CaseMaster Evolution
Spare Your Time, Save Your money
when carburizing within state of the art furnace
economic generation of sealed quench furnaces

through Evolution to the Perfection in carburizing

Why Seco/Warwick?

- Know-How
- Customer Satisfaction
- Service 24/7
- Professional Service & Advice
- Long Experience
- Stable Market Position
- Commitment
- Reliable & Proven Solutions
**Aviation**
**Automotive**
**Machine-building**
**Bearing**
**Commercial Heat Treating**
**Industry**

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### CaseMaster Evolution®

**MAIN TECHNICAL DATA FOR STANDARD APPLICATIONS**

<table>
<thead>
<tr>
<th>Type</th>
<th>Size</th>
<th>W [mm]</th>
<th>H [mm]</th>
<th>L [mm]</th>
<th>Weight [kg]</th>
<th>Power [kW]</th>
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<tbody>
<tr>
<td>D/T</td>
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<td>D/T</td>
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<td>900</td>
<td>600</td>
<td>150</td>
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<td>800</td>
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<td>D/T</td>
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<td>1000</td>
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<td>1500</td>
<td>2000</td>
<td>340</td>
</tr>
</tbody>
</table>

Customized version can be produced to the furnace chamber dimensions requested by customer.

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### Applicable Technologies

- High-temperature carburizing by PreNitLPC®
- Low pressure carburizing by FineCarb®
- Bright hardening
- Oxidation in the preheating chamber
- Annealing
- Tempering

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### Versions Available

- **T** – Triple chamber for continuous work flow with additional chamber dedicated separately for:
  - Pre-heating, pre-oxidation,
  - Pre-heating with pre-nitriding acc. to PreNitLPC® technology,
  - High Pressure Gas Quenching

- **D** – Double chamber for batch (In & Out) work processing.

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There is gas heating system available as an option – pictorial view.
Main Advantages of CaseMaster Evolution furnaces

- Uniformity and high quality of parts following heat treatment
- High temperature carburizing for the typical & special steels
- High-speed & economic process performance
- Very low consumption of processing mediums
- Nominal temperature up to 1320°C
- Oil or Gas quench features
- Reduction of distortion and their repeatability
- Process simulators & fully automated processing
- Flexibility, no furnace idling periods, quick start up & shut down of the furnaceing
- The furnace meets AMS2750D, AMS 2759, BAC 5621, PN-EN 98/37, PN-EN 746-1
- Very short workload transport time within the furnace, fast opening & closing of internal door
- Compact and modular design
- New design of an oil circulation system enabling maximum uniformity and rate of cooling
PreNitLPC® + FineCarb® as an equipment of furnaces type CaseMaster Evolution in comparison to controlled-atmosphere furnaces type Sealed Quench allow for:

- Shorter carburizing cycle time because of very high carbon transition into the workload & high dissociation rate in the pertinent temperature ranges of up to 1050°C
- Greater repeatability results in terms of parts and workloads
- No CO/CO₂ emission, no exhaust hoods, lack of atmosphere to utilize
- No Endothermic generators
- No furnace idling periods, quick start up & shut off of the furnace,
- Process flexibility
- Workplace safety improvement due to lack of flammable process gases
- Clean, non-toxic work environment
- Easy & intuitive process control
**FineCarb® – low pressure carburizing technology**

Low pressure carburizing is characterized by an extraordinarily high coefficient of carbon transfer. In the initial phase of carburizing, for example, at the temperature of 950°C (1740°F), the carbon stream directed at the charge surface reaches the rate of 250 g/m²h. This means that, in the case of thin carburization layers, the process is considerably faster than the gas carburizing process.

The advantage is smaller in the case of thick layers that exceed for example, .00315 inches (0.8 mm), where the carbon transfer is much more dependent on the diffusion coefficient (DC). The low pressure carburizing process may easily be carried out even at temperatures of up to 1050°C (1900°F), within the natural temperature range of a vacuum furnace. The process temperature increases up to 950-980°C (1700-1800°F), where in comparison the traditional gas carburizing processes typically operate within a temperature range of 880-930°C (1600-1700°F). Operating at higher temperatures results in shorter carburizing cycles due to the considerable increase of the diffusion coefficient (DC). Both the increased amount of carbon in the carburizing atmosphere, and faster diffusion (Dc) are responsible for the increase of efficiency during vacuum carburizing when compared to the traditional gas carburizing.

**Comparison of carburizing processes**

- **Purity of process** because of multicomponent carburizing gases mixture
- **Excellent carbon penetration** when carburizing densely packed loads & complex shaped workpieces or blind holes parts
- **Repeatable & high-speed processing**
- **Very low consumption of carburizing gases**
- Better quality thanks to **No grain boundary oxidation** & precise case uniformity
- Process-simulation software package, SimVac (carburizing & gas quench simulator),
- Simplicity of carburizing of Aircraft & Alloy Steels i.e.: **Pyrowear® Alloy 57, M-50 NIL, SAE 9310, Ferrium® C61 alloy etc.**
- **Compatible with NADCAP**
- **High carbon potential of carburizing gas mixture** (C₃H₂, C₂H₆, H₂)
- Green manufacturing process – no CO₂ emission

**FineCarb® - The method of Carburizing Steel in an Oxygen Free Atmosphere Under Low Pressure**

**Comparison of vacuum carburizing process for 16MnCr5 steels, correlated to the temperature and the required thickness of the A HT layer**

- 0.9 Jamasco steel / Case depth to 0.3%C (mm)
- 2.0
- 1.6
- 1.3
- 1.1
- 0.9
- 0.7
- 0.5
- 0.3

**INTERNAL OXIDATION**

**NO INTERNAL OXYGEN**

**GAS CARBURIZING**

**VACUUM CARBURIZING**

**70 µm**
**SimVac™ – carburizing and quenching simulator**

This process simulation software package enables to design and simulate the carburizing SimCarb and quenching processes SimHard, prior to running trials. Optimal design and checking of process parameters, will help to save the real process time and to avoid having scrapped parts.

- Optimal segment planning of carburizing process, divided into: carburizing and diffusion stages
- Calculations based on steel grade, size and shape of parts as well as cooling profile for hardening
- Automatic or manual simulation mode of operation
- Simulated carbon profile comparison
- Intuitive graphical interface
- Compatible with SecoVac – furnace control system
PreNitLPC® – high Speed and economic vacuum carburizing

Pre-nitriding for low pressure carburizing, PreNitLPC®, allows the expansion of the applications of FineCarb® family of LPC Vacuum Carburizing Technology toward higher carburizing temperatures and wider range of steel grades. PreNitLPC® is a modern, fast and economic alternative of low pressure carburizing, which allows to significant intensify this process.

Through dosing of the nitrogen carrier during controlled heat up ramp 1, the furnace can run at higher temperatures (1000°C and above), while maintaining a fine grain structure within the case 2. The strength properties are similar to work that has been conventionally carburized at lower temperatures.

This technology saves process costs by reducing the carburizing cycle time and reducing the consumption of process gases (C₂H₂, C₂H₄, H₂, NH₃) as measured in liters and not, as in the case of conventional technologies, in cubic meters per hour.

### Technical Benefits

**PROCESS DATA: 1000°C, 1 h, 18CrNiMo7-6**

- **GRAIN SIZE**
  - LPC: 26.2 µm
  - PreNitLPC: 13.1 µm

- **CASE DEPTH**
  - LPC: 1.26 mm
  - PreNitLPC: 1.47 mm

**PROCESS DATA: 1050°C, 18CrNiMo7-6**

- **RETAINED AUSTENITE**
  - LPC: 25%
  - PreNitLPC: 15%

**PROCESS DATA: 1050°C, 16MnCr5**

- **CARBIDES**
  - LPC: less retained
  - PreNitLPC: less carbides
Economical Benefits

PreNitLPC® is a unique process offering total value in both cost of operation and process efficiency:

- Reduce Carburizing Cycle Time
- Lower Process Cost
- No intergranular oxidation
- Excellent Uniformity
- Optimum carbon penetration
- No CO₂ emissions
- Environmentally-friendly

For every 100 processes (i.e. for 0.6mm ECD) according to traditional carburizing methods, PreNitLPC® technology can offer you up to 40% in increased process efficiency. Optimum carbon penetration allows efficient heat treatment of complex shapes and the densely packed loads with superior case uniformity.

This technology is adaptable to both new and existing furnaces equipped with FineCarb® technology and may be equipped with either an oil or gas quench.
SecoVac – automatic control systems

Aspects of maintenance and control

» Functional, simple to use, intuitive system
» Full visualization, comprehensive management of emergency situations
» Automatical generation of predefined reports (graphical & numerical versions) and their export to external files
» The hierarchy of user access levels
» Custom setup of all data analysis charts and printouts
» Full integration with SCADA software – no need of extra software

Aspects of operation management

» Operation time counters, ability to plan periodic reviews
» Viability monitoring of the thermocouples
» History of operation of the equipment
» Media consumption counter, with an option to be informed of the need to supplement
» Two-stage warning alarm – color coding allows immediate identification of alerts
» Easy system backups

Aspects of management

» Integration with the superior company management systems
» Data security - different levels of user’s access
» Optimization of production on the basis of collected information
» Work time saving by automation of the production

Aspects of production technology

» A friendly programming of the machining process
» Advanced Process Management (Unlimited number of recipes)
» System resistance to the wrong technological programs

» Programmable by a calendar delayed start of the process with an option of GSM notification
» Long-term data logging and remote access to archived information
» Application browser provides “read – only” access to data
Auxiliary equipment

High & Low tempering furnaces
Washing machines

External Closed Loop Water Cooling System

The CLWS is designed to collect the heat from all elements of the furnace which are exposed to the high temperatures, i.e. heating chamber casing, convection fan motor, power feedthrough etc.

The CLWS includes among others: coolant tank, pump assembly, heat exchanger, instrumentation, etc.

Advantages:

➤ Lack of waste water,
➤ Stable temperature of the f’ce skin
➤ Maintenance of cooling medium parameters (hardness, temperature) at a preset, constant level
➤ Extension of the life of the furnace equipment items which require cooling
➤ Emergency water supply for charge & furnace protection

Mobile loading and unloading machines

Loading trays
Gas buffer tanks
Others