- ✓ Atmosphere curtains.
- ✓ Multipoint atmosphere injection and sampling.
- ✓ Control over direction of gas flow.
- ✓ Draft resistant entry & exit throats.
- ✓ Safety monitoring of process gas streams.
- ✓ A section for carbon restoration that follows sintering
- ✓ Sinter hardening module.
- ✓ Convection assist for quick cooling.
- ✓ Electrically heated debinding with atmosphere humidification (EDB).
- ✓ Rapid gas heated debinding (in exogas + controlled air addition).
- ✓ Chimney incinerator.
- ✓ NEMA 12 control cabinets with air conditioning.
- ✓ Open frame gas control panel with several metered gas streams.
- ✓ Open frame water control panel with flow monitoring.



## WALKING BEAM FURNACES



Modern walking beam furnaces are increasingly being seen as an alternative to wire mesh belt furnaces for iron parts in addition to higher temperature applications. The ability to stack several layers of parts increases the plant capacity (>20 tpd) while reducing the thermal mass and energy costs. Entry/exit gas lock doors reduce atmosphere consumption. Combining other conveyor mechanisms with the walking beam (such as pusher, belt and roller) makes the walking beam furnace very versatile. Plants are available with isolated dewax chambers, accelerated cooling devices, separated atmosphere zones and other custom designed features to suit particular applications e.g. in-line case hardening.



### EQUIPMENT FEATURES & OPTIONS

Upto 1750°C (3182°F)

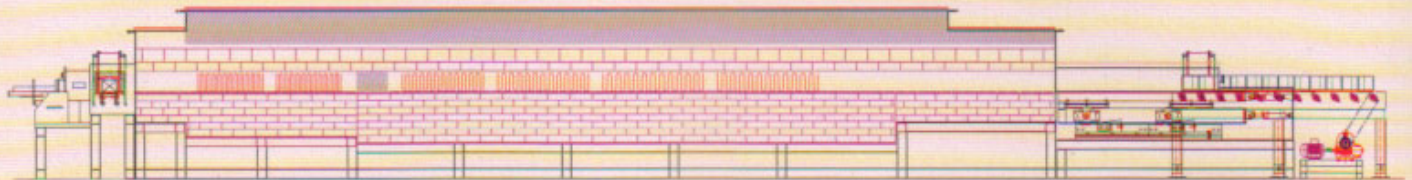
Electrically heated with NiCr, SiC, MoSi<sub>2</sub> or Mo elements depending on the operating temperature, processing atmosphere, emissions & product reactivity.

Nitrogen, Hydrogen & N<sub>2</sub>+H<sub>2</sub> atmosphere (or plain air), multiple injection & sampling points & optional humidification.

Precision machined walking beam mechanism for "soft" handling of trays with hearth loading upto 2000 kg/m<sup>2</sup> (400 lbs/ft<sup>2</sup>).

PLC with SCADA for sequence, interlock & safety monitoring, visualisation and data acquisition.

## PUSHER TRAY FURNACES



High Temperature Furnaces upto 1750°C (3182°F)

For sintering of hard metal, ceramic parts, nuclear fuel, stainless steel and several other applications. SiC, MoSi<sub>2</sub>, or Moly heaters depending on operating temperature and atmosphere. Alumina hearth and refractories ensure contamination free processing. Available for use with air, Nitrogen, Hydrogen & N<sub>2</sub>+H<sub>2</sub> atmosphere, with optional humidification. Dependable mechanical pushers with automatic loading, unloading and tray return.

Medium Temperature Furnaces upto 1000°C (1830°F)

Electric or gas fired, with metal alloy or ceramic muffle for reduction annealing (H<sub>2</sub> or N<sub>2</sub>+H<sub>2</sub>) of Iron or Copper powder placed in trays and for gravity sintering of porous parts.



## CW SERIES & CUSTOM DESIGNED FURNACES

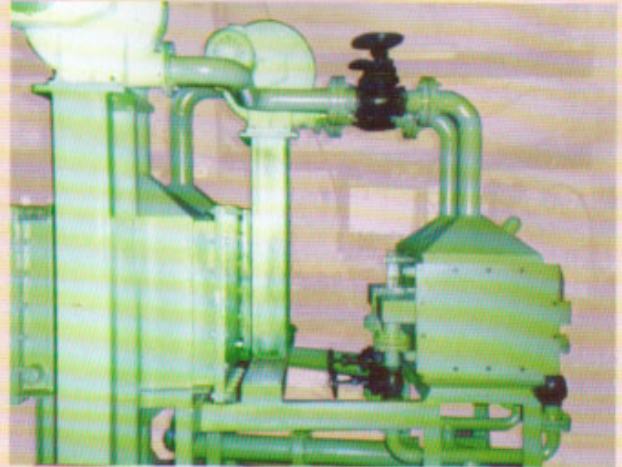
CW series furnaces are more economical than the FW series furnaces. While the basic furnace construction is the same as the FW series, CW series furnaces generally have fewer zones of control and atmosphere injection points. Several upgrade options bring the CW series upto the FW series.

**Custom furnace designing** to meet any specific requirements the customer may have is generally done at no extra cost. Our engineers and representatives welcome the opportunity to discuss customer concerns.

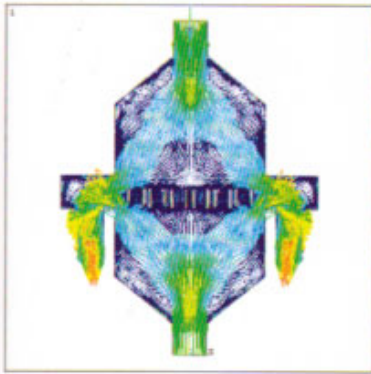
## THE VRRC MODULE FOR SINTER HARDENING

The VRRC module is basically a device that is designed for rapid heat extraction (by radiation & impinged convective jets of cooled furnace atmosphere) from components as they emerge from a furnace.

Originally designed for experimental work for hardening of bearings, a variety of models have been installed for hardening of thick section air hardenable steel parts, for increased bainite content in normalised forgings and for sinter hardening.

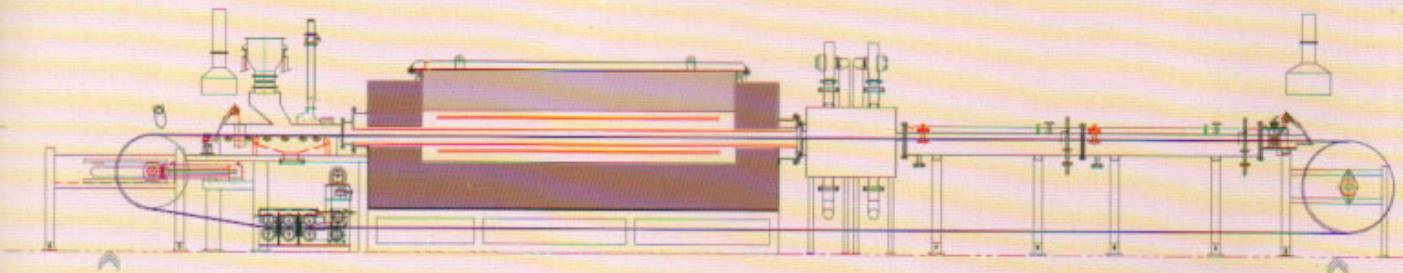


In each case the design effort is assisted by CFD modeling and experimentation at our thermal processing facility. Development work on the VRRC is continuous and aimed at increasing the heat extraction rate. Systems are also available for use with roller hearth & walking beam sintering furnaces.



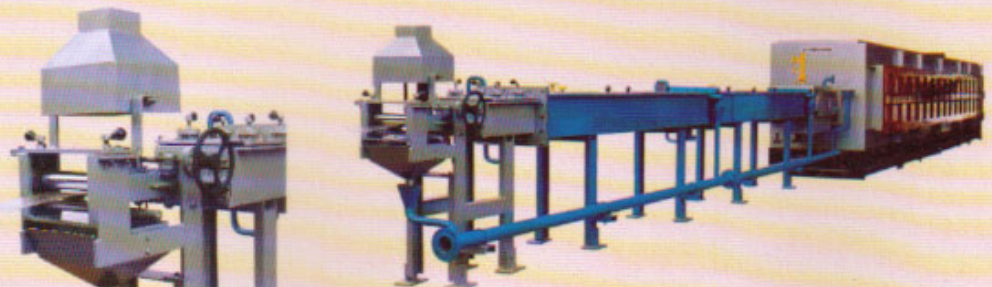
## POWDER (REDUCTION) ANNEALING FURNACES

Continuous Band  
Mesh Belt  
Pusher Tray  
Walking Beam

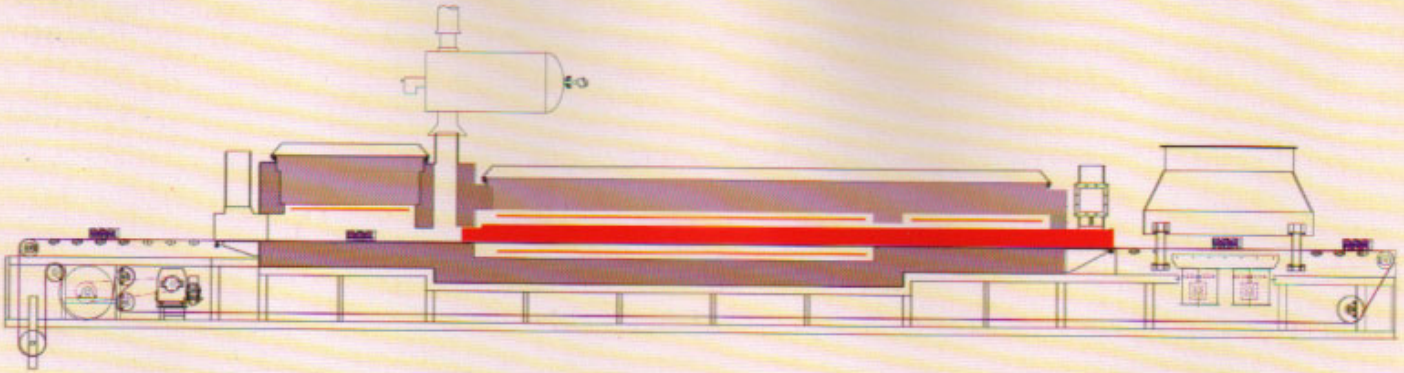


## FURNACES FOR BIMETAL STRIP

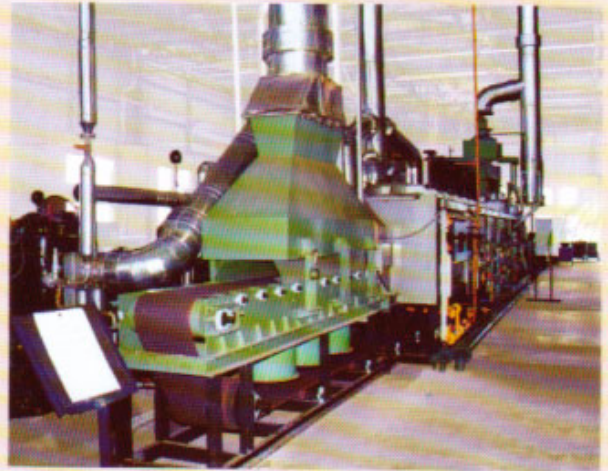
Muffle Type  
Roller Hearth  
Electric or Gas Fired



## CONTINUOUS STEAM TREATMENT FURNACES



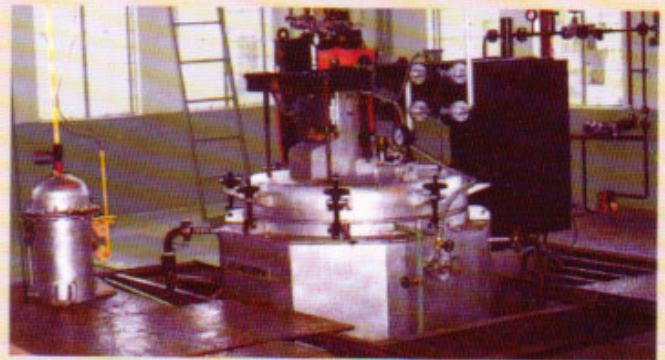
Suitable for high throughput, mesh belt continuous furnaces are designed to handle parts placed in mesh baskets to obtain a high belt load. The design & construction of these furnaces ensures high quality consistency in terms of colour, hardness, uniform & penetrative oxide layer thickness (upto 4-6 $\mu$ m) and pressure tightness (upto 10 bar) on parts like pressure plates & pistons. Standard models with an hourly output of 100 Kg (220 Lbs), 200 Kg (440 Lbs) & 300 Kg (660 Lbs) (based on a 3 hour steaming cycle) are available with a wide belt speed range (0.5 to 6 hours steaming).



- ✓ Electrically heated standard models, gas fired custom designed plants.
- ✓ Multipoint steam injection with control over flow direction.
- ✓ Cooling in steam precedes rapid air cooling.
- ✓ Preheat in air. Prior degreasing not required.
- ✓ Chimney incinerator to neutralise off gas (oil fumes & hydrogen).
- ✓ Auto tray handling.
- ✓ PLC with SCADA control.

## BATCH STEAM TREATMENT FURNACES

These pit retort furnaces are designed for use at moderate pressures upto 600 mm (24") WC and are heated with NiCr wire coils outside an alloy retort. Steam is superheated and recirculated. A heat exchanger on the outlet condenses oil vapour & steam and a burn off is provided for oil mist and hydrogen. The system design ensures a high degree of temperature uniformity and the ability to load oily parts without precleaning. Standard models (50 to 500 Kg/110 to 1100 Lbs per batch) and custom designed plants are available with several design features & options.



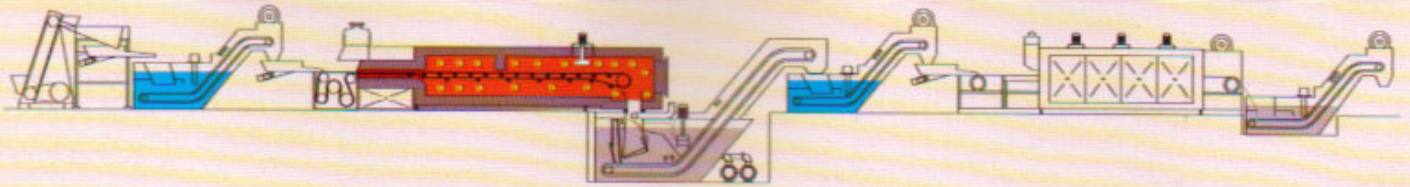
Unetched  
Microstructure of PM pressure part steam treated at 560°C (1040°F) for 4 hrs



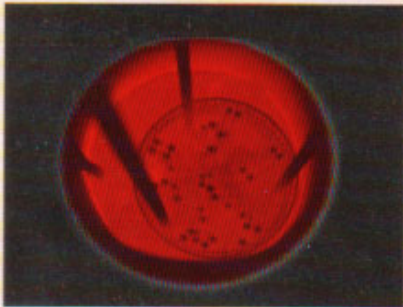
## HEAT TREATMENT FURNACES

for PM Parts

Continuous hardening mesh belt (& case hardening) + tempering (& post oiling) plants for throughput rates from 50 Kg (110 Lbs) to 1500 Kg (3300 Lbs) per hour.

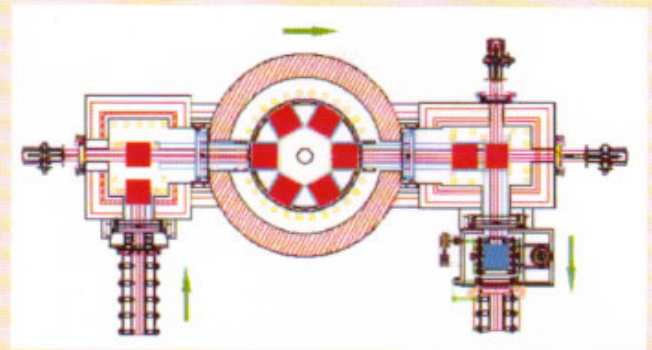
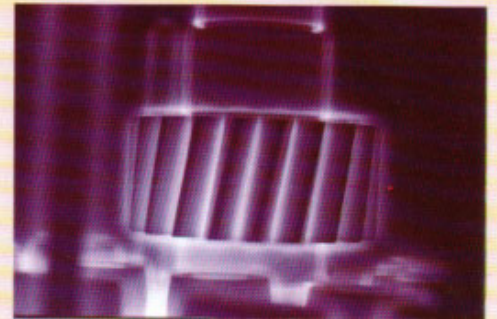


**FLUIDCARB Sealed/Integral Quench Furnaces.** Electric or gas heated, 50 Kg (110 Lbs) to 1500 Kg (3300 Lbs) / batch.



**Fluidised Bed Furnaces.** A homogeneous environment for precision heat treatment of PM parts & tooling. High hardness (& case depth) uniformity. Versatile furnaces for hardening, carburising, nitriding, nitrocarburising, combination processes & also steam treatment.

**IONIN® Plasma Nitriders.** A range of pulse plasma reactors for nitriding & nitrocarburising.



A new generation of semi continuous sealed quenching furnaces that bridges the gap between batch and continuous furnaces with advantages of both. Processes different case depth jobs simultaneously. Frequent output of small lots reduces inventory costs.

  
**FLUIDTHERM**  
Technology

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