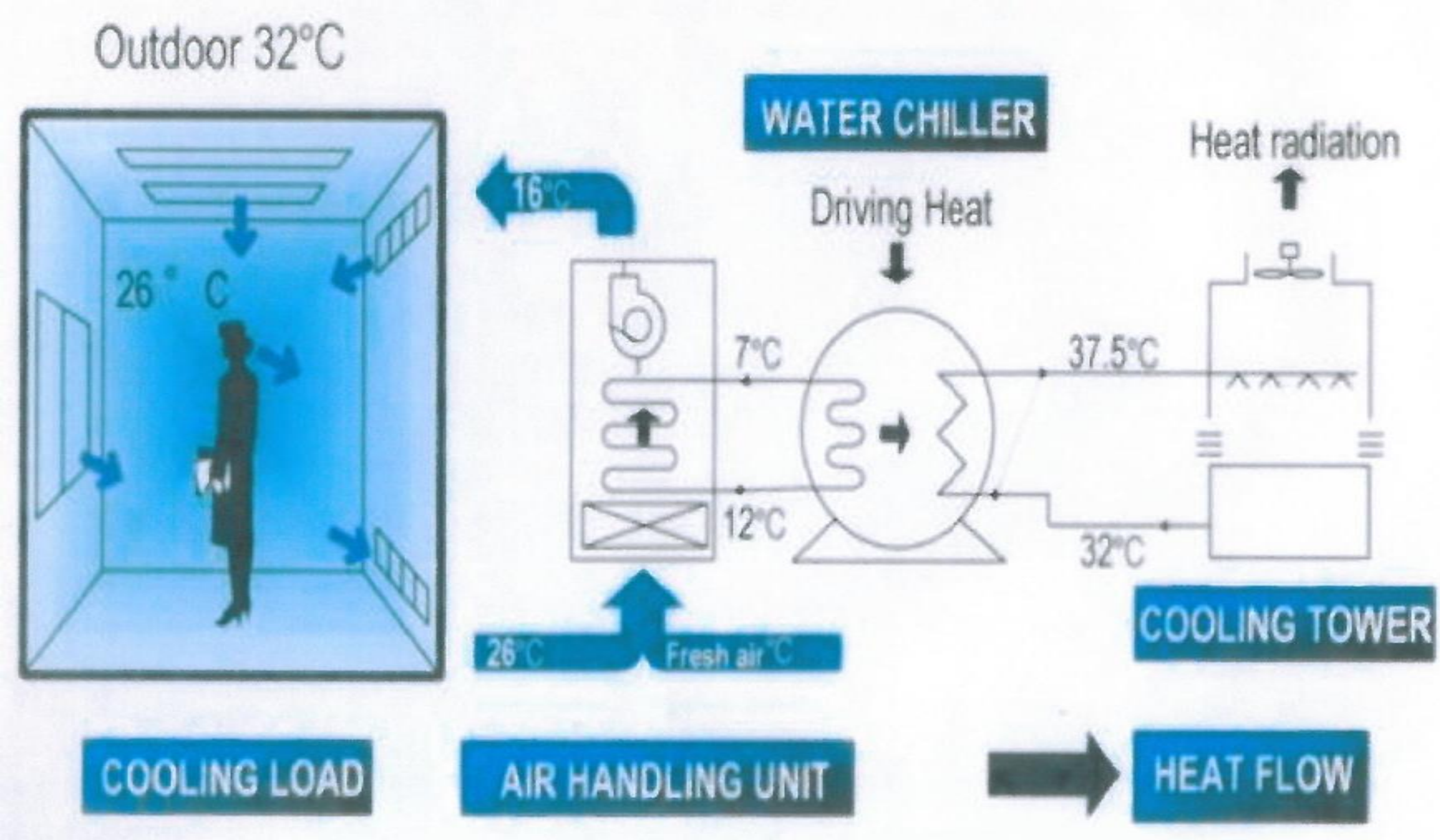
Product Introduction

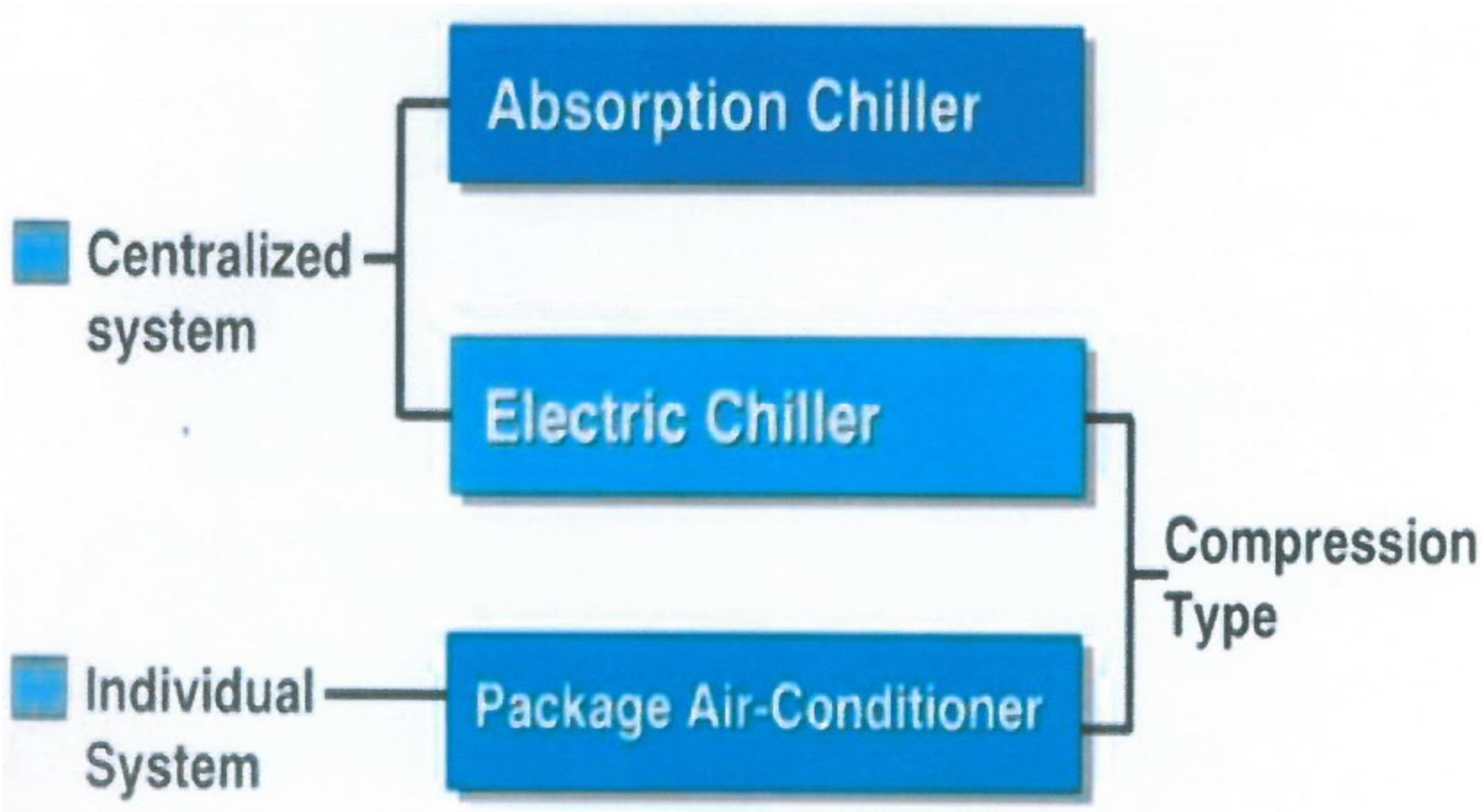
(Absorption & Electric Chiller)

WORLD EnC

Commercial Air Conditioning System



Type of Air-Conditioner



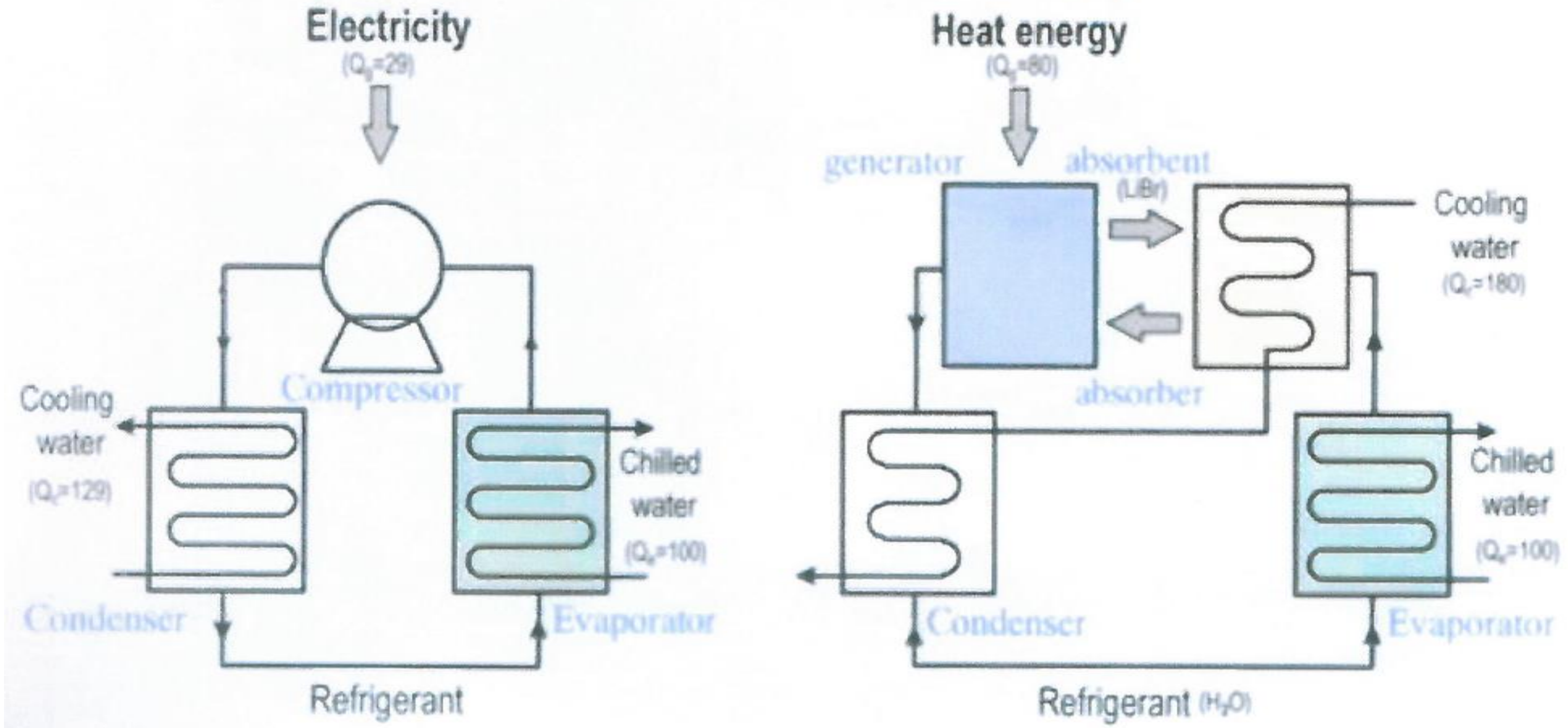
Absorption vs. compression

Compression cycle

(COP= Q_e/Q_g=100/29=3.5)

Absorption cycle

(COP= Q_e/Q_g=100/80=1.2)

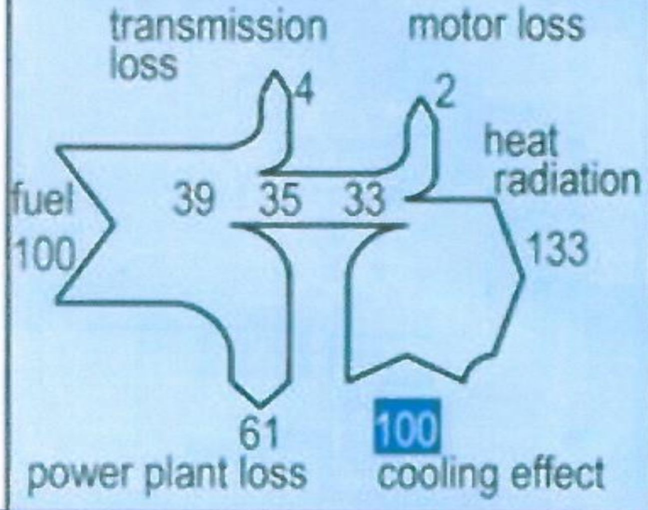
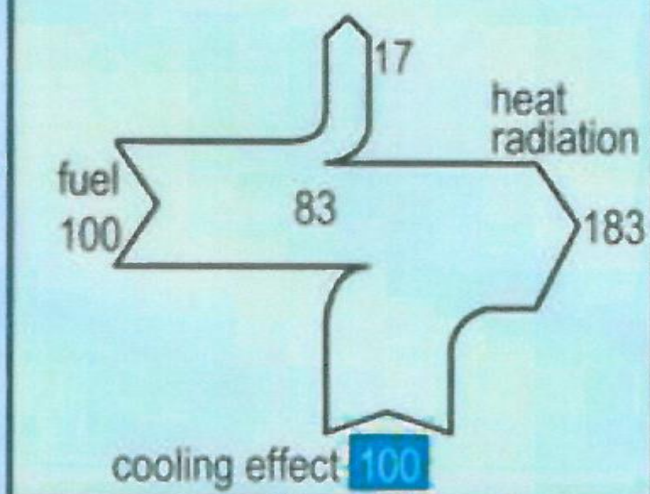


Commercial Air Conditioning System

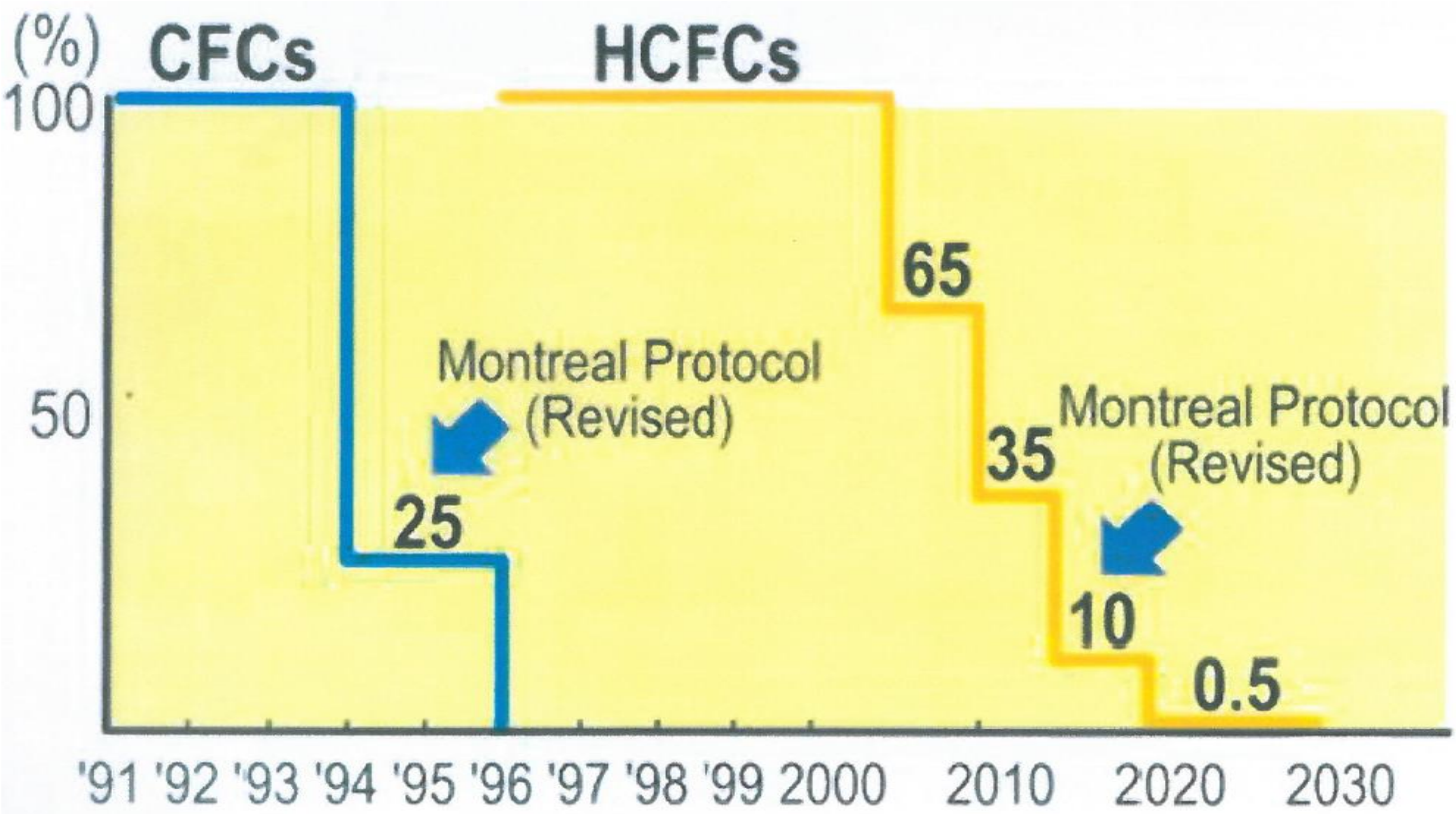
Advantages of Absorption Chiller

	Absorption Chiller	Electric Chiller
Energy Source	Town Gas,Oil, Steam,Hot Water	Big Electricity
	Small Electricity	Expensive power Receiving Facility
Heat Medium	Refrigerant:H_2O Absorbent:LiBr	Refrigerant: CFC,HCFC,HFC
	Safe&Harmless	Environmental Problem
Principle	Static Process	Dynamic Process
	Low Noise and Vibration	Noise and Vibration

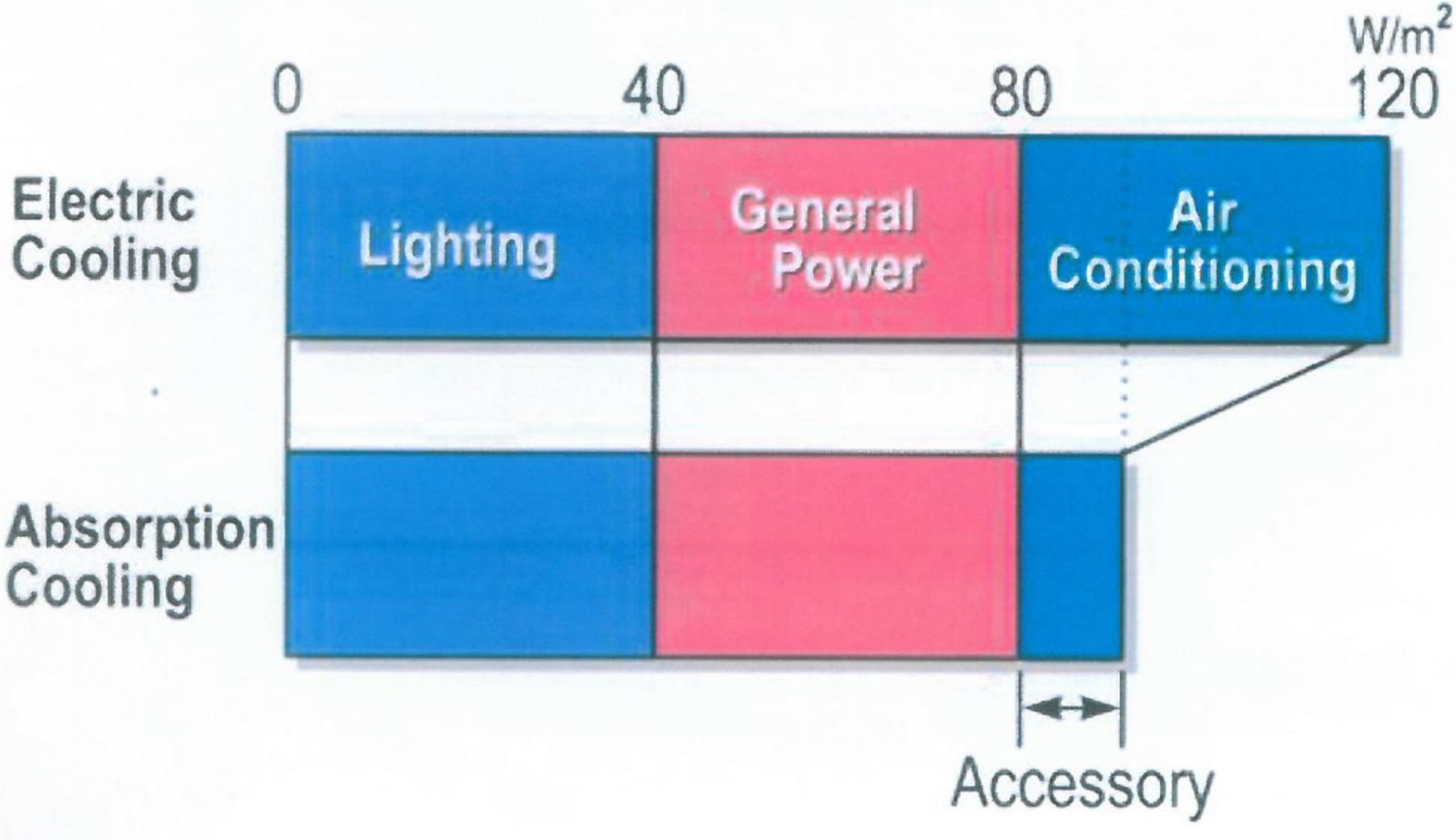
Coefficient of Performance

	Electric Chiller	Absorption Chiller
		
System	COP=100/100= 1.0	COP=100/100= 1.0
Energy Efficiency	η = 33%	η = 83%

Schedule of CFC & HCFC Phase Out



Power Demand on Office Building



History of Absorption Technology

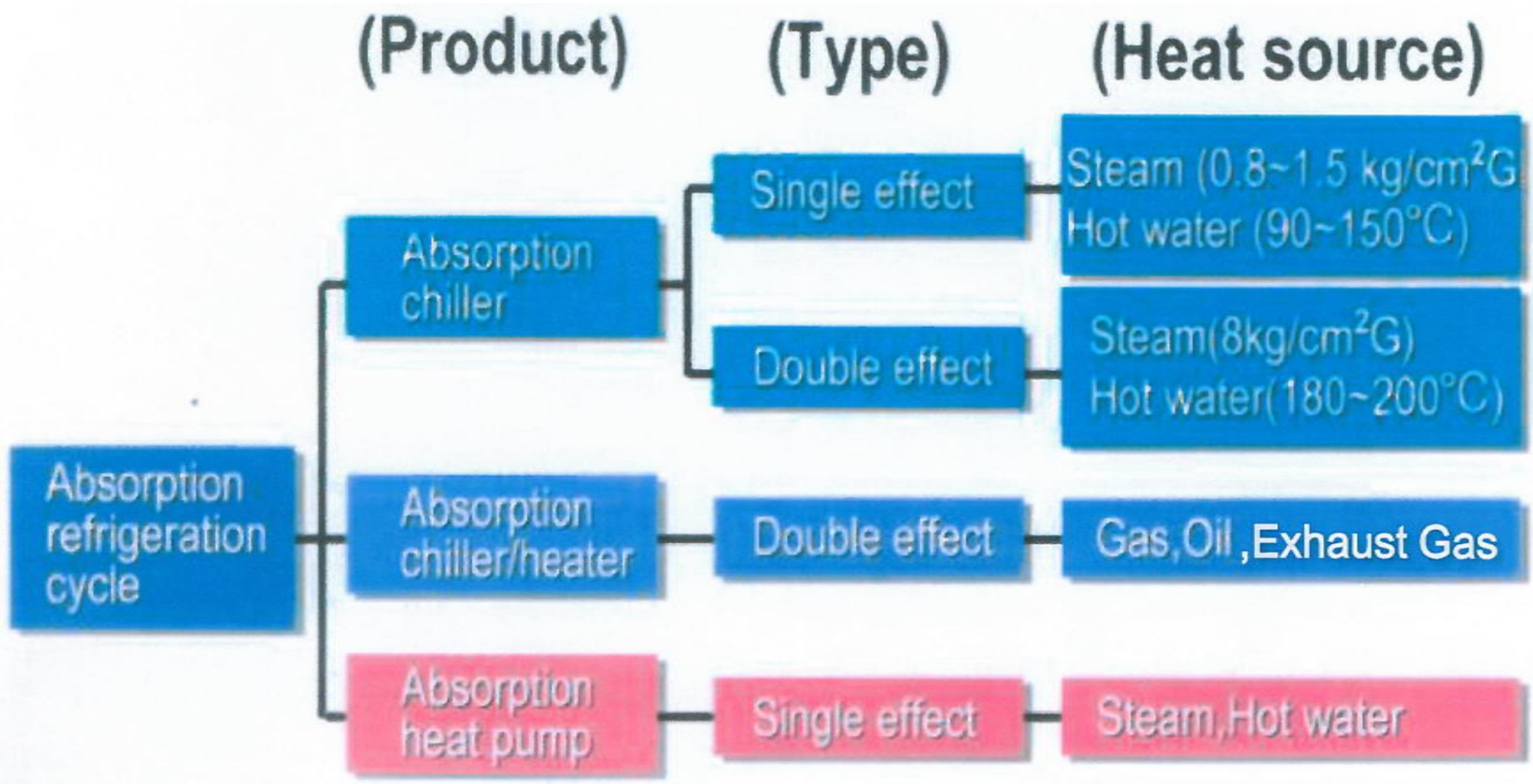
1775	Ice Making under Vacuum by William Cullen(UK)
1777	Absorption Chilling Theory by Nairne(France)
1860	Ammonia Absorption Chiller(France)
1945	Absorption Chiller(LiBr/H_2O)(Carrier,USA)
1958	Gas Fired Absorption Chiller(Kisha,Japan)
1961	Double Effect Steam Fired Absorption Chiller(Statham,USA)
1968	Double Effect Gas Fired Absorption Chiller(Kisha,Japan)
1972	Simultaneous Supply Absorption Chiller/Heater (SANYO,Japan)
1983	**Double Effect Absorption Chiller (LG Cable, Korea)**
1983	**Generator of Absorption Chiller (World E&C,Korea)**
2005	**2 Stage WF Absorption Chiller (World E&C,Korea)**
2010	**High Eff. Absorption Chiller/Heater(World E&C,Korea)**

World E&C started Absorption Chiller business from 1983 with LG Cable

Features of Absorption Chiller

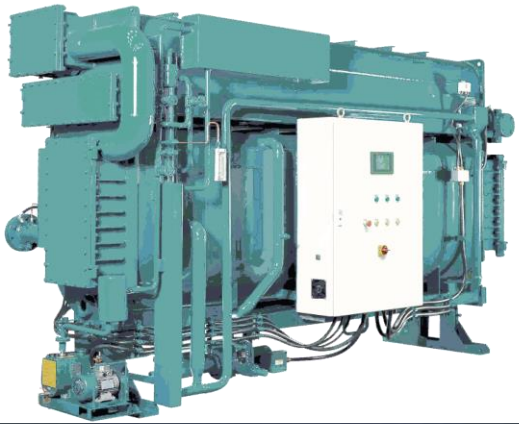
- Small Power Consumption
- Ozone Safe,CFCs Free
- Low Noise and Vibration
- Low Maintenance Cost
- Waste Heat is Applicable
- Chilled/Hot Water Supply(Direct fired type)
- Wide Range Selection

Type of Absorption Products

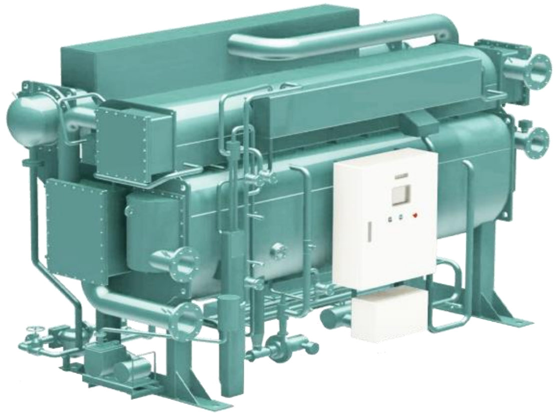


Absorption Chiller & Heater (50RT ~ 1,500RT)

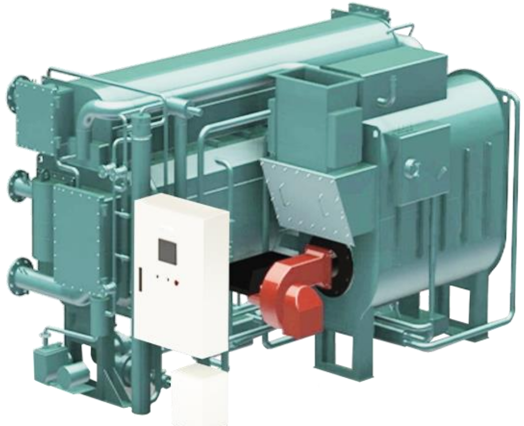
Double Lift Hot Water Absorption Chiller



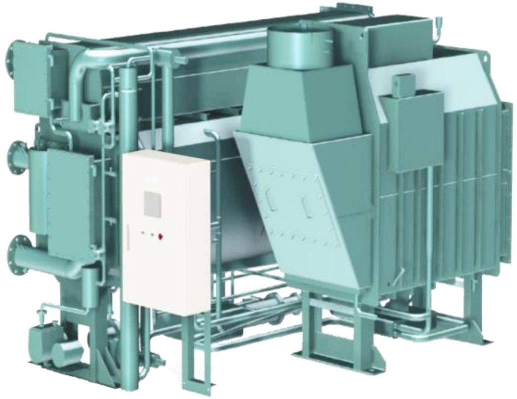
Single Effect Hot water Absorption Chiller



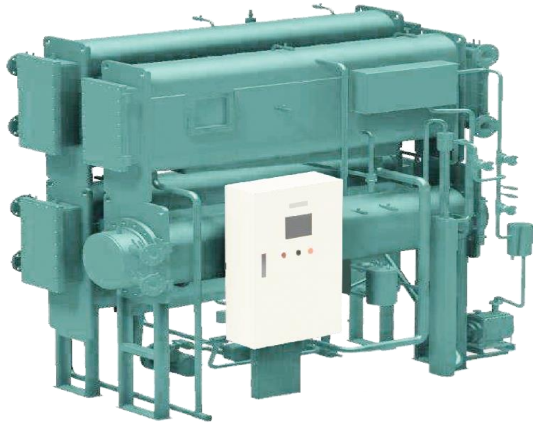
Steam Fired Absorption Chiller & Heater



Direct Fired Absorption Chiller & Heater

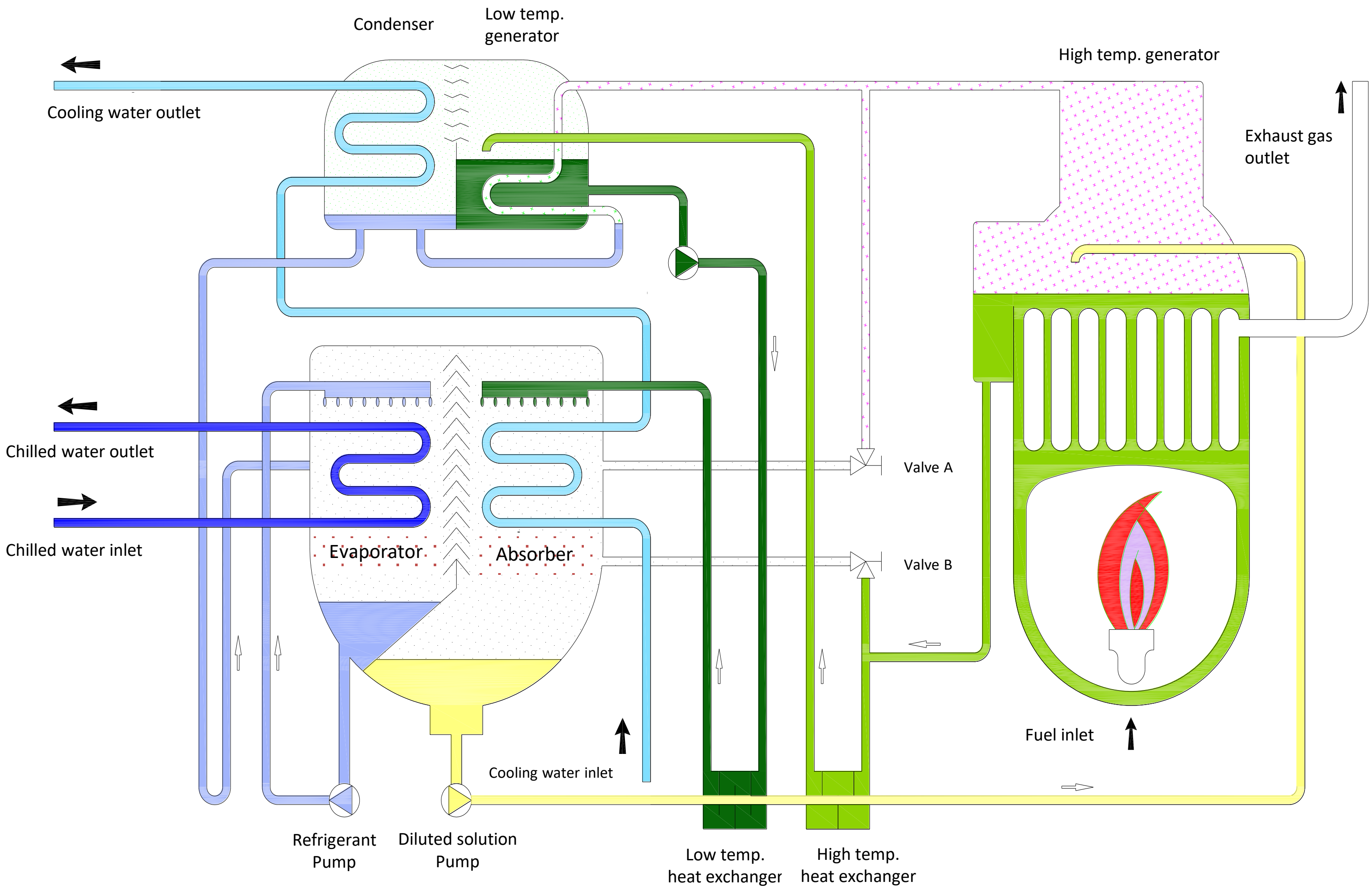


Exhaust Gas Absorption Chiller & Heater

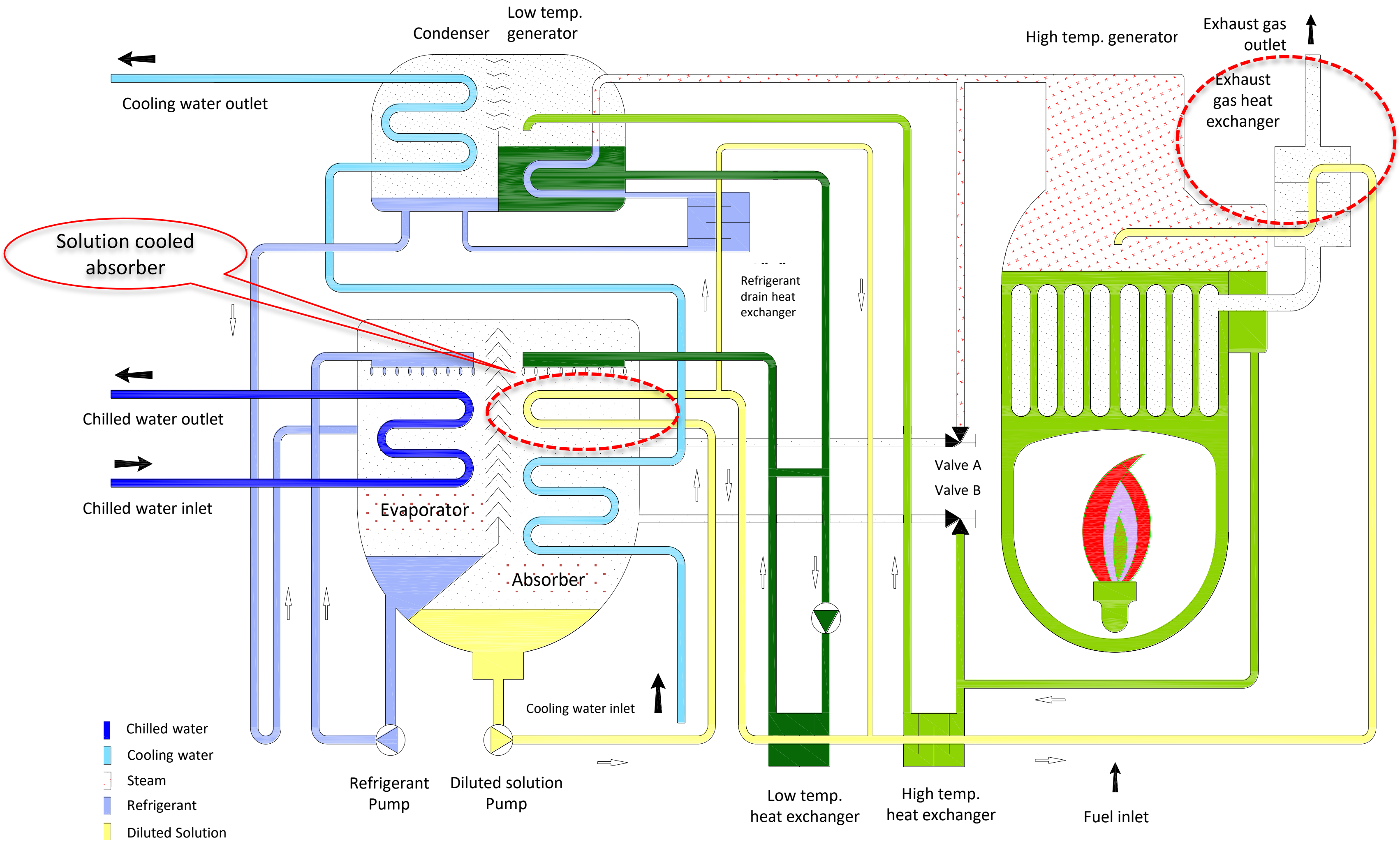


Absorption Heat Transformer (Heat Pump)

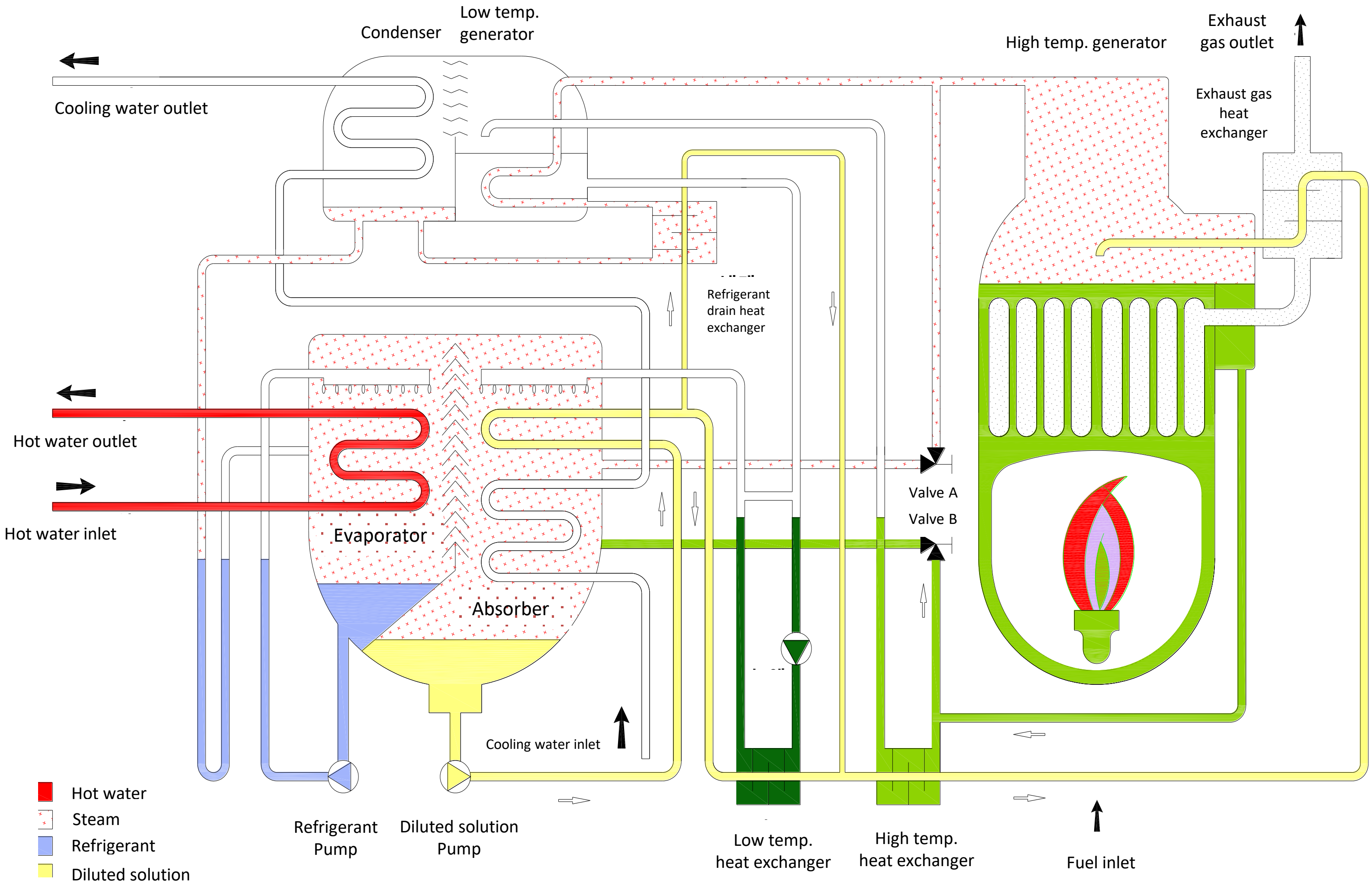
Direct Fired Absorption chiller & heater(COP 1.1) - Cooling Cycle



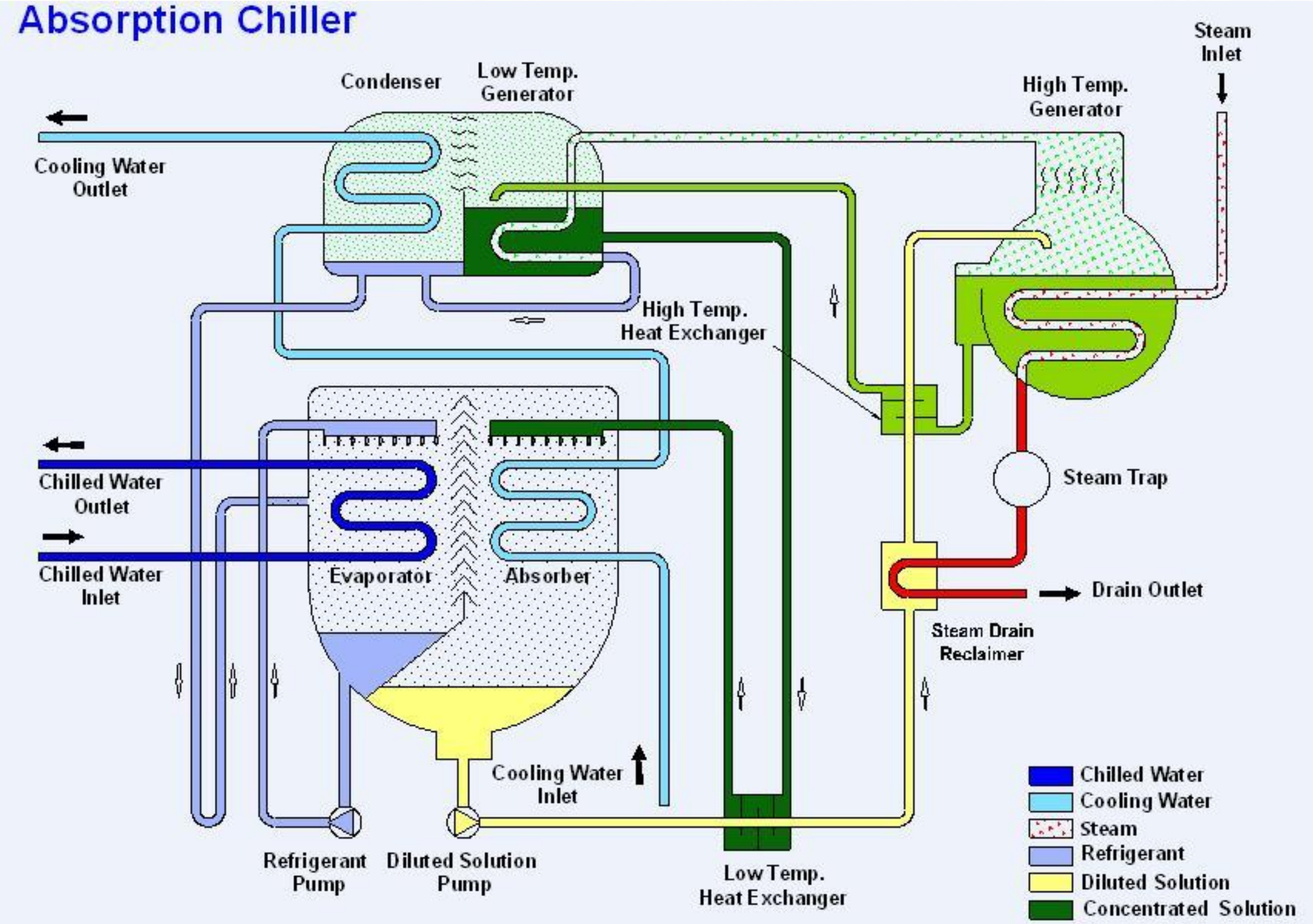
High-efficiency Direct Fired Absorption chiller & heater(COP 1.51) - Cooling Cycle



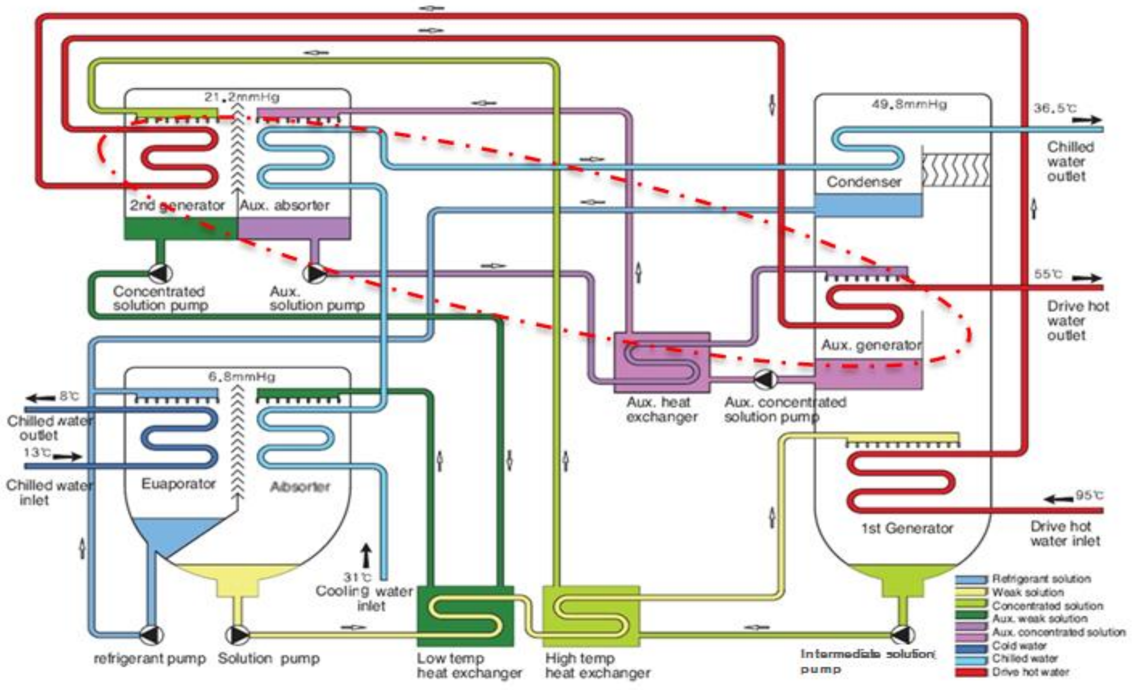
High-efficiency Direct Fired Absorption chiller & heater(COP 1.51) - Heating Cycle



Steam Fired Absorption Chiller Cycle



Hot Water Absorption Chiller (Inlet 95℃ -> Outlet 55℃)



Main cycle solution flow

Absorber → Diluted solution pump → Low-temp heat exchanger → high-temp heat exchanger → 1st generator

Intermediate solution pump → high-temp heat exchanger → 2nd generator → Concentrated solution pump → Low-temp heat exchanger

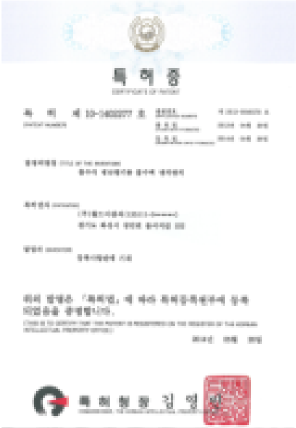
Aux cycle solution flow

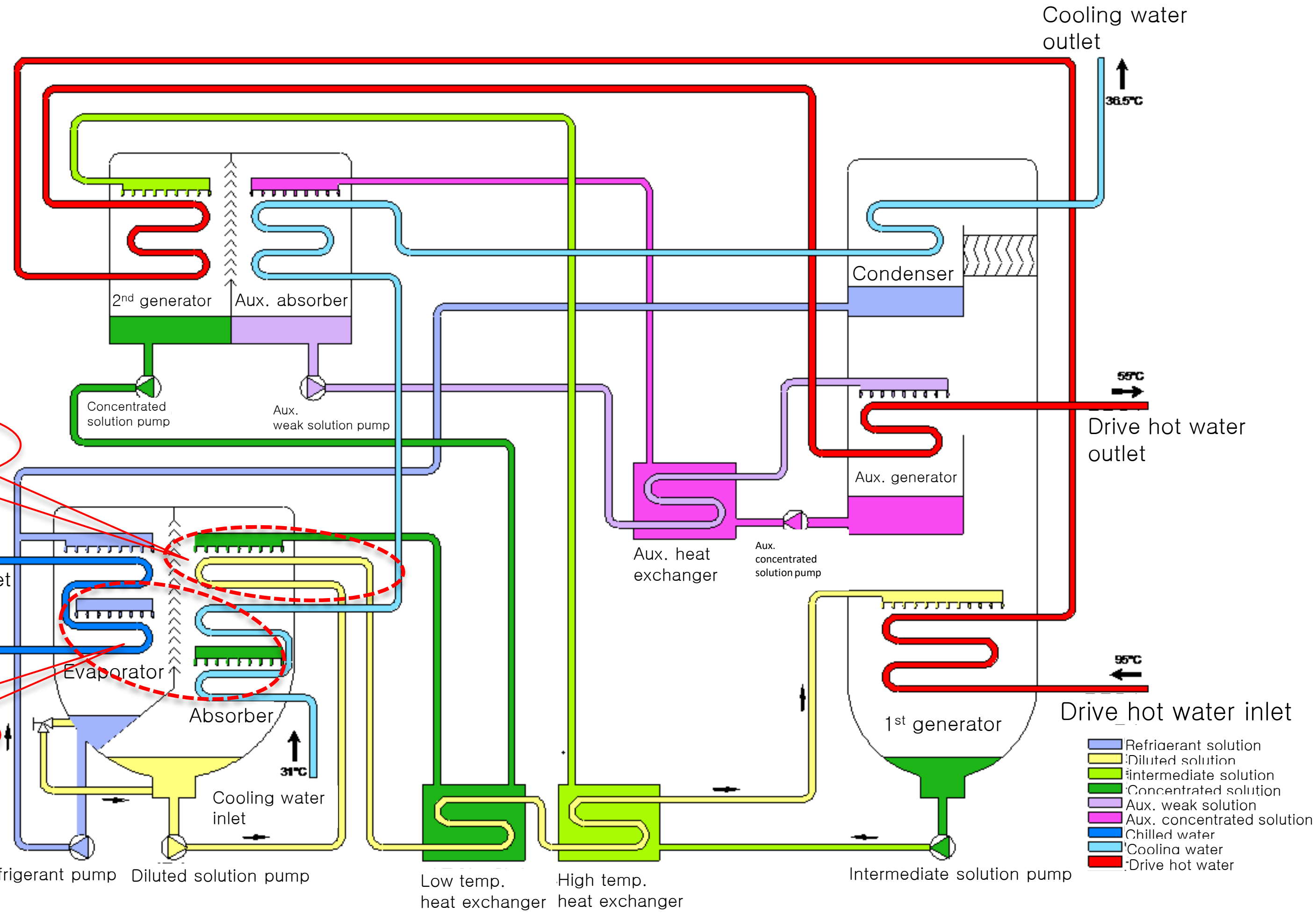
Aux. diluted solution pump → Aux heat exchanger → Aux. generator

Aux. absorber → Aux heat exchanger → Aux concentrated solution pump

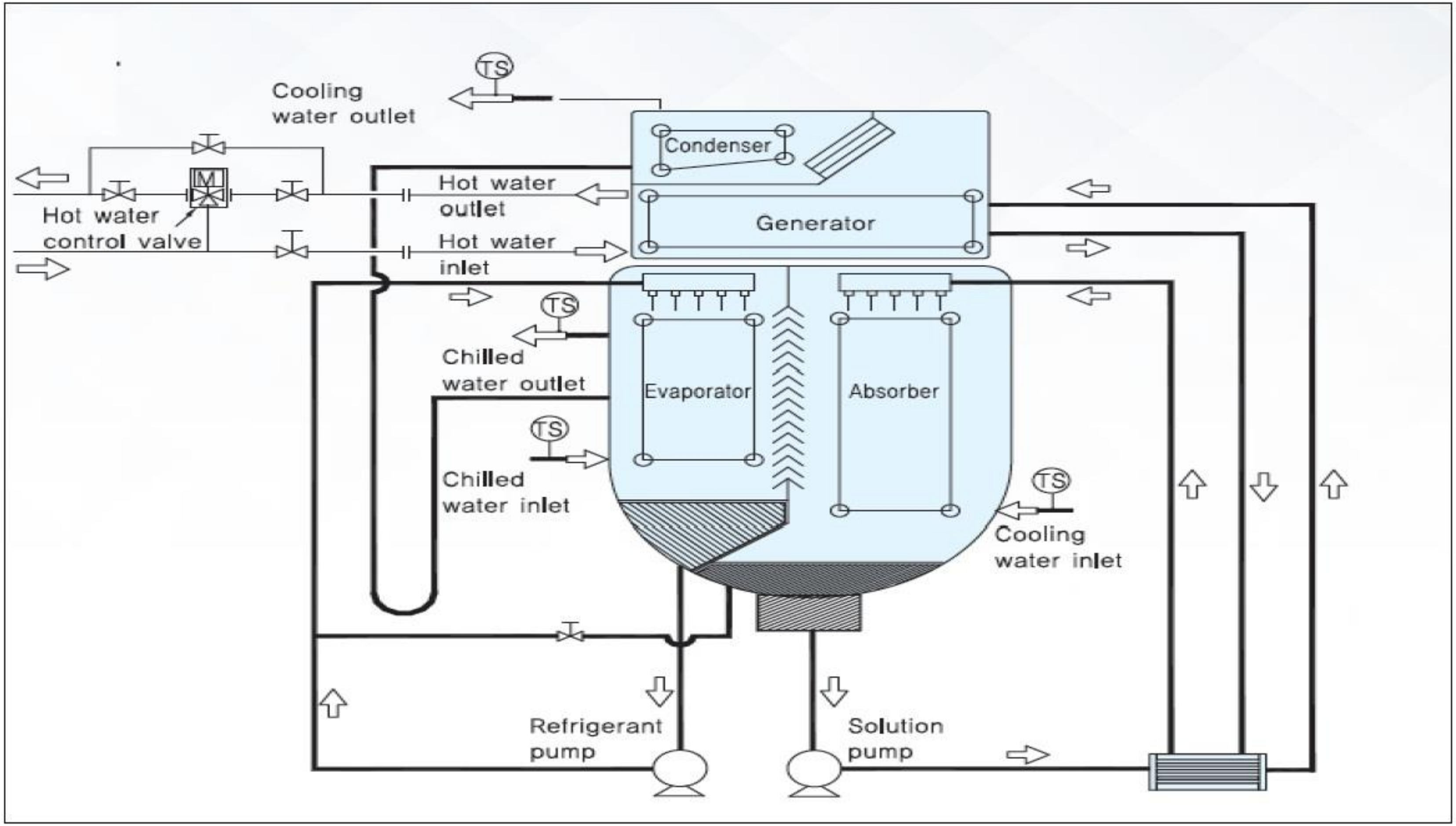
High-efficiency Hot Water Absorption Chiller

Patent

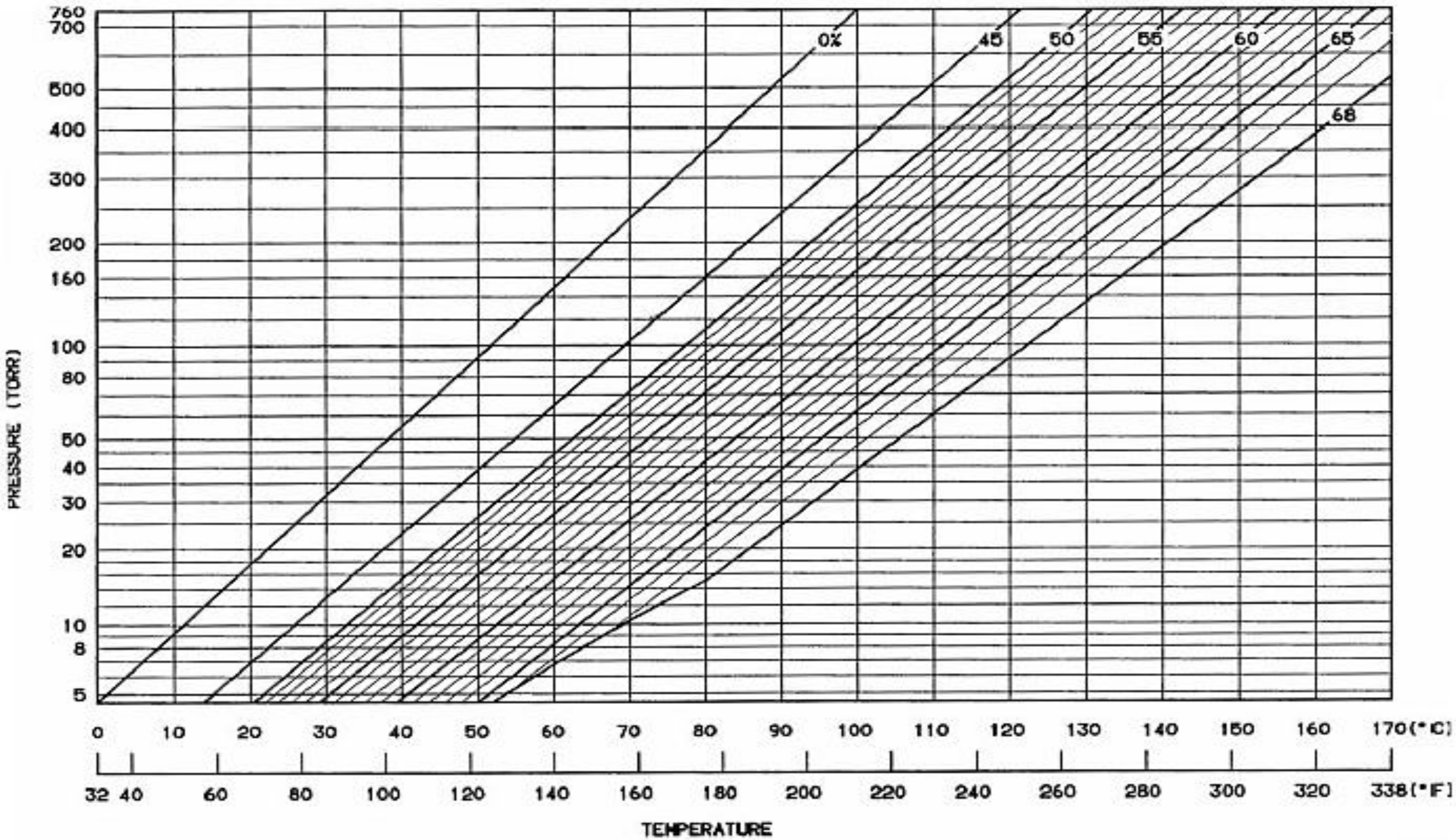




Hot Water Absorption Chiller Cycle (WSL Series)
Hot Water 95℃ -> 80℃



LiBr DURING Diagram



The earth we live is pressed by the weight of air layer of thickness of approx. 10km which is surrounding the earth and this pressure is called the atmospheric pressure.

The pressure lesser than this atmospheric pressure is called the vacuum. When explaining the vacuum for the absorption machine, it is required to know the relation between the pressure and the evaporation temperature of the water. It is experienced in a daily life that the water is boiled (evaporated) at 100°C (212°F) in the atmospheric pressure. When the pressure is higher than the atmospheric pressure, it is boiled at the temperature higher 100°C (212°F) while when the pressure is lower(vacuum), it is boiled at the temperature lower than 100°C (212°F). Table 2-1 shows the relation between the pressure and the evaporation temperature.

	Gauge Pressure (kg/cm^2G)	Absolute Pressure (kg/cm^2G)	Temp. (°C)	Remarks
Atmospheric Pressure	10	11	183.2	
	8	9	174.5	Driving pressure for double effect type
	5	6	158.1	
	1	2	119.6	Driving pressure for single effect type
	0.5	1.5	110.8	
1 atm.		760mmHg	100	Atmospheric Pressure
Vacuum		650.0	95.5	Pressure in he high temp. generator
		525.9	90.0	
		167.6	62.6	
		92.5	50.0	
		61.0	41.5	
		31.8	30.0	Pressure in the condenser
		29.4	28.6	
		9.2	10.0	
		6.54	5.0	Pressure in the evaporator
		5.68	3.0	

Table 2-1. The Relation Between The Pressure and The Evaporation Temperature

The pressure higher than the atmospheric pressure can be experienced with a boiler. The pressure lower than the atmospheric pressure can be experienced when climbing a mountain. Namely, in high mountains, as the air layer becomes weak by its height, the pressure to be applied becomes low. For this reason, the water boils at 89°C at the summit of 2,750m mountain and rice of a canteen cannot be well boiled. Like this, the lower the pressure, that is, the closer the atmospheric to the vacuum, the lower the temperature at which the water is evaporated. Therefore, the inside of the absorption machine should be always kept in high vacuum. Since a refrigerant is evaporated at 5°C to get the chilled water of 7°C by an Absorption Machine, it is required to keep a high-vacuum condition with pressure of 6.54mmHg in the Evaporator.

Thank you

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