

DX[®] Exothermic Atmosphere Gas Generator

Surface[®] generators produce consistent and reliable protective atmospheres



Surface[®] Combustion annular cooled DX[®] Gas Generators provide efficient, low cost, and reliable production of exothermic gas. Exothermic gas, produced by the DX[®] Gas Generator, can be varied in composition from inert to rich, producing an atmosphere suitable for a wide variety of heat treating processes, as well as general applications such as purging and blanketing operations.

DX[®] Exothermic Atmosphere Gas Generator

DX Gas Generators produce versatile exothermic atmospheres

Surface Solutions:

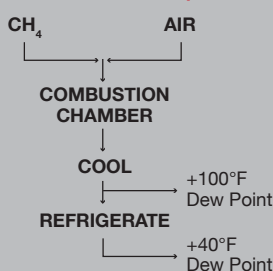
DX[®] generator gas is produced by the burning of an air and fuel gas mixture in a refractory lined combustion chamber and cooling the products of combustion in a packed annular cooling chamber. This unique cooling system minimizes required floor space and eliminates the need for a hot crossover pipe between the combustion chamber and the heat exchanger. The standard generator is manually adjusted to produce lean or rich atmospheres by changing the air-to-gas ratio. Dewpoint of the product gas is controlled by different methods of cooling. Delivery pressure of the product gas out of the generator is 14" w.c. (3.5 kPa).

Standard generator sizes range from 4,000 cfm to 25,000 cfm capacities. Smaller and larger capacity units have also been provided to meet specific process demands.

Typical Gas Composition % By Volume

	LEAN		RICH	
	+100°F D.P.	+40°F D.P.	+100°F D.P.	+40°F D.P.
DX [®]				
CO ₂	10.4	11.0	4.7	5.0
CO	0.5	0.5	9.4	10.0
H ₂	0.5	0.5	9.4	10.0
CH ₄	0.0	0.0	0.4	0.4
H ₂ O	6.5	0.8	6.5	0.8
N ₂	82.1	87.2	69.6	73.8

Generation of DX Atmosphere



Processes Include:

- Annealing
- Blanketing
- Bluing
- Brazing
- Bright Annealing
- Ferritic Nitrocarburizing (FNC)
- Normalizing
- Purging
- Sintering
- Tempering

Standard Features:

- Wide range of product gas compositions by varying air/gas ratio
- 2:1 turndown
- Multiple fuels may be used to create DX gas
- Compact, annular cooled design
- Stainless steel casing and combustion barrel
- Safety aids in accordance with NFPA 86 standards
- Start-up assistance and operator training

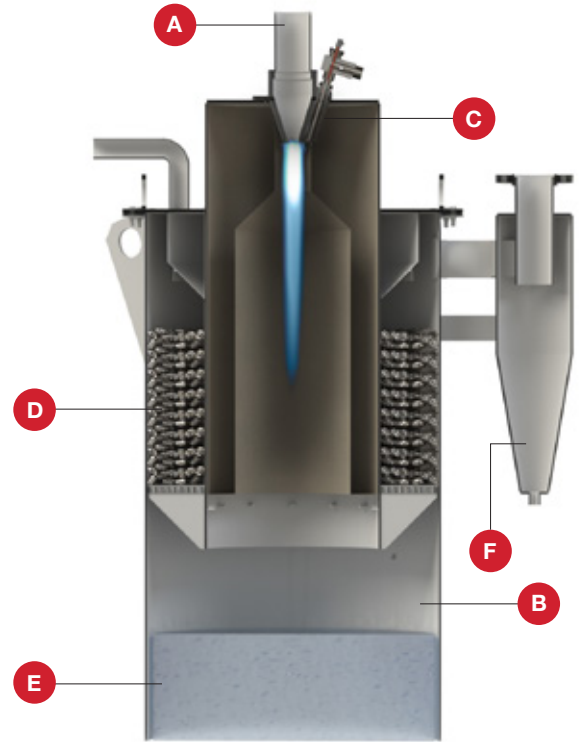
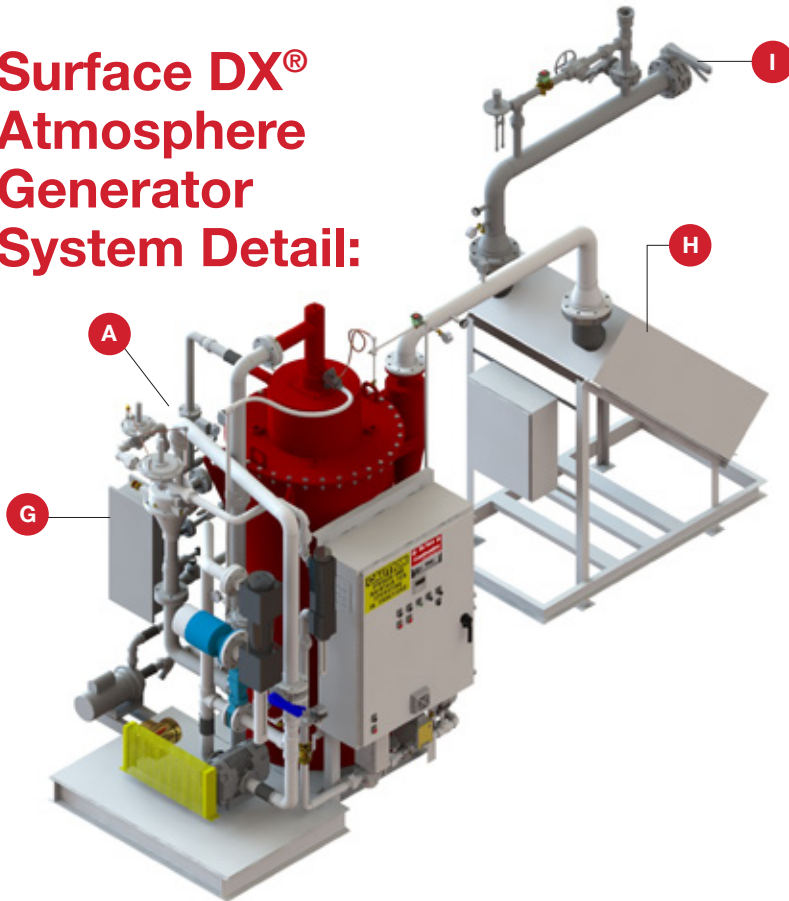
Optional Systems:

- Water- or air-cooled recirculating condensate system
- Water- or air-cooled DX chiller system
- Additional refining equipment to reduce dewpoint or create NX[®] or HNX[®] gas
- Automatic turndown

Applications:

SURFACE TRADEMARK (AGA Code)	ALUMINUM, BRASS and COPPER	LOW CARBON STEEL Up to 0.2%C	MEDIUM CARBON STEEL 0.2%C to 0.6%C	HIGH CARBON STEEL Above 0.6%C	SPECIAL STEELS and IRONS	CHEMICAL and PETROLEUM	FOOD
DX Inert (101)	Bright Annealing, Sintering	Bluing, Tempering	Bluing, Tempering	Bluing, Tempering	Bluing Silicon Steel Laminations, Electrical & Tool Steels	Inert Atmosphere to Prevent Oxidation and Explosion/ Fires, Process Gas For Manufacturing	Processing, Packaging and Storage to Prevent Deterioration
DX Rich (102)		Bright Annealing, Brazing, and Sintering	Up to 30 Min. Exposure- Bright Annealing		Clean Annealing Silicon Steel Laminations (Electrical)		

Surface DX[®] Atmosphere Generator System Detail:



A. Combustion System

- Air, supplied by a blower, and fuel each have direct reading flowmeter
- Air and fuel mixed in standard Surface Combustion mixer with an air-flow based constant proportioning system enabling 2:1 turndown
- Air-fuel ratio manually set by variable orifice located in fuel gas line
- Standard Surface Combustion premix tunnel burner system with integrated pilot and dual flame sensors produces product gas
- Natural gas and many other fuels may be used to make DX gas

B. Generator Casing

- Stainless steel construction to minimize corrosion
- Contains combustion barrel, annular cooler and recirculation condensate sump

C. Combustion Barrel

- Stainless steel construction to minimize outer barrel corrosion and lined with castable refractory to maximize inner barrel temperature
- Integral cover plate bolts to generator casing to easily remove barrel for maintenance

D. Annular Cooler

- Formed by the space between the outside of the combustion barrel and the inside of the generator casing
- Cooling water moves counterflow to product gas
- Filled with high surface area stainless steel rings to maximize contact between water and gas

E. Recirculation Condensate Sump

- Located at the bottom of the generator casing
- Cools product gas leaving combustion barrel and turns it into annular cooler
- Collects condensate from product gas as it cools then recirculates it into the annular cooler
- Proximity level activated solenoid valve automatically controls sump water level

F. Cyclone Separator

- Product gas spins and cools within cyclone while water condenses out from it
- Condensate transferred to recirculation condensate sump
- DX gas leaves cyclone with a dewpoint of approximately 100°F

G. Recirculating Condensate Cooling System*

- Water in sump cooled by water- or air-cooled heat exchanger
- Lowers product gas oxygen concentration to approximately 75 ppm

H. DX Chiller System*

- Product gas is dehydrated to approximately 40°F dewpoint by water- or air-cooled chiller

I. Process Gas Delivery

- Automatic vent relief regulator set at 14" w.c. (3.5 kPa)
- Can be tied to optional automatic turndown system to reduce DX gas supply based on demand

*Optional

Generator Specifications and Data:

BASE GENERATOR

Model Number	DX-4M	DX-6M	DX-8M	DX-10M	DX-15M	DX-20M	DX-25M
Capacity							
Maximum Flow Rate	4,000 cfh (113 m ³ /hr)	6,000 cfh (170 m ³ /hr)	8,000 cfh (227 m ³ /hr)	10,000 cfh (283 m ³ /hr)	15,000 cfh (425 m ³ /hr)	20,000 cfh (566 m ³ /hr)	25,000 cfh (708 m ³ /hr)
Minimum Flow Rate	2,000 cfh (57 m ³ /hr)	3,000 cfh (85 m ³ /hr)	4,000 cfh (113 m ³ /hr)	5,000 cfh (142 m ³ /hr)	7,500 cfh (212 m ³ /hr)	10,000 cfh (283 m ³ /hr)	12,500 cfh (354 m ³ /hr)
Fuel: Natural Gas¹							
Lean Operation	468 cfh (13 m ³ /hr)	702 cfh (20 m ³ /hr)	936 cfh (27 m ³ /hr)	1,170 cfh (33 m ³ /hr)	1,750 cfh (50 m ³ /hr)	2,340 cfh (66 m ³ /hr)	2,920 cfh (83 m ³ /hr)
Rich Operation	620 cfh (18 m ³ /hr)	930 cfh (26 m ³ /hr)	1,240 cfh (35 m ³ /hr)	1,550 cfh (44 m ³ /hr)	2,325 cfh (66 m ³ /hr)	3,100 cfh (88 m ³ /hr)	3,875 cfh (110 m ³ /hr)
Cooling Water²							
Base Generator	28 gpm (106 l/m)	42 gpm (159 l/m)	60 gpm (227 l/m)	71 gpm (269 l/m)	105 gpm (397 l/m)	140 gpm (530 l/m)	175 gpm (662 l/m)
Water-Cooled Chiller (optional)	15 gpm (57 l/m)	20 gpm (74 l/m)	20 gpm (74 l/m)	23 gpm (85 l/m)	30 gpm (114 l/m)	45 gpm (170 l/m)	52 gpm (197 l/m)
Electric Power³							
Base Generator	5.0 HP (3.75 kW)	7.0 HP (5.25 kW)	7.5 HP (5.63 kW)	10.5 HP (7.88 kW)	13.0 HP (9.75 kW)	14.0 HP (10.50 kW)	16.0 HP (12.0 kW)
Water-Cooled Chiller (optional)	5.0 HP (3.75 kW)	5.0 HP (3.75 kW)	5.0 HP (3.75 kW)	5.0 HP (3.75 kW)	5.0 HP (3.75 kW)	5.0 HP (3.75 kW)	5.0 HP (3.75 kW)

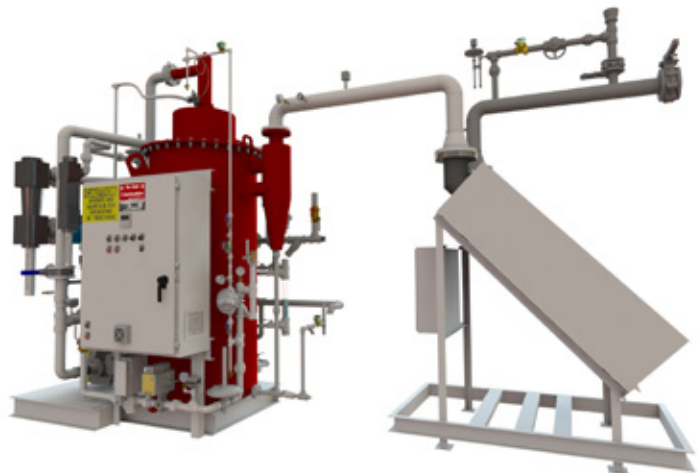
Notes:

¹ Natural Gas demand based on 1000 BTU/ft³ (9000 kcal/m³) gross heating value at 5-10 psig (0.35-0.70 bar)

² Water demand based on clean water at 80°F and 20 psig (1.4 bar)

³ Electric power based on 480V (+5%, -10%), 3 phase, 60Hz supply







Larger and smaller capacity models available upon request. See detailed proposal for dimensions, shipping weights and additional data.



Get started with Surface!

Call Surface with the following information to get your furnace solution underway.

Work Description and your Process needed:

-  cycle
-  operation
-  hours per year
-  available space
-  operating temperature range
-  heat source

We will work with you to develop the best processing solution for your heat treating requirements. This starts with developing a complete process solution and continues through shipment, installation and equipment commissioning.

Once your system is in place we continue working with you for the life of the equipment through our industry leading aftermarket services including customer service, Aftermarket Parts, Rebuild and Upgrade Service. We look forward to working with you.



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