

Thermochemical Treatment

We deliver:

- Process consistency
- Safety
- Supply reliability
- Cost-effectiveness



The Industry Challenge

Heat treatment (HT) is a transverse application with multiple processes and is used in a variety of industries from automotive and aeronautics to machinery and metal fabrication.

With the development of new alloys and ever-increasing requirements for mechanical properties by end-users, new heat treatment applications are rapidly expanding such as low pressure carburizing - or nitriding & gas quenching. To ensure a truly reliable and efficient process, safety and reproducibility are essential.

Our Solution

With more than 50 years of experience in heat treatment applications, Air Liquide has developed solid expertise in providing gas solutions adapted to your needs.

A complete end-to-end solution for thermochemical treatment combines nitrogen and active molecules to reach the physical and chemical properties of the final metal part.

It combines the best of our gases, application technologies and expert support for:

- Atmospheric carburizing
- Low pressure carburizing & gas quenching
- Carbonitriding
- Nitriding
- Nitrocarburizing

As with all of our solutions, we work closely with you to define your needs and targets to be achieved and we commit to delivering them.

Your Advantages

▪ Quality & reproducibility

Thanks to homogenous and controlled gas injections in the furnace over the long run, you are ensured a stable gas atmosphere for your process, limiting the defect rate of your parts. For many heat treatment processes, we offer recurring furnace audit service. This provides the end-user with process measurements and performance gap analysis.

▪ Optimal safety

Our installation designs comply with the most rigorous safety requirements, including local regulations as well as our own very stringent safety rules. Coupled with quality training, your operations are ensured maximum safety.

▪ Total reliability

Proven with many customers, all our gas application equipment is designed for heavy duty operations. We define your gas needs and availability requirement together and ensure full supply via remote monitoring of your gas consumption.

▪ Cost-effectiveness

Through a thorough audit and solid expertise, we help you reduce energy and gas consumption while optimizing the quality of your final parts.

Core Features

Our solution for thermochemical treatment provides nitrogen coupled with active molecules together with installation design supported by our heat treatment experts.

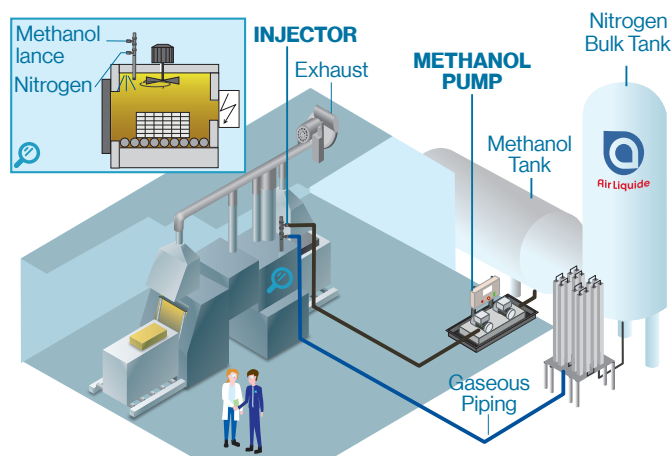
- **Nitrogen** is a neutral gas for many metal alloys. Pure and dry nitrogen is an excellent protection atmosphere against oxidation.
- Active molecules are defined depending on the heat treatment process used:
- Methanol is sprayed and cracked in the furnace to reach carbon potential needed for carburizing in the atmosphere.
- Acetylene is often used as a carburizing agent for low-pressure carburizing process.
- High-pressure nitrogen / helium are efficient for rapid cooling gas quenching processes.
- Ammonia is used for nitriding, carbo-nitriding or nitro-carburizing to reach hardness requirement for the part surface.

State-of-the-Art Application Technology:

• Atmospheric carburizing

The **METHANOL INJECTION LANCE** guarantees the homogeneity of methanol injection and treatment efficiency. Made of stainless steel, it's composed of internal capillary tubes for the methanol and nitrogen injections. The lance can also be used to inject ammonia for the carbonitriding process.

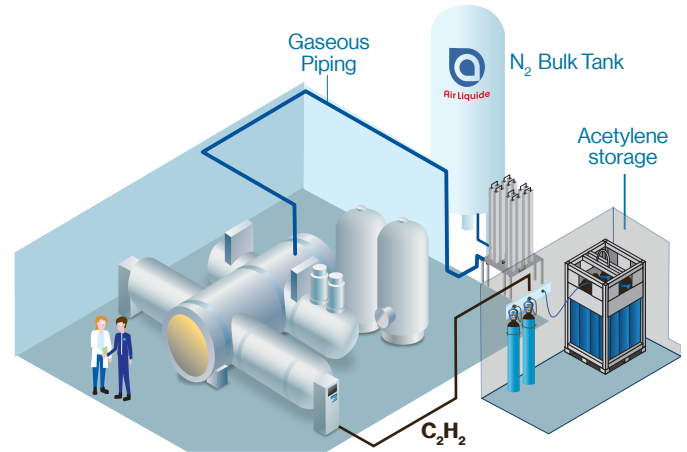
The **METHANOL PUMPING STATION** ensures reliable operation for methanol supply from the storage tank to the methanol injection lance. A dual methanol pumping station is available to ensure full availability of the system even during maintenance.



• Low pressure carburizing & gas quenching

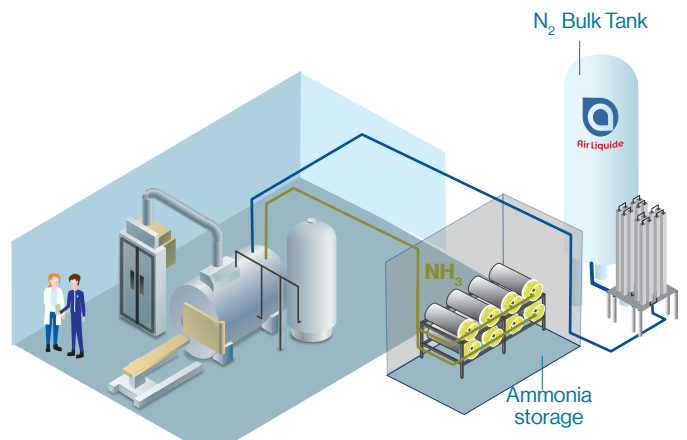
The acetylene supply installation injects the carburizing agent into the furnace. Equipped with pressure sensors and automatic switching, it maximizes gas supply with the required safety parameters. It can also be used for the nitrocarburizing process.

For the gas quenching process, the nitrogen supply installation is designed for high-pressure operations based on your needs. Depending on your quenching cell, helium can also be supplied for increased efficiency.



• Nitriding

The ammonia supply installation is designed according to your consumption and peak flow, either in gaseous or liquid form.



Process Expertise & Service:

Our worldwide network of heat treatment experts provide you with:

- Design of your installation according to your needs
- Audit your process and train your operators
- Define the most consistent process methods for you

We also support you in risk analysis according to local regulations.

Case Study

Atmospheric carburizing: advantages of a methanol pumping station

	Pressurized Methanol storage	Methanol pumping station	Customer Benefits
Regulation	<ul style="list-style-type: none">- Local regulations for methanol storage- Directive for pressure equipment with periodic testing	Local regulations for methanol storage	<ul style="list-style-type: none">- Ease-of-use- Continuous operations
Pressure Adjustment	Fixed Pressure	Adjustable	Flexibility in case of several furnaces
Pressure stability	0.8 bar \pm 0.2	1 bar \pm 0.05	Consistency of process recipes
Safety in case of piping rupture	No automatic switch off	Automatic switch off	Safe operations
Tank filling	Interruption of supply during filling or need of a second storage tank	Full time availability	Continuous operations
Flexibility	Fixed design for current needs with limited alteration options	Compatible with removable storage	<ul style="list-style-type: none">- Flexibility- Storage cost

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