

H₂Ic High Convection Hydrogen Bell Annealing

Mechanical properties and surface quality are important factors when annealing steel wire and strip. SECO/MARWICK's annealing technology produces excellent results with low cost per ton and consistent quality for both wide and narrow width coils using 100% hydrogen or cracked ammonia gas as a protective atmosphere.

The hydrogen atmosphere used in conjunction with a high convection recirculation fan promotes optimum temperature uniformity which yields higher quality crystalline structure, reduced decarburization and homogeneous physical properties of the annealed material.



High Convection Bell Annealing Furnace Installation



Steel Strip Loaded on Base

Hydrogen Base

SECO/MARWICK has designed and manufactured over 200 annealing bases up to 120 metric ton capacity. The system uses high convection heat transfer with swing-type hydraulic clamping and mechanical locks for safe operation.

The product is supported on the base. The base is where the high convection fan is housed, and provides a location for both the atmosphere inlet and exhaust outlet. The fan motor has an extended shaft and is of gas-tight, water-cooled construction. This proprietary SECO/MARWICK fan is capable of running at high RPMs with a variable frequency drive.

Corrugated Inner Protective Covers

The corrugated, gas-tight inner cover is used to contain the protective atmosphere. Corrugation provides more rigidity and offers more surface area for heat transfer. The covers are typically constructed out of stainless steel and may be hydraulically or pneumatically clamped to the base.

Heating Hood/Bell Furnace

The bell furnace can be heated by either electric heating elements or gas fired burners. Electric heated bells have a uniform array of heating elements mounted on the refractory wall. The heat is then transferred via radiation to the inner cover. If gas burners are used they are positioned in two rows and fired tangentially to promote a uniform heating of the inner cover. Each burner has its own custom built recuperator to provide preheated air to improve the thermal efficiency.

Valve Stands

A main pressure reducing station for all utilities required for the annealing installation is provided, constructed on a skid for ease of installation and to help conserve space. Utilities such as hydrogen, nitrogen, fuel and water are then distributed to each base stand. The base valve stands are also skid mounted. All can be prewired to a junction box to reduce installation time.

Cooling Systems

SECO/MARWICK offers three types of cooling methods. Air jet cooling uses fans to draw ambient air to cool the inner cover. With mist cooling, water sprays are used to provide additional cooling after the air jet. Bypass cooling involves taking the atmosphere out of the inner cover using a fan and lowering the temperature through a heat exchanger. Then the fan returns the atmosphere back to the load at a lower temperature. All three methods can be used in different combinations depending on customers needs.

Systems for coil storage, coil post cycle cooling and deminifit cation are also available.

Control Systems

Typical control systems are composed of PLCs for control with PC operator stations for supervision. The control system allows for control and monitoring as well as all required safeties for the equipment.

The main analog values and status of each base including the anneal plot and report details are displayed on PC screens. Archiving the data and preparation of annealing cycles are also accomplished by the control system.

The main PC station shows the alarm history, log book provision for events for a particular annealing cycle, malfunction and reporting for the time intervals requested for the corrective action and operating hours of the equipment for the maintenance and/or calibration requirements. The deployment of the equipment is displayed in a tabular bar chart manner. With this system, it is easy to view the actual time till the end of the heating or cooling sequence. This helps the operator plan future cycles by knowing when a heating or cooling hood will be available.

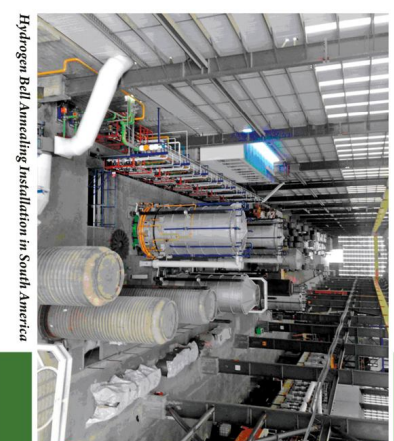
Logging of the various process activities, utility consumption plots for hydrogen and nitrogen, anneal plot with zoom feature and the annealing protocol for each charge is available.

Safety Systems

Many redundant safety checks are provided to ensure safe operation of the equipment. Some of these checks are for tightness, purging, oxygen analysis, base pressure and warm leak test, as well as combustion system safety. To continue to the next step in the annealing sequence, the previous safety condition must be fulfilled. All safeties are automatically performed through the control system.

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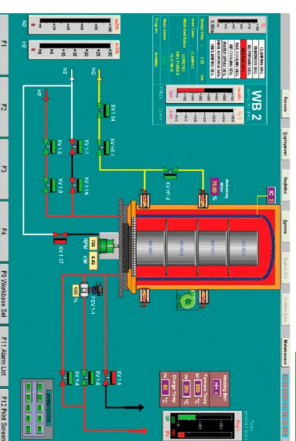
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Hydrogen Bell Annealing Installation in South America



Typical Valve Stands



Typical SCADA Process Screen

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