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ENERGY EFFICIENT HEAT PUMPS

Walking the path of DECARBONIZATION AND ENERGY SAVINGS

Manufacturing Partner

KeHeMS
TECHNOLOGIES

KEHEMS TECHNOLOGIES

ACE CONSULTING & ENGINEERING

INNOVATIVE PARTNERSHIP

ACE and KEHEMS have partnered to bring the best Design, Engineering and Technology in Thermal Energy Storage Systems.

Combined they bring more than4 decades of industry experience and 150+ man-years of experience & global expertise.

With stringent quality systems KEHEMS surpass client specifications and requirements.

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ACE is a global management consulting firm providing Supply Chain solutions to businesses around the world. Headquartered in Connecticut, USA, ACE is committed to driving performance improvement for its clients by offering cutting-edge solutions and innovative approaches to business operations. ACE has a visible presence in the USA and Latin America with a vast network in Europe, India, and the Middle East.

ACE has partnered with the best equipment manufacturers in India and abroad, allowing us to source high quality products and services in the Environmental and Energy sectors. These solutions include the latest technology products, equipment, design, and engineering services. All our partners are thoroughly vetted in technology, expertise, manufacturing processes and financial stability.

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Applications

Heating & Cooling

- Building airconditioning
- Commercial projects
- Hospitals
- Hospitality
- Marine
- Process
- Ltr
- Plastic industry
- Industrial
- Regeration projects
- Mining
- Shipping
- All segments where air in an important aspect of application engineering

Lets analyse the situation

Buildings are a significant contributor of carbon emissions. As the broader economy transitions to net zero, various stakeholders are pushing for building decarbonization.

Electrifying space and water heating systems is one way to reduce building emissions—and electric heat-pump technology, which has improved and become cost-competitive in certain markets, has emerged as an increasingly viable solution.

Heating and cooking in commercial and residential buildings account for 6 percent of global Co2 emissions, according to our recent report on the netzero transition.1 (By factoring in emissions from total electric power consumed, energy use by buildings contributes approximately 27 percent of global CO2 emissions.2) These emissions are largely due to the on-site use of fossil fuels such as oil and natural gas.

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Solution

Building heat has typically been a challenge to electrify at scale because of the high cost and complexity of converting a wide variety of current heating systems (steam, hot water, forced air, to name a few), as well as the relative cost effectiveness of fossil-fuel energy sources.

However, electric heat pumps have become an increasingly effective way for buildings to decarbonize due to operating, equipment, and installation costs becoming more competitive.

A heat pump uses refrigerant and electricity to transfer heat from outdoor air or the ground to the inside of a building, even in colder temperatures). Today's models are 2.2 to 4.5 times more efficient than gas furnaces. If implemented worldwide, using heat pumps instead of traditional boilers and furnaces could cut global CO2 emissions by 3 gigatons per year. According to McKinsey analysis, heat pumps could constitute approximately 90 percent of new heating unit sales by 2050, compared with 35 percent today.

Are heat Pumps a fit?

Heat pumps are an optimal decarbonization solution for only certain building types. When assessing for viability, building owners and other stakeholders will often need to start by looking at a building's current heat distribution system.

Buildings with forced air or low-temperature hot water distribution, for example, tend to be good candidates for heat-pump retrofits, as they don't require high operating temperatures, such as steam, might make less sense for a retrofit. For some buildings and markets, heat-pump conversion could be significantly expensive compared with other low-emission options, including hybrid boiler systems in which a fossil-fuel backup turns on when electricity prices spike (in certain cases, the gas distribution system could continue to provide reliability and resiliency in the case of power outages*).

Regions that rely on district heating are markets in which decarbonizing central facilities could be more cost-effective than installing individual heat pumps.

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* This will require gas-powered heating units to be able to function without electricity, but that should not pose a significant barrier technologically,

Heating & Cooling Cycle

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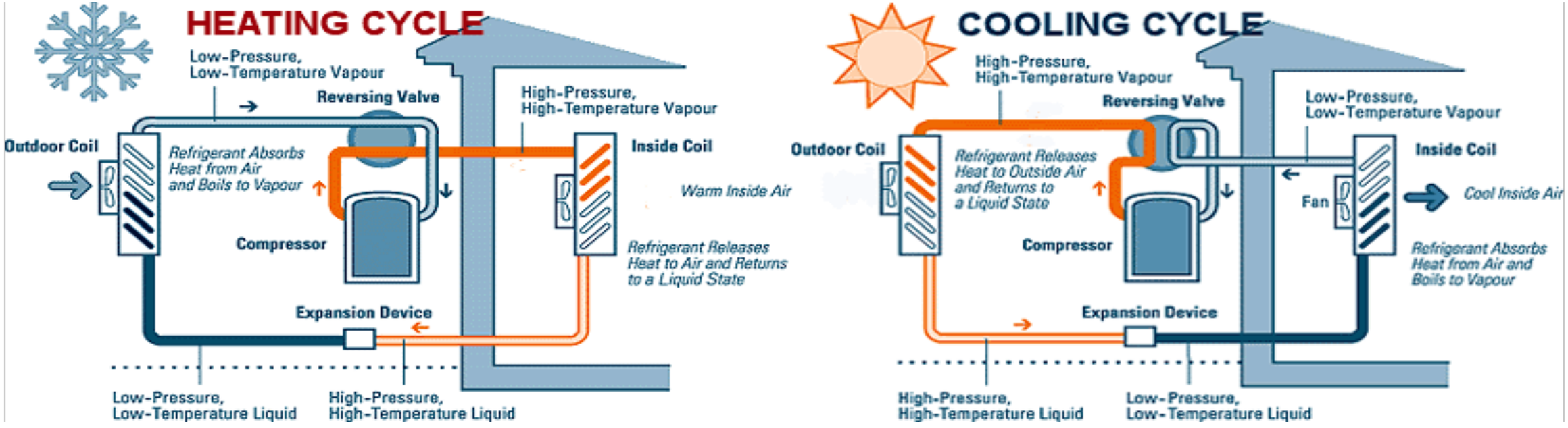
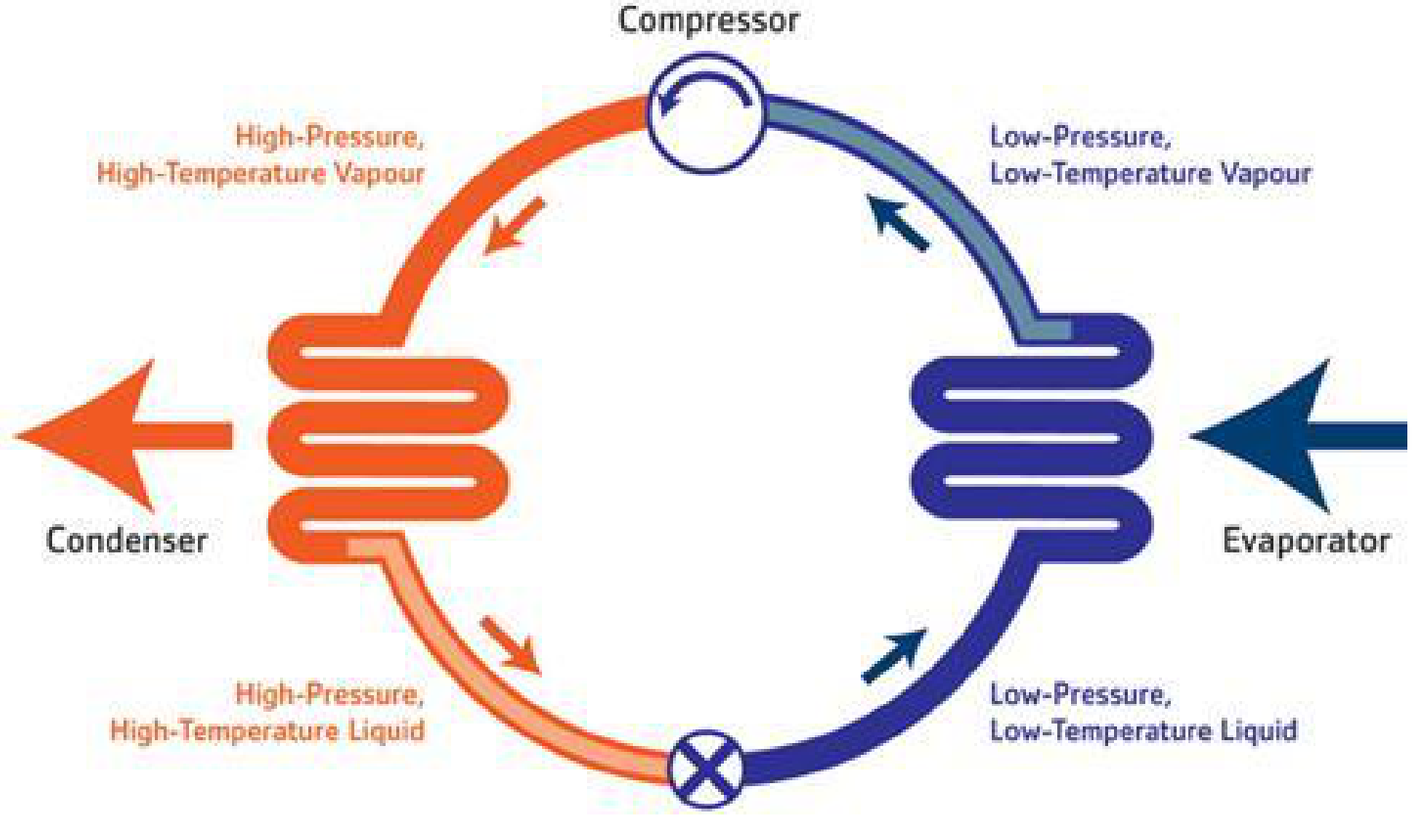
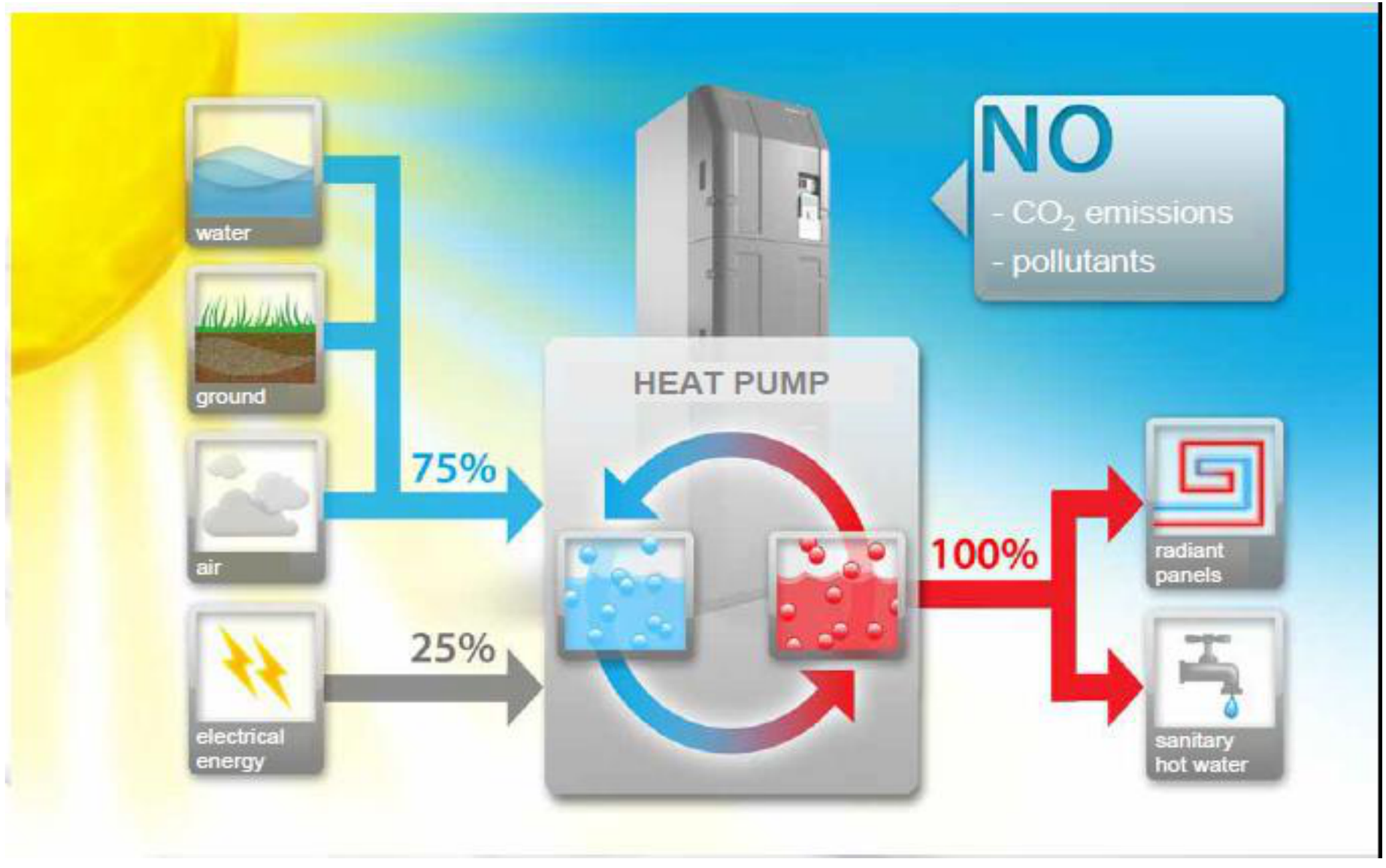
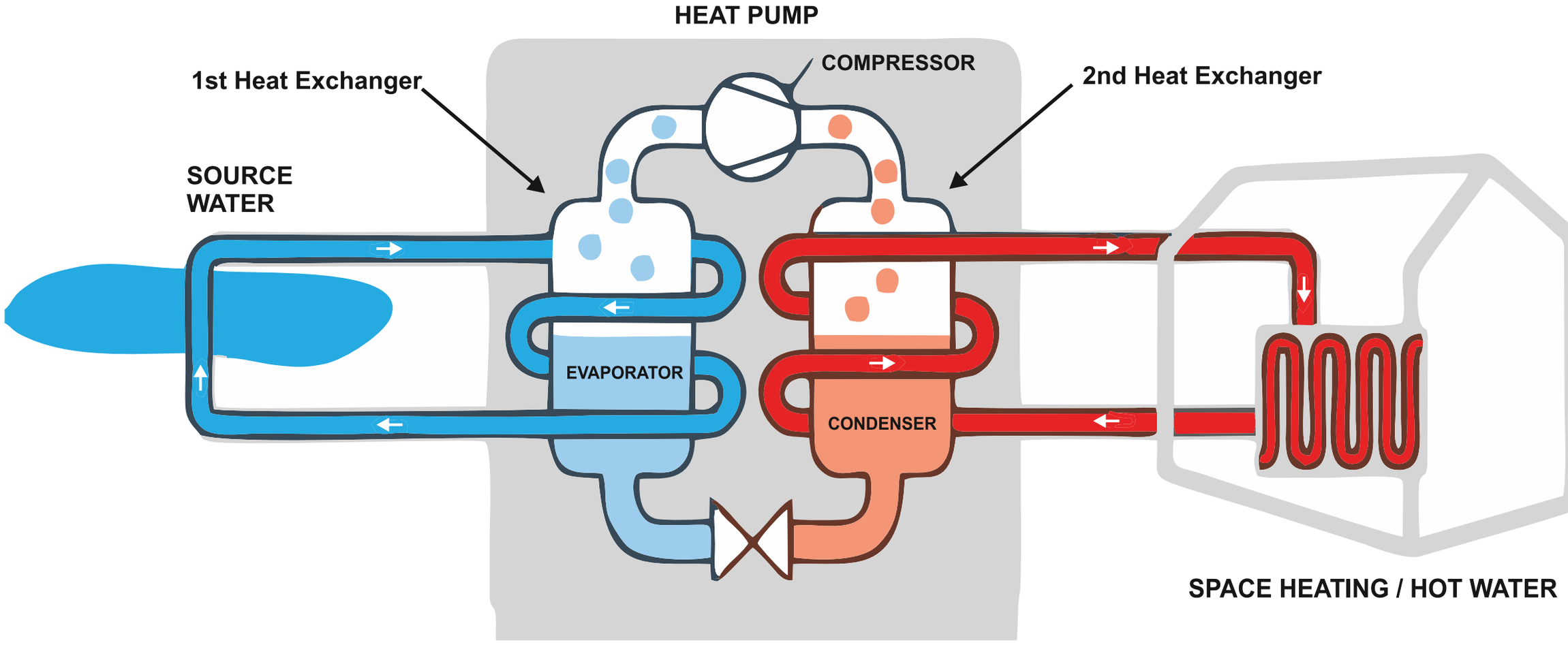


Heat Pump Working

Heat pump is a technologically advanced system adjusted to make use of renewable energy sources. Heat Pumps work on a Vapour Compression cycle like a typical refrigerator; absorb energy from the surrounding outdoor air and transfer into a refrigerant. The heat energy is upgraded using a refrigerant cycle and this renewable energy is used to heat water.




NO
- CO_2 emissions
- pollutants
water
ground
air
electrical energy
75%
25%
HEAT PUMP
100%
radiant panels
sanitary hot water


HEAT PUMP
COMPRESSOR
1st Heat Exchanger
2nd Heat Exchanger
SOURCE
WATER
EVAPORATOR
CONDENSER
SPACE HEATING / HOT WATER

Conventional Methods

- Pros & Cons

- PROS:
- Old and known System
- Perceived to be useful across the seasons
- Initial cost

- CONS:
- High Energy Consumption
- Less COP
- High Electrical Load
- Fuel Handling & Inventory
- Usage of Fossil Fuel
- Safety Concerns
- Efficiency
- Sustainability
- Compliances
- High Operational Expenses

Applications of heating

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Applications	Temperature Wise	Segment Wise	New TRends
Water Heating	45°C	Industrial	WWT
Space Heating	50°C	Pharma	Steam
Cleaning	55°C	Hospitality	Automobile
Process Heating	60°C	Health Care	Non Conventional Applications
Steam Generation	65°C	Beverages	Machining
Drying	75°C	Dairy	Export Oriented Fruit Packaging
Dye	80°C	Commercial Buildings	Hybrid Systems
Critical Applications	90°C	Weather Based Heating	Printing

Few Observations

Challenges in conventional

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Independence

Forthcoming impacts of limited oil supply can take place due to its rapidly increasing demand.

Heat Pumps help to reduce dependence on imported fuel supplies.

Comfort Technology

Heat pumps offers the highest possible comfort in terms of operation, & maintenance.

Its operate quietly, automatically and are maintenance-free.

Disposal of ashes and Chimney cleaning are all eliminated.

COP Range > 300 % to 700 %

Lowest operating cost results into highest savings

Future Security

The energy resources of a Heat Pump are practically unlimited as far as quantity, availability, and time are concerned.

It is necessary to understand that heating systems which we are installing, we should ensure energy security.

With the use of Heat Pumps savings can be achieved up to 70 % in the operation cost of over conventional systems.

Can use night time electricity when it is cheap

And also help power companies for DSM

Flammability

Heat Pumps works on thermodynamic cycle, without combustion and flames.

This significantly reduces any chance of dangerous accident.

Challenges in conventional

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Responsibility for future

In the future also, oil and gas will be urgently needed as raw materials for applications in which they cannot be replaced.

It is our responsibility to maintain ecological system which belongs to us and our children.

Heat pump is a Non Polluting – Environmental Friendly Technology.

Retrofit

Increasing energy costs, regulations or breakdown of an existing boiler make a new investment necessary.

Retrofitting a heat pump becomes more feasible as new technologies generates hot water up to **75ºC.**

Retrofitting at existing installation can save money, energy and environment

Multiple Function

Heat Pumps produces HEATING & COOLING simultaneously.

Cooling can be achieved without additional investment or operation cost.

This free cooling can be rejected in the atmosphere by using dry cooler if not required

Promotions

ECBC

Income Tax

Why Heat Pump?

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Heat Pumps are extremely energy efficient and can achieve 3 to 5 COPs; means they produce 3-4 kW of heat for every 1 kW consumed. As no fossil fuels are directly burnt in the operation of a heat pump, CO2 emissions are also greatly reduced in comparison to gas or oil-fired boilers.

Energy Efficiency

Heat pumps offer the highest levels of energy efficiency with the ability to provide 3-4 kW of heat energy and / or cooling benefit for every 1 kW used.

Eco Friendly Refrigerant

Heat Pumps are one of the most efficient ways to heat water all year round. A highly efficient system utilising an environment friendly refrigerant like R410A/R407C/R134A which has zero or lesser ozone depletion potential. This refrigerant allows useful heat energy to be absorbed even with low outdoor temperature.

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Convenient Controls

Heat pumps supply hot water which delivers radiant heat energy to potable water systems. Easy-to-use controls allow you to adjust temperature settings at the touch of a button.

Lowest Running Costs

The more energy efficient a heating system is, the cheaper it is to run. Hot water heat pumps offer the cheapest available kW/h rate for hot water heating.

Safety

Heat pumps are the safest option as there is no direct electrical water heating or hot surfaces; they are an extremely safe option.

Year Round Performance

Heat pumps provide energy-efficient water heating year-round, operating effectively in both high and low outdoor ambient temperatures.

Maintenance Free

Compared to traditional water boilers, heat pumps are maintenance-free: fuel deliveries, disposal of ashes, and chimney cleaning are eliminated.

TYPES OF HEAT PUMP

AIR TO WATER

WATER TO WATER

AIR TO AIR

GEOTHERMAL

SOLAR HYBRID

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THE BASIC PROBLEM IN COMMERCIAL BUILDING HEATING SYSTEM IS TOO MUCH FOCUS ON CAPITAL INVESTMENT AND LESS FOCUS ON RUNNING COST AND RATIO BETWEEN THESE TWO, FOR AN EXAMPLE SAME IS 1:20 THAT MEANS RUNNING COST IS 20 TIMES HIGHER FOR 20 YEARS IN COMPARISON TO CAPITAL INVESTMENT

Need of Heat Pumps

PRESENT SCENARIO OF DEMAND AND SUPPLY EQUATIONS FOR HEATING IN COMMERCIAL BUILDINGS

Heat Pump Range

- Up to 65^{o}C temperature by KRISTHERM SCREW HEATPUMP (HP) (Range - 100 KW to 2000 KW)
- Up to 75^{o}C by KRISTHERM HIGH TEMPERATURE SCREW HEAT PUMP (HT) (Range - 200 KW to 2000 KW)
- Up to 60^{o}C temperature KRISTHERM SCROLL Air to Water Heat Pump (Mini HP) (Range – 3.5 KW to 300 KW)
- Partial Heat Recovery Through DESUPERHEATER up to 50 ^{o}C - OPTIONAL
- Up to 75^{o}C Hot Air by KRISTHERM HIGH EFFICIENCY SCREWE AIR TO AIR HEAT PUMP

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SCREW HEAT PUMP

Capacity from 100 kW to 2000 kW
Hot Water outlet temperature from 45 C to 75 C
Environment Friendly, Maintenance Free & Emission Free

A firm step towards Energy Efficient and Environment-friendly heating solution for Decarbonisation Strategies - Eco-friendly Refrigerants.

- The most versatile application range for water heating, process heating & special applications.
- Highest COP in it's class
- Lowest operational cost
- Reduces capital cost
- Year-round performance
- Highest safety parameters
- Micrprocessor-based controls
- Reduces chiller load with by-product of chilled water

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High Energy Efficient Screw Heat Pumps – Water To Water

KRISTHERM

AHRI CERTIFIED™ www.ahridirectory.org

- Water Temperature range: From 45°C to 75°C
- Capacity Range: 100 KW to 2000 KW
- KW/KW Range : 0.22 to 0.40

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High Energy Efficient Mini Water-to-water Scroll Heat Pumps

KRISTHERM

- Water Temperature range : Up to 60°C
- Capacity Range: 32 KW to 160 KW
- KW/KW Range : 0.32 to 0.36

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High Energy Efficient Scroll Heat Pumps – Air To Water

KRISTHERM

- Water Temperature range: Up to 60°C
- Capacity Range: 7.5 KW to 290 KW
- KW/KW Range : 0.28 to 0.30

Heat Pump Benefits Over Oil /Gas

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KRISTHERM

- Up to 70% savings in heating bills are being achieved compared to conventional fossil fuel systems.
- No Exhaust flue so flexibility in positioning indoor unit
- No Carbon Monoxide threats.
- Easy and Low cost installation.
- Achieve LEED certification as per Green Building Regulations, with heat pump alone, where a solar system would need to be incorporated with an Oil Boiler to achieve the same results.
- Risk of fuel theft eliminated.

Salient Features

KRISTHERM

- Combustion & flames free technologies.
- Less maintenance, Ashes Disposal / Chimney cleaning eliminated.
- 80% depreciation can be claimed in first year.
- The products are eligible for Federal / State incentives.

Salient Features

KRISTHERM

- Heating & Cooling Simultaneously in Screw HP.
- Saving in operation cost up to 70 % then Conventional Systems.
- Screw Compressor.
- High-pressure Condenser.
- Single / Twin Circuits – Flexibility in operation.
- Star Delta starter/VFD for lower starting currents.
- Fully Microprocessor controlled automatic operation.
- KRISTHERM range is most environment friendly using minimized charge of HFC refrigerant.

Design Consideration

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Estimate Hot Water Requirement per day in Liters.

Estimate Peak Consumption rate in Liters / Hr

Calculate Present Fuel Consumption

Select Hot Water System for Correct Size to meet daily requirement as well as Peak Requirement

We can assist you in Selection of suitable system

Critical Case Studies Of Various Projects

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Leela Palace At Bangalore

Critical Case Studies Of Various Projects

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DETAILS OF THE REQUIREMENT

No of rooms	:	357
Hot water consumption	:	1,25,000 Litres per day
No. Of Zones	:	2
Hot water temperature	:	55°C

ORIGINAL SYSTEM

Hot water system	:	Diesel fired steam boiler
Diesel Consumption	:	700 Litres per day

PROPOSED SYSTEM

Heat Pump installed	:	413 KW
Free Cooling	:	72 TR
Year of installation	:	2014

ACTUAL SAVINGS ACHIEVED

Average daily savings	**:**	**$ 309/-**
Annual savings	**:**	**$ 112,785/-**

"We have done the same in LEELA Chennai also"

Critical Case Studies Of Various Projects

Leela Palace at Chennai

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Critical Case Studies Of Various Projects

Ritz Carlton at Bangalore

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Critical Case Studies Of Various Projects

Ritz Carlton at Bangalore

Critical Case Studies Of Various Projects

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DETAILS OF THE REQUIREMENT

No of rooms	:	277
Hot water consumption	:	80,000 Litres per day
No. Of Zones	:	4
Hot water temperature	:	55°C

ORIGINAL SYSTEM

Hot water system	:	Diesel fired steam boiler
Diesel Consumption	:	380 Litres per day

PROPOSED SYSTEM

Heat Pump installed	:	352 KW
Free Cooling	:	67 TR
Year of installation	:	2016

ACTUAL SAVINGS ACHIEVED

Average daily savings	**:**	**$ 187/-**
Annual savings	**:**	**$ 68,255/-**

Critical Case Studies Of Various Projects

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DR. REDDY'S LABORATORIES, HYDERABAD

Critical Case Studies Of Various Projects

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DETAILS OF THE REQUIREMENT

Hot water required : For Laboratory
Hot water temperature: 45°C

ORIGINAL SYSTEM

Hot water system : Diesel-fired steam boiler
Diesel Consumption: 2000 Litres per day Approx.
Working hours : 24 Hrs.

PROPOSED SYSTEM

Heat Pump installed : 400 KW x 4 Nos. (3+1)
Free Cooling : 90 TR each
Year of installation: 2011

ACTUAL SAVINGS ACHIEVED

Annual savings: $ 487,446/-

“At present 18 Nos. machines have installed in Dr. Reddy’s Group”

Project Summary

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Project Financials

- Total Heat Pump Cost – $ 171,000
- Expected savings per annum at 100% load – $ 487,446
- Payback period – Less than 6 months

Other advantages

- Heat Pump falls under Energy Saving Devices and
- Depreciation @ 80 % can be claimed in the First Year
- Combustion Free Eco friendly System
- Very Low Maintenance
- Heating and Cooling Simultaneous Production

Critical Case Studies Of Various Projects

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TEJANKAR HOSPITAL, UJJAIN

Critical Case Studies Of Various Projects

Sr.No.	Yearly operating cost with Existing Electrical Heater			Yearly operating cost with KEKEMS Heat Pump System	
1	Hot water System	: Electrical Heater		Hot water System	: Heat Pump System
2	Hot water generation temperature	: 55°C		Hot water generation temperature	: 55°C
3	Present rate of electricity	: $ 0.13/ Unit		Present rate of electricity	: $ 0.13/ Unit
4	Total Hot water requirement per day	: 4000 LTR.		Total Hot water requirement per day	: 4000 LTR.
5	Daily Working Hours	: 6 Hrs.		Daily Working Hours	: 6 Hrs.
6	Heating capacity/Hr.	: 25.0 KW		Heating capacity/Hr.	: 25.0 KW
7	Power consumption per day	: 150 KW		Power consumption per day	: 51.3 KW
8	Monthly operating cost	: $ 570/-		Monthly operating cost	: $ 195/-
9	Yearly Operating cost	: $ 208,050/-		Yearly Operating cost	: $71,175/-

Estimated Yearly saving using Heat Pump over Electrical Heater = $136,875/-

Conclusion

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- Use of Hot Water System lead to A SIGNIFICANT REDUCTION in CO2 emission, thus help us in maintaining ecological equilibrium.
- Offers Excellent overall COP.
- Offers Lowest Operation Cost.
- PAYBACK PERIOD – LESS THAN 18 MONTHS
- This MOST MODERN, SAFE & FLEXIBLE TECHNOLOGY Offers ECONOMICAL & ENVIRONMENTAL benefits.

HYBRID HEAT PUMP

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- Hybrid Heat Pumps, a breakthrough innovation born out of Fusion of Compression and Absorption Technologies.
- Single product to derive benefits of Electrical and Absorption technologies.
- Generates Hot Water upto 1200C with upto 40% savings in Fuel Consumption.
- Cooling capacity upto 30% of Heating capacity can also be generated.
- No need for cascade compressor arrangement / multiple refrigerant.

SALIENT FEATURES

- High Operational Savings
- Fully Automated Operation
- Low Maintenance
- Patented Technology

SCHEMATIC

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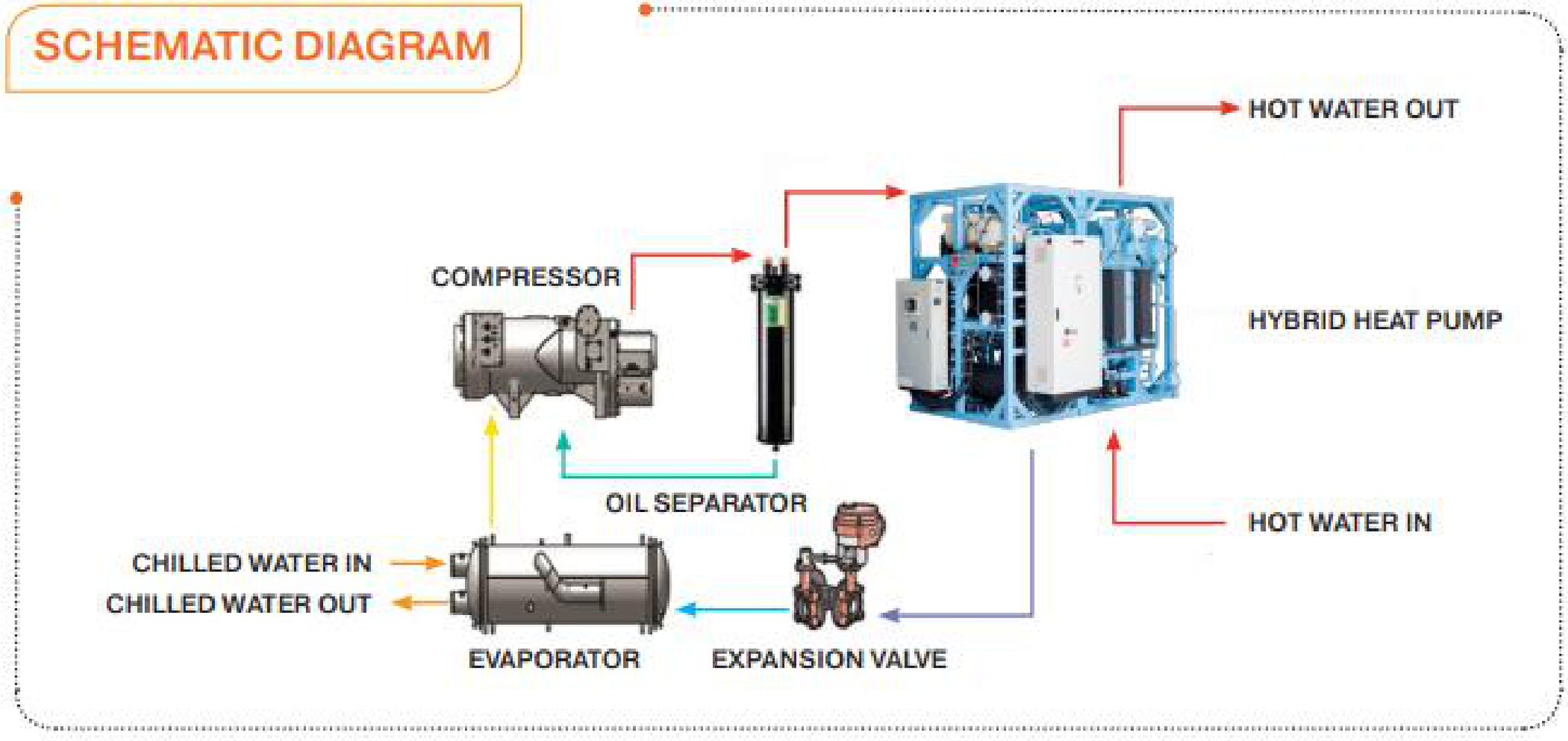

APPLICATIONS AND SCHEMATIC

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- **F & B** - Sugar syrup production / Pasteurization / CIP
- **BREWERY** - Wort preparation / Bottle cleaning
- **METAL PROCESSING** – Electroplating / Immersion bath
- **AUTOMOBILE** - Seven tank treatment process / Paint booth
- **PAPER** – Pulp drying
- **CHEMICAL & PHARMA** – Various heating applications
- **Textile** Industry
- **Petrochemicals & Refinery**
- Green **hydrogen**
- **Data** centers / Space heating
- District **heating**

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