



INNOVATIVE TECHNOLOGIES FOR THE CHEMICAL AND PHARMACEUTICAL SECTOR

4th Edition of CII's ChemPharma Summit, Hyderabad

June 20 – 21, 2024



HEATING DEMAND IN CHEMICALS AND PHARMACEUTICALS:

- With production processes being energy intensive, these industries together account for, roughly
 - 20% of total worldwide energy demand and
 - 14% of global industrial greenhouse gas (GHG) emissions.

*Source: [MAXIMPACT.COM | ENERGY EFFICIENCY – CHEMICALS & PHARMA – Maximpact.com](https://www.maximpact.com/energy-efficiency-chemicals-pharma); (Solutions portal)

INDIAN SCENARIO:

- Thermal energy accounts for about 75–80% of total energy consumption by chemical manufacturing units, and is mainly used in equipment such as boilers, thermic fluid heaters, hot air generators, dryers, etc.
- Electricity accounts for the remaining 20–25% of energy consumption.
- Demand for chemical products is expected to grow at 9 % during 2020–2025.

*Source: [SAMEEEKSHA SEPTEMBER 2022.pdf](#)

Heating Need in Process Industries

Key Processes that require heating:

1) CHEMICALS:

- Chemical Reactor Jacketed Vessel Heating
- Distillation
- Evaporating
- Centrifuging
- Tempering
- Drying

2) PHARMACEUTICALS:

- Sterilization
- Reactor – Jacketed vessel heating
- Culture Preparation
- Distillation
- Drying



Aspiration Cleantech Ventures
Leaders in Energy Efficiency Solutions

- **VISION:** Pioneering Sustainable heating revolution
- **UNIQUENESS:** Working on diverse Financial models



About Us



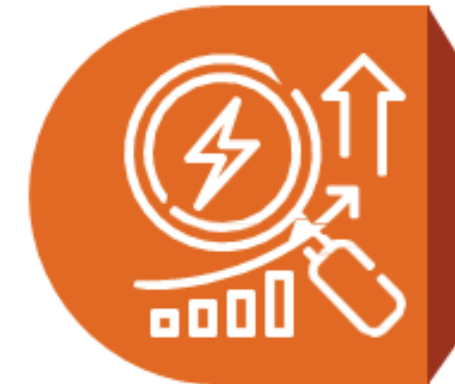
5+ MW industrial heat pumps installed



Unique ESCO model for industrial heating through heat pumps and solar



2+ MW industry scale solar thermal installed



Research and Development at IIT Madras

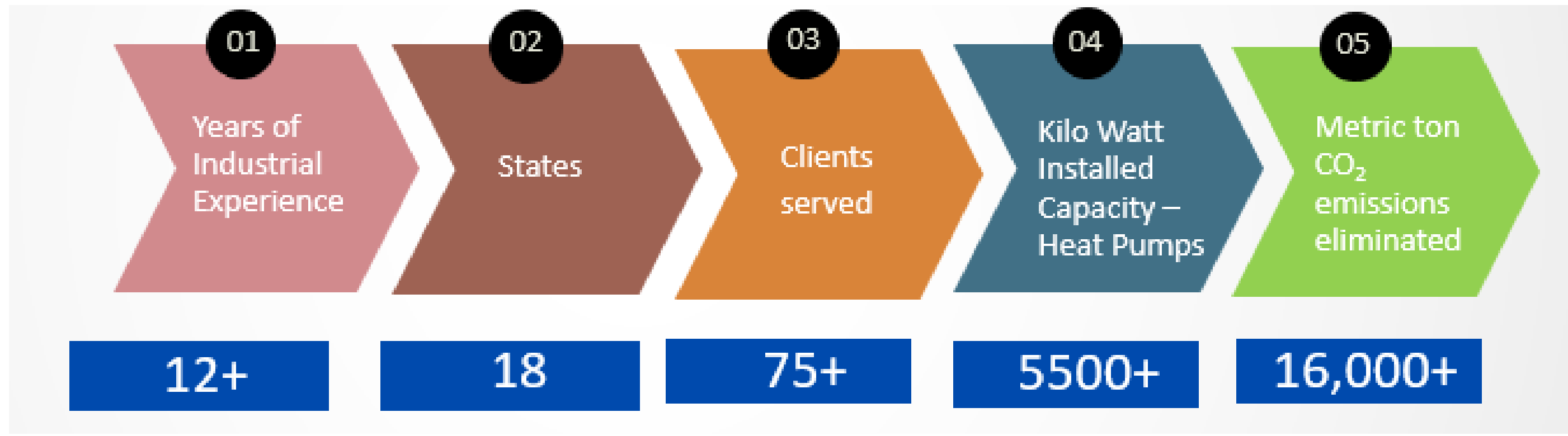


Introduced India's first 90 °C & 120 °C heat pump



Pan India reach and servicability

OUR JOURNEY



Our Services



Heat pumps for industrial heating

- » 200 - 400% energy efficient
- » Fully online and low maintenance



Solar heat for industrial process

- » Rooftop installation for 40-120 °C
- » Energy security for 25 years



Thermelgy monitoring

- » Measures real time performance of heating system 24/7
- » Makes autonomous decisions to enhance energy savings



Assured heat servicing

- » Servicing and maintenance of heat pump and solar thermal systems of any brand.

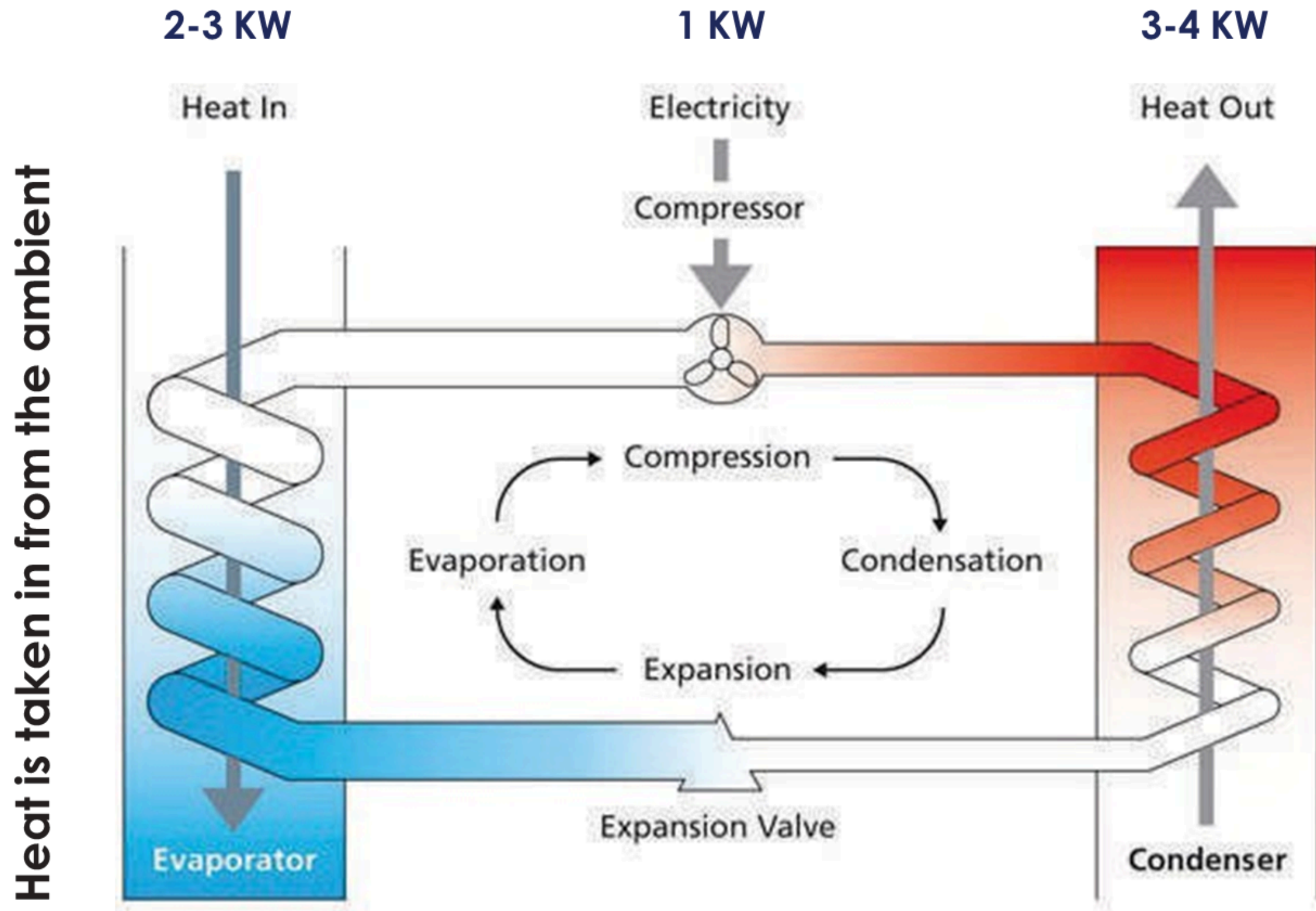


OUR SOLUTIONS OFFERINGS

The Products, brought up with Technology and Project Expertise are as, follows:

- Heat Pumps
- High – Temperature Heat Pump Systems (up to 120 Deg. C)
- Heat Pump Dryers
- Solar Dryers
- Waste Heat Recovery Systems
- Organic Rankine Cycle Systems
- Waste to Energy
- Hydrogen Generator

Heat Pump – Working Principle



Heat pumps use an air conditioning vapor compression cycle with a compressor, condenser, expansion device, and evaporator.

The system pumps heat from a low temperature reservoir to a high temperature

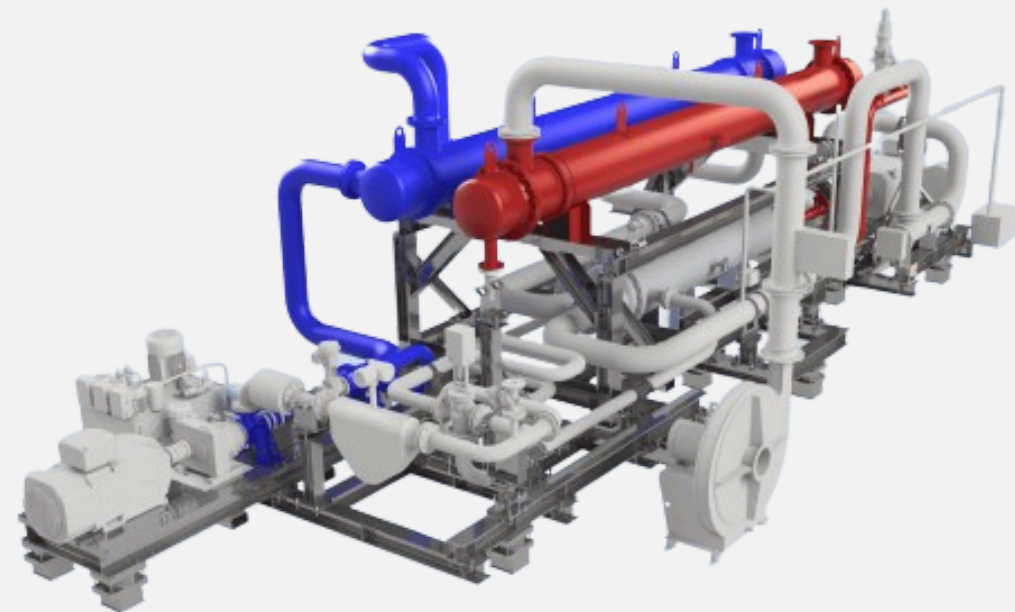
Heat Pumps and Chillers



Unique Features

1. We offer Heat Pumps totally in 4 different outlet temperature models, namely 60 Deg. C , 80 Deg. C, 90 Deg. C and 120 Deg. C.
2. We can achieve from 50 – 70% savings on operational costs.
3. Ideal for non-solar hours, they ensure 24/7 heat when combined with solar thermal energy.
4. Payback is around one year for continuous operation.
5. They produce free cold air or water, boosting overall COP to higher values.

High Temperature heat pumps



Max. 120 °C outlet, Screw Compressor based High Temperature Heat Pump

Key Features

- The first in India to offer max 120 Deg. C outlet Heat Pump.
- Cascaded model machine
- Offering customized Heat Pumps as per the clients' peak process load needs.

Drying Solutions

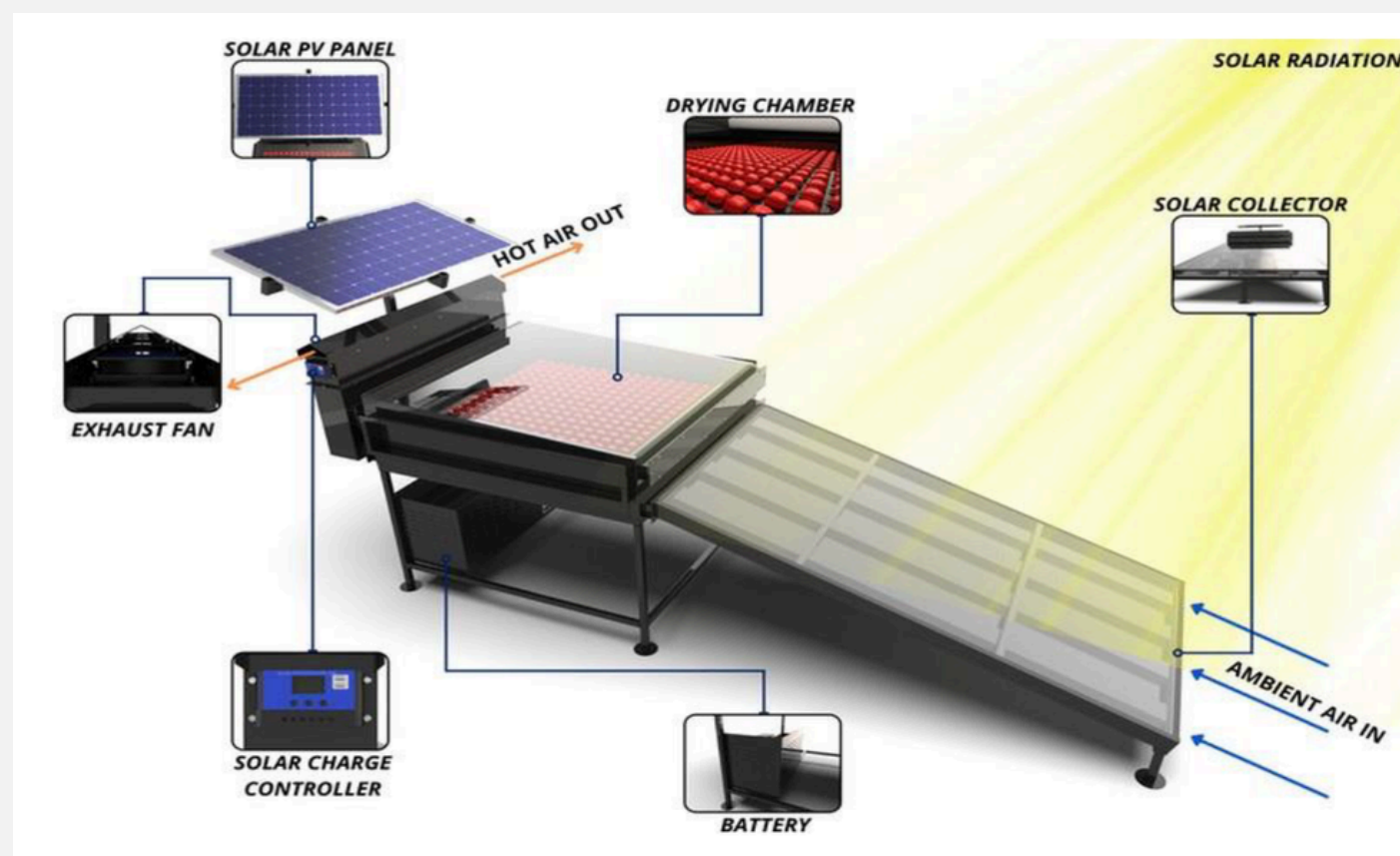


1. HEAT PUMP DRYERS

- Working on Vapor Compression Cycle
- 50 % Operational Savings compared to Electrical Heaters
- KEY BENEFITS:
 - Air flow control
 - Temperature control
- Application: Process industries, Spices, Agricultural produce

2) SOLAR DRYERS:

- Renewable energy powered Dryer
- Better performance compared to Traditional Sun-Drying
- Application: Agricultural produce.



Waste Heat Recovery Systems (WHRS)



Industrial exhaust heat, called waste heat, often lost to the environment, can be recovered to improve process efficiency and reduce costs. The recovery method depends on the temperature and economics of the waste heat.

Features of WHR:

1. Use compact and highly efficient tube-in-tube / shell and tube heat exchangers.

Benefits:

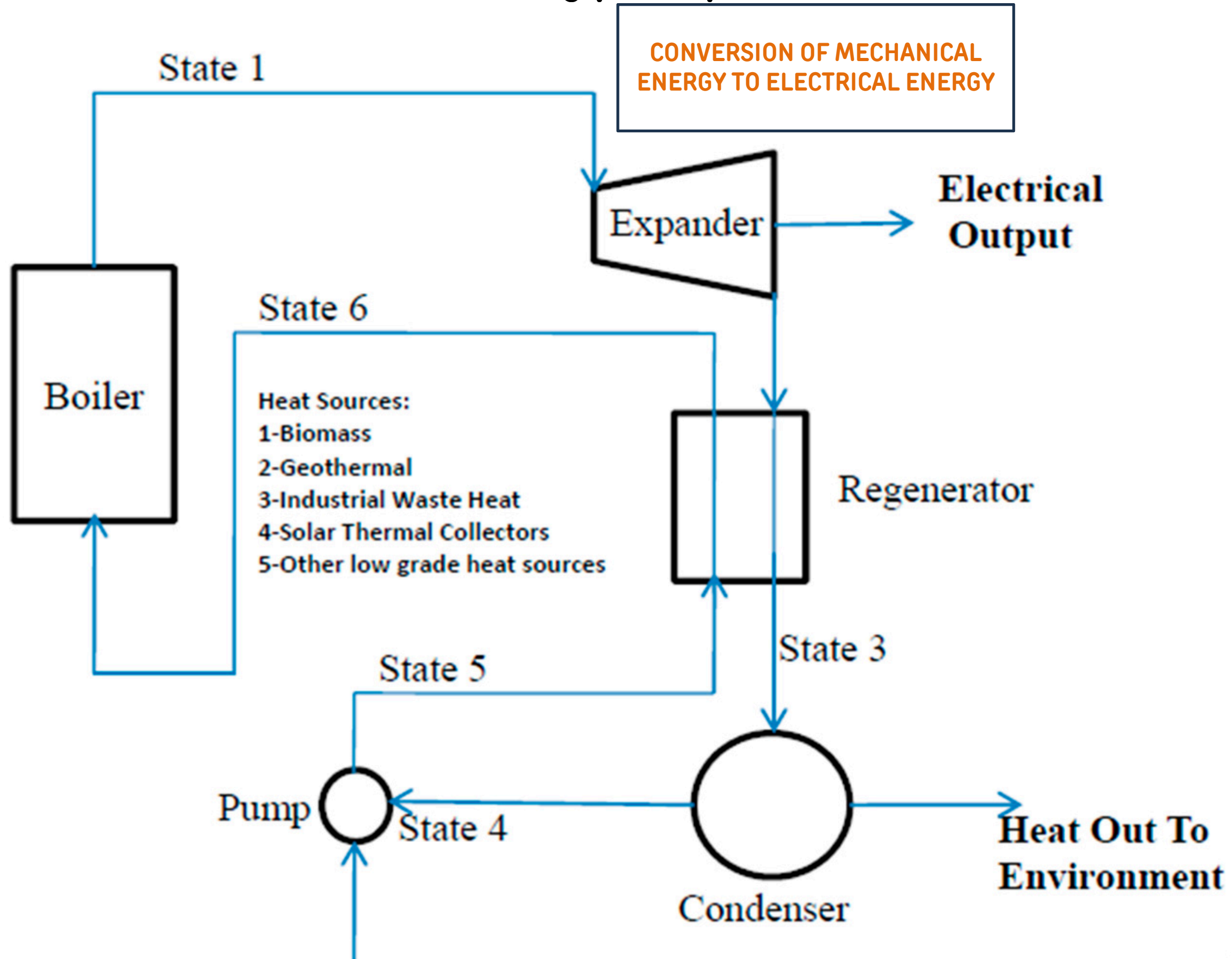
2. Increases process efficiency.
3. Reduces equipment sizes.
4. Lowers auxiliary energy consumption.
5. Decreases pollution.

Common Waste Heat Recovery Methods:

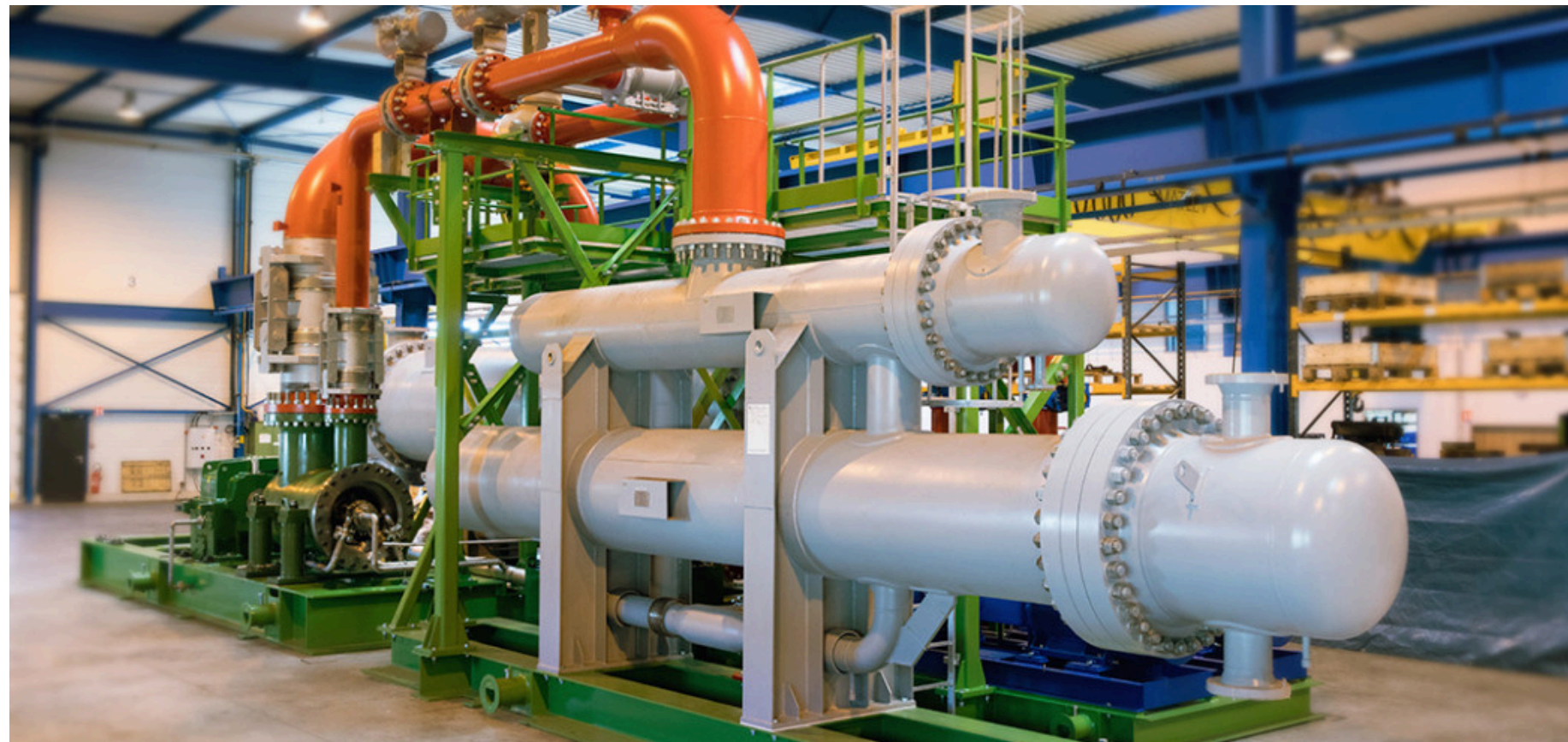
- Flue Gas Heat Recovery
- Chiller Heat Recovery
- Compressor Heat Recovery

Organic Rankine Cycle (ORC)

Working principle



Organic Rankine Cycle Systems



Our patented ORC power plant technology with advanced solutions can offer:

- 1) Impressive economy 2) High system efficiency**

Solutions:

- 1) ORC Turbines – Electrical energy from the recovered Waste heat, with the application of Organic fluids.
- 2) Hybrid Power Plant systems :
 - i) Waste heat operated ORC Turbines + Flash steam module.
 - ii) Geothermal energy based ORC Turbines + Flash steam module.
- 3) Hydrogen Generators
- 4) Biomass to Electrical energy / Methanol production, through Waste Heat Recovery (WHR)

Case Studies

A leading Indian Chemical industrial client

Process need: 16.5 kL in every 3 hours



Description	Before	After
Hot Water Generation Solution	Oil fired Hot water generator	High Temperature heat pump
Energy Source	Furnace Oil	Electricity
Energy Consumption	39 Kg / hr. (At peak load)	138 kWh (Rated power consumption)
Annual fuel operational cost	Rupees 1.8 Crores	Rupees 91 Lakhs

- Annual operational savings on heating – Rs 89 Lakhs

A leading Indian Paints manufacturer

BEFORE INSTALLING HEAT PUMP	
Source of Heating	LPG Fired Hot water Boiler
LPG Consumption per month (appx.)	5800 Kg
Annual Fuel Operational Cost	Rs. 61 Lakhs

AFTER HEAT PUMP INSTALLATION	
Source of Heating	Electricity; Heat Energy of Process Fluid
Heat Pump Rated Power Consumption	62.6 kWh
Annual Operational Cost	Rs. 25 Lakhs

Annual Operational savings on fuel	<i>Rupees 36 Lakhs</i>
Annual CO ₂ abatement	<i>125 Tons of CO₂ emission</i>

A leading Indian Paints manufacturer

Explicit indication in their Annual Report:

Firm's reporting:

An estimated reduction of fuel use to the tune of 3.5 tonnes /month

Reduction in Scope 1 emissions (i.e.) tCO2 by 51% between 2021-22 compared to 2013-14.



2. Fuel Savings in Boiler by using technologies like Heat pump & Heat recovery unit:

At the Sriperumbudur plant, the installation of a heat pump has resulted in an estimated reduction of fuel use to the tune of 3.5 tonnes/month. The installation has also led to a reduction in boiler running hours, scope 1 emission, effluent generation by 60 KL/year and 200 KL/year DM water use. A similar initiative has been undertaken in the Rohtak plant as

Process areas concentrated in the Pharmaceutical Company:

- 1) Melting of Jelatin – 200 kL of Hot water consumed day 2) Maintaining Jelatin’s viscosity – 10 kL hot water consumed / day

OPERATIONAL COSTING OF THE ELECTRICAL HEATERS

1	Hourly Energy Consumption of the Electrical Heaters at peak load	kWh	690
2	Hourly Energy Consumption Cost	Rs.	4727
3	<i>Daily Energy Operational Cost of the Heaters</i>	Rs.	1,13,436
4	<i>Annual Energy Operational Cost of the Heater</i>	Rs.	4,14,04,140

OPERATIONAL COSTING OF THE PROPOSED HEAT PUMP SYSTEM, FOR FULL LOAD

5	HP Capacity Designed, to be positioned	kW	840
6	Rated Input Power of the 840 kW Heat Pump	kW	375.00
7	COP	No unit	2.24
8	Electrical input needed to generate 690 kW Energy	kW	308.04
9	Hourly Operational Cost for 690 kW Energy	Rs.	2110.04
10	<i>Daily Operational Cost of the Heat Pump to deliver the 690 kW Thermal Energy</i>	Rs.	50,641
11	<i>Annual Operational Cost of the Heat Pump</i>	Rs.	1,84,83,991

COMPARATIVE OPERATIONAL SAVINGS AND PAYBACK PROJECTIONS

12	The Annual Operational Cost on Electrical Energy	Rs.	4,14,04,140
13	Annual Operational Cost of the Heat Pump proposed	Rs.	1,84,83,991
14	The Comparative Annual Operational Savings	Rs.	2,29,20,149
15	Total Project Value of the Direct Integration set up of the 840 kW Heat Pump System	Rs.	1,93,00,000
16	Return On Investment	months	10.1

OPERATIONAL SAVINGS (as per case studies):

- Diesel and Electricity Units to Heat Pumps - 50 % Operational Savings
- LPG / Natural Gas Units to Heat Pumps - 40 – 45 % Operational Savings

RETURN ON INVESTMENT:

- **Heat Pumps:**

The details as per BEE's arrival are as follows:

HEATING CAPACITY (IN kW)	POTENTIAL SAVINGS(IN %)	INVESTMENT (IN LAKHS)	ANNUAL SAVINGS (IN LAKHS)	RETURN ON INVESTMENT (IN MONTHS)
339	30 – 40	30 – 35	20 – 25	15 – 18

Clients' Testimonials



"When I saw the proposal for 630 KW Solar Thermal system, I found the ROI really attractive. The fossil fuel saving was 360 litres per month. The ROI is quite low for a Solar project of this size."



MR SRIVATS RAM
Managing Director



"We saved 116 K of Fuel cost during 2013-2014 due to the Solar system 8% more than what was estimated during the proposal stage. We have now identified a few more applications with similar saving potential"



MR RAJARAM Vice
President Manufacturing



"We were the first to attempt integration of a Roof Top Solar Thermal system with an industrial Process Cooling application that runs 24/7. We recently did a workshop to all TVS Group companies explaining about our experience, practical problems and implementation challenges faced and how we overcame them as the others coming after us can plan their projects better."



MR VELUMANI GM
Plant Engineering

Thank you!!

We will be glad to answer your doubts and queries

Contact:

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