

Flue Gas-Fired LiBr Absorption Water Chiller & Heater



The flue gas-fired LiBr absorption water chiller & heater is used to supply cold in summer and heat in winter utilizing flue gas emissions from gas turbines, industrial furnaces and kilns as a source of heat. This system involves no expenses in terms of thermal energy. When the flue gas emissions are insufficient to supply the required quantities of cold or heat, a flue gas-supplementation system may be adopted as a substitute.

Working principle

The flue gas-fired LiBr absorption water chiller & heater is a system which uses the thermal energy of HT flue gas (200-600°C) to generate cold or heat quantities. The cycling working medium is the aqueous solution of lithium bromide (LiBr). LiBr works as an absorbent and water works as a refrigerant.

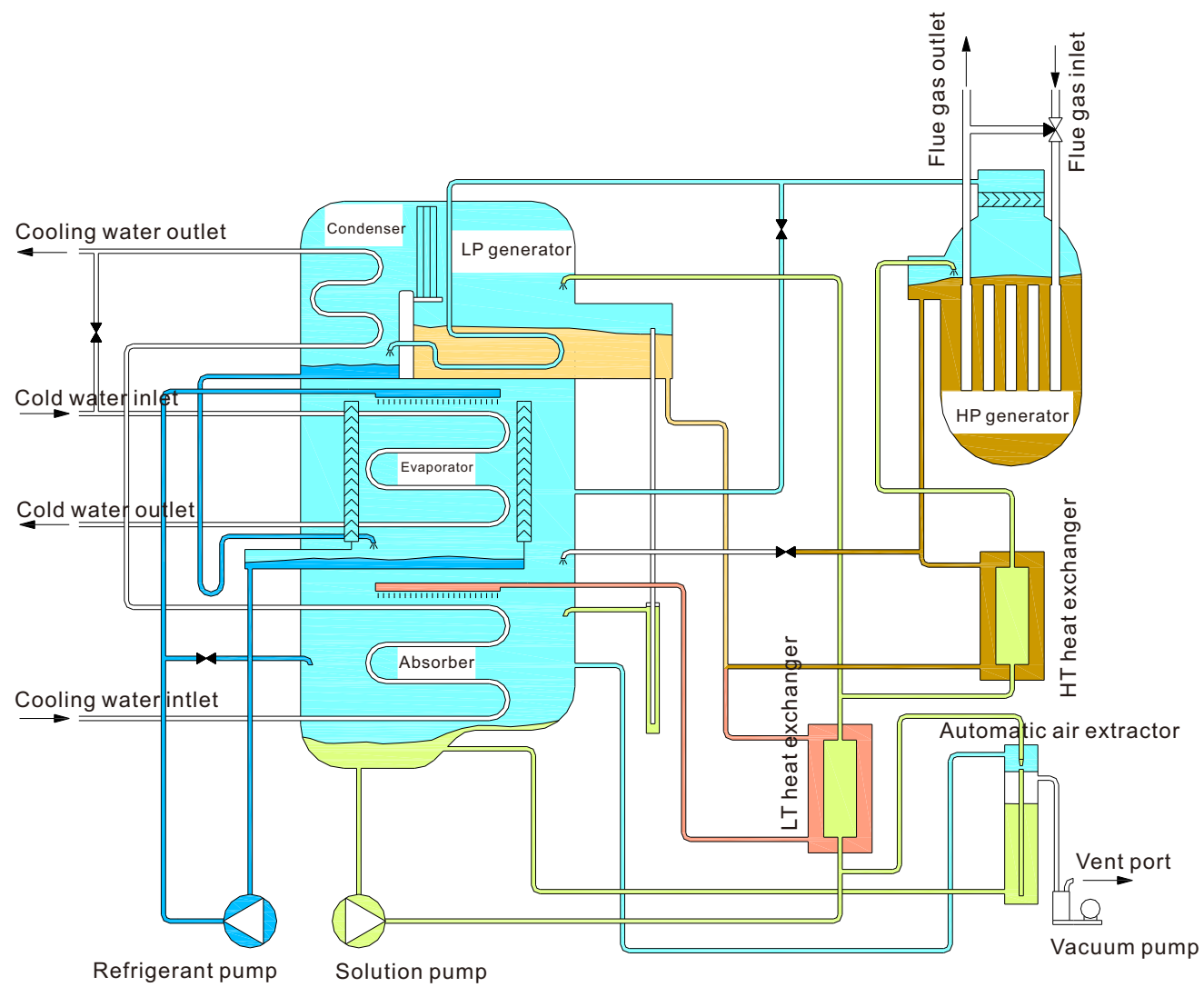
The system comprises primarily the HP generator, LP generator, condenser, evaporator, absorber, HT heat exchanger, LT heat exchanger, automatic air extractor, burner, vacuum pump and canned pump.

Refrigeration Principle: The refrigerant water in the evaporator evaporates away from the surface of the heat conducting tube. As heat in the cold water is taken away from the tube, the water temperature drops and quantities of cold are generated. The refrigerant steam evaporated from the evaporator is absorbed by the mixed solution in the absorber and therefore dilutes the solution. The diluted solution in the absorber is then delivered by the solution pump to the LT heat exchanger, where the solution flow branches into two ways. One part of the solution is delivered via the HT heat exchanger to the HP generator, where it is heated by HT flue gas to produce refrigerant steam. Then the solution becomes an HT thick solution. The other part of the solution is delivered to the LP generator, where it is heated by the refrigerant steam from the HP generator. After refrigerant steam is produced, the solution becomes a LT thick solution. The HT thick solution in the HT heat exchanger releases heat before converging with the LT thick solution to form a mixed solution. After the mixed solution releases heat in the LT heat exchanger and enters the absorber, it absorbs the refrigerant steam from the evaporator, becomes a thin solution and enters the next cycle. The refrigerant steam/water generated by the HP/LP generators is cooled in the condenser to form refrigerant water, which is further depressurized by a throttle valve. The depressurized refrigerant water is then delivered into the evaporator, where it is evaporated and used for refrigeration purposes. Then the next cycle begins.

Heating Principle: The circulated cooling water flow is therefore stopped. The thin solution in the absorber is then delivered by the solution pump to the HP generator by way of the LT heat exchanger and HT heat exchanger, where it is heated by HT flue gas to produce refrigerant steam. The refrigerant steam is directly delivered to the evaporator and absorber, where it is used to heat water in the evaporator (the water works as a heating medium) into hot water. After the heating process is completed, the refrigerant steam will condense into refrigerant water. The thin solution in the HP generator, which releases refrigerant steam, is condensed into a thick solution, enters the absorber and mixes with the refrigerant water to produce a thin solution. Then the thin solution is delivered by the solution pump to the next cycle.

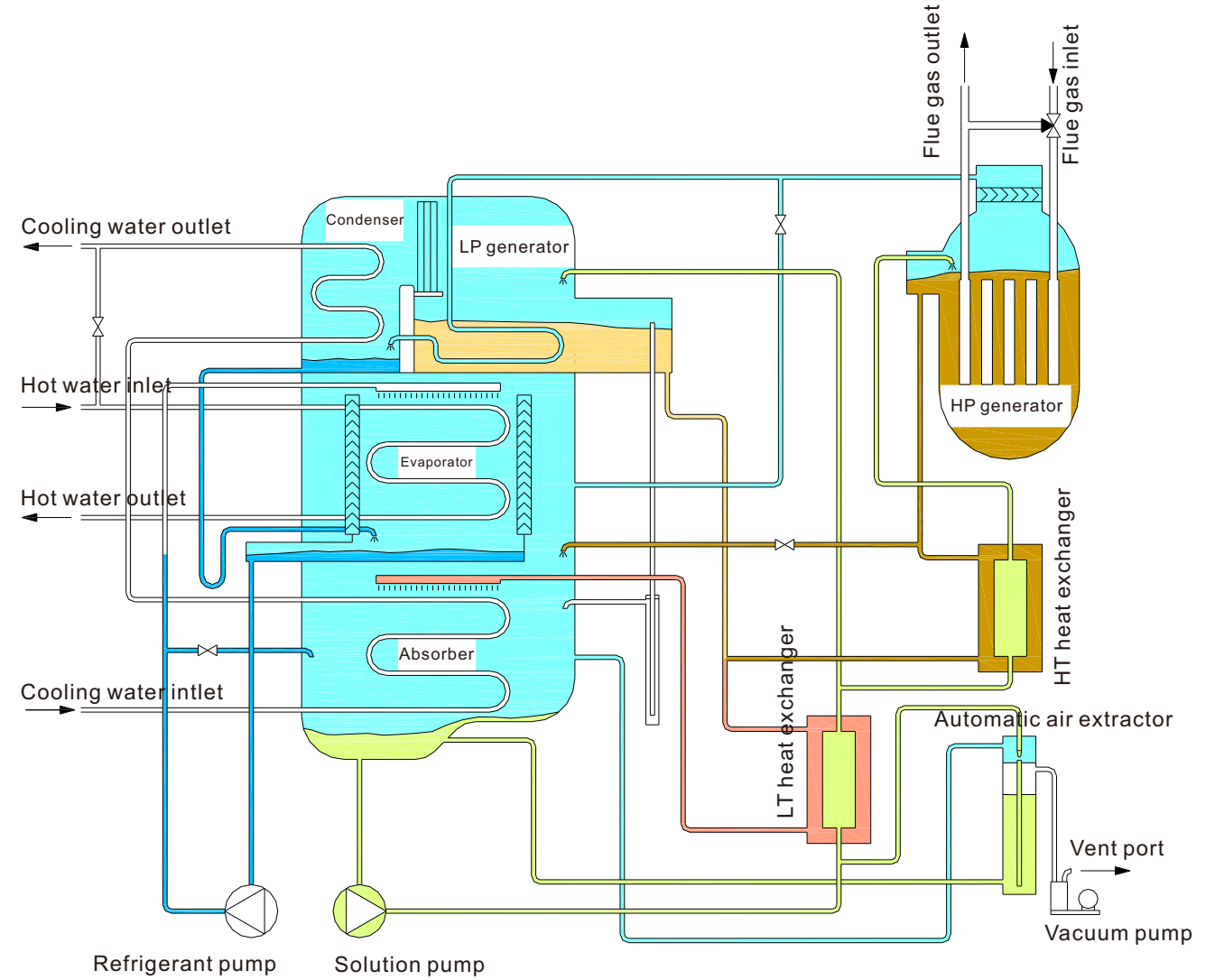
The aforesaid cycle occurs repeatedly to form a continuous heating process.

Refrigeration Flowchart



Thin solution
 Mixed solution
 HT thick solution
 LT thick solution
 Refrigerant steam
 Refrigerant water
 Valve open

Heating Flowchart



Thin solution
 Mixed solution
 HT thick solution
 LT thick solution
 Refrigerant steam
 Refrigerant water
 Valve open

Product Model No. Format

YX—116 D

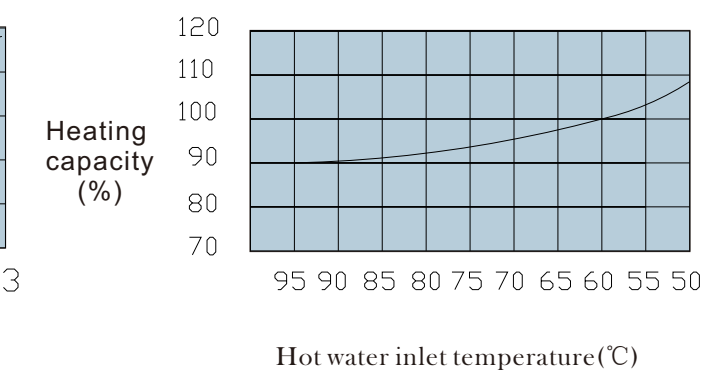
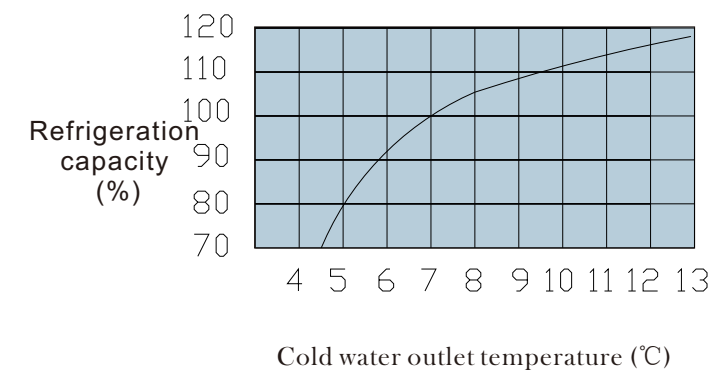
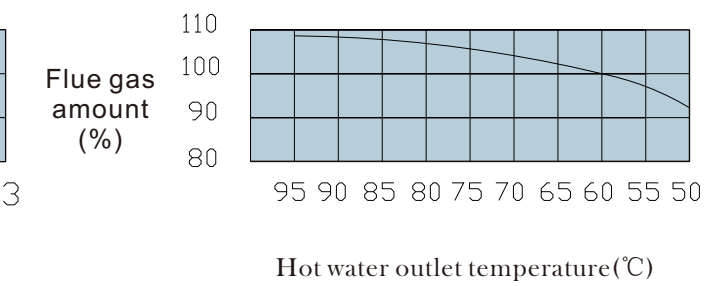
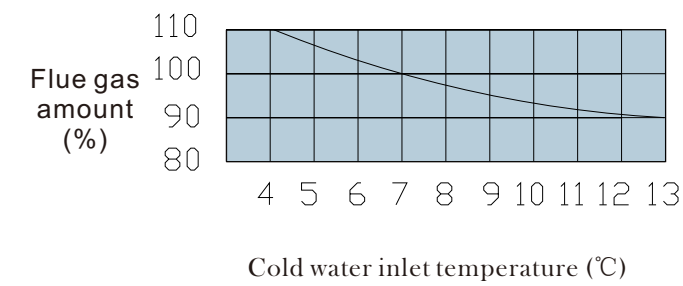
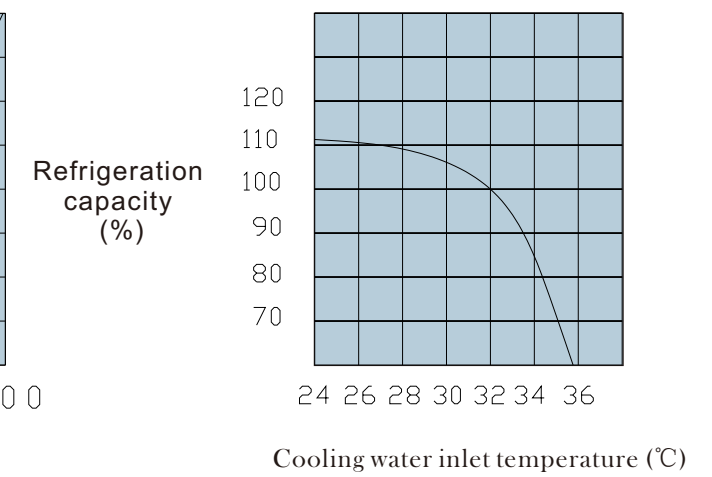
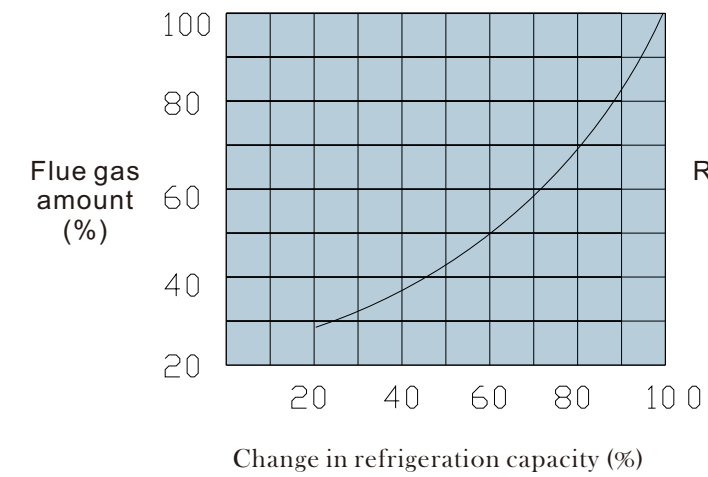
Cold Water Outlet Temperature: D (7°C), Z (10°C), II (13°C) and T (16°C)

Nominal Refrigeration Capacity: 116×10kW

YX (flue gas-fired LiBr absorption water chiller & heater)

YZX (flue gas-supplementation LiBr absorption water chiller & heater)

Performance curve



Nominal Parameters of a Flue Gas-Fired LiBr Absorption Water Chiller & Heater

Model Number		YX-	58	70	81	93	105
Refrigeration Capacity		KW	580	700	810	930	1050
		×10 ⁴ Kcal/h	50	60	70	80	90
		USRT	165	198	231	265	299
Heating Capacity		KW	407	582	686	779	884
		×10 ⁴ Kcal/h	35	50	59	67	76
Cold/Heat Water	Inlet/Outlet Temperature	℃					
	Refrigeration Flow	m ³ /h	100	120	140	160	180
	Heating Flow	m ³ /h	70	84	98	112	126
	Pressure Loss	kPa	85.1	85.4	52.3	52.3	36.0
	Adaptor Diameter	DN(mm)	125	125	150	150	150
Cooling Water	Inlet/Outlet Temperature	℃					
	Flow Rate	m ³ /h	143	171	200	228	257
	Pressure Loss	kPa	58	58	84	84	58
	Adaptor Diameter	DN(mm)	150	150	200	200	200
Flue Gas	Inlet/Outlet Temperature	℃					
	Consumption	Nm ³ /h	3188	3825	4463	5100	5738
	Adaptor Diameter	DN(mm)	400	400	450	450	500
Electricity	Total Power	KW	2.8	3.8	3.8	3.8	4.2
	Power Supply						
Unit Size	Length (L)	mm	4000	4030	4550	4750	4250
	Width (W)	mm	2260	2340	2410	2500	2620
	Height (H)	mm	2100	2160	2160	2320	2480
Transportation							
Total Shipment Weight		t	7.7	9.1	10.4	10.6	12.8
Operation Weight		t	9.2	10.5	10.6	12.1	14

116	145	174	204	233	262	291	349	465	407	523	582	698
1163	1450	1740	2040	2330	2620	2910	3490	4650	4070	5230	5820	6980
100	125	150	175	200	225	250	300	400	350	450	500	600
331	413	496	579	661	744	827	992	1323	1157	1488	1653	1984
814	1018	1221	1425	1628	1832	2035	2442	3256	2849	3663	4070	4884
70	88	105	123	140	158	175	210	280	245	315	350	420
Cold Water 12→7/hot water 55→60												
200	250	300	350	400	450	500	600	800	700	900	1000	1200
140	175	210	245	280	315	350	420	560	490	6308	700	840
52.5	52.5	52.5	73.2	73.0	98.8	73.1	98.6	49.3	49.3	93.9	93.8	93.8
150	200	200	200	250	250	250	250	300	300	350	350	400
Cooling Water 32→38												
285	356	428	499	570	581	713	855	1140	998	1283	1425	1710
84	84	118	50	67	50	67	113	113	113	64	64	64
200	250	250	250	300	300	350	350	400	350	400	400	450
500→170												
6375	7969	9563	11156	12750	14344	15938	19125	25500	22313	28688	31875	38250
550	600	650	700	700	750	800	850	1000	950	1100	1250	1250
4.2	4.4	5.4	5.8	6.4	6.4	7.4	7.7	8.7	8.2	9.7	12.2	13.2
3-phase/380V/50Hz												
4920	4960	5440	5500	6020	5560	6060	7080	7150	7120	8720	8750	8780
2740	2815	3025	3180	3315	3480	3520	3695	3890	3810	4305	4410	4790
2620	2640	2640	2920	3130	3320	3360	3380	3810	3600	3610	3840	3920
Transportation in whole												
14.1	17	18.8	21.7	24.6	26.1	29.1	34.0	42.6	38.4	49.7	54.3	61.6
16.2	19.4	21.2	24	27.8	29.3	32.2	37.9	48.5	42.3	53.4	58.8	67.2

Nominal Parameters of a Flue Gas-Supplementation Water Chiller & Heater

Model Number		YX-	58	70	81	93			
Refrigeration Capacity		KW	580	700	810	930			
		×10 ⁴ Kcal/h	50	60	70	80			
Heating Capacity		USRT	165	198	231	265			
		KW	488	582	686	779			
		×10 ⁴ Kcal/h	42	50	59	67			
Cold/Heat Water	Inlet/Outlet Temperature		℃						
	Flow Rate		m ³ /h	100	120	140	160		
	Pressure Loss		kPa	85.1	85.4	52.3	52.3		
	Adaptor Diameter		DN(mm)	125	125	150	150		
Cooling Water	Inlet/Outlet Temperature		℃						
	Flow Rate		m ³ /h	142.5	171	200	228		
	Pressure Loss		kPa	58	58	84	84		
	Adaptor Diameter		DN(mm)	150	150	200	200		
Flue	Rated thermal energy consumption	Flue Gas	Inlet/Outlet Temperature		℃				
			Refrigeration consumption		Nm ³ /h	1594	1913	2232	2550
			Heating consumption		Nm ³ /h	1875	2250	2625	3000
			Adaptor Diameter		DN(mm)	300	350	350	400
		Max. supplementation for refrigeration		×10 ⁴ Kcal/h	18.4	22.1	25.8	29.4	
		Max. supplementation for heating		×10 ⁴ Kcal/h	20.4	24.4	28.5	32.6	
		Fuel gas adaptor diameter		DN(mm)	32	32	32	32	
		Fuel oil adaptor diameter		DN(mm)					
Electricity		Total Power		KW	3.6	4.2	4.2	4.2	
		Power Supply							
Unit Size		Length (L)		mm	4000	4030	4550	4750	
		Width (W)		mm	2260	2365	2470	2560	
		Height (H)		mm	2100	2160	2160	2320	
Transportation									
Total Shipment Weight		t	7.1	8.3	9.5	10.6			
Operation Weight		t	8.0	9.3	10.6	11.9			

105	116	145	174	204	233	262	291	349	407	465	523	582	698
1050	1163	1450	1740	2040	2330	2620	2910	3490	4070	4650	5230	5820	6980
90	100	125	150	175	200	225	250	300	350	400	450	500	600
299	331	413	496	579	661	744	827	992	1157	1323	1488	1653	1984
884	977	1221	1465	1710	1954	2198	2442	2931	3419	3908	4396	4885	5862
76	84	105	126	147	168	189	210	252	294	336	378	420	504
Cold Water 12→7/Hot Water 55.8→60													
180	200	250	300	350	400	450	500	600	700	800	900	1000	1200
36.0	52.5	52.5	52.5	73.2	73.0	98.8	73.1	98.6	49.3	49.3	93.9	93.8	93.8
150	150	200	200	200	250	250	250	250	300	300	350	350	400
Cooling Water 32→38													
256.5	285	356.3	427.5	498.75	570	581	713	855	998	1140	1283	1425	1710
58	84	84	118	50	67	50	67	113	113	113	64	64	64
200	200	250	250	250	300	300	350	350	350	400	400	400	450
500→170													
2869	3188	3985	4782	5579	6376	7173	7970	9564	11158	12752	14346	15940	19128
3375	3750	4688	5625	6563	7500	8438	9375	11250	13125	15000	16875	18750	22500
400	400	450	500	500	550	600	600	700	750	800	850	850	950
33.1	36.8	46.0	55.2	64.4	73.6	82.6	92.0	110.4	128.8	147.2	165.6	184.0	220.8
36.6	40.7	50.9	61.6	71.2	81.4	91.6	101.8	122.1	142.5	162.8	183.2	203.5	244.2
32	32	40	40	50	50	50	50	50	50	50	65	65	80
25													
4.6	5.0	5.0	5.0	6.5	7.3	7.9	8.9	10.0	10.4	13.2	14.2	16.7	20.7
3-phase/380V/50Hz													
4250	4920	4960	5440	5500	6020	5560	6060	7080	7120	7150	8720	8750	8780
2680	2835	2900	3100	3205	3350	3675	3742	3980	4100	4250	4505	4720	4910
2480	2620	2640	2640	2920	3130	3320	3360	3380	3600	3810	3610	3840	3920
Transportation in whole													
11.7	12.8	15.5	18.1	20.6	23.1	25.5	27.9	32.6	37.2	41.7	46.0	50.4	58.8
13.2	14.4	17.4	20.3	23.2	25.9	28.7	31.4	36.6	41.7	46.8	51.7	56.5	66.0