



DR SERIES Scraped Surface Heat Exchanger/Evaporator

Description

The DR Series Scraped Surface Heat Exchanger/Evaporator is designed to heat, cool or concentrate a wide variety of products particularly highly viscous, proteinaceous or heat sensitive liquids which tend to stick to or foul a heat transfer surface. The DR Series achieves extremely high heat transfer rates by incorporating jackets on both the inner and outer walls of a narrow product annulus. This dual jacketed design provides twice the heat transfer area of conventional scraped surface heat exchangers of the same size. During operation, the inner and outer wall of the product annulus are continuously scraped by spring-loaded scraper blades which prevent sticking or scorching of product feeds. In addition to product fouling, the scraper blades also provide for even heat transfer and homogeneity of product throughout processing.

The DR Series is available in 47 different sizes for atmospheric, vacuum or pressure operation and can be constructed of various materials to accommodate a wide variety of product applications.

Construction

The DR Series Scraped Surface Heat Exchanger/Evaporator is constructed of Type 304 or 316 stainless steel on all interior product contact surfaces with Type 304 stainless steel outer jackets. Other types of corrosion resistant alloys are available by special order. The systems can be designed for either sanitary or NPT connection. DR Series units are constructed with outer steam jacket and steam core ASME approved for a maximum working pressure of 120 psi for heating and 150 psi for cooling.

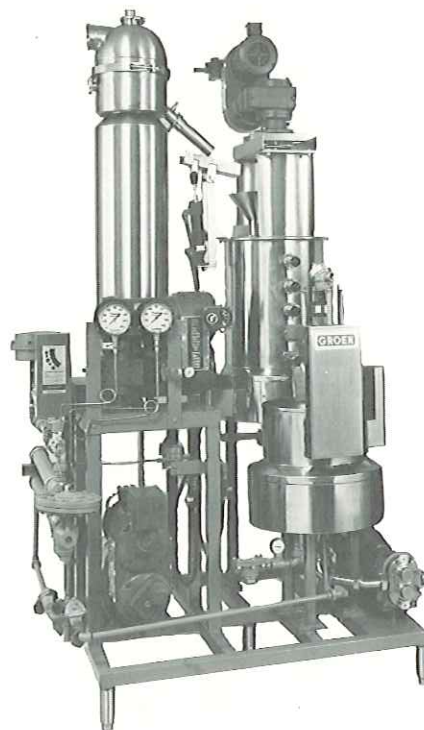
- Heat Transfer Area

Groen manufactures 47 different sizes of DR Series Scraped Surface Heat Exchangers with heat transfer areas ranging from 4 to 200 square feet (See table on back page for a complete listing of available sizes and heat transfer areas). DR's with annular diameter of 12" or less are constructed with a 5/8" wide product annulus, while larger DR units contain an 11/16" wide product annulus.

- Scraper/Rotor

Rotor drives are available with single or variable speed motors chain linked or direct coupled to the bottom of a rotor drive shaft. Rotor speeds range from 10-200 RPM, depending on the size and application of DR unit. The stainless steel rotor and drive shaft are segregated to allow for easy rotor removal and replacement without interfering with rotor shaft alignment.

Scraper blades are connected to the rotor by a spring-action attachment which, together with wear blocks, aligns the rotor in the product annulus, eliminating the need for an additional bottom rotor support. Scraper blades are available in several different materials including teflon filled delrin blades, nickel alloy blades and specially formulated plastic blades.



Caramel System with Model DR-1248 (complete with caramellization vessel and surge tank.)

- Base Assembly

Units are furnished with standard components including variable speed rotor and product feed pump drives with tachometers, automatic temperature controller, jacket pressure indicators, valving and piping for heating or cooling medium and a pre-wired enclosure containing all control and indicating equipment. The DR System is completely automatic and requires only one operator for start-up or shut-down. Addition or deletion of support components and instrumentation is possible to suit each particular application.

- Vacuum Operation

For heat sensitive products, the DR Series is capable of operation under a vacuum of 28" Hg. Vacuum systems are useful in concentrating products up to high total solids (99.8%) at low temperatures, and in increasing evaporative rates. Vacuum systems are equipped with a vacuum receiver, vacuum pump, condenser, condensate receiver, product feed pump, and condensate and product take-away pumps.

- Chilling Operation

For chilling operations, the DR(C) units use a modern, pump circulated refrigeration system that is compatible with most types of refrigerants. Instead of flooding a large volume jacket, refrigerant is pumped through a series of very thin jackets surrounding the product channel on both sides, for more efficient heat transfer. In addition to refrigerant feed pump and refrigerant pressure gauge, larger models have hydraulic lift controls for raising the outer casing of the chiller for easy inspection of product annulus. An optional control system can be ordered which will automatically eliminate the possibility of chiller freeze-up. DR(C) can also use chilled water or a water/glycol mixture for cooling medium, when direct expansion refrigeration is not available or desirable.



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Finish

All product contact surfaces shall have a No. 4 sanitary finish conforming to all known sanitary standards.

Approvals

The DR Series Scraped Surface Heat Exchanger/Evaporator is sanitary approved by the U.S. Department of Agriculture and conforms to the latest ASME codes.

Performance

Evaporative rates obtained using the DR Series Scraped Surface Heat Exchanger depend on product viscosity, thermal conductivity, density, heat capacity, hygroscopicity and flow rate, along with steam pressure in the DR jackets. Highly concentrated liquids (over 95% total solids) have been found to evaporate water at rates of up to 10 lbs./hr./ft² of heat transfer surface, while less concentrated feeds have been found to evaporate at 25 lbs./hr./ft². Discharge product concentrations of 99% + total solids have been achieved. Overall heat transfer coefficients of 430 BTU/hr./ft² °F have been achieved, evaporating water in a DR-536, although U values of 100-150 BTU/hr./ft² °F are typical in food product applications. The DR Series Scraped Surface Heat Exchanger can handle product flow rates from 500 lbs./hr. to 50,000 lbs./hr. For typical processing results, see table on page 3.

The simple, durable design of the DR Series allows for easy disassembly of the unit for inspection, cleaning or blade replacement. The top dome is removed and the rotor assembly simply lifted off of the drive shaft and out of the jacket assembly to replace the blades. Product changeovers can also be accomplished easily, with downtime kept at a minimum.

Applications

The DR Series has been successfully used for a wide variety of products, especially those in the food, pharmaceutical and cosmetic industries. Typical applications include:

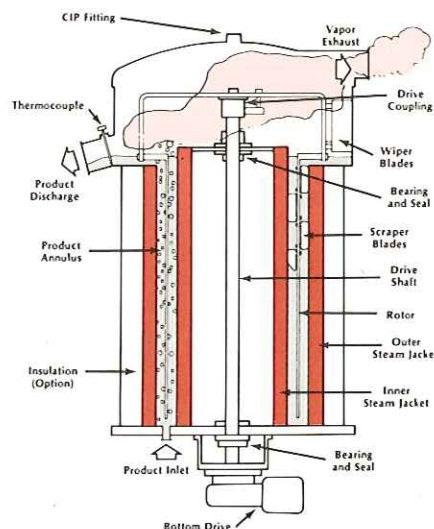
- Heating
Milk caramels, chocolate crumb, chocolate liquor, pie fillings, gravies, purees, sauces, syrups, cereal coatings, candies, salad dressings and other products.
- Cooling
Creams, lotions, fondants, peanut butter, shortening, margarines, vegetable oil chilling and crystallization, slush freezing fruit juices and other products.
- Vacuum
Cheese products, whey, juices, jams, jellies, sorbitol and other heat sensitive products.

For typical product performance data, see table on page 3.

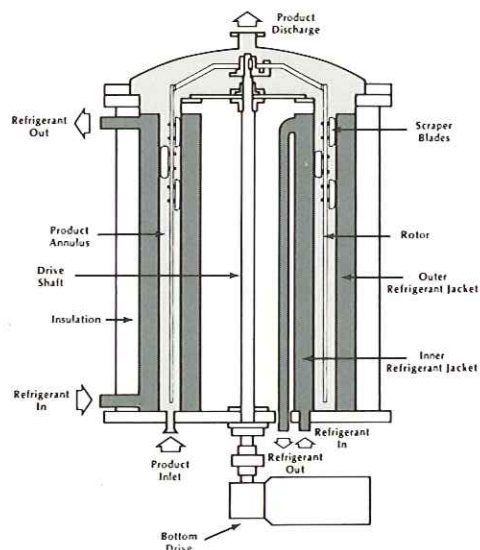
Origin of Manufacture

All components of the DR Series are manufactured in the United States.

DR - For Heating Applications



DR(C) - For Cooling Applications



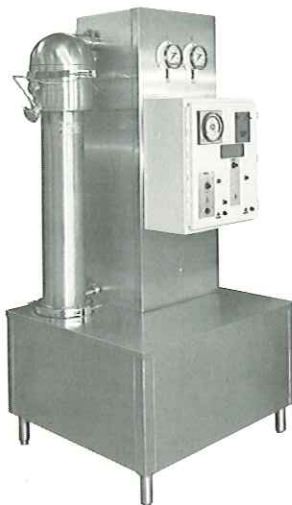
Dual Jacketed Design

The DR Series achieves extremely high heat transfer rates by incorporating jackets on both the inner and outer walls of the product annulus. During operation, these walls are continuously scraped by scraper blades which prevent product fouling and also provide for uniform product throughout processing. For chilling operations, this dual jacketed design and narrow product annulus provides greater refrigeration efficiencies than conventional scraped surface heat exchangers.



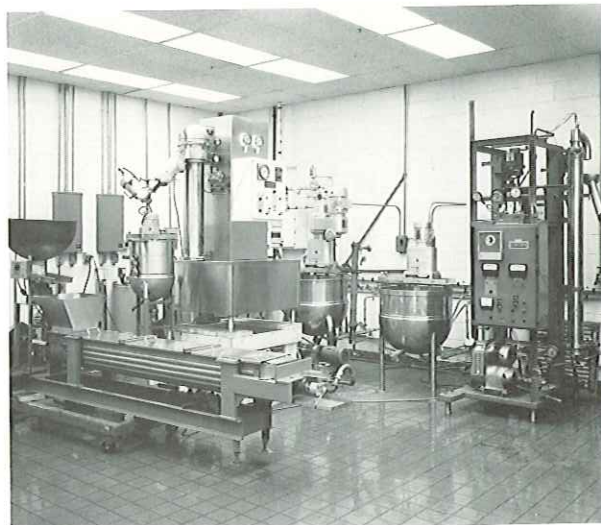
DR-3672

This compact DR-3672 can produce 35,000 pounds of shortening per hour. When used with non-motorized crystallizing elements, this edible oil processing system reduces electrical requirements by 85% and occupies only 34 square feet of production floor space.



Pilot Plant Systems

DR-536 pilot units are available on a rental basis for in-field testing to determine performance and capacity requirements. Units are available for atmospheric, vacuum and cooling applications.



Groen Test Programs

Performance on the DR Series can be demonstrated with your products, in Groen's fully-equipped test laboratory in Elk Grove Village, Illinois. In addition to feasibility studies on various applications, test runs may be used to accurately size production equipment.

TYPICAL HEATING APPLICATIONS FOR DR SERIES

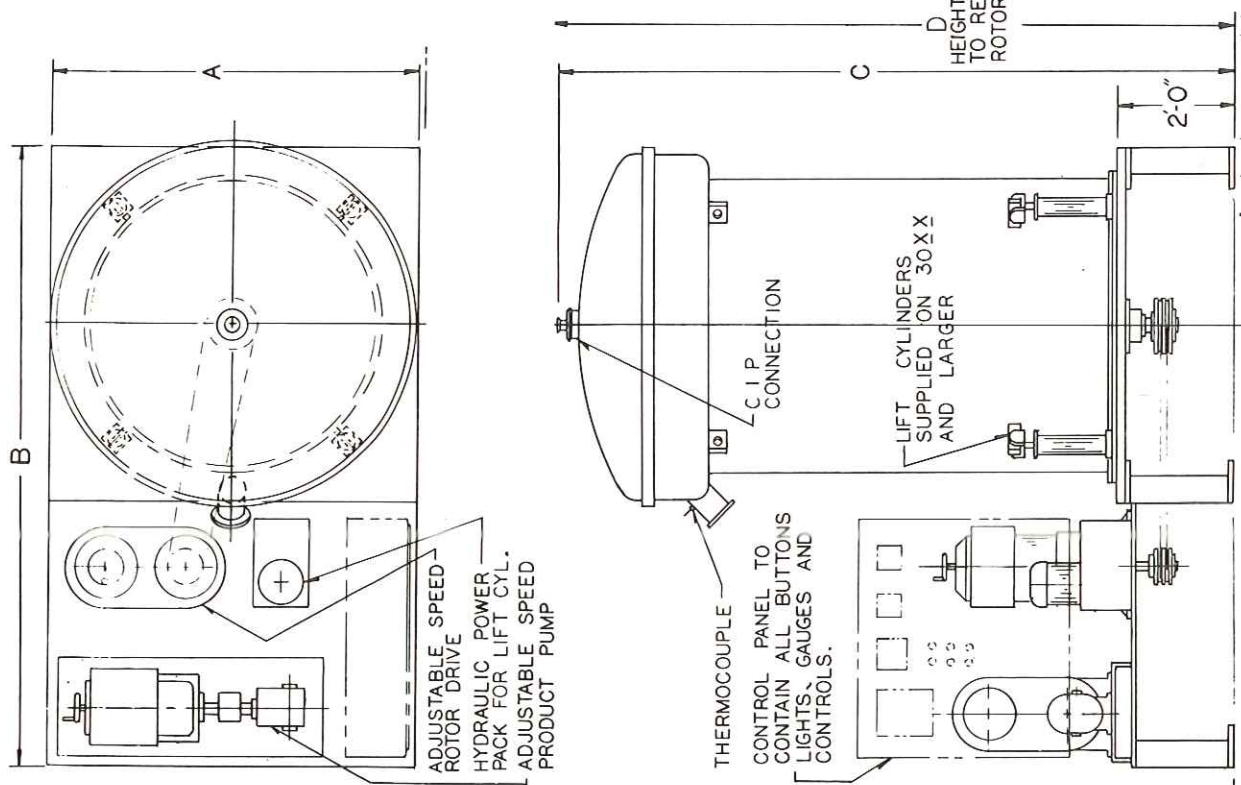
END PRODUCT	FEED CONSTITUENTS	% SOLIDS		RATE LB./HOUR PER SQ. FT.		TEMPERATURE OF		STEAM PRESSURE PSIG
		FEED	FINISH	FEED	FINISH	FEED	FINISH	
Coating, Popped Corn, Etc.	Sugar, Molasses, Corn Syrup, Butter	75	96	11.5	10	150	300	100
Cereal Coating	Sugar, Corn Syrup, Fruit Flavors, Chocolate	67	86	71	55	150	241	100
Chocolate Crumb	Sugar, Whole Milk, Cocoa Calce	72	95	35	26	160	255	115
White Crumb	Sugar, Whole Milk	72	96	35	26	160	255	115
Milk Caramels (Soft)	Sugar, Corn Syrup, Whole Milk	75	89	65	55	160	235	100
Milk Caramels (Hard)	Sugar, Corn Syrup, Whole Milk	75	94	56	45	160	252	100
Toffee	Sugar, Butter or Margarine	75	98	16	12	160	320	115
Distillers Sillage	By Product of Alcohol Distillation	30	75	32	13	147	220	110

SIZE	APPROX. DIMENSIONS INCHES											
	536	1236	1260	1842	1860	2460	2472	3066	3660	3672	4272	
HEAT TRANSFER AREA SQ. FT.	8	19	31	33	47	63	74	86	94	113	131	
A	17	24	24	30	30	36	36	42	48	48	54	
B	50	55	55	60	60	65	65	75	85	92	100	
C	84	92	116	102	120	120	130	126	120	130	130	
D	100	128	152	142	164	164	182	170	164	182	182	

SIZE	APPROX. DIMENSIONS M.M.											
	536	1236	1260	1842	1860	2460	2472	3066	3660	3672	4272	
HEAT TRANSFER AREA SQ. METR	74	1.77	2.88	3.07	4.37	5.86	6.88	7.99	9.74	10.50	12.17	
A	432	610	610	762	762	914	914	1067	1219	1219	1372	
B	1270	1397	1397	1524	1524	1651	1651	1905	2159	2337	2540	
C	2134	2337	2946	2590	3048	3048	3302	3200	3048	3302	3302	
D	2540	3251	3960	3606	4166	4166	4623	4318	4166	4623	4623	

NOTES

1. OTHER SIZES CAN BE ENGINEERED PER CUSTOMERS APPLICATION.
2. DIRECT DRIVE ARRANGEMENTS FOR DR ALSO AVAILABLE.
3. VACUUM CONFIGURATION UPON REQUEST.
4. DIMENSIONS ARE SUBJECT TO CHANGE. CONSULT FACTORY FOR INSTALLATION SPECIFICATIONS.



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DR SERIES

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