GAS DRIVEN RECIRCULATING SYSTEM

Features

- **Provides Optimum Liquid Feed to Evaporators Without Mechanical Pumps**
- **Provides Efficient Utilization of Evaporator's Internal Surface for Heat Transfer**
- **Provides Liquid Slop-Over Protection for System Compressors**
- **One Central Vessel (Accumulator) for all Evaporators on a Common Suction**

Description

The Phillips® Gas Driven Recirculating System functions through the use of constant pressure to feed partially sub-cooled liquid refrigerant to the evaporators, in lieu of totally sub-cooled liquid by a mechanical pump, at a typical rate in the range of 1.5 to 2 times the evaporator load.

The refrigerant is fed to the evaporators from a Controlled Pressure Receiver (CPR). The liquid/vapor mixture from the evaporators is then separated in a suction accumulator with the dry vapor directed back to the compressors and the overfed liquid refrigerant drained by gravity into the transfer vessel. Transfer to the CPR is accomplished by compressor discharge vapor.

Typically, a High Side Control is utilized to attain the CPR function, principally when the CPR is the main receiver for the plant. The CPR pressure is normally set in the range of 50 to 75 PSIG. Other vessels in the system can also act as the source of sub-cooled liquid to lower pressure evaporators on two stage systems.

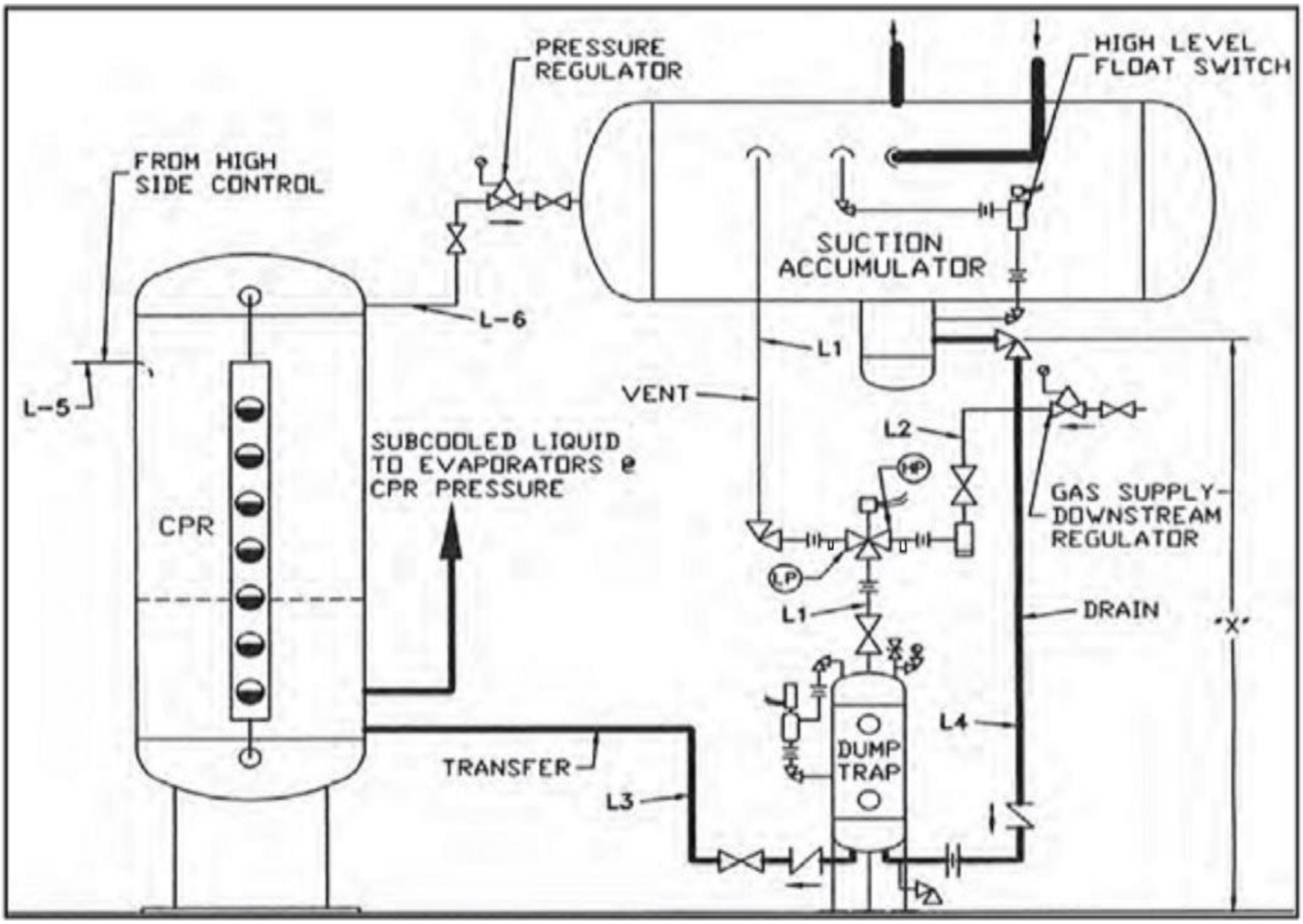
VERTICAL DUMP TRAP SYSTEMS

LIQUID RETURN UNIT CAT. NO.	TOTAL TONS AT ACCUMU-LATOR	LIQUID RETURN CAPACITY (GPM)	DUMP TRAP SIZE (D. X HT.) (IN.)	MIN. DRAIN HEIGHT 'X' REQ'D (IN.)	DIM. 'Y' (IN.)	LINE SIZES (IPS-IN.)				SHIPPING WEIGHT (LBS.)
						L-1 (TRAP) (VENT)	L-2 (GAS) SUPPLY	L-3 (TRANSFER)	L-4 DRAIN (TO TRAP)	
DR40V	40	7	12 X 26	30	10	3/4"	3/4"	3/4"	1-1/2"	275
DR75V	75	14	16 X 38	43	11	3/4"	3/4"	1-1/4"	2"	400
DR100V	100	18	18 X 38	44	12	1-1/4"	1-1/4"	1-1/4"	2-1/2"	585
DR150V	150	28	20 X 40	47	13	1-1/4"	1-1/4"	1-1/2"	3"	630
DR260V	260	48	24 X 42	52	16	1-1/4"	1-1/4"	2"	4"	780
DR520V	520	98	30 X 54	66	18	2"	1-1/4"	3"	4" (TWO)	1630
DR920V	920	190	42 X 60	78	24	3"	1-1/2"	3"	4" (THREE)	1875

HORIZONTAL DUMP TRAP SYSTEMS

LIQUID RETURN UNIT CAT. NO.	TOTAL TONS AT ACCUMU-LATOR	LIQUID RETURN CAPACITY (GPM)	DUMP TRAP SIZE (D. X HT.) (IN.)	MIN. DRAIN HEIGHT 'X' REQ'D (IN.)	DIM. 'Y' (IN.)	LINE SIZES (IPS-IN.)				SHIPPING WEIGHT (LBS.)
						L-1 (TRAP) (VENT)	L-2 (GAS) SUPPLY	L-3 (TRANSFER)	L-4 DRAIN (TO TRAP)	
DR40H	40	7	12 X26	20	10	3/4"	3/4"	3/4"	1-1/2"	275
DR75H	75	14	16 X 38	24	11	3/4"	3/4"	1-1/4"	2"	400
DR100H	100	18	18 X 38	27	12	1-1/4"	1-1/4"	1-1/4"	2-1/2"	585
DR150H	150	28	20 X 40	30	13	1-1/4"	1-1/4"	1-1/2"	3"	630
DR260H	260	48	24 X 42	37	16	1-1/4"	1-1/4"	2"	4"	780
DR520H	520	98	24 X 84	37	16	2"	1-1/4"	3"	4" (TWO)	1830
DR920H	920	190	30 X 115	45	18	3"	1-1/2"	4"	4" (THREE)	2110

Flow Schematic for Typical "DR" System

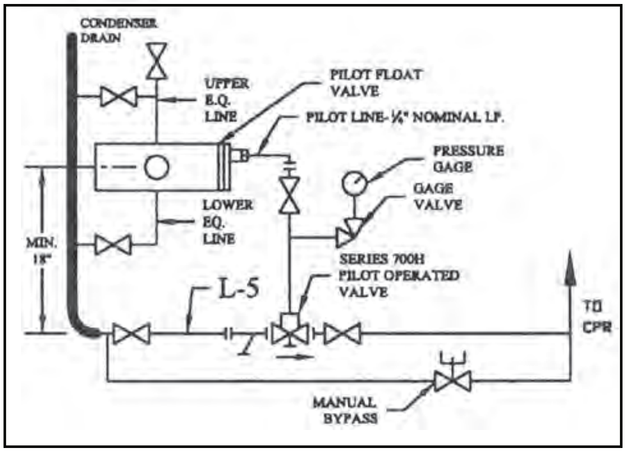


ITEMS SUPPLIED WITH STANDARD 'GDR' SYSTEMS

BASIC COMPONENTS

DUMP TRAP, ASME 300# PHILLIPS 3-WAY VALVE WIRED PANEL, 120 VOLT	FLOAT SWITCH, w/SERV. VALVES & UNIONS PRESSURE GAUGE & GAUGE VALVE RELIEF VALVE(S)
LINE L-1 SERVICE VALVES UNIONS	**LINE L-3** SERVICE VALVE OUTLET CHECK VALVE
LINE L-2 SERVICE VALVE DOWNSTREAM REGULATOR SERVICE VALVE 3-WAY VALVE FILTER UNION	**LINE L-4** SERVICE VALVE INLET CHECK VALVE UNION(S) PURGE VALVE

Typical High Side Control



"RC" SELECTION TABLE

SELECTION GUIDELINE TABLE FOR HIGH SIDE CONTROL w/o PILOT RECEIVER

HIGH SIDE CONTROL WITHOUT PILOT RECEIVER*

PLANT SIZE (TONS)	CATALOG NUMBER	L-5 SIZE (IN.)	L-6 SIZE (IN.)	SHIPPING WEIGHT (LBS.)
80	RC075	3/4	3/4	130
160	RC100	1	3/4	145
250	RC125	1-1/4	3/4	190
400	RC150	1-1/2	3/4	240
800	RC200	2	1-1/4	310
1250	RC250	2-1/2	1-1/2	490
2000	RC300	3	2	560
3000	RC400	4	2-1/2	740

*Supplied with 6 X 24" horizontal steel chamber

"RC-PR" SELECTION TABLE

SELECTION GUIDELINE TABLE FOR HIGH SIDE CONTROL w/PILOT RECEIVER

HIGH SIDE CONTROL WITH PILOT RECEIVER

PLANT SIZE (TONS)	CATALOG NUMBER	L-5 SIZE (IN.)	L-6 SIZE (IN.)	PILOT RECEIVER SIZE (IN.)*	SHIPPING WEIGHT (LBS.)
80	RC075PR	3/4	3/4	12 X 48	280
160	RC100PR	1	3/4	12 X 48	295
250	RC125PR	1-1/4	3/4	12 X 48	340
400	RC150PR	1-1/2	3/4	12 X 48	390
800	RC200PR	2	1-1/4	12 X 48	460
1250	RC250PR	2-1/2	1-1/2	16 X 48	730
2000	RC300PR	3	2	16 X 48	800
3000	RC400PR	4	2-1/2	20 X 60	1280

*Vertical pilot receiver supplied unless horizontal requested. Vessel supplied with Phillips Level Eye. Pilot float valve furnished with cast chamber. A relief valve is also supplied.

ITEMS SUPPLIED WITH "RC" HIGH SIDE CONTROL

COMMON ITEMS	LINE L-5
SERIES 275AP PILOT FLOAT VALVE STEEL CHAMBER WITH LEVEL EYE SERVICE VALVES FOR CHAMBER, 3/4" THD. (TWO) PRESSURE GAUGE AND GAUGE VALVE PILOT LINE SERVICE VALVE, 1/4" THD. NUT UNION, 1/4" THD. BUSHING, 1/2 X 1/4" THD.	HIGH SIDE PILOT OPERATED VALVE, WITH STRAINER SERVICE VALVES (TWO) BY-PASS VALVE **LINE L-6** UPSTREAM PRESSURE REGULATOR SERVICE VALVES (TWO)

Single Stage or High Stage System (Figure 1)

The high side control maintains a liquid seal in the condenser drain line, allowing only liquid to flow to the CPR. In effect, this converts the main receiver to a CPR due to a regulator that vents excess flash gas downstream. From this vessel, partially sub-cooled liquid at CPR pressure is fed to the evaporators through conventional hand expansion valves that are set to overfeed. The unevaporated liquid overfeed exits from the evaporator, with the vapor produced by the heat load, to the suction accumulator. In a properly designed suction accumulator, the liquid is separated from the vapor, and the Liquid Transfer System returns the excess liquid back to the CPR.

There is no penalty due to dropping the liquid from the condenser down to an intermediate pressure receiver (the CPR). All liquid must eventually be expanded down to suction pressure to do its work. The CPR is needed to facilitate the transfer of the overfed liquid back to its source by using higher pressure gas. The mixture becomes partially sub-cooled, because lower temperature liquid from the suction accumulator combines with liquid that has flashed down to the CPR pressure.

Typical recirculating rates with the gas driven systems are 1.5 to 2 to 1. This lower rate is caused by the very small amount of flash gas that forms immediately after the hand expansion valve at the inlet to the evaporator. This flash gas accelerates the liquid and gas mixture through the evaporator, keeping oil moving and fully wetting the inside of the evaporator surface.

Low Stage System (Figure 2)

Liquid feed to the low temperature evaporators takes place from a specially designed intermediate pressure vessel. This vessel may also act as an intercooler, desuperheater, or suction accumulator. The lower section of this vessel acts as a reservoir of sub-cooled liquid that is fed to the evaporators. The overfeed liquid is returned to this section. A low side control maintains the level. Typically, a downstream regulator would be utilized to lower the pressure required to move the liquid from low pressure back to the reservoir.

Totally Sub-Cooled Liquid Feed System (Figure 3)

The low stage type of system is used to accomplish the feed of totally sub-cooled liquid to low temperature evaporators. The variation employed feeds the liquid supply into the low temperature suction accumulator even though the level control is on the reservoir. The make-up liquid is flashed to the low temperature and is transferred to the reservoir by the liquid return unit. Almost totally sub-cooled liquid is now available for feed to the low temperature evaporators.

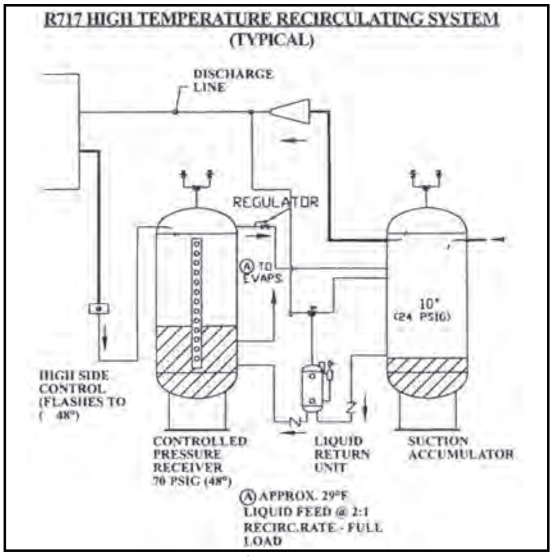


Figure 1

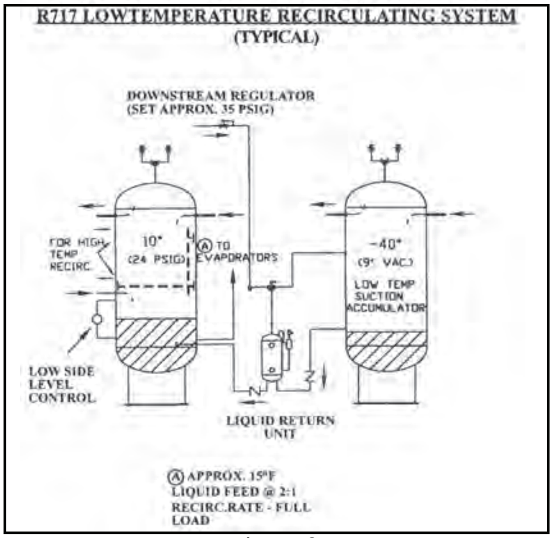


Figure 2

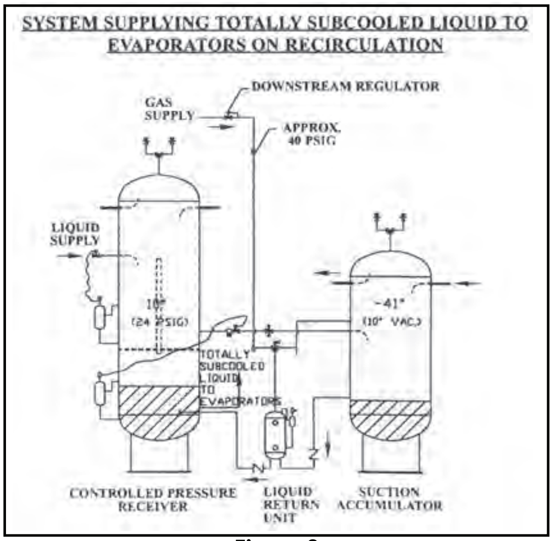


Figure 3

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