Fig. 1 The LMH

LIQUI-MOVER

fluid handling series

FEWER MOVING PARTS MEANS GREATER RELIABILITY

A Liqui-Mover performs the same liquid transport functions as vane or centrifugal pumps. But since the Liqui-Mover is based on an entirely different operating concept, it has fewer moving parts than conventional pumps.

Since it is a positive displacement pressure-powered pump, the Liqui-Mover has no motors, starters, shafts, rotating mechanical seals or impellers. Instead, the Liqui-Mover uses steam (or any compatible inert gas) under pressure as the motive force to lift or pump liquids.

With none of these maintenance-intensive components to leak, wear or fail, the Liqui-Mover is naturally more reliable than conventional pumps. Therefore, the Liqui-Mover will work longer, with less maintenance and far less downtime.

FEWER OPERATIONAL RESTRICTIONS

Many conventional pumps have difficulty handling liquids with temperatures above 185°F (85°C), so coolers or flash tanks must be added to the system. Valuable steam is lost during the flashing process (see p.36 for steam loss cost calculations), while the extra cooling equipment increases both installation and operating costs, and further reduces system reliability.

However, Liqui-Movers have few temperature restrictions. For most applications, no additional coolers or flash tanks are needed. Cooling losses from flashing condensate are minimized. The result is savings over other pump systems – in reduced capital and operating costs, in greater energy conservation, and in lower maintenance.

Also, since the Liqui-Mover has no impellers or rotors, it does not suffer from cavitation, which limits conventional pump performance.

THE BENEFITS

No rotating parts and a minimum of moving parts for greater reliability and lower maintenance.

Can handle most high-temperature fluids without venting or cooling.

Little or no condensate cooling loss.

Compact dimensions, easy to install and operate.

Some models require no electricity for operation.

OTHER ADVANTAGES

Due to their simple design and compact dimensions, Liqui-Movers are easy to integrate into system designs – and they're equally easy to install. In fact, LRFP models (see p. 22) arrive fully framed, piped and wired (if necessary), and require only a final hook-up to plant piping and wiring.

Another advantage is liquid metering. Each Liqui-Mover discharges a fixed volume per cycle. So by counting the number of complete cycles, you can determine liquid volume pumped by the unit.

On LMH models, the 3-way valve that controls the operating cycle can be mounted remotely from the Liqui-Mover unit to facilitate convenient control and observation.

To prevent corrosion, all Liqui-Mover receiver tanks are equipped with magnesium anodes.

DIFFERENT MODELS FOR DIFFERENT APPLICATIONS

There are two separate Liqui-Mover series, each designed for optimum performance through a range of conditions.

The LMH Series is externally powered, with or without electricity, and has single-tank capacities ranging up to 186 GPM (705 Lpm) or 89,000 lbs./hr. (40,455 Kg/hr.). LMH Liqui-Movers are used with coils, heaters, hospital equipment, coolers and evaporators, to name a few applications.

The Liqui-Mover LMV Series is self-actuating – it requires no electricity to operate. This makes it well-suited to remote locations, like tank farms, where it is impractical to supply electricity. LMV Liqui-Movers are also ideal where using electricity can be hazardous. This includes wet environments like sumps/pits, bottle washers and laundry equipment, and explosive environments such as refineries, chemical plants or distillation towers. The LMV's single-tank capacities range up to 30 GPM (114 Lpm) or 14,370 lbs./hr. (6,532 Kg/hr.).

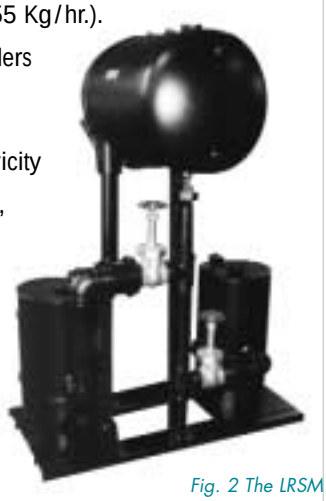

Fig. 2 The LRSM

In addition, each Series is available in three different configurations. Special models are also available for unique requirements.

For further information on Liqui-Mover applications and specifications, ask your Johnson representative.

LIQUI-MOVER LMH SERIES

HOW LMH SERIES LIQUI-MOVERS WORK

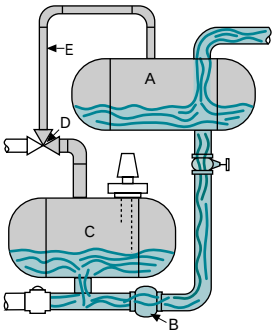

Fig. 16

STAGE ONE:

During the fill cycle, fluid flows from the receiving chamber (A) through the inlet check valve (B) into the pumping chamber (C). The 3-way valve (D) is open between the pumping chamber and the receiving chamber, equalizing the pressure between them through the equalizing line (E).

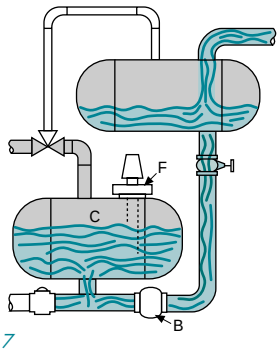

Fig. 17

STAGE TWO:

When the level control (F) senses that the pumping chamber is full, the 3-way valve energizes to admit the motive pressure into the pumping chamber (C). The inlet check valve (B) prevents backflow into the fill line.

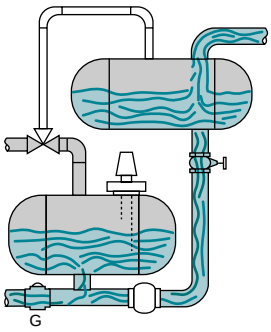

Fig. 18

STAGE THREE

The discharge cycle begins when pressure inside the pumping chamber is greater than in the discharge line. The discharge check valve (G) opens and fluid flows into the discharge line. During this cycle, incoming condensate is stored in the receiver.

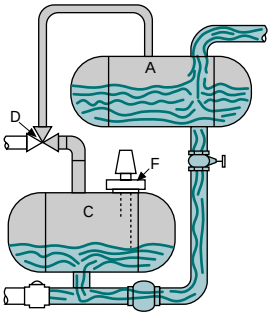

Fig. 19

STAGE FOUR:

Once the level control (F) senses the pumping chamber has emptied, the 3-way valve (D) de-energizes, shutting off the motive pressure, and opening the vent port in the valve. This equalization cycle allows the pumping chamber (C) and the receiving chamber (A) to equalize in pressure, and the fill cycle begins again.

MODEL LMH-LOOO

Without receiver – for systems with existing receivers or other accumulators (i.e. condensate headers).

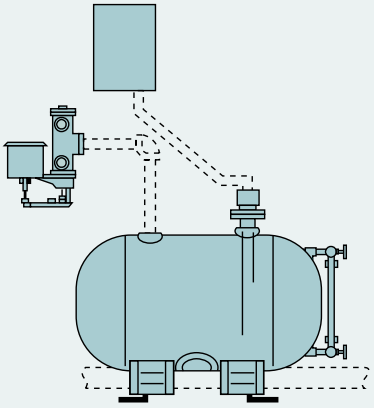

Fig. 20

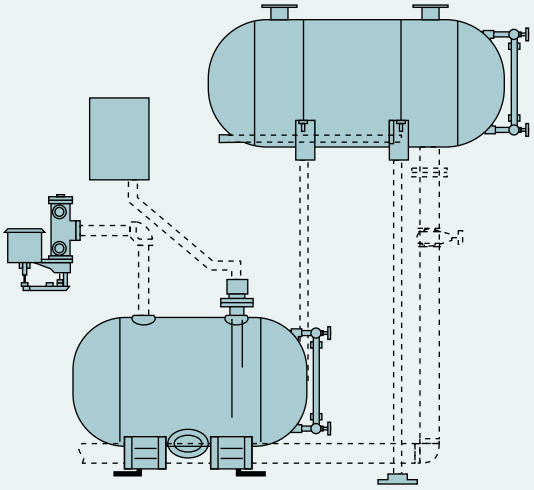

Fig. 21

MODEL LMH-LRFP

With receiver, framework, wiring and piping assembled – a complete package. Installation requires only hook-up of electric power (if required) and motive pressure, along with condensate return and discharge lines.

MODEL LMH-LROO

With receiver – the individual components facilitate installation flexibility and accommodate space limitations.

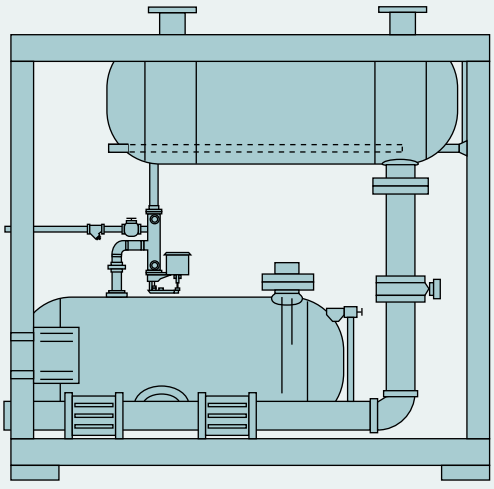

Fig. 22

LMH QUICK REFERENCE SIZING CHART

LMH SERIES (U.S.)

FILL HEAD IN FEET	TOTAL STATIC BACK PRESSURE (PSIG)	LMH-5		LMH-10		LMH-20		LMH-40		LMH-50	
		GPM	LB/HR	GPM	LB/HR	GPM	LB/HR	GPM	LB/HR	GPM	LB/HR
0.5	10	4.3	2,044	5.9	2,816	10.9	5,246	14.2	6,797	22.2	10,675
	20	4.1	1,966	5.6	2,708	10.5	5,044	13.6	6,536	21.4	10,265
	30	4.0	1,907	5.5	2,627	10.2	4,893	13.2	6,340	20.7	9,957
	40	3.9	1,887	5.4	2,600	10.1	4,843	13.1	6,274	20.5	9,854
1	10	4.7	2,246	6.4	3,095	11.8	5,641	15.4	7,388	24.4	11,731
	20	4.5	2,160	6.2	2,976	11.3	5,424	14.8	7,104	23.5	11,280
	30	4.4	2,096	6.0	2,887	11.0	5,261	14.4	6,891	22.8	10,942
	40	4.3	2,074	6.0	2,857	10.8	5,207	14.2	6,820	22.6	10,829
1.5	10	5.1	2,449	7.0	3,374	12.8	6,149	16.6	7,979	26.6	12,787
	20	4.9	2,354	6.8	3,244	12.3	5,912	16.0	7,672	25.6	12,295
	30	4.8	2,284	6.6	3,147	11.9	5,735	15.5	7,442	24.8	11,926
	40	4.7	2,260	6.5	3,114	11.8	5,676	15.3	7,365	24.6	11,803
2	10	5.5	2,651	7.6	3,652	13.7	6,600	17.7	8,496	28.8	13,843
	20	5.3	2,549	7.3	3,512	13.2	6,346	17.0	8,170	27.7	13,310
	30	5.2	2,472	7.1	3,406	12.8	6,156	16.5	7,925	26.9	12,911
	40	5.1	2,447	7.0	3,371	12.7	6,092	16.3	7,843	26.6	12,778
3	10	6.7	3,212	9.2	4,395	16.6	7,954	21.9	10,491	34.9	16,776
	20	6.4	3,069	8.8	4,226	15.9	7,648	21.0	10,088	33.6	16,130
	30	6.2	2,995	8.5	4,099	15.5	7,418	20.4	9,785	32.6	15,646
	40	6.2	2,965	8.5	4,057	15.3	7,342	20.2	9,684	32.3	15,485
4	10	7.5	3,617	10.3	4,395	18.5	8,856	23.2	11,156	39.3	18,887
	20	7.2	3,478	9.9	4,226	17.7	8,516	22.3	10,727	37.8	18,161
	30	7.0	3,373	9.6	4,099	17.2	8,260	21.7	10,405	36.7	17,616
	40	7.0	3,338	9.5	4,057	17.0	8,175	21.5	10,298	36.3	17,434
5	10	8.3	3,999	11.5	5,509	20.4	9,815	25.6	12,264	43.7	20,999
	20	8.0	3,845	11.0	5,297	19.7	9,438	24.6	11,793	42.1	20,191
	30	7.8	3,729	10.7	5,138	19.1	9,155	23.8	11,439	40.8	19,585
	40	7.7	3,691	10.6	5,085	18.9	9,060	23.6	11,321	40.4	19,384
LRFP MODEL	10	6.3	3,010	8.8	4,209	16.3	7,841	21.9	10,491	32.7	15,720
	20	6.0	2,894	8.4	4,047	15.7	7,539	21.0	10,088	31.5	15,115
	30	5.8	2,806	8.2	3,926	15.2	7,313	20.4	9,785	30.5	14,662
	40	5.8	2,779	8.1	3,885	15.1	7,238	20.2	9,684	30.2	14,511
CHECK VALVE AND PIPE SIZE		1 INCH		1.25 INCH		1.5 INCH		2 INCH		2.5 INCH	
CAPACITY PUMPED PER CYCLE		7.5 GALS.		11.3 GALS.		20.7 GALS.		27.7 GALS.		41.0 GALS.	
RECOMMENDED RECEIVER CAPACITIES		7.5 GALS.		22.5 GALS.		34.0 GALS.		47.0 GALS.		69.0 GALS.	

- *Above based on motive pressure being 20 PSIG higher than total static back pressure.*
- *For unvented systems, multiply actual capacity by: 1.09.*
- *For compressed air as motive force, multiply actual capacity by: 1.5 (for vented systems only).*

LMH SERIES (U.S.)

FILL HEAD IN FEET	TOTAL STATIC BACK PRESSURE (PSIG)	LMH-65		LMH-110		LMH-150		LMH-200	
		GPM	LB/HR	GPM	LB/HR	GPM	LB/HR	GPM	LB/HR
0.5	10	28.6	13,719	36.0	17,262	61.9	29,720	97.0	46,581
	20	27.5	13,191	34.6	16,598	59.5	28,577	93.3	44,790
	30	26.7	12,796	33.5	16,100	57.7	27,719	90.5	43,446
	40	26.4	12,664	33.2	15,934	57.2	27,434	89.6	42,998
1	10	31.4	15,076	39.5	18,970	76.4	36,691	119.8	57,508
	20	30.2	14,496	38.0	18,240	73.5	35,280	115.2	55,296
	30	29.3	14,061	36.9	17,693	71.3	34,222	111.7	53,637
	40	29.0	13,916	36.5	17,510	70.6	33,869	110.6	53,084
1.5	10	34.2	16,433	41.9	20,108	81.0	38,893	127.0	60,958
	20	32.9	15,801	40.3	19,334	77.9	37,397	122.1	58,614
	30	31.9	15,327	39.1	18,754	75.6	36,275	118.4	56,855
	40	31.6	15,169	38.7	18,561	74.8	35,901	117.2	56,269
2	10	37.1	17,789	46.6	22,384	89.4	42,929	140.2	67,284
	20	35.6	17,105	44.8	21,523	86.0	41,278	134.8	64,696
	30	34.6	16,592	43.5	20,878	83.4	40,039	130.7	62,755
	40	34.2	16,421	43.0	20,662	82.6	39,626	129.4	62,108
3	10	44.9	21,558	56.5	27,127	104.0	49,900	162.9	78,211
	20	43.2	20,729	54.3	26,083	100.0	47,981	156.7	75,203
	30	41.9	20,107	52.7	25,301	97.0	46,541	152.0	72,946
	40	41.5	19,900	52.2	25,040	96.0	46,062	150.4	72,194
4	10	50.6	24,272	63.6	30,541	119.2	57,238	186.9	89,712
	20	48.6	23,339	61.2	29,366	114.7	55,037	179.7	86,262
	30	47.2	22,638	59.3	28,485	111.2	53,386	174.3	83,674
	40	46.7	22,405	58.7	28,192	110.1	52,835	172.5	82,811
5	10	56.2	26,986	70.7	33,956	119.2	57,238	186.9	89,712
	20	54.1	25,948	68.0	32,650	114.7	55,037	179.7	86,262
	30	52.4	25,169	66.0	31,670	111.2	53,386	174.3	83,674
	40	51.9	24,910	65.3	31,344	110.1	52,835	172.5	82,811
LRFP MODEL	10	42.1	20,202	53.0	25,419	89.4	42,929	140.2	67,284
	20	40.5	19,425	50.9	24,442	86.0	41,278	134.8	64,696
	30	39.3	18,842	49.4	23,708	83.4	40,039	130.7	62,755
	40	38.8	18,648	48.9	23,464	82.6	39,626	129.4	62,108
CHECK VALVE AND PIPE SIZE		3 INCH		4 INCH		6 INCH		6 INCH	
CAPACITY PUMPED PER CYCLE		53.7 GALS.		67.6 GALS.		115.5 GALS.		180.0 GALS.	
RECOMMENDED RECEIVER CAPACITIES		76.0 GALS.		98.0 GALS.		182.0 GALS.		340.0 GALS.	

- *Total static back pressure is the maximum height the fluid is pumped, plus the discharge line pressure.*
- *Fill head is the distance between the top of the pumping chamber and the bottom of the receiving chamber.*
- *Consult your Johnson representative or factory for application verification.*

LMH QUICK REFERENCE SIZING CHART

LMH SERIES (METRIC)

FILL HEAD IN METERS	TOTAL STATIC BACK PRESSURE (BAR)	LMH-5		LMH-10		LMH-20		LMH-40		LMH-50	
		L/M	KG/HR	L/M	KG/HR	L/M	KG/HR	L/M	KG/HR	L/M	KG/HR
0.2	0.69	16.1	927	22.2	1,281	41.1	2,384	53.7	3,092	84.2	4,852
	1.38	15.5	891	21.4	1,232	39.8	2,293	51.6	2,973	81.0	4,665
	2.07	15.0	864	20.7	1,195	38.6	2,224	50.1	2,884	78.6	4,525
	2.76	14.9	855	20.5	1,183	38.2	2,201	49.5	2,854	77.8	4,478
0.3	0.69	17.7	1,021	24.4	1,408	44.5	2,564	58.3	3,358	92.6	5,332
	1.38	17.0	982	23.5	1,354	42.8	2,465	56.1	3,229	89.0	5,127
	2.07	16.5	952	22.8	1,313	41.5	2,391	54.4	3,132	86.3	4,973
	2.76	16.4	943	22.6	1,299	41.1	2,367	53.8	3,100	85.5	4,922
0.5	0.69	19.3	1,110	26.6	1,534	48.5	2,795	63.0	3,629	97.0	5,811
	1.38	18.5	1,067	25.6	1,475	46.7	2,687	60.6	3,490	97.0	5,588
	2.07	18.0	1,035	24.8	1,431	45.3	2,607	58.8	3,385	94.1	5,420
	2.76	17.8	1,025	24.6	1,416	44.8	2,580	58.2	3,350	93.1	5,364
0.6	0.69	20.9	1,202	28.8	1,661	52.1	3,000	67.1	3,865	109.2	6,291
	1.38	20.1	1,155	27.7	1,597	50.1	2,884	64.5	3,716	105.0	6,049
	2.07	19.5	1,121	26.9	1,549	48.6	2,798	62.6	3,605	101.9	5,868
	2.76	19.3	1,109	26.6	1,533	48.1	2,769	61.9	3,567	100.8	5,807
0.9	0.69	25.3	1,456	34.7	1,999	62.8	3,615	82.8	4,772	132.4	7,624
	1.38	24.3	1,400	33.4	1,922	60.3	3,476	79.7	4,589	127.3	7,331
	2.07	23.6	1,358	32.4	1,864	58.5	3,372	77.3	4,451	123.5	7,111
	2.76	23.3	1,344	32.0	1,845	57.9	3,337	76.5	4,405	122.2	7,038
1.2	0.69	28.5	1,640	39.1	2,252	69.9	4,025	88.1	5,075	149.0	8,584
	1.38	27.4	1,577	37.6	2,166	67.2	3,870	84.7	4,879	143.3	8,254
	2.07	26.5	1,529	36.5	2,101	65.2	3,754	82.2	4,733	139.0	8,006
	2.76	26.3	1,513	36.1	2,079	64.5	3,716	81.3	4,684	137.6	7,923
1.5	0.69	31.5	1,813	43.5	2,506	77.5	4,461	96.9	5,579	165.7	9,543
	1.38	30.3	1,743	41.8	2,409	74.5	4,290	93.1	5,364	159.3	9,176
	2.07	29.4	1,691	40.6	2,337	72.2	4,161	90.3	5,203	154.5	8,901
	2.76	29.0	1,673	40.2	2,313	71.5	4,188	89.4	5,149	152.9	8,809
LRFP MODEL	0.69	23.7	1,365	33.2	1,915	61.9	3,564	82.8	4,772	124.0	7,144
	1.38	22.8	1,312	32.0	1,841	59.5	3,427	79.7	4,589	119.3	6,869
	2.07	22.1	1,273	31.0	1,786	57.7	3,324	77.3	4,451	115.7	6,663
	2.76	21.9	1,260	30.7	1,841	57.1	3,290	76.5	4,405	114.5	6,595
CHECK VALVE AND PIPE SIZE		25mm		32 mm		38 mm		50 mm		62 mm	
CAPACITY PUMPED PER CYCLE		30.3 L		42.8 L		78.5 L		105.0 L		155.4 L	
RECOMMENDED RECEIVER CAPACITIES		28.4 L		85.3 L		128.9 L		178.1 L		261.5 L	

- *Above based on motive pressure being 1.4 bar higher than total static back pressure.*
- *For unvented applications, multiply actual capacity by: 1.09.*
- *For compressed air as motive force, multiply actual capacity by: 1.5 (for vented systems only).*

LMH SERIES (METRIC)

FILL HEAD IN METERS	TOTAL STATIC BACK PRESSURE (BAR)	LMH-65		LMH-110		LMH-150		LMH-200	
		L/M	KG/HR	L/M	KG/HR	L/M	KG/HR	L/M	KG/HR
0.2	0.69	108.3	6,236	136.2	7,844	234.5	13,509	367.6	21,175
	1.38	104.1	5,996	130.9	7,543	225.5	12,989	353.5	20,361
	2.07	101.0	5,816	127.0	7,316	218.7	12,599	342.9	19,750
	2.76	99.9	5,757	125.7	7,241	216.5	12,469	339.3	19,546
0.3	0.69	119.0	6,853	149.7	8,623	289.5	16,678	453.8	26,104
	1.38	114.4	6,589	143.9	8,291	278.4	16,036	436.4	25,135
	2.07	111.0	6,391	139.6	8,042	270.1	15,555	423.3	24,381
	2.76	109.8	6,326	138.2	7,959	267.3	15,395	418.9	24,129
0.5	0.69	129.7	7,470	158.6	9,137	306.9	17,678	481.1	27,711
	1.38	124.7	7,182	152.5	8,786	295.1	16,998	462.6	26,645
	2.07	121.0	6,967	148.0	8,522	286.3	16,488	448.7	25,845
	2.76	119.7	6,895	146.4	8,435	283.3	16 318	444.1	25,579
0.6	0.69	140.4	8,087	176.6	10,172	338.8	19,512	531.0	30,586
	1.38	135.0	7,776	169.8	9,781	325.7	18,762	510.6	29,410
	2.07	130.9	7,542	164.7	9,487	316.0	18,199	495.3	28,528
	2.76	129.6	7,465	163.0	9,389	312.7	18,011	490.2	28,233
0.9	0.69	170.1	9,800	214.0	12,327	393.8	22,681	617.2	35,553
	1.38	163.6	9,423	205.8	11,853	378.6	21,809	593.5	34,186
	2.07	158.7	9,140	199.6	11,497	367.3	21,154	575.7	33,160
	2.76	157.0	9,046	197.5	11,379	363.5	20,936	569.8	32,818
1.2	0.69	191.6	11,033	240.9	13,878	451.7	26,017	708.0	40,782
	1.38	184.2	10,609	231.7	13,345	434.3	25,016	680.8	39,213
	2.07	178.7	10,291	224.4	12,944	421.3	24,265	660.4	38,037
	2.76	176.8	10,185	222.4	12,811	416.9	24,015	653.6	37,645
1.5	0.69	213.0	12,267	267.9	15,430	451.7	26,017	708.0	40,782
	1.38	204.8	11,795	257.6	14,837	434.3	25,016	680.8	39,213
	2.07	198.6	11,441	249.9	14,392	421.3	24,265	660.4	38,037
	2.76	196.6	11,323	247.3	14,243	416.9	24,015	653.6	37,645
LRFP MODEL	0.69	159.4	9,183	200.5	11,551	338.8	19,512	531.0	30,586
	1.38	153.3	8,830	192.8	11,107	325.7	18,762	510.6	29,410
	2.07	148.7	8,565	187.0	10,774	316.0	18,199	495.3	28,528
	2.76	147.2	8,477	185.1	10,663	312.7	18,011	490.2	28,233
CHECK VALVE AND PIPE SIZE		76 mm		100 mm		150 mm		150 mm	
CAPACITY PUMPED PER CYCLE		203.5 L		256.2 L		437.8 L		682.2 L	
RECOMMENDED RECEIVER CAPACITIES		288.0 L		371.4 L		689.8 L		1288.6 L	

- *Total static back pressure is the maximum height the fluid is pumped, plus the discharge line pressure.*
- *Fill head is the distance between the top of the pumping chamber and the bottom of the receiving chamber.*
- *Consult your Johnson representative or factory for application verification.*

LMH SPECIFICATIONS & DIMENSIONS

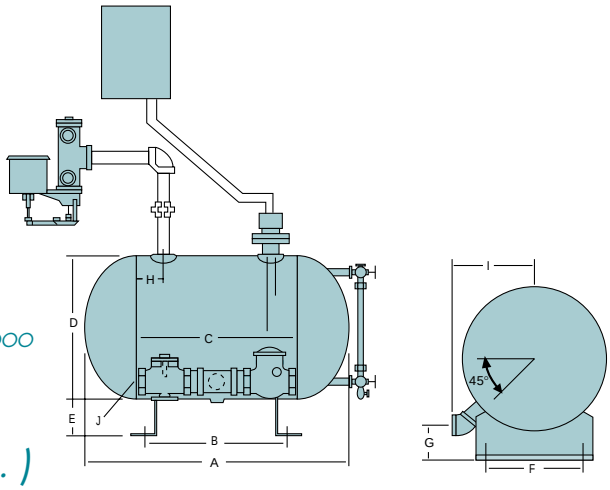

Fig. 23 Type LMH-LOOO

LMH-LOOO (U.S.)

MODEL	*DIMENSIONS (in inches)										Estimated Shipping Weight (Lbs.)
	A	B	C	D	E	F	G	H	I	J	
LMH-5-LOOO	25	12	18	10	4	5	3.81	3.5	6	1	120
LMH-10-LOOO	37	22	28	14	4	9	4.63	4	7.75	1.25	200
LMH-20-LOOO	35	18	24	18	4	11	4.81	4	9.5	1.5	245
LMH-40-LOOO	47	30	36	18	4	11	5.13	4	10	2	255
LMH-50-LOOO	40	20	26	24	4	15	5.5	4	12.81	2.5	360
LMH-65-LOOO	44	24	30	24	4	15	5	4	13.25	3	370
LMH-110-LOOO	56	36	42	24	8.6	15	4.5	4	16.13	4	495
LMH-150-LOOO	66	42	48	30	10.5	21	7.25	4	18.5	6	700
LMH-200-LOOO	60	30	36	42	9	25	6.12	4	23.88	6	1100

**Dimensions are subject to change at manufacturer's discretion*

LMH-LOOO (METRIC)

MODEL	*DIMENSIONS (in millimeters)										Estimated Shipping Weight (Kg)
	A	B	C	D	E	F	G	H	I	J	
LMH-5-LOOO	635	305	457	254	102	127	97	89	152	25	55
LMH-10-LOOO	940	559	711	356	102	229	117	102	197	32	91
LMH-20-LOOO	889	457	610	457	102	279	122	102	241	38	111
LMH-40-LOOO	1194	762	914	457	102	279	130	102	254	51	116
LMH-50-LOOO	1016	508	660	610	102	381	140	102	325	64	164
LMH-65-LOOO	1118	610	762	610	102	381	127	102	337	76	168
LMH-110-LOOO	1422	914	1067	610	218	381	114	102	406	102	225
LMH-150-LOOO	1676	1067	1219	762	267	533	184	102	470	152	318
LMH-200-LOOO	1524	762	914	1067	229	635	155	102	605	152	500

**Dimensions are subject to change at manufacturer's discretion*

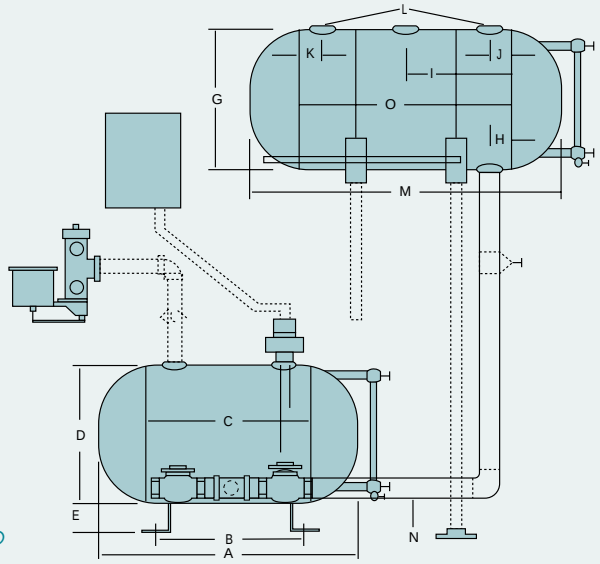

Fig. 24 Type LMH-LROO

LMH-LROO (U.S.)

MODEL	*DIMENSIONS (in inches)														Estimated Shipping Weight (Lbs.)
	A	B	C	D	E	G	H	I	J	K	L	M	N	O	
LMH-5-LROO	25	12	18	10	4	10	3	9	3	2	2	26	1	19	185
LMH-10-LROO	37	22	28	14	4	14	4	14	4	4	2	37	1.25	28	315
LMH-20-LROO	35	18	24	18	4	18	4	12	4	4	2	35	1.5	24	415
LMH-40-LROO	47	30	36	18	4	18	4	18	4	4	3	47	2	36	470
LMH-50-LROO	40	20	26	24	4	24	4	13	4	4	3	40	2.5	26	585
LMH-65-LROO	44	24	30	24	4	24	4	15	4	4	3	44	3	30	615
LMH-110-LROO	56	36	42	24	8.6	24	4	21	4	4	4 Flgd	56	4	42	795
LMH-150-LROO	66	42	48	30	10.5	30	5	24	5	5	6 Flgd	66	6	48	1215
LMH-200-LROO	60	30	36	42	9	30	5	52.5	5	5	6 Flgd	123	6	105	1915

**Dimensions are subject to change at manufacturer's discretion*

LMH-LROO (METRIC)

MODEL	*DIMENSIONS (in millimeters)														Estimated Shipping Weight (Kg)
	A	B	C	D	E	G	H	I	J	K	L	M	N	O	
LMH-5-LROO	635	305	457	254	102	254	76	229	76	51	51	660	25	483	84
LMH-10-LROO	940	559	711	356	102	356	102	356	102	102	51	940	32	711	143
LMH-20-LROO	889	457	610	457	102	457	102	305	102	102	51	889	38	610	189
LMH-40-LROO	1194	762	914	457	102	457	102	457	102	102	76	1194	51	914	214
LMH-50-LROO	1016	508	660	610	102	610	102	330	102	102	76	1016	64	660	266
LMH-65-LROO	1118	610	762	610	102	610	102	381	102	102	76	1118	76	762	280
LMH-110-LROO	1422	914	1067	610	218	610	102	533	102	102	100 DIN	1422	102	1067	361
LMH-150-LROO	1676	1067	1219	762	267	762	127	610	127	127	150 DIN	1676	152	1219	552
LMH-200-LROO	1524	762	914	1067	229	762	127	1334	127	127	150 DIN	3124	152	2667	870

**Dimensions are subject to change at manufacturer's discretion*

LMH SPECIFICATIONS & DIMENSIONS

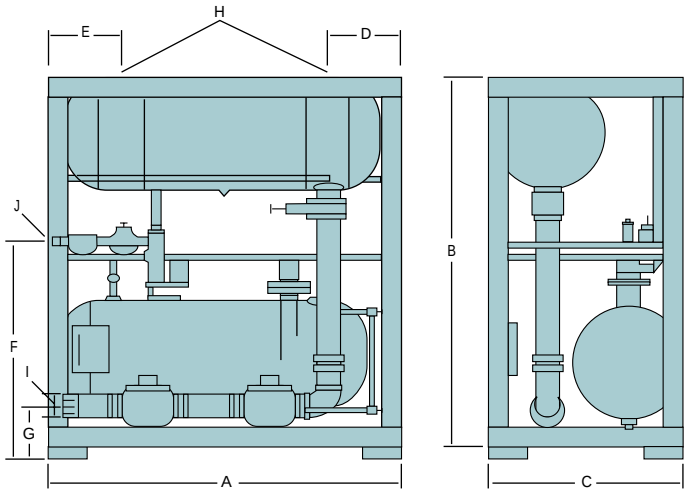

Fig. 25 Type LMH-LRFP

LMH-LRFP (U.S.)

MODEL	*DIMENSIONS (in inches)										Estimated Shipping Weight (Lbs.)
	A	B	C	D	E	F	G	H	I	J	
LMH-5-LRFP	36	51	22	11.75	10.25	29	6.5	2	1	0.75	400
LMH-10-LRFP	48	60	26	15.75	12.25	34.5	7.5	2	1.25	0.75	540
LMH-20-LRFP	45.5	67.5	31.6	15.25	14.25	38.75	7.5	2	1.5	1	680
LMH-40-LRFP	55	76.6	32	15.5	11.7	39	7.9	3	2	1.5	800
LMH-50-LRFP	58.6	78.6	42.5	17.6	23	45	8	3	2.5	1.5	1000
LMH-65-LRFP	58.6	79.6	42.5	17.6	19	45	8	3	3	2	1165
LMH-110-LRFP	73.5	82	43.4	20	19	45	7.25	4 Flgd	4	2	1600
LMH-150-LRFP	108	91	57	21	49	56	8	6 Flgd	6	2	2500
LMH-200-LRFP	138	111.5	62	21.5	21.5	65	9.75	6 Flgd	6	2	3000

**Dimensions are subject to change at manufacturer's discretion*

LMH-LRFP (METRIC)

MODEL	*DIMENSIONS (in millimeters)										Estimated Shipping Weight (Kg)
	A	B	C	D	E	F	G	H	I	J	
LMH-5-LRFP	914	1295	559	298	260	737	165	51	25	19	182
LMH-10-LRFP	1219	1524	660	400	311	876	191	51	32	19	245
LMH-20-LRFP	1156	1715	803	387	362	984	191	51	38	25	309
LMH-40-LRFP	1397	1946	813	394	297	991	201	76	51	38	364
LMH-50-LRFP	1488	1996	1080	447	584	1143	203	76	64	38	455
LMH-65-LRFP	1488	2022	1080	447	483	1143	203	76	76	51	530
LMH-110-LRFP	1867	2083	1102	508	483	1143	184	100 DIN	102	51	727
LMH-150-LRFP	2743	2311	1448	533	1245	1422	203	150 DIN	152	51	1136
LMH-200-LRFP	3505	2830	1575	546	546	1651	248	150 DIN	152	51	1364

**Dimensions are subject to change at manufacturer's discretion*

PRODUCT OPTIONS

optional components

CONSTRUCTION FOR CORROSIVES AND HIGH PRESSURES

Liqui-Mover tanks are made of welded black steel or cast iron (LMH-500 only) and are rated to 150 PSIG (10.2 BAR) in accordance with ASME Boiler Codes for unfired vessels. Temperature rating of tanks is 450°F (243°C). Each steel tank is individually inspected and labeled by the National Board of Boiler and Pressure Vessel Inspectors. Most Liqui-Mover models are available for higher pressure applications on request. For corrosive applications, stainless steel construction is also available.

CONTROL SYSTEMS (LMH SERIES ONLY)

Control panels, 3-way valves and pilot valves are available to meet any of the following standards:

- *NEMA 1 (general indoor use)*
- *NEMA 3R (rain-tight)*
- *NEMA 4 (water- and dust-tight)*
- *NEMA 7 (explosion-proof)*
- *NEMA 12 (industrial)*
- *OTHERS (upon request)*

Liqui-Mover Number	Solenoid Valve Number*	Pipe Size	Coil Size	Maximum Differential Pressure	
				PSIG	BAR
LMH-5	SV3S-303-DIS-DX-XXX-1	3/4"†	D7	95	6.5
			D3	175	12
LMH-10	SV3S-303-DIS-DX-XXX-1	1"	D4	250	17.2
LMH-20	SV3S-403-DIS-DX-XXX-1	1 1/4"	D7	40	2.8
			D3	80	5.5
LMH-40 LMH-50 LMH-65 LMH-110 LMH-150 LMH-200	SV3S-403-DIS-DX-XXX-2	1 1/2"	D4	180	12.4

** For X, substitute coil size (i.e. D7, D4, D3) For XXX, substitute desired AC voltage (i.e. 120, 220, etc.)*

† 1" bushed to 3/4".

Liqui-Mover Number	Cylinder Valve Number	Pipe Size	Air Connection	Maximum Differential Pressure @ 80 PSIG	
				PSIG	BAR
LMH-5 LMH-10	CV3S-1250-DIB-150D-F-1	3/4"	1/8"	215	14.8
LMH-20	CV3S-1300-DIB-200D-F-1	1"	1/4"	240	16.5
LMH-40 LMH-50	CV3S-1500-DIB-250D-F-1	1 1/2"	1/4"	180	12.4
LMH-65 LMH-110 LMH-150 LMH-200	CV3S-1550-DIB-250D-F-1	2"	1/4"	105	7.2

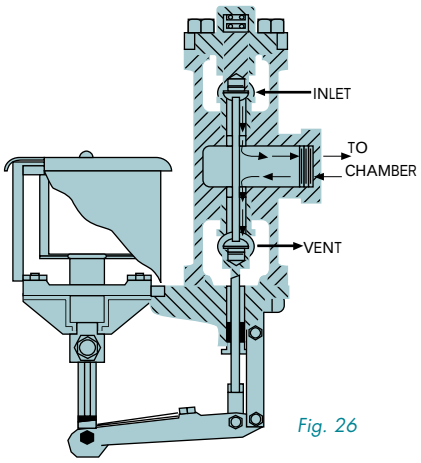

Fig. 26

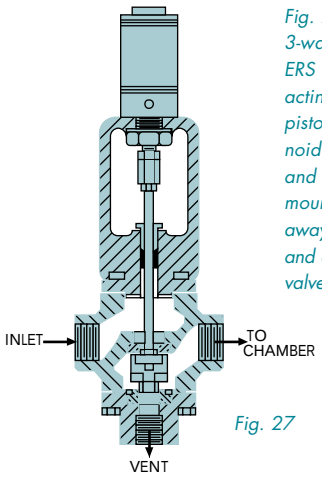

Fig. 27

Fig. 26: A solenoid-operated 3-way valve, used with Type ERS level controls. A direct-acting valve, without pilots or pistons, its side-mounted solenoid uses a lever to transmit and amplify power. The side mounting also keeps the coil away from the heat of the line, and allows easier access to the valve mechanism.

Fig. 27: A pneumatic-operated 3-way valve, used with Type EFAC and ERC level controls. The air cylinder on this pneumatic valve is fitted directly to the valve stem for fast, smooth response. Cylinders can withstand hundreds of thousands of cycles, but can be easily replaced if ever necessary.

PRODUCT OPTIONS

optional components

LEVEL CONTROLS

Three different level control systems may be specified for the LMH Series Liqui-Movers:

- *Type ERS uses long and short electrodes to sense liquid levels, and actuates the 3-way solenoid valve.*
- *Type ERC uses long and short electrodes to sense liquid levels, and actuates a 3-way cylinder-operated valve by means of a pilot valve.*
- *Type EFAC requires no electricity for operation. A rising and lowering float actuates a pneumatic pilot valve to control the 3-way cylinder valve.*
- *Type FSA (LMV and LMH-500 Series only) requires no electricity for operation. A rising and lowering float actuates a built-in 3-way valve by means of a snap-acting spring assembly.*

STAND-BY VALVE (LMH SERIES ONLY)

Since the 3-way valve is critical to Liqui-Mover operation, installing a duplicate manually selected valve allows system operation during maintenance of the primary valve.

CYCLE COUNTERS

As the Liqui-Mover discharges a fixed quantity at each cycle, counting the cycles provides an accurate measurement of condensate.

Pneumatic counters can be used with all units having cylinder operated 3-way valves. Electrical counters can be used with all units except type EFAC.

optional components

STEAM / AIR CONSUMPTION

lmh series

The Liqui-Mover's only significant chargeable operating cost is the steam (or compressed air) used as the motive force. The tables below show approximate consumption rates for steam and air. NOTE: these rates will vary with motive pressure and fluid temperature.

LMH SERIES (U.S.)

Steam Consumption*									
System Supply Pressure PSIG**	Lbs. per Hour (Based on 60 cycles per hour)								
	LMH-5	LMH-10	LMH-20	LMH-40	LMH-50	LMH-65	LMH-110	LMH-150	LMH-200
25	24	54	84	90	109	121	163	271	356
30	26	58	91	98	117	130	176	293	398
35	27	60	94	101	121	134	181	302	440
45	32	72	113	121	145	161	217	362	521
55	38	82	127	136	163	181	245	407	550
65	40	90	141	151	181	201	271	452	603
75	44	100	155	166	199	221	299	498	684
85	48	109	169	181	217	241	326	543	766
95	53	117	183	197	236	261	353	589	924
105	57	126	197	212	254	281	380	634	1005
115	61	135	212	227	272	302	407	679	1085
125	65	144	226	242	290	322	434	725	1164

**The figures shown are for closed systems; for vented systems, multiply consumption figures by 1.5. For actual flow rate, multiply consumption figure by 3. **Minimum motive steam supply pressure must equal: static back pressure + 20 PSIG.*

LMH SERIES (METRIC)

Steam Consumption*									
System Supply Pressure BAR**	Kg per Hour (Based on 60 cycles per hour)								
	LMH-5	LMH-10	LMH-20	LMH-40	LMH-50	LMH-65	LMH-110	LMH-150	LMH-200
1.70	10	24	38	40	49	55	74	123	162
2.04	11	26	41	44	53	59	80	133	181
2.38	12	27	42	45	55	60	82	137	200
3.06	14	32	51	55	65	73	98	164	237
3.74	12	37	57	61	74	82	111	185	250
4.42	18	40	64	68	82	91	123	205	274
5.10	20	45	70	75	90	100	135	226	311
5.78	21	49	76	82	98	109	148	246	348
6.46	24	53	83	89	107	118	160	267	420
7.14	25	57	89	96	115	127	172	288	457
7.82	27	61	96	103	123	137	185	308	493
8.50	29	65	102	110	131	146	197	329	529

**The figures shown are for closed systems; for vented systems, multiply consumption figures by 1.5. For actual flow rate, multiply consumption figure by 3. **Minimum motive steam supply pressure must equal: Static back pressure + 1.4 BAR.*

Air Consumption									
CF per Cycle (Based on 1 cycle per minute)									
	LMH-5	LMH-10	LMH-20	LMH-40	LMH-50	LMH-65	LMH-110	LMH-150	LMH-200
U.S.	0.7	2.4	3.7	5.2	7.6	8.6	10.4	18.7	27.5
Metric	0.02	0.07	0.10	0.15	0.22	0.24	0.29	0.53	0.78

Minimum air supply pressure must equal: Static back pressure +20 PSIG. For actual flow rate, multiply consumption figure by 3.

PRODUCT CONFIGURATIONS

just a few of the ways liqui-movers can be used

OPEN DESIGN

Fig. 28 An open design intended for use with mixed return pressures, this design requires no supplemental cooling of condensate.

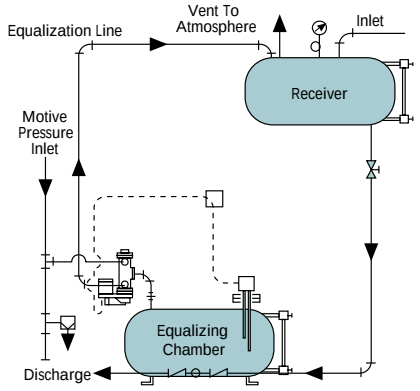

Fig. 28

FLASH DESIGN

Fig. 29 A flash design. For applications requiring flash steam – such as high pressure processing equipment – the receiver in this design acts as a flash tank.

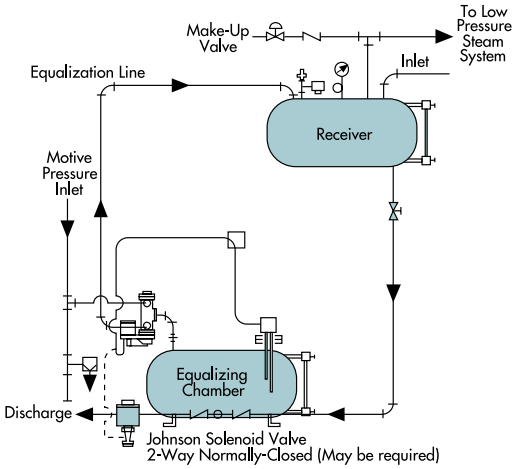

Fig. 29

CLOSED DESIGN

Fig. 30 A closed design. All steam/gas is vented back into receiver to prevent BTU losses from flashing.

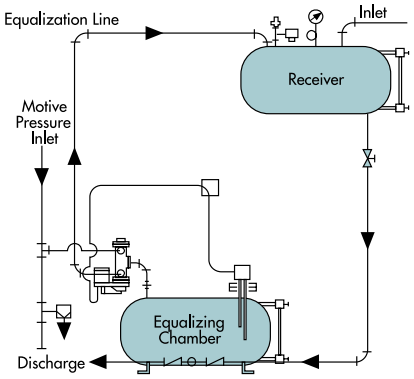

Fig. 30

APPLICATION PROFILE:

flash tank sizing (U.S.)

Instructions for properly sizing the flash tanks used with Johnson Liqui-Movers.

STEP 1:

Find the percent of flash, based on the operating pressure.

INSTRUCTIONS:

Use the chart below.

EXAMPLE:

Use the following operating conditions:
Inlet condensate pressure: 100 PSIG
Condensate rate: 15,000 LBS./HR.
Flash tank pressure: 10 PSIG
Flash steam velocity: 4,000 FPM
Enter chart at inlet condensate pressure of 100.
Move horizontally to 10 column.
Result — 10.6% flash.

FLASH TANK SIZING (U.S.)

INLET CONDENSATE PSIG	FLASH TANK PSIG											
	0	5	10	15	20	25	30	35	40	45	50	55
5	1.6											
10	2.8	1.3										
15	3.9	2.4	1.1									
20	4.9	3.3	2.1	1.0								
25	5.7	4.2	2.9	1.8	0.9							
30	6.5	5.0	3.7	2.6	1.7	0.8						
35	7.2	5.7	4.4	3.3	2.4	1.5	0.7					
40	7.8	6.3	5.1	4.0	3.0	2.2	1.4	0.7				
45	8.4	6.9	5.7	4.6	3.7	2.8	2.0	1.3	0.6			
50	9.0	7.5	6.2	5.2	4.2	3.4	2.6	1.9	1.2	0.6		
55	9.5	8.0	6.8	5.7	4.8	3.9	3.2	2.4	1.8	1.2	0.6	
60	10.0	8.5	7.3	6.2	5.3	4.5	3.7	3.0	2.3	1.7	1.1	0.5
65	10.5	9.0	7.8	6.7	5.8	4.9	4.2	3.5	2.8	2.2	1.6	1.0
70	10.9	9.4	8.2	7.2	6.2	5.4	4.6	3.9	3.3	2.7	2.1	1.5
75	11.4	9.9	8.7	7.6	6.7	5.9	5.1	4.4	3.7	3.1	2.5	2.0
80	11.8	10.3	9.1	8.0	7.1	6.3	5.5	4.8	4.2	3.6	3.0	2.4
85	12.2	10.7	9.5	8.4	7.5	6.7	5.9	5.2	4.6	4.0	3.4	2.8
90	12.5	11.1	9.9	8.8	7.9	7.1	6.3	5.6	5.0	4.4	3.8	3.3
95	12.9	11.5	10.3	9.2	8.3	7.5	6.7	6.0	5.4	4.8	4.2	3.6
100	13.3	11.8	10.6	9.6	8.7	7.8	7.1	6.4	5.8	5.1	4.6	4.0
105	13.6	12.2	11.0	9.9	9.0	8.2	7.5	6.8	6.1	5.5	4.9	4.4
110	13.9	12.5	11.3	10.3	9.4	8.5	7.8	7.1	6.5	5.9	5.3	4.7
115	14.3	12.8	11.6	10.6	9.7	8.9	8.1	7.4	6.8	6.2	5.6	5.1
120	14.6	13.1	12.0	10.9	10.0	9.2	8.5	7.8	7.1	6.5	6.0	5.4
125	14.9	13.4	12.3	11.2	10.3	9.5	8.8	8.1	7.5	6.9	6.3	5.8
130	15.2	13.7	12.6	11.5	10.6	9.8	9.1	8.4	7.8	7.2	6.6	6.1
135	15.5	14.0	12.9	11.8	10.9	10.1	9.4	8.7	8.1	7.5	6.9	6.4
140	15.8	14.3	13.1	12.1	11.2	10.4	9.7	9.0	8.4	7.8	7.2	6.7
145	16.0	14.6	13.4	12.4	11.5	10.7	10.0	9.3	8.7	8.1	7.5	7.0
150	16.3	14.9	13.7	12.7	11.8	11.0	10.3	9.6	8.9	8.3	7.8	7.3

STEP 2:

Find flash rate in lbs./hr.

INSTRUCTIONS:

Multiply percent of flash (from Step 1) by initial condensate rate. Then divide by 100.

EXAMPLE:

$$\frac{10.6 \times 15{,}000}{100} = 1{,}590 \text{ lbs./hr.}$$

STEP 3:

Find condensate surface per 1,000 lbs. of flash steam per hour.

INSTRUCTIONS:

Use the chart below.

EXAMPLE:

Enter chart at 10 in the first column.
Result — 13.5 sq./ft. per 1,000 lbs./hr.

FLASH TANK PSIG	CONDENSATE SURFACE AREA (SQ. FT.) Required Per 1000 lbs. Steam Per Hour
0	22.7
5	16.9
10	13.5
15	11.2
20	9.6
25	8.4
30	7.5
35	6.7
40	6.1
45	5.6
50	5.2
55	4.8
60	4.5

STEP 4:

Find required condensate surface area for flash tank.

INSTRUCTIONS:

Multiply condensate surface area (from Step 3) by flash rate in lbs./hr. (from Step 2). Then divide by 1,000.

EXAMPLE:

$\frac{13.5 \times 1{,}590}{1{,}000}$ = 21.46 sq./ft.

STEP 5:

Determine minimum size for vent and supply piping.

INSTRUCTIONS:

Use the chart below.

EXAMPLE:

Move down "Flash Tank PSIG" column for 10 PSIG (the flash tank pressure) to reach the number closest to the flash rate of 1,590 (from Step 2). The closest number is 1,287, which equals 4".

Sizing for vent and supply piping (for steam flow velocity at 4,000 FPM)*

PIPE SIZE (IN.)	STEAM FLOW IN LBS/HR Flash Tank PSIG											
	0	5	10	15	20	25	30	35	40	45	50	55
1	54	71	87	104	120	136	152	168	184	200	215	231
1.25	93	122	151	180	208	236	263	291	318	346	373	400
1.5	127	167	206	245	283	321	359	396	434	471	508	545
2	209	274	339	403	466	529	591	653	714	776	837	897
2.5	298	392	484	575	665	755	844	932	1,020	1,107	1,194	1,281
3	460	605	747	888	1,027	1,165	1,303	1,439	1,574	1,709	1,844	1,977
3.5	615	809	1,000	1,188	1,374	1,559	1,742	1,925	2,106	2,286	2,466	2,645
4	792	1,041	1,287	1,529	1,769	2,007	2,243	2,478	2,711	2,943	3,174	3,405
5	1,245	1,637	2,023	2,404	2,781	3,154	3,526	3,894	4,261	4,626	4,990	5,352
6	1,797	2,363	2,920	3,470	4,014	4,554	5,090	5,623	6,152	6,679	7,204	7,727

**NOTE:*

For steam flow velocities above 4,000 FPM, multiply steam flow in chart by the following factors —velocity at 5,000 FPM = 1.25, velocity at 6,000 FPM = 1.50

APPLICATION PROFILE:

flash tank sizing (metric)

Instructions for properly sizing the flash tanks used with Johnson Liqui-Mover fluid handling systems.

STEP 1:

Find the percent of flash, based on the operating pressure.

INSTRUCTIONS:

Use the chart below.

EXAMPLE:

Use the following operating conditions:
Inlet condensate pressure: 6.9 BAR
Condensate rate: 6,818 KG/HR.
Flash tank pressure: 0.7 BAR
Flash steam velocity: 1,219 M/M
Enter chart at inlet condensate pressure of 6.9.
Move horizontally to 10 column.
Result — 10.6% flash.

FLASH TANK SIZING (METRIC)

INLET CONDENSATE BAR	FLASH TANK BAR											
	0	0.3	0.7	1.0	1.4	1.7	2.1	2.4	2.8	3.1	3.4	3.8
0.3	1.6											
0.7	2.8	1.3										
1.0	3.9	2.4	1.1									
1.4	4.9	3.3	2.1	1.0								
1.7	5.7	4.2	2.9	1.8	0.9							
2.1	6.5	5.0	3.7	2.6	1.7	0.8						
2.4	7.2	5.7	4.4	3.3	2.4	1.5	0.7					
2.8	7.8	6.3	5.1	4.0	3.0	2.2	1.4	0.7				
3.1	8.4	6.9	5.7	4.6	3.7	2.8	2.0	1.3	0.6			
3.4	9.0	7.5	6.2	5.2	4.2	3.4	2.6	1.9	1.2	0.6		
3.8	9.5	8.0	6.8	5.7	4.8	3.9	3.2	2.4	1.8	1.2	0.6	
4.1	10.0	8.5	7.3	6.2	5.3	4.5	3.7	3.0	2.3	1.7	1.1	0.5
4.5	10.5	9.0	7.8	6.7	5.8	4.9	4.2	3.5	2.8	2.2	1.6	1.0
4.8	10.9	9.4	8.2	7.2	6.2	5.4	4.6	3.9	3.3	2.7	2.1	1.5
5.2	11.4	9.9	8.7	7.6	6.7	5.9	5.1	4.4	3.7	3.1	2.5	2.0
5.5	11.8	10.3	9.1	8.0	7.1	6.3	5.5	4.8	4.2	3.6	3.0	2.4
5.9	12.2	10.7	9.5	8.4	7.5	6.7	5.9	5.2	4.6	4.0	3.4	2.8
6.2	12.5	11.1	9.9	8.8	7.9	7.1	6.3	5.6	5.0	4.4	3.8	3.3
6.6	12.9	11.5	10.3	9.2	8.3	7.5	6.7	6.0	5.4	4.8	4.2	3.6
6.9	13.3	11.8	10.6	9.6	8.7	7.8	7.1	6.4	5.8	5.1	4.6	4.0
7.2	13.6	12.2	11.0	9.9	9.0	8.2	7.5	6.8	6.1	5.5	4.9	4.4
7.6	13.9	12.5	11.3	10.3	9.4	8.5	7.8	7.1	6.5	5.9	5.3	4.7
7.9	14.3	12.8	11.6	10.6	9.7	8.9	8.1	7.4	6.8	6.2	5.6	5.1
8.3	14.6	13.1	12.0	10.9	10.0	9.2	8.5	7.8	7.1	6.5	6.0	5.4
8.6	14.9	13.4	12.3	11.2	10.3	9.5	8.8	8.1	7.5	6.9	6.3	5.8
9.0	15.2	13.7	12.6	11.5	10.6	9.8	9.1	8.4	7.8	7.2	6.6	6.1
9.3	15.5	14.0	12.9	11.8	10.9	10.1	9.4	8.7	8.1	7.5	6.9	6.4
9.7	15.8	14.3	13.1	12.1	11.2	10.4	9.7	9.0	8.4	7.8	7.2	6.7
10.0	16.0	14.6	13.4	12.4	11.5	10.7	10.0	9.3	8.7	8.1	7.5	7.0
10.3	16.3	14.9	13.7	12.7	11.8	11.0	10.3	9.6	8.9	8.3	7.8	7.3

STEP 2:

Find flash rate in Kg/hr.

INSTRUCTIONS:

Multiply percent of flash (from Step 1) by initial condensate rate. Then divide by 100.

EXAMPLE:

$$\frac{10.6 \times 6{,}818}{100} = 723 \text{ Kg/hr.}$$

STEP 3:

Find condensate surface per 1,000 kg of flash steam per hour.

INSTRUCTIONS:

Use the chart below.

EXAMPLE:

Enter chart at 0.7 in the first column.
Result — 2.75m^2 per 1,000 kg/hr.

FLASH TANK BAR	CONDENSATE SURFACE AREA (SQ. M.) Required Per 1,000 Kg Per Hour
0.0	4.64
0.3	3.45
0.7	2.75
1.0	2.29
1.4	1.96
1.7	1.72
2.1	1.54
2.4	1.36
2.8	1.25
3.1	1.14
3.4	1.06
3.8	0.99
4.1	0.92

STEP 4:

Find required condensate surface area for flash tank.

INSTRUCTIONS:

Multiply condensate surface area (from Step 3) by flash rate in kg/hr. (from Step 2). Then divide by 1,000.

EXAMPLE:

$$\frac{2.75 \times 723}{1{,}000} = 1.99 \text{ m}^2$$

STEP 5:

Determine minimum size for vent and supply piping.

INSTRUCTIONS:

Use the chart below.

EXAMPLE:

Move down "Flash Tank BAR" column for 0.7 BAR (the flash tank pressure) to reach the number closest to the flash rate of 723 (from Step 2). The closest number is 585, which equals 100.

Sizing for vent and supply piping (for steam flow velocities at 1,219 m/m)*

PIPE SIZE (mm)	STEAM FLOW IN KG/HR Flash Tank BAR											
	0	0.3	0.7	1.0	1.4	1.7	2.1	2.4	2.8	3.1	3.4	3.8
25	25	32	40	47	55	62	69	76	84	91	98	105
32	40	50	69	82	95	107	120	132	145	157	170	182
40	58	76	94	111	129	146	163	180	197	214	231	248
50	95	125	154	183	212	240	269	297	325	353	380	408
65	135	178	220	261	302	343	384	424	464	503	543	582
75	209	275	340	404	467	530	592	654	715	777	838	899
90	280	368	455	540	625	709	792	875	957	1,039	1,121	1,202
100	360	473	585	695	804	912	1,020	1,126	1,232	1,338	1,443	1,548
125	566	744	920	1,093	1,264	1434	1,603	1,770	1,937	2,103	2,268	2,433
150	817	1,074	1,327	1,577	1,825	2070	2,314	2,556	2,796	3,036	3,275	3,512

**NOTE:*

For steam flow velocities above 1,219 m/m, multiply steam flow in chart by the following factors – velocity at 1,524 m/m = 1.25, velocity at 1,829 m/m = 1.50

USING PIPE ACCUMULATORS AS RECEIVERS

Large diameter pipe (3” or larger) can be used as a receiver for the accumulating condensate. The table below shows the lengths of Schedule 40 pipe needed to provide storage capacity equivalent to standard-size receivers.

Pipe Size (Sch. 40)	Gallons per Foot	Approximate Pipe Lengths (in feet) Needed for Equivalent Receiver Capacity								
		LMH-5 10x25 7.5 Gal.	LMH-10 14x37 22.5 Gal.	LMH-20 18x35 34 Gal.	LMH-40 18x47 47 Gal.	LMH-50 24x40 69 Gal.	LMH-65 24x44 76 Gal.	LMH-110 24x56 98 Gal.	LMH-150 30x66 182 Gal.	LMH-200 30x123 340 Gal.
3"	0.3672	21	62	93	128	188	207	267	496	926
4"	0.6528	12	35	53	72	106	117	151	279	521
5"	1.02	8	23	34	47	68	75	97	179	333
6"	1.469	6	16	24	32	47	52	67	124	231
8"	2.611	3	9	14	18	27	30	38	70	130
10"	4.080	2	6	9	12	17	19	24.5	45	83
12"	5.875	1.5	4	6	8	12	13	17	31	58
14"	7.997	1	3	4.5	6	9	9.5	12.5	23	43
16"	10.44	1	2.5	3.5	4.5	7	7.5	9.5	17.5	33
18"	13.22	1	2	3	4	5.5	6	7.5	14	26
20"	16.32	0.5	1.5	2.5	3	4.5	5	6	11.5	21

USING PIPE ACCUMULATORS AS RECEIVERS (METRIC)

Large diameter pipe (75mm or larger) can be used as a receiver for the accumulating condensate. The table below shows the lengths of pipe needed to provide storage capacity equivalent to standard-size receivers.

Pipe Size (mm)	Liters per Meter	Approximate Pipe Lengths (in meters) Needed for Equivalent Receiver Capacity								
		LMH-5 28 liters	LMH-10 85 liters	LMH-20 129 liters	LMH-40 178 liters	LMH-50 262 liters	LMH-65 288 liters	LMH-110 371 liters	LMH-150 690 liters	LMH-200 1289 liters
75	4.6	6.4	18.9	28.3	39.0	57.3	63.1	81.4	151.2	282.2
100	8.1	3.7	10.7	16.2	21.9	32.3	35.7	46.0	85.0	158.8
125	12.7	2.4	7.0	10.4	14.3	20.7	22.9	29.6	54.6	101.5
150	18.3	1.8	4.9	7.3	9.8	14.3	15.8	20.4	37.8	70.4
200	32.5	0.9	2.7	4.3	5.5	8.2	9.1	11.6	21.3	39.6
250	50.7	0.6	1.8	2.7	3.7	5.2	5.8	7.5	13.7	25.3
300	73.1	0.5	1.2	1.8	2.4	3.7	4.0	5.2	9.4	17.7
350	99.4	0.3	0.9	1.4	1.8	2.7	2.9	3.8	7.0	13.1
400	129.8	0.3	0.8	1.1	1.4	2.1	2.3	2.9	5.3	10.1
450	164.4	0.3	0.6	0.9	1.2	1.7	1.8	2.3	4.3	7.9
500	202.9	0.2	0.5	0.8	0.9	1.4	1.5	1.8	3.5	6.4

GENERAL LMH LIQUI-MOVER SPECIFICATION

Furnish and install according to plans and manufacturer's specifications the quantity of positive displacement pressure-powered pumps as shown on the drawings. Operating components of an externally powered Liqui-Mover® shall consist of a pump tank with inlet and discharge check valves, a 3-way valve, and a liquid level control as shown on the schedule. Unit shall be manufactured by an I.S.O. 9001-approved facility and have proven system and design experience for a minimum of 10 years. Unit shall be manufactured by The Johnson Corporation.

All tanks are to be built in compliance with the latest ASME Boiler Code for Unfired Pressure Vessels and inspected and labeled by the National Board of Boiler and Pressure Vessel Inspectors. All tanks are to be rated for a working pressure of 150 PSIG steam and a temperature of 450°F (243°C). All standard openings to be NPT threads including female connections for a liquid level gauge glass assembly, flanged connections on larger sizes (4" and above). All tanks are to be of welded black steel construction. A replaceable magnesium anode, which retards the corrosive action of most waters and adds to the service life of any tank, is to be furnished with any receiver tank required. Galvanizing (coating) is not a satisfactory substitute for an anode.

The operation of the unit(s) shall be such that it shall be of a non-cavitating design and be capable of handling 365°F (185°C) condensate in a closed or flash system. Fluid flows by gravity from the receiving device, through the inlet check valve, and into the pump tank. When the fluid level reaches a predetermined high point, the liquid level control actuates a 3-way valve to admit steam (or other compatible inert gas) into the pump tank. The motive force causes the fluid to be discharged from the pump tank, through the discharge check valve, and into the return line. When the fluid reaches a predetermined low point, the liquid level control deactivates, and the 3-way valve returns to its original position, allowing the cycle to repeat itself.

The 3-way valve is to be constructed of ductile iron with stainless steel push rod, and either stainless steel valves and seats (ERS) or composition disc and bronze seat (ERC).

For specification of LMH models, refer to the chart on page 35.

GENERAL LMH
LIQUI-MOVER SPECIFICATION

MODELS

LOOO	Model "LOOO" units will include, but are not limited to: 150 PSIG ASME coded and labeled pump tank, inlet and discharge check valves, level control assembly, 3-way valve, and liquid level gauge glass assembly.
LROO	Model "LROO" units will include, but are not limited to: 150 PSIG ASME coded and labeled pump tank and receiver, inlet and discharge check valves, level control assembly, 3-way valve, anode in receiver and liquid level gauge glass assemblies for both tanks.
LRFP	Model "LRFP" units will include, but are not limited to: 150 PSIG ASME coded and labeled pump tank and receiver, inlet and discharge check valves, level control assembly, 3-way valve, pre-piped with appropriate hand valves and wired, anode in receiver and liquid level gauge glass assemblies on both tanks. Unit to be assembled in a steel frame.

GENERAL LMV-FSA
LIQUI-MOVER SPECIFICATION

MODELS

LOOO	Model "LOOO" units will include, but are not limited to: 150 PSIG ASME coded and labeled pump tank, inlet and discharge check valves, and non-electric level control assembly. Liquid level gauge glass assembly is optional.
LROO	Model "LROO" units will include, but are not limited to: 150 PSIG ASME coded and labeled pump tank and receiver, inlet and discharge check valves, non-electric level control assembly, anode in receiver and liquid level gauge glass assemblies for both tanks.
LRSM	Model "LRSM" units will include, but are not limited to: 150 PSIG ASME coded and labeled pump tank and receiver, inlet and discharge check valves, non-electric level control assembly, pre-piped with appropriate hand valves, anode in receiver and liquid level gauge glass assemblies on both tanks. Unit to be assembled on a steel skid.

STEAM LOSS CALCULATIONS

lmv and lmh series

THE OPERATING COSTS OF UNRESTRICTED FLASHING

One of the advantages of the Liqui-Mover is that it eliminates flashing in many cases. That means the Liqui-Mover's chargeable operating costs include only the steam or inert gas used as the motive force, and the electricity to operate the 3-way valve (if needed).

If you have to flash steam now, the process is probably costing you a lot more than you think. The following example will give you a good idea of the true cost of flashing. Just substitute your own application's figures, and you'll see some of the operational savings possible with a Liqui-Mover system.

OPERATING CONDITIONS:

A. 50 PSIG flashing to 0 PSIG

B. 10,000 lbs./hr.

C. Cost of steam: $5.00 per 1,000 lbs.

D. Specific volume of make-up water:

0.120 gal./lb. (40°F to 60°F)

E. Heat of liquid at initial pressure:

267.50 BTU/lb.

F. Heat of liquid at final pressure:

180.07 BTU/lb.

G. Latent heat at final pressure: 970.30 BTU/lb.

H. Latent heat at initial pressure: 911.60 BTU/lb.

NOTE: Following are only the direct costs of flashing! Additional costs associated with flashing to atmosphere – water replacement and water treatment costs – are not included in these estimates.

CALCULATIONS

Estimated Steam Loss:

1. $\frac{E - F}{G} \times 100 =$ % flash loss

   Example:
   $\frac{267.50 - 180.07}{970.3} \times 100 =$ *9% flash loss*

2. B x % flash loss = lbs./hr. loss

   Example:
   10,000 x 9% = 900 lbs./hr. loss

3. Lbs./hr. loss x 24 = lbs./day loss

   Example:
   900 x 24 = 21,600 lbs./day loss

4. Lbs./day loss x 365 = lbs./year loss

   Example:
   21,600 x 365 = 7,884,000 lbs./year loss

ESTIMATED DOLLAR LOSS:

5. $\frac{\text{Lbs./yr. x C}}{1{,}000} =$ $ loss per year

   Example:
   $\frac{7{,}884{,}000 \times \$5.00}{1{,}000} =$ *$39,420 loss per year to flashing*

ESTIMATED ENERGY LOSS:

6. Lbs./yr. loss x (F+G) = loss/year

   Example:
   7,884,000 x (180.70 + 970.30) = 9,074,484,000 BTU loss/year to flashing

ESTIMATED WATER LOSS:

7. Lbs./yr. loss x D = gal./year of make-up water

   Example:
   7,884,000 x 0.120 = 946,000 gal./year of make-up water

8. Make-up water and chemicals x $3.25/1,000 gal. = $ water loss/year

   Example:
   $\frac{946{,}000 \times \$3.25}{1{,}000} =$ *$3,074.50 loss/year*

9. Total estimated dollar loss: (Step 5 + Step 8)

   Example:
   $39,420 + $3,074.50 = $42,494.50

APPLICATION INFORMATION

johnson liqui-mover® products

To get specific details on a Johnson Liqui-Mover for your application, just fill in the information requested below, and send this form to us. There is no obligation, of course.

Date: _____

1. Name: _____ Title: _____

2. Company: _____

3. Address: _____

City: _____ State: _____ ZIP: _____

Phone: _____ Fax: _____

4. Your Project or Job Number for this application: _____

SERVICE:

5. Condensate from (type of equipment): _____
_____

6. Is this equipment trapped? ❒ Yes ❒ No
What trap type? _____

7. Equipment pressure: Constant at _____PSI
or
Modulated from _____ PSI min.
_____PSI max.

8. Condensate line diameter: _____In.

9. Max. condensate load:_____GPM
_____Lbs./Hr.

If known,
Condensate conductivity
value:_____

Condensate specific gravity
value:_____

RECEIVER:

10. Will you use an existing receiver? ❒ Yes ❒ No
If "Yes", list — Diameter _____In.
Length_____In.
Outlet Connection:
Diameter _____In.
Capacity _____Gal.
ASME pressure rating: _____

11. What will you be pumping to?
❒ Deaerator _____PSI
❒ Flash Tank _____PSI
❒ Hot Well _____PSI
❒ Return Line _____PSI
❒ Other (specify) _____PSI

12. Max. steam pressure available: _____PSI
Line Size: _____

13. Max. air pressure available: _____PSI
Line Size: _____

ELECTRICAL REQUIREMENTS:

14. List NEMA Type:
❒ NEMA 1 (general indoor use)
❒ NEMA 3R (rain-tight)
❒ NEMA 4 (water- and dust-tight)
❒ NEMA 7 (explosion-proof)
❒ NEMA 12 (industrial)
Other (specify)_____

15. Electrical service available: (LMH Series Only)
_____Volts _____Hertz _____Phase
For NEMA 7 applications only:
Class_____ Group_____ Division_____

SPECIAL REQUIREMENTS:

16. Tank construction materials: _____
_____
_____

17. Where unit will be installed: ❒ Indoors ❒ Outdoors

18. Is a stand-by system needed? ❒ Yes ❒ No

19. Any other special requirements?
(i.e. insulation, special control panel, etc.)

_____

_____

_____

_____

– OVER –

APPLICATION DIMENSIONS

johnson liqui-mover products

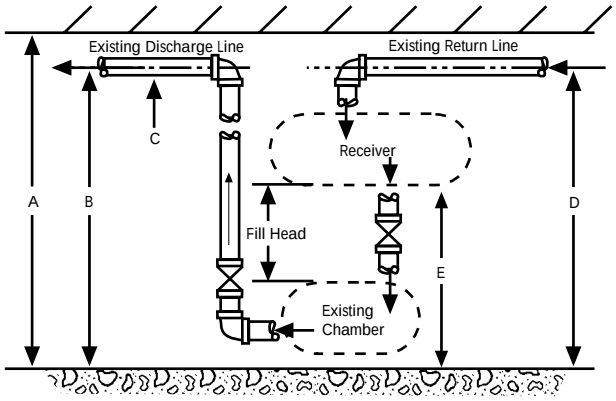

Fig. 31

PLEASE PROVIDE US WITH THE FOLLOWING DIMENSIONS

A._____

(distance from floor to ceiling)

B._____

(elevation of existing discharge line)

C._____

(diameter and length of discharge line – if multiple lines, list each line)

D._____

(diameter and elevation of existing condensate supply line to receiver)

E._____

(existing receiver height – enter only if you are using an existing receiver)

MODEL/SERIES DESIRED

LMH Series –

- ❒ LMH-LOOO
- ❒ LMH-LROO
- ❒ LMH-LRFP
- ❒ LMH-500

LMV Series –

- ❒ LMV-LOOO
- ❒ LMV-LROO
- ❒ LMV-LRSM

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HOW TO ORDER A LIQUI-MOVER

A Liqui-Mover catalog number specifies the type, size and construction details of the unit you're ordering. The example below shows how this system works.

Product Type		LMH – Liqui-Mover Horizontal LMV – Liqui-Mover Vertical
Size		LMH Only – 5, 10, 20, 40, 50, 65, 110, 150, 200, 500 (Please refer to sizing charts on pgs. 16 & 17 for specific capacities.) LMV Only – 1610, 1615, 1620, 1630
Model		LOOO – Without Receiver LROO – With Receiver LRFP – With Receiver, Framed, Piped (LMH models) LRSM - With Receiver, Skid Mounted (LMV models)
Level Control		ERS (LMH only) – Electrodes, Relay, Solenoid Valve ERC (LMH only) – Electrodes, Relay, Cylinder Valve EFAC (LMH only) – Float, Air Switch, Cylinder Valve FSA (LMV and LMH-500 only) – Float, Self-Actuated
LMV only	# of Pumps	1, 2, 3, 4, 5 or 6
ERC/ERS MODELS	NEMA Rating	1 (general indoor use) 3 (rain-tight) 4 (water- and dust-tight) 7 (explosion-proof, Class 1, Group D, Div. 1) 12 (industrial)
ERC/ERS MODELS	Voltage	120/60/1 Standard (other voltages available)