Endogas™

Endothermic Atmosphere for Hardening, Brazing, Sintering and Gas Carburizing

Saves Floor Space -
Vertical design save plant floor space.

Easy to Install
Generators are pre-piped and wired and shipped completely assembled and ready for connection to utility supply lines.

Simplified Operation
Equipment is fully automatic and control panels are centrally located.

Flexible Operation
Generator flow operates over a wide range and can be turned down from nominal rating without affecting the analysis of the produced atmosphere.

Electric Heating (optional)
Vertically mounted electric bayonet heating elements also provide an efficient heating source.

Safety Features
All SECO/WARWICK equipment adheres to the latest NFPA standards regarding industrial furnaces and equipment.

Endogas atmosphere generators give you all the cost savings advantages of a compact unit: lower initial cost, less floor space and fewer component parts. Each unit is built to provide years of useful service.

Endogas atmosphere generators produce an endothermic gas for many protective surface heat treating processes. The generators heat fuel gas and air under controlled conditions to provide either a rich or lean endothermic gas containing hydrogen, carbon monoxide, and nitrogen. This gas can protect surfaces being treated or be a carrier for carburizing. Controlled heating in the presence of a catalyst produces low levels of carbon dioxide and water. After startup, operation is automatic with only minimum supervision required.

Atmosphere Generators

Applications

SECO/WARWICK endothermic atmosphere generators are used with heat treating furnaces of suitable design for the protection of surfaces being treated or as a carrier for carburizing.

A rich endothermic atmosphere is produced by operating at the richer air-gas ratios and is used for the following processes:

- Bright hardening of high carbon and alloy carbon steels, without oxidation or decarburization. Completely reacted endothermic atmosphere is non-decarburizing to high carbon steels because it contains no carbon dioxide and little water vapor. It is particularly applicable to hardening where decarburization cannot be tolerated.
- Bright hardening of high-speed steels of both the high molybdenum and high tungsten types.
- Sintering of high carbon and alloy powdered compacts.
- Brazing of ferrous metals, particularly those containing high carbon and requiring brazing without decarburization.
- Used as a carrier gas in gas carburizing applications.

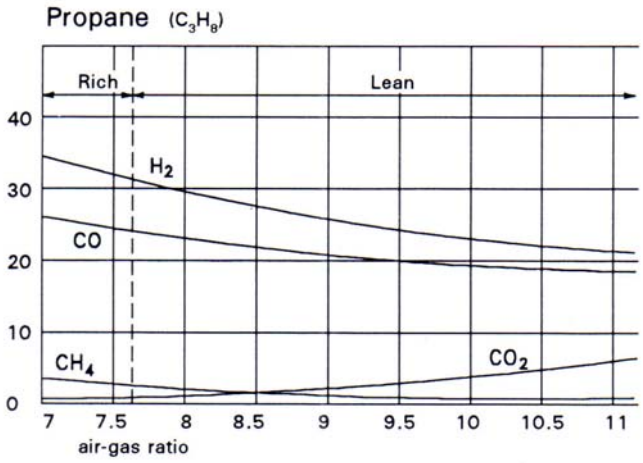
A lean endothermic atmosphere is produced by operating at the leaner air-gas ratios and is used for the following processes:

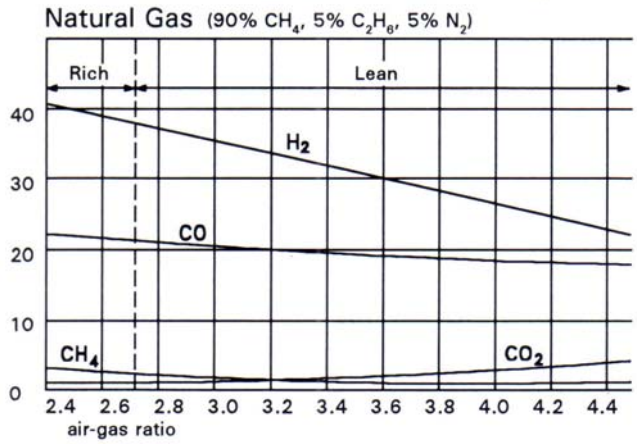
- Hardening of medium carbon steels, without decarburization.
- Sintering and powder metallurgy processes on low and medium carbon metals and nonferrous metals—where long heating and cooling cycles and an atmosphere with reducing properties greater than that of a rich exothermic atmosphere are required. The room temperature dew points help prevent possible gas reactions which cause carbon deposition on slow cooling—particularly in the range of 1000ºF (538ºC) to 1200ºF (649ºC).
- Furnace brazing of ferrous metals (except stainless steel) because of its high reducing properties.

Process and Gas Cost

An endothermic atmosphere is produced at a low cost from any regular fuel gas such as natural gas, propane, and butane. Call SECO/WARWICK for a production cost estimate using your current utility prices.

Atmosphere Composition (%)





Gas Reaction On Steel

When steel is heated, its carbon content becomes active and tends to move to a medium deficient in carbon or to a medium having lower carbon potential. The greater the temperature of the steel, the greater becomes the tendency of the carbon to move to a state of equilibrium.

If the atmosphere surrounding the steel has a carbon potential at the heat treating temperature less than that of the steel, an inter-reaction will occur and carbon will move from the steel to the atmosphere; thus causing surface decarburization or “soft skin” on the steel.

Many of the controlled atmospheres in use today are not in equilibrium as produced from the generator and the resultant inter-gas reactions in the heat treating furnace make it almost impossible to control the constituents to prevent excessive decarburization or carburization.

Endothermic atmosphere is fully reacted as produced. This eliminates subsequent inter-gas reactions in the heat treating furnace.

Endothermic atmosphere prevents decarb. The carbon potential of endothermic atmosphere can be adjusted to be in carbon balance with steels having a wide range of carbon content.

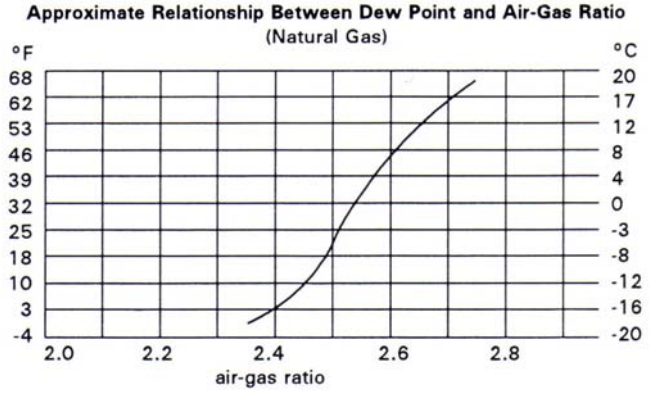
Gas Carburizing

An endothermic atmosphere is used effectively as a carrier gas in gas carburizing applications with small amounts of propane or natural gas being added to the product gas to supply the hydrocarbons.

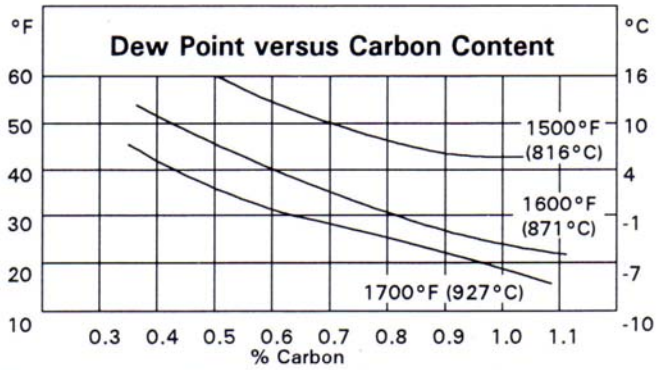
Since the product gas can be closely controlled, it is possible to gas carburize with an endothermic atmosphere to obtain deep penetration and wide diffusion of carbon in the steel without developing a hypereutectoid condition.

Further, deposition of soot, which would insulate the work from the quenching medium and cause soft spots, is eliminated. The prevention of deposited soot results in cleaner work that can be uniformly hardened.

Dew Point



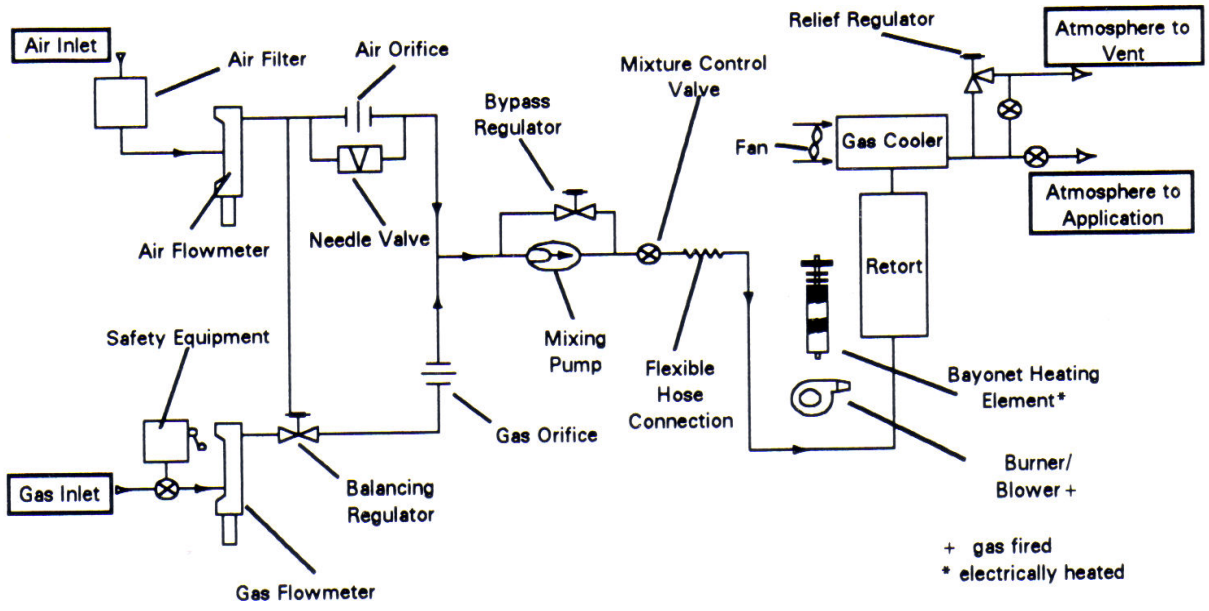
Note: Dew point produced at a given air-gas ratio will vary with changes in (1) composition of raw gas supply, (2) dew point of room air, (3) temperature of reaction chamber, (4) condition of retort catalyst, and (5) flow rate.



Typical relationship in neutral hardening application between carbon content of a steel and dew point of endothermic atmosphere at various temperatures.

How it works:

After air has been filtered, it is automatically mixed with gas to give a predetermined air-gas ratio which is then indicated by visual flowmeters. Air and gas are mixed in a mixing pump which also compresses the mixture and moves it through a piping system to a heated, catalyst-filled chamber where the reaction takes place producing the endothermic atmosphere. As the gas leaves the catalyst-filled chamber, it is quickly quenched in a forced-air cooler.



Construction Features:

Mixing Pump—Constructed to give quiet operation and enduring service. It is equipped with a bypass regulator which maintains constant pressure at any output.

Flowmeters– Flowmeters are mounted on the front of the panel to indicate the gas and air input to the generator in cubic feet per hour.

Gas Cooler—A forced air gas cooler is used to cool the newly formed atmosphere, eliminating costly water consumption.

Heating Equipment—The reaction chamber is heated by a pressure type burner that uses a pilot equipped with a flame supervision.

Model No.	Output		Process Gas 1000 btu/ft3		Utilities			Approximate Dimensions						Retort Removal Height		Approximate Shipping Weight	
					Electric	Gas 1000btu/ft3		Width		Height		Length					
	cfh	cmh	cfh	cmh	kw	cfh	cmh	ft	mm	ft	mm	ft	mm	ft	mm	lbs	kg
EN-5	500	14	100	3	15	108	3	3'-5"	1041	10'	3048	6'-6"	1981	12'	3658	2200	1000
EN-10	1000	28	200	6	20	155	4	3'-5"	1041	10'	3048	6'-6"	1981	12'	3658	2300	1044
EN-20	2000	57	400	11	30	233	7	4'	1219	10'	3048	7'	2134	12'	3658	3000	1362
EN-30	3000	85	600	17	36	276	8	5'	1524	10'	3048	7'-6"	2286	12'	3658	4000	1816

The latest design, materials, and equipment specifications should be obtained from the company before any reliance is placed on the enclosed since changes may occur due to product improvement.

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