



Ipsen Multi-Treater Furnaces with HydroNit sensor for Nitriding & Ferritic Nitrocarburizing Applications

The New Multi Treater®

Completely new design of a horizontal retort furnace:

- Unique concept for decoupling the charge weight support from the furnace retort
- Higher maximum weight up to 10,000 pounds
- A drastic improvement in cooling speed with reducing process duration by up to 30 %



Multi-Purpose Vacuum Furnace

- Gas Nitriding
- Ferritic Nitrocarburizing (FNC)
- ProNox™ (Black Oxide)
- Clean Tempering
- Annealing

The New Multi Treater® Specification



Size M & XL

- Load dimensions (W x L x H):
- 24" x 36" x 24"
- 36" x 48" x 36"
- Temperature up to 1380°F
- Gas Heated or Electrical Heated

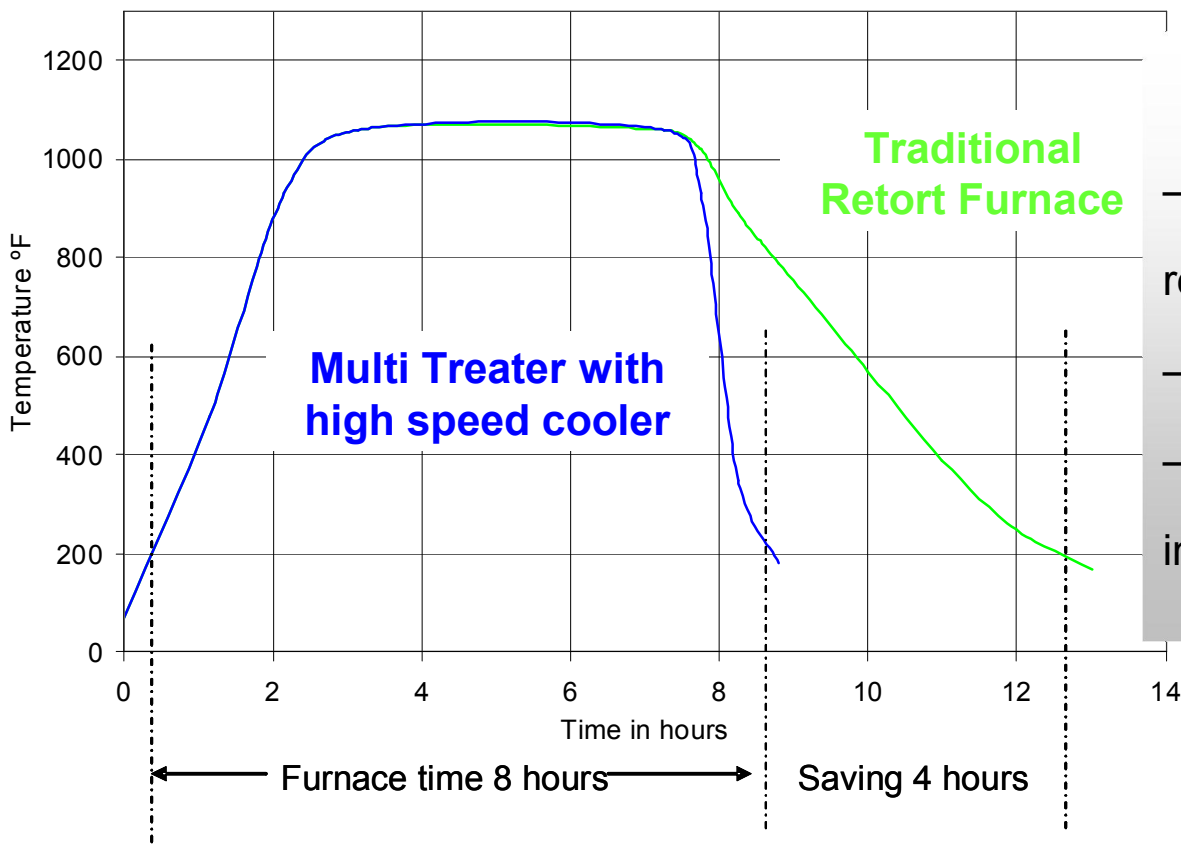


Controls

- Measurement of the hydrogen content using an Ipsen HydroNit® sensor
- Control of the nitriding potential (KN-control)
- IPSEN Nitro-Prof for data acquisition, process data
- Controlled post-oxidation PRONOX®

The New Multi Treater®: More speed equals greater profit

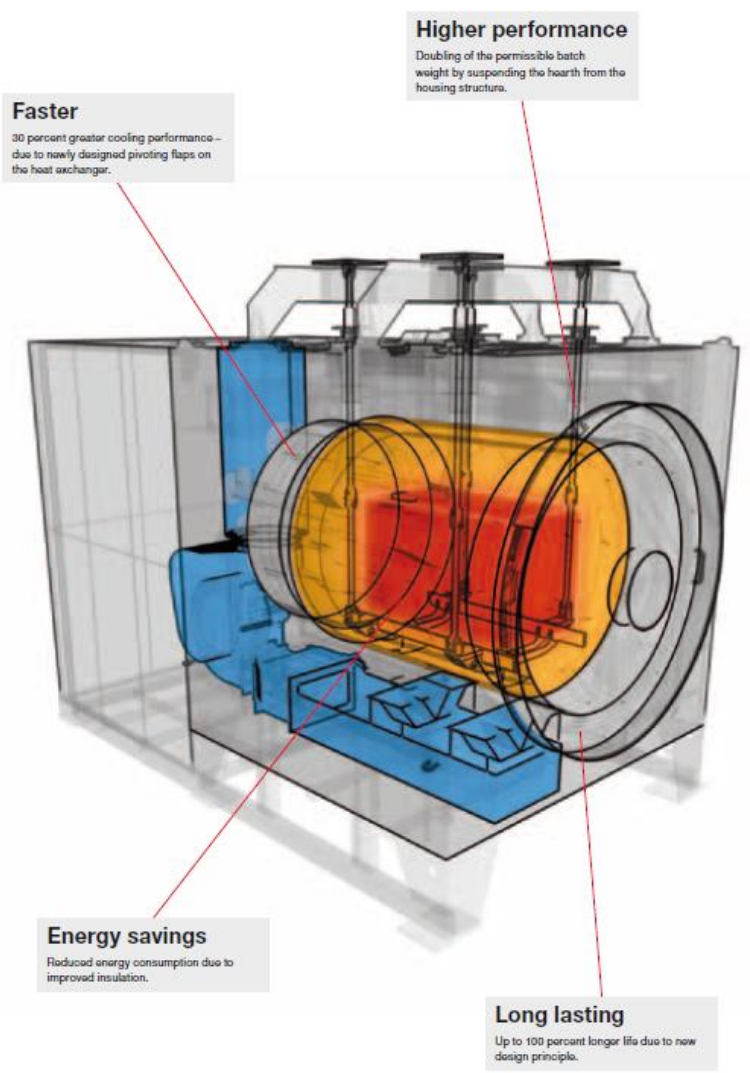
4,000 pounds load Ferritic Nitrocarburizing 4 hours at 1060°F



- To produce 10-15µm white layer
- Conventional furnace requires 12hrs
 - Multi Treater requires **8hrs**
 - Multi Treater produces 3 batches instead of 2 batches/day



The New Multi Treater®: Benefits



Uniformity

- Gas Circulation within the retort can be optimized through increased efficiency & improved directional flow
- Excellent temperature uniformity $\pm 7^{\circ}\text{F}$

Versatile

- High quench intensity with new shut-off flaps on the cold and hot side of the cooling stream

Speed

- Cycle time reduced by-up to 30%



The New Multi Treater®: Nitriding Internal Gear

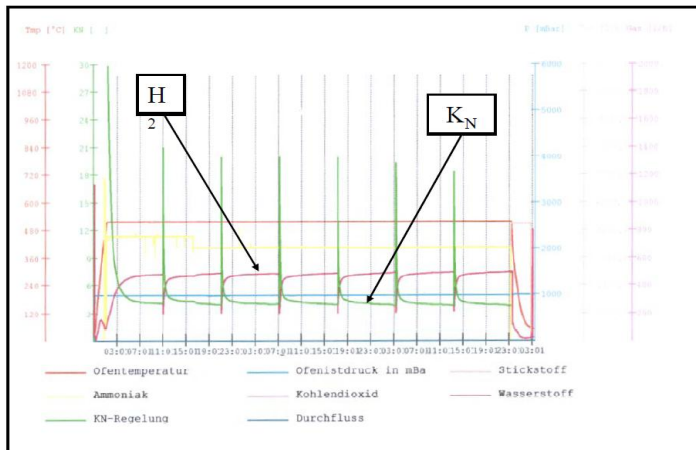
Specification/Results

Material	31CrMoV9V
Nitriding Temperature	960°F
Process duration	70 h
Nitriding Potential	4-4.5
Nitriding Depth	0.015" - 0.029 " / 0.018 "
Compound layer thickness	Max 20µm / 17µm

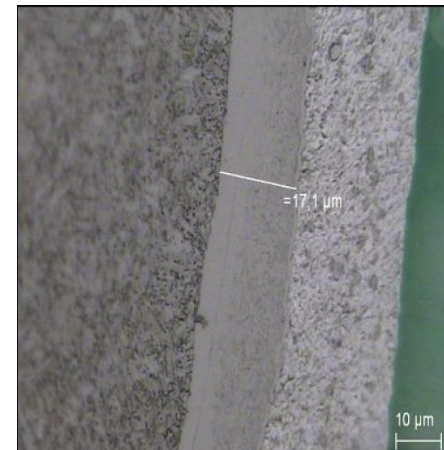
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Process Printout



Microstructure



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The New Multi Treater®: Ferritic Nitrocarburizing: Balance Pin

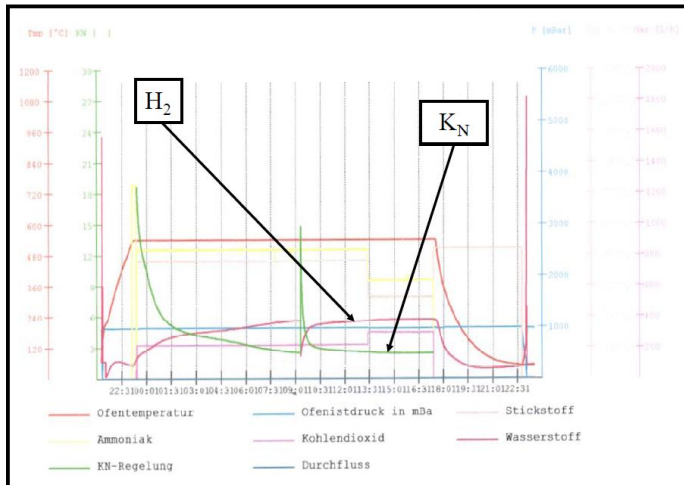
Specification/Results

Material	31CrMoV9V
Nitriding Temperature	1000°F
Process duration	18 h
Nitriding Potential	3
Surface hardness	720-820 HV10/ 758 HV10
Compound layer thickness	14-22µm/ 16.2µm

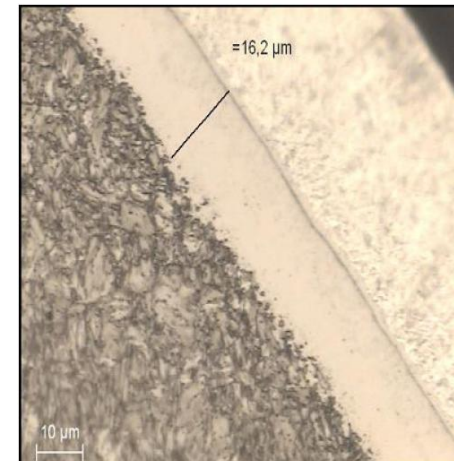
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The New Multi Treater®: Ferritic Nitrocarburizing: Inner Gear

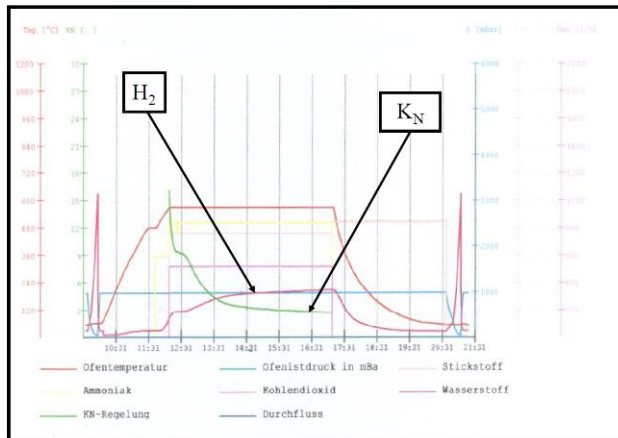
Specification/Results

Material	4140/42CrMo4
Nitriding Temperature	1060°F
Process duration	5 h
Nitriding Potential	2.5
Surface hardness	550-650 HV10/ 630 HV10
Nitriding depth	0.4-0.55 mm/ 0.5 mm
Compound layer thickness	8-35µm/ 14.3µm

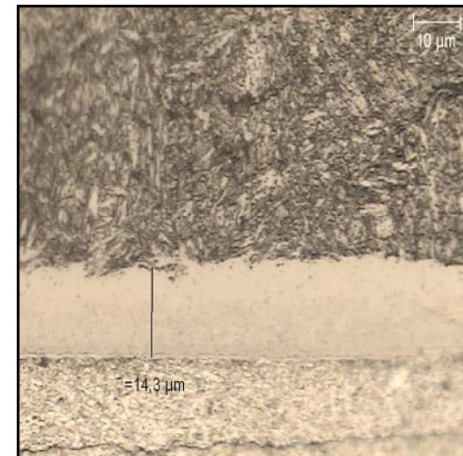
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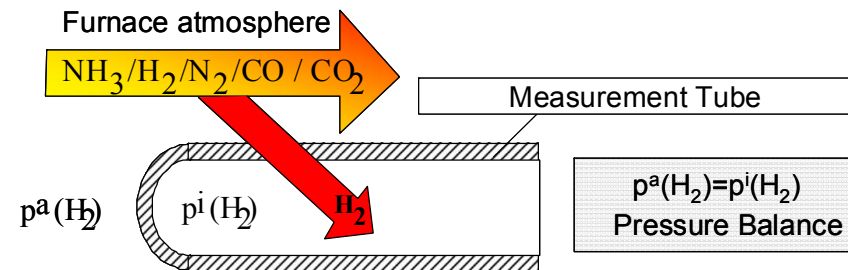
The New Multi Treater®: Atmosphere control with HydroNit® sensor

Goals:

- Controlled layer structure generation
- Reproducible layer structure & thickness
- Minimal process duration

Requirements:

- Measurement device for the continuous monitoring of an atmospheric component (e.g. H₂)
- Continuous monitoring of the input gases
- Atmosphere & Nitriding potential - Algorithm
- Cracked ammonia or hydrogen for the reduction of the nitriding potential
- Automatic gas flow controller



The New Multi Treater®: Advantages & Benefits

- Novel suspension of the charge weight support ensures complete decoupling from the furnace retort
- Considerable extension of the retort service life
- Long-term cost reduction due to improved maintenance & repair friendliness
- Improved utilization of the furnace chamber by increasing the load weight to 10,000 pounds
- Process time reduction by-up to 30% thanks to the new external high speed cooler
- Optimized uniformity of the hot gas flow and the increased hot gas volume flow result in a temperature uniformity of $\pm 7^{\circ}\text{F}$
- Increase in throughput more components are treated in shorter time

Summary

Today the advanced process and furnace technology make it possible to create uniform nitrided or nitrocarburized layers on a wide variety of materials.

This can be achieved by using the **New Multi Treater®**:

Optimized processes:

Nitriding, Oxinitriding, Nitrocarburizing, Oxinitrocarburizing
pre-oxidation, post-oxidation

Process- monitoring and – controlling:

Gas-analysers, Oxygen-probe, HydroNit[®]-Sensor, KiNit[®]-Sensor,
Atmosphere-calculation-model

