

For Ammonia (R-717)

Features

- High Efficiency Oil Separation
- 4"–10" Line Sizes
- Reduces Oil Migration to Evaporators

- No Change in Condenser Capacity or Pressure
- Transfers Oil via Solenoid Valve Operated by Float Switch or Controller

Description

Phillips® Flooded Oil Scrubbers help make ammonia refrigeration plants more efficient and less costly to operate by preventing oil contamination of freezers and process evaporators. This makes possible considerably longer periods of operation for ice cream freezers, scraped surface heat exchangers, flooded shell and tube chillers, and other high efficiency evaporators without deteriorating capacity and without time lost to draining low side oil traps. Typically, Phillips Flooded Oil Scrubbers will reduce oil migration into process evaporators (within a 1000-ton refrigerant plant) from ten gallons per week to one gallon per week.

Design Function

Phillips Flooded Oil Scrubber operation is shown in Figure 1. Injecting hot gas into a liquid bath of ammonia condenses the fine "mist" of oil. The larger particles that result are then conglomerated in a stainless steel packing or mesh grid and passed through a zigzag vane mist extractor.

Phillips Flooded Oil Scrubber operating cost is limited to the "cost" of a 0.5 PSI drop in pressure. Although the desuperheating of gas to near ambient temperature reduces its volume, the evaporation of liquid ammonia increases mass flow through the condenser without the scaling effect of hot gas. Thus, there isn't any measurable change in either condenser capacity or pressure.

Ideally, the natural liquid level at condenser outlet is used to "flood" Phillips Flooded Oil Scrubbers, as shown in Figure 2. Liquid level is depressed by pressure drop through the condenser and connecting piping. Minimum liquid level is at lowest Phillips Level Eye® liquid indicator when the maximum level is midway between top and bottom of the scrubber. Since pressure drop is usually one to three feet of liquid head equivalent, the scrubber is located with a lower Level Eye three feet below the liquid seal on the condenser outlet. For automatic dumping of oil, an Electric Contact Controller (ECC), set at 120°F, can operate a solenoid valve to transfer to an oil regenerator.

Alternatives to ideal installations of Phillips Flooded Oil Scrubbers use a float switch with a liquid solenoid valve for flooding (see Figure 3). Liquid make-up is sized to provide 1 GPM for each 100 tons of capacity. This combination of scrubber, auxiliary controls, and oil still has been within a variety of chemical and food processing plants. Recent improvements make installation more compact and efficient.

Figure 1: Phillips Flooded Oil Scrubber

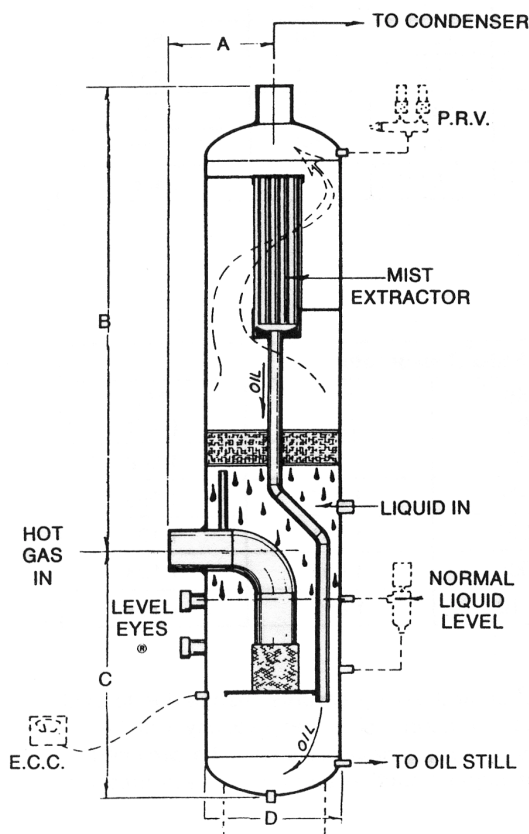


Figure 2: Phillips Flooded Oil Scrubber Installation

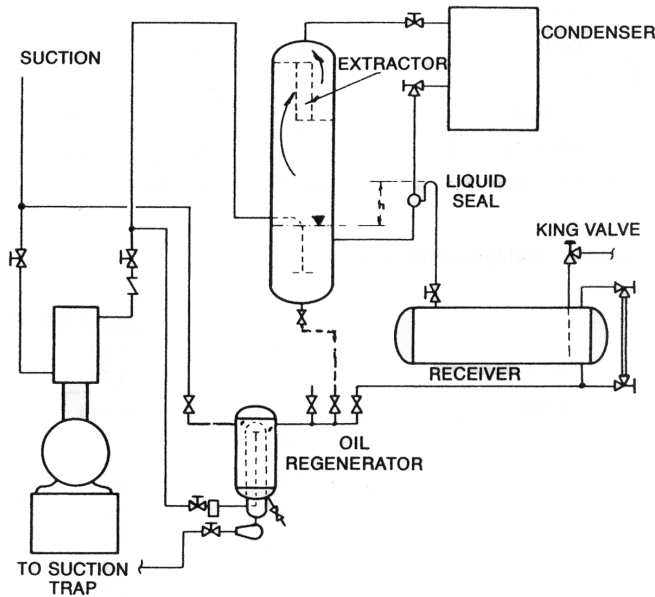
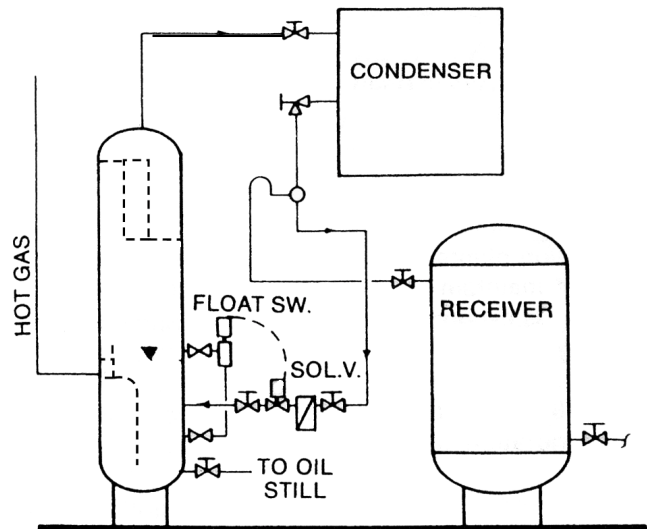


Figure 3: Alternative Installation



FLOODED OIL SCRUBBER SIZES

FLOODED OIL SCRUBBER	LINE SIZE (IN.)	NOMINAL TONS*	DIMENSIONS (IN.)				SHIPPING WT. (LBS.)
			A	B	C	D	
FOS16-4	4	250	15	50	52	16	580
FOS18-5	5	400	17	57	55	18	762
FOS20-6	6	630	18	69	58	20	1310
FOS24-8	8	1000	20	76	61	24	1710
FOS30-10	10	1700	23	89	64	30	2495

* at 86°F condenser (155 PSIG) and 14°F evaporator (27 PSIG)

CAPACITY MULTIPLIERS for SELECTION

SUCTION PRESSURE PSIG TEMPERATURE (°F)	CONDENSING PRESSURE PSIG (TEMPERATURE °F)				
	110 (68)	131 (77)	155 (86)	181 (95)	211 (104)
13 (-4)	0.887	0.938	0.988	1.038	1.088
20 (5)	0.892	0.944	0.994	1.045	1.095
27 (14)	0.897	0.949	1.000	1.051	1.101
37 (23)	0.902	0.954	1.005	1.056	1.108
48 (32)	0.906	0.959	1.010	1.062	1.114

* Multiply the capacity Multiplier in this table by the Nominal Tons above.

ORDERING AND INSTALLATION TIPS:

Select line size entering the Phillips Flooded Oil Scrubber as large or larger than the main plant discharge line so as to reduce “hot spots” within the scrubber.

When plant expansion is anticipated, select oversize to accommodate such growth. Operation within the present plant will be just as efficient.

When a plant outgrows a scrubber installation, or when compressors are added to an existing installation, separate Phillips Flooded Oil Scrubbers can be fitted to each set of condensers. When suction and head pressures change due to load and seasonal variations, scrubber capacity will be affected. Thus, adequate capacity should be provided in selection for highest suction and lowest head pressure anticipated.

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