NXL CONTINUOUS FURNACES

NXL SERIES FOR NITRIDING & NITROCARBURIZING

The NXL series is a modular, multi-chamber flow-through line of nitriding/nitrocarburizing furnaces. These furnaces incorporate a computer control system, process software and control technology known as NITREG®. They are designed to operate in a completely automatic manner without the need of specialized personnel. All the stages of the heat treating process from pre-oxidation, pre-heating, through nitriding/nitrocarburizing and post-oxidation, to purging and cooling are accomplished in one uninterrupted cycle as the loads are automatically transferred from chamber to chamber.

PROCESS CONTROL HARDWARE & TECHNOLOGY

The NXL continuous furnace is run by a dependable combination of the Nitrex Controller and PLC based controls. This approach guarantees an unparalleled degree of flexibility in process design, accuracy in process execution and safety of operations.

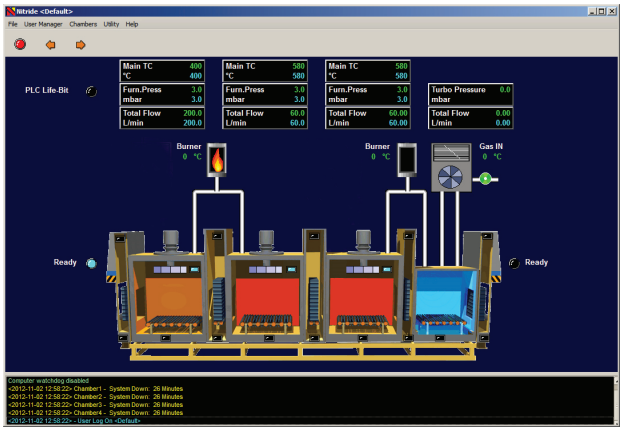
The Nitrex Controller running the NPC program (Nitrex Process Control) is responsible for all technological process steps taking place in the furnace chambers. The NPC controls the flows and compositions of required process atmospheres, pressures and temperatures in the chambers while an intelligent PLC slave manages the safety interlocks and load transfer sequences.

The consistency of nitriding/nitrocarburizing results are assured by the renown NITREG® technology based on the concept of potentials (K_N, K_C, K_O) as the principal control parameter. It applies individual customized processes to different applications and materials for optimum results.

TURNKEY SYSTEMS & PRODUCTION CELLS

The development of the NXL series is a direct response to ever rising operating costs hampering the efficiency of manufacturing companies. Ideally, in high-production environments, a furnace should be integrated into a production cell and operated by a sophisticated computer control system requiring little or no operator involvement. Therefore our philosophy is to deliver automated turnkey installations, which provide process stability and reliability and enhance performance and productivity while lowering costs.

SOLUTIONS TO OFFSET HIGH OPERATING COSTS



User interface displaying a continuous furnace with four modules: preheating/pre-oxidation, nitriding, nitriding/post-oxidation and turbo cooling.

PRODUCTION CELLS FOR HIGH-VOLUME MANUFACTURING

STANDARD & CUSTOM ENGINEERED FURNACES

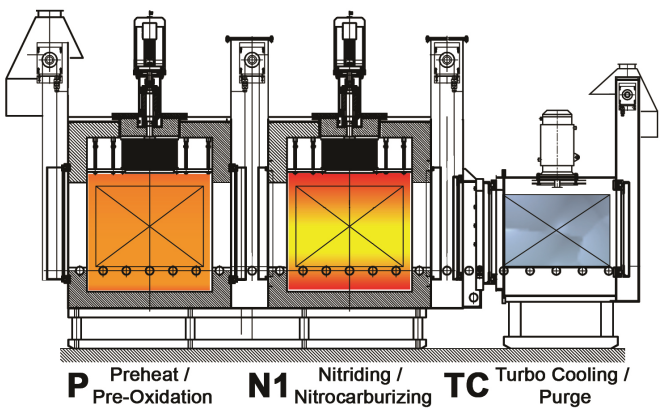
The NXL series of furnaces are offered in standard or customized sizes and configurations to suit your specific needs in terms of dimensions of parts, loads to be processed as well as metallurgical requirements.

- All metal parts in contact with active nitriding/ nitrocarburizing atmospheres are made of Inconel 600
- Energy efficient light-fiber insulation
- Control of nitriding & nitrocarburizing complies with the requirements of ASM 2759/10 and 2759/12
- Efficient internal recirculation assures process atmosphere uniformity
- Turbo cooling module shortens cycle times
- Clean, environmentally friendly processes are assured by integrated Nitrex effluent neutralizers

Standard Sizes*	Rack Size	
Model	NXL-9912	NXL-9918
Width	35½" / 900 mm	35½" / 900 mm
Height	35½" / 900 mm	35½" / 900 mm
Length	47¼" / 1200 mm	71" / 1800 mm
Load Capacity	3,300 lbs./ 1500 kg	3970 lbs./ 1800 kg

MODULES AND CONFIGURATIONS

The NXL line type furnace consists of modules with different possible configurations: preheat/pre-oxidation, post-nitriding oxidation, purge/cooling and one or more nitriding/nitrocarburizing chambers. The line is designed for nitriding/nitrocarburizing processes at temperatures up to 1200°F (650°C). All units are connected to form a single furnace. A system of rollers provides precise transfer and positioning of the load inside each chamber. A laser positioning system controls the position of the load within chambers.



Cut-away view and configuration of a PN1-TC

TYPICAL CONFIGURATIONS

PN1-TC
includes the following chambers:

- 1 Preheat/Pre-oxidation
- 1 Nitriding/Nitrocarburizing
- 1 Turbo Cooling/Purge

PN2-TC
includes the following chambers:

- 1 Preheat/Pre-oxidation
- 2 Nitriding/Nitrocarburizing
- 1 Turbo Cooling/Purge

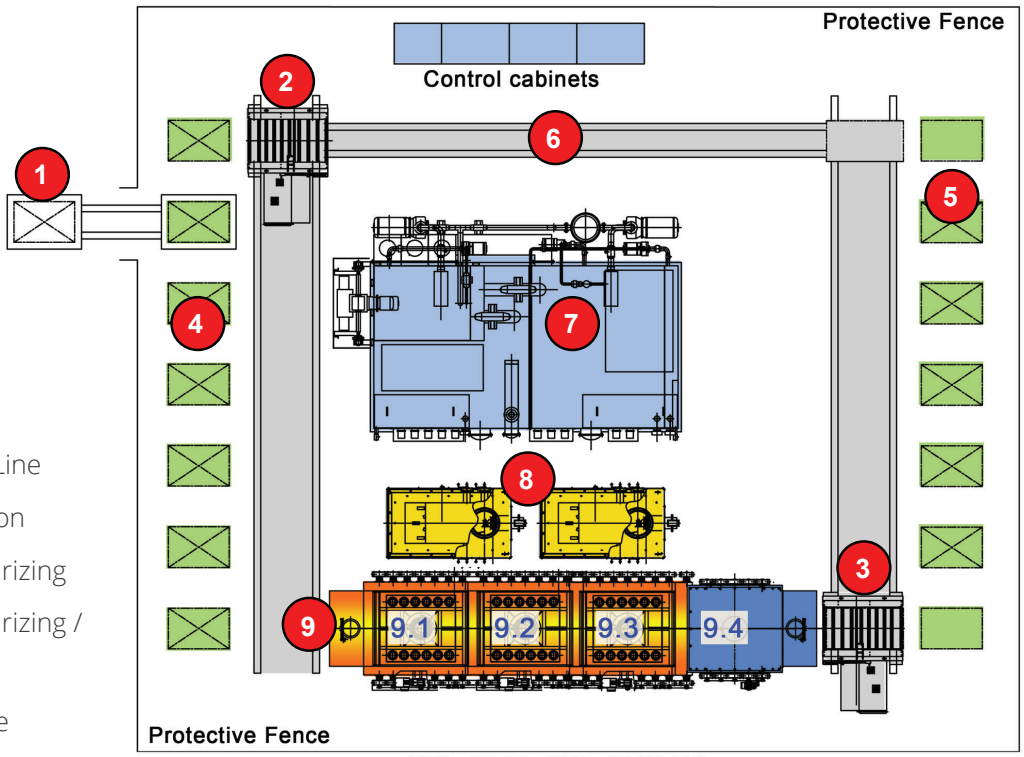
PN1-OXN-TC
includes the following chambers:

- 1 Preheat/Pre-oxidation
- 1 Nitriding/Nitrocarburizing
- 1 Nitriding/Nitrocarburizing / Post-oxidation
- 1 Turbo Cooling/Purge

PRODUCTION CELLS FOR HIGH-VOLUME MANUFACTURING

EXAMPLE OF A CONTINUOUS FURNACE INTEGRATED WITHIN A PRODUCTION CELL

1. Load/unload Station
2. Front Charge Car
3. Rear Charge Car
4. Front Holding Stations
5. Rear Holding Stations
6. Transverse Line
7. Washer
8. Effluent Gas Neutralizers
9. Nitriding/Nitrocarburizing Line
   - 9.1 - Preheat/Pre-oxidation
   - 9.2 - Nitriding/Nitrocarburizing
   - 9.3 - Nitriding/Nitrocarburizing / Post-Oxidation
   - 9.4 - Turbo Cooling/Purge



NXL-9912-PN1-OXN-TC

OPERATING MODE OPTIONS IN NITREX PRODUCTION CELLS

Nitrex cells are offered in three different operating modes.

Fully Automatic Mode

Load transfers within the production cell are entirely automated. Loads are transferred by PLC controlled charge cars guided by a laser distance measuring device.

Semi Automatic Mode

Requires an operator to control the transfers within the cell through a computer terminal

Manual Mode

Each transfer is carried out by a shop employee.

All automated transfers are controlled by the Protherm 9800 software (request the PT9800 brochure for more details).

SEQUENCE OF OPERATIONS OF AN AUTOMATED CELL

STEP 1 LOAD STATION: The load is retrieved from the loading station by the front charge car and enters the cell.

STEP 2 HOLDING STATION: The front charge car moves the load to one of the holding stations.

STEP 3 WASHER: The front charge car transfers the load to the washer and the wash cycle starts automatically. Once the cycle is finished, the front charge car retrieves and transfers the load to a holding station.

STEP 4 NXL CONTINUOUS FURNACE: The front charge car transfers the load to the furnace. The cycle starts and the load is moved from chamber to chamber through each treatment stage automatically. When the process is finished, the load is retrieved by the rear charge car and transferred to a vacant holding station.

STEP 5 TRANSVERSE LINE: When a request is made for the load to leave the cell, the rear charge car retrieves it and loads it onto the transverse line, which takes it across the cell to be retrieved by the front charge car.

STEP 6 UNLOAD STATION: The front charge car transfers the load to the unloading station where it exits the cell.

NXL CONTINUOUS FURNACES

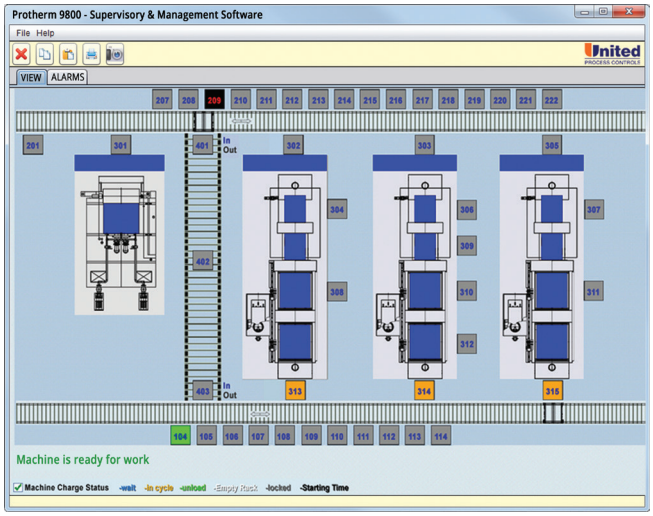
AUTOMATION AND HIGHER-LEVEL INTERFACING

The Protherm 9800 is a supervisory and management software that offers an overview of your heat treating operations, full automation and capabilities for interfacing with higher-level resources and planning systems included in your Business Management System.

Your heat treating shop becomes visible, transparent and interactive for all your key people:

- the plant floor operator knows what occurs in the furnaces at all times
- the metallurgist can change existing or design new processes
- the manufacturing manager can monitor the status of the day's output and sequence jobs to maximize production flow
- sales people are able to access relevant, up-to-date information to produce quotations on demand
- accounting can track transactions in order to stay on top of customer billing and payments
- QA staff can enter and retrieve stored data regarding quality

OVERVIEW SCREEN OF A FULLY AUTOMATED LIGHTS-OUT PRODUCTION CELL



PT9800 user interface displaying three continuous furnaces in an automated production cell.

Green Solutions

NXL SERIES ADVANTAGES: TECHNOLOGICAL AND ECONOMICAL

- Highly economical solution for just-in-time high-volume production
- Easy integration into the production flow
- Modular design for flexibility in multi-stage processes; customized configurations to suit any given application
- By shortening the cooling times the Turbo Cooling module improves furnace utilization rates
- Fully automated operation reduces the need of highly skilled operators and guarantees repeatable and consistent results
- Modular, flow-through design provides 30-40% energy savings in comparison to batch-type furnaces
- Heating system provides exceptional temperature uniformity throughout the workload
- Available technologies: Nitreg® potential (K_N) controlled nitriding, Nitreg®-C potential (K_N and K_C) controlled nitrocarburizing, ONC® potential (K_O) controlled "in-process" post nitriding/nitrocarburizing oxidation (contact us for more information on these technologies - brochures available)
- Wide spectrum of process atmospheres – NH_3, N_2, NH_3 dissociated, CO_2, Endo, Air, and others
- The NXL series is capable of continuous 3-shift "lights-out" operation using the Protherm 9800, a production management software package from United Process Controls - request a brochure for more information.

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