



PROMETHEAN ENERGY

HEAT RECOVERY FROM AMMONIA/FREON COMPRESSORS

Discussion details

Current state

Recuperator and NG Furnace

Investment and ROI

Discussion details

About us

Case Studies on Ammonia compressor heat recovery

Technical discussion points



“At Promethean Energy, we make **unique waste heat recovery (WHR) products** for industrial purposes to help reduce heating costs by upto 75%”

Objective of our innovative products



Reduce fuel usage



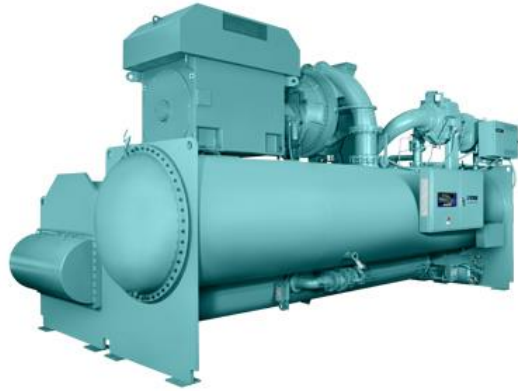
Reduce carbon dioxide emissions



Waste heat recovery from utilities discussed today

Highly focused ENERGY SAVINGS product suite

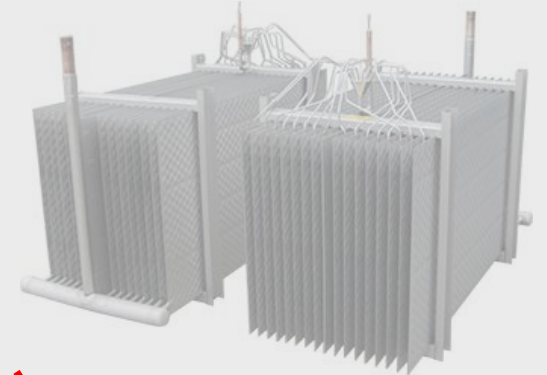
ChillerMate – refrigeration WHR



CompMate – air compressor WHR



FlowTherm – Heat recovery from hot air



Application

Description

Waste heat recovery from chiller units

Waste heat recovery from air compressors

Hot water from hot air

Key advantages

- Upto 75°C hot water recovered
- Reduction in chiller power – not possible with any alternative
- Fast payback

- Upto 90 °C hot liquid recovered
- High heat transfer achieved with lowest pressure drop in the world

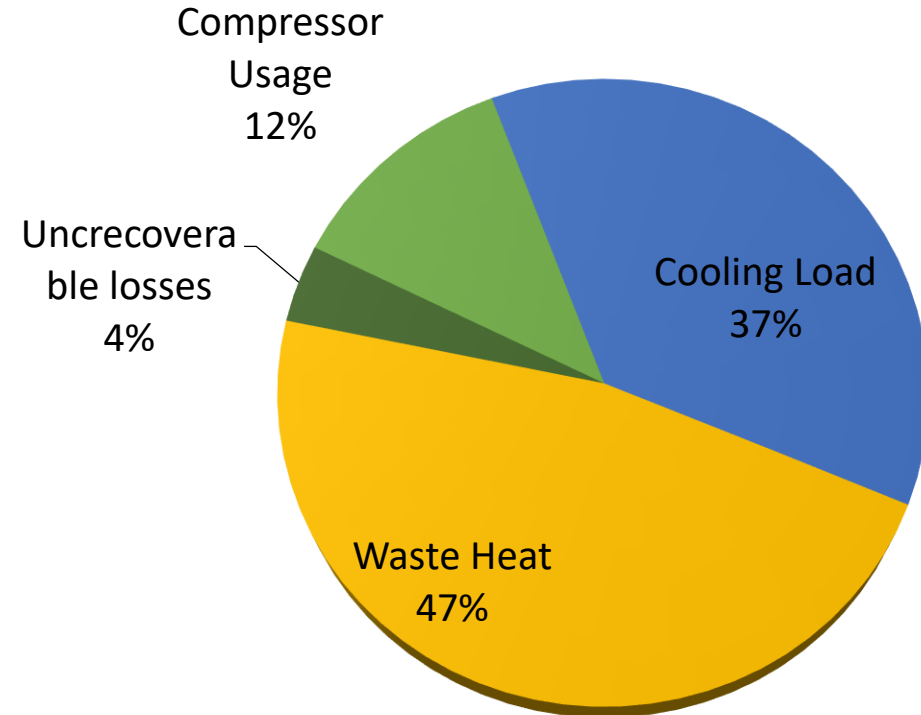
- Generate hot water at a fraction of cost of existing systems
- Saves energy costs, no emissions, low on maintenance

Monetary value

All of our products come with monitoring systems and typically have **rapid paybacks ranging from 6 months to 20 months**

Not discussed here

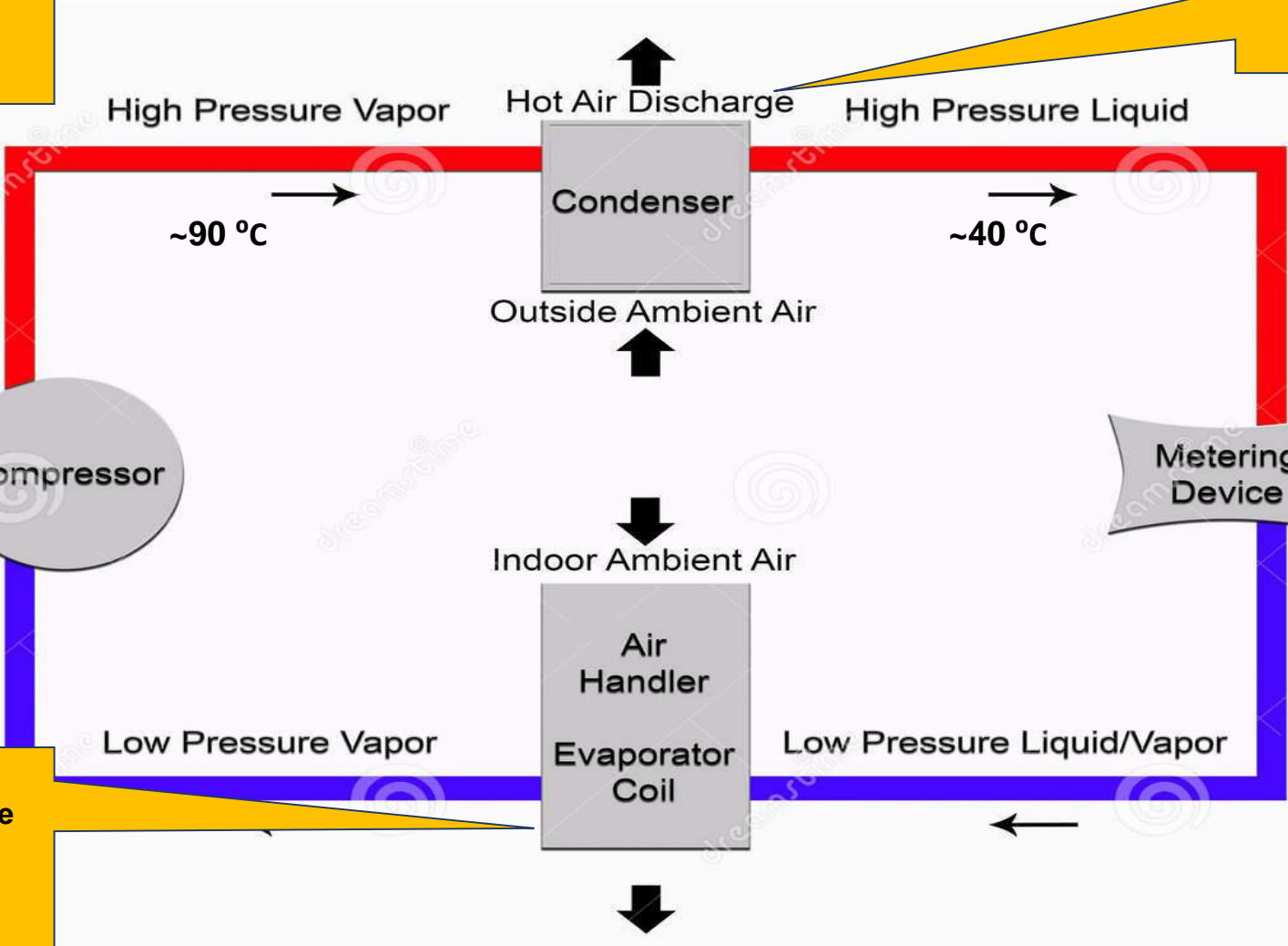
50% of energy in a refrigeration cycle is waste heat



Typical refrigeration cycle

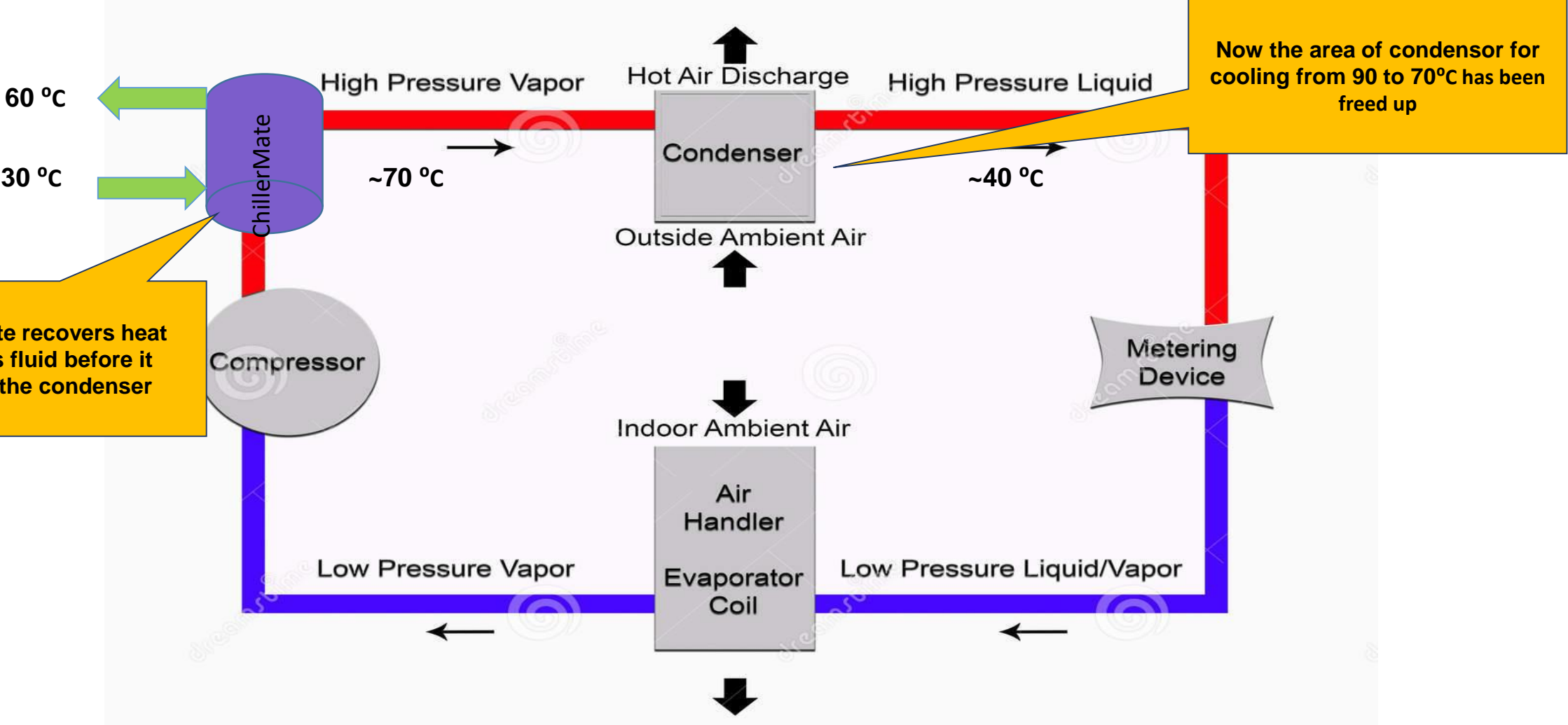
The condenser and evaporator consists of pipes/ fins for transferring heat

2. The hot liquid in the pipe has to be cooled down, and that occurs in the pipes of the condenser



1. Cold air is circulated inside the room by using the cold liquid (blue pipe)

ChillerMate sits between the compressor and condenser



Discussion details

About us

Case Studies on Ammonia compressor heat recovery

Technical discussion points



Case Study 1: Iconic Dairy in North India

Case Background

- NDRI (National Dairy Research) is one of the oldest and most respected dairy facility in the country
- They have a Model Dairy Plant (MDP) within NDRI, which is a processing facility of close to 3 Lakh liters per day
- A set of 4 x KC-4 (60 TR equivalent) ammonia compressors run 24x7 to cool the facility.
- A desuperheater system was required to recover heat from ammonia for hot water.
- Recovered hot water used to heat boiler feed water
- Promethean Energy was approached because of various challenges they had faced with existing technology
 - Low temperatures achieved using conventional heat exchangers
 - High pressure drop expected with conventional designs
 - Reliability and long life were key criteria

Heat recovery system designed to heat water from ambient to 60 C



Live data capture shows transparency in savings



Daily Savings : INR 1578

Realtme savings measurement

Analytics on system performance

**8 month
payback period**

Dairy is now getting average feedwater temperature at 60 C

It was a great experience to work with Promethean Energy. It is a reliable product with safety.

It was commissioned with without any downtime in the plant. It has good pay back

The datalogger is very nicely designed and we get the report of previous day on mail daily. It helps in monitoring the performance.

**Testimonial
from Gian
Mutreja, GM
of NDRI,
Karnal**



**It is a blend of Perfection and
Technology.**

Applications

- CIP
- Crate washing
- Preheating Ghee/Curd
- Boiler feedwater



Milk Chilling Center



Milk Chilling Center



Milk processing facility
(100,000 – 10,00,000 lpd)

Case Study 2: Milk Chilling Center in UP

Application Case study : Milk Chilling Center



Chilling center located in UP

Require chillers for cooling milk to 4C

Require hot water for CIP, can washing etc

Details

35,000 liters of milk
per day

2 x KC-3 compressors

Wood boiler for hot water



Expensive
and unreliable
sources of hot
water
currently

Electricity or
wood or
diesel heaters
used currently





Can washing using normal water leads to poor quality milk including bacterial growth



Expected :

Hot water will be used for can washing and CIP

Reality :

Hot water used for 3-4 months, remaining time 1-2 times per month

Expected :

600 liters of hot water are used every day



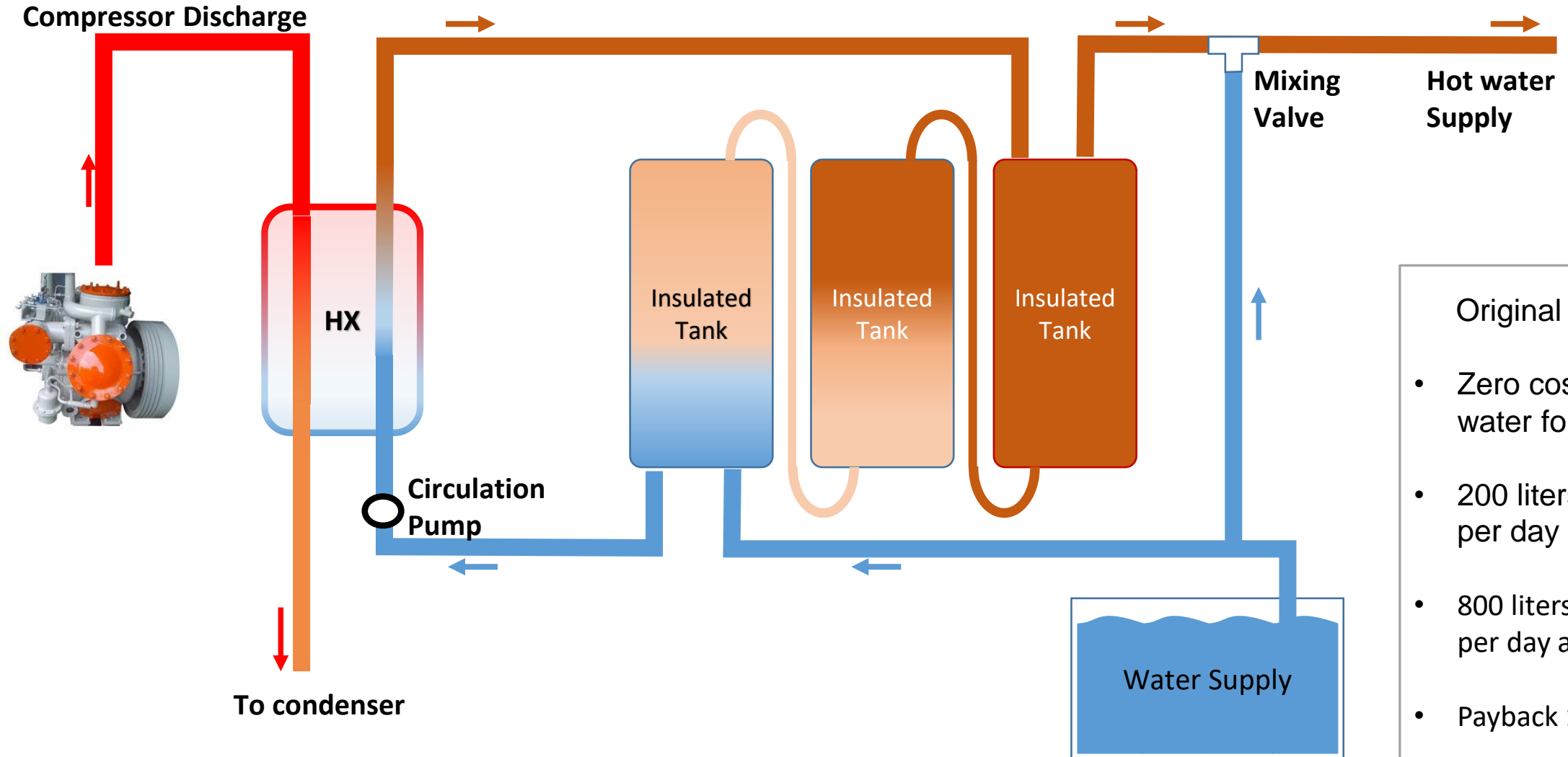
Reality :

~3000 liters of hot water are used every day



Schematic for heat recovery

Milk chilling center



Original design:

- Zero cost hot water for MCC
- 200 liters of water per day at 70 °C
- 800 liters of water per day at 45 °C
- Payback 1-2 years





5/10/11
S3 EST-1000
INDIA





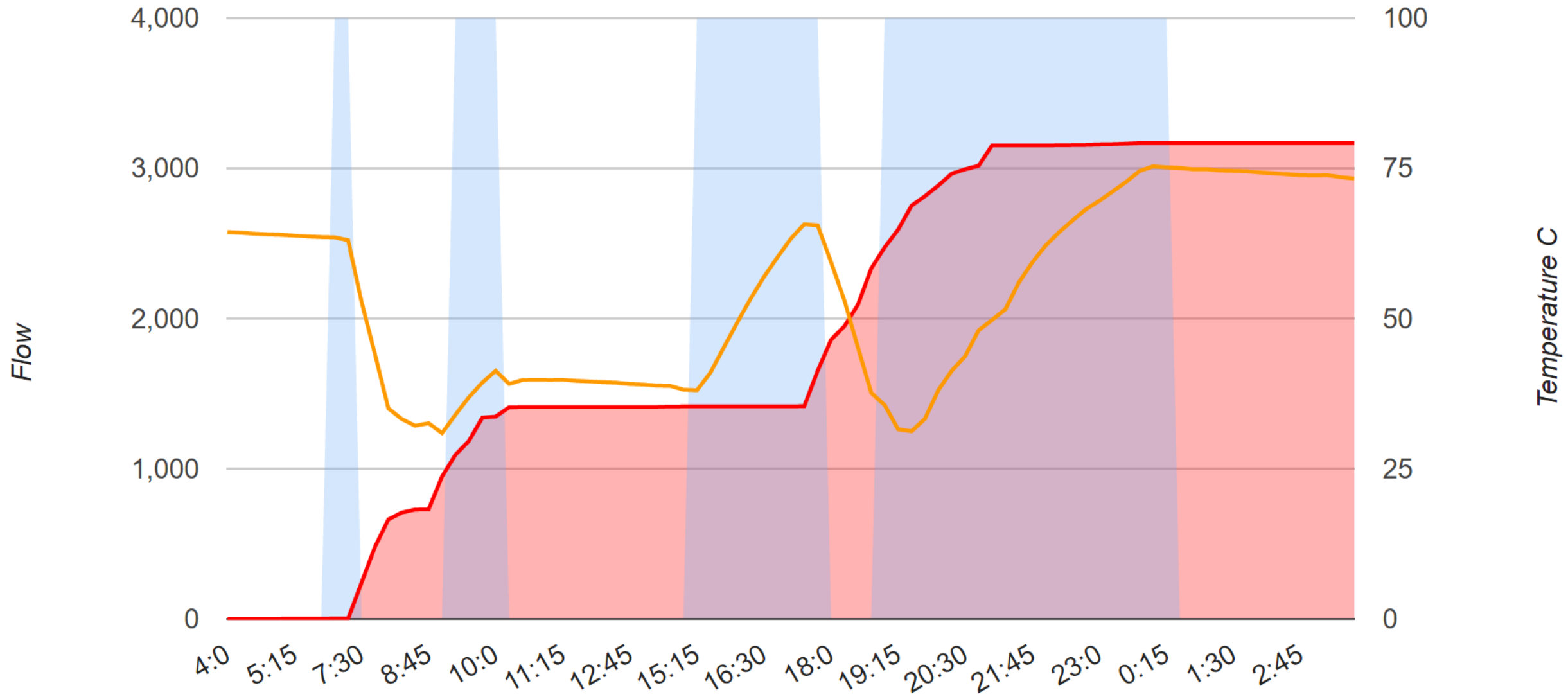
Milk Chilling Center is now generating 3000 liters per day at zero cost

Online digital monitoring is helping the dairy monitor the chilling centers remotely

9 December 2016

MCC - 24 hour hot water usage = 3168 liters

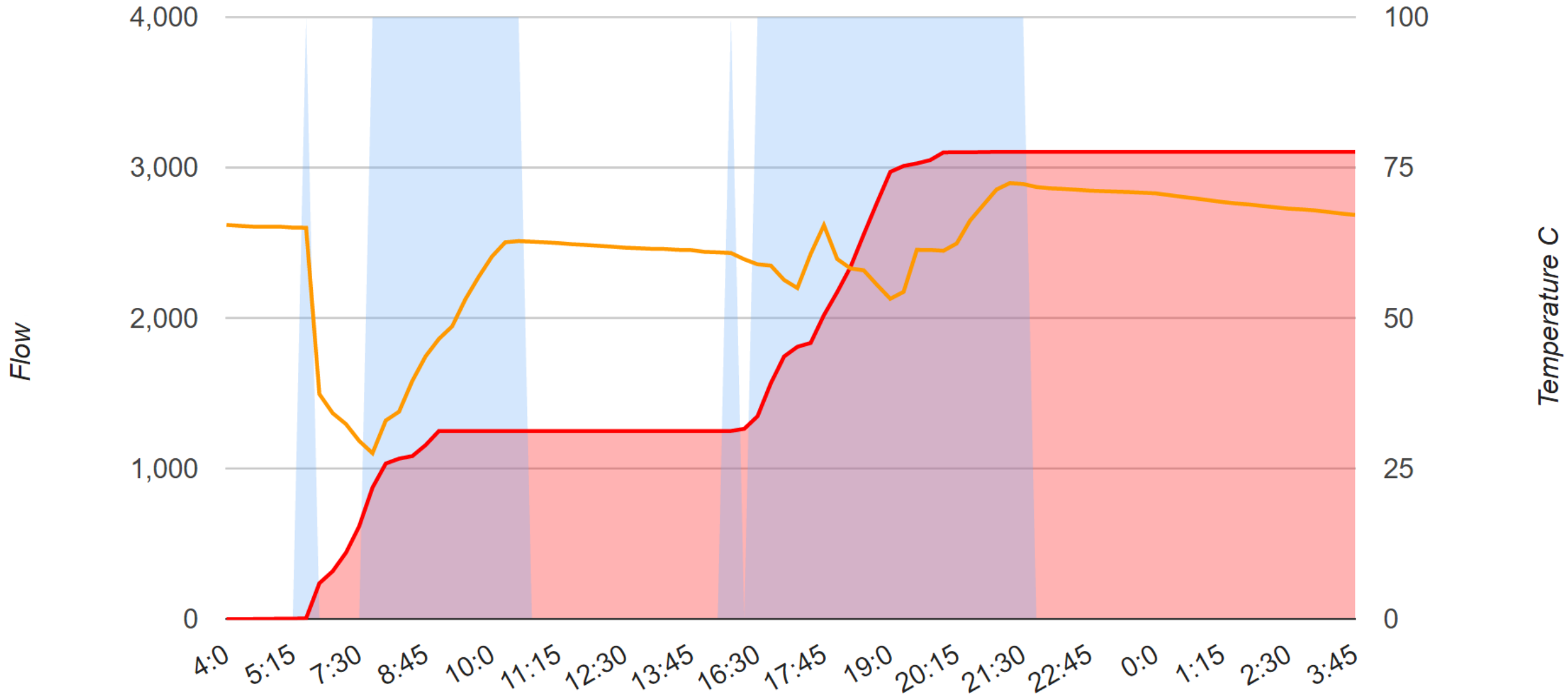
Flow Chiller on/off Hot water temp



11 December 2016

MCC - 24 hour hot water usage = 3105 liters

Flow Chiller on/off Hot water temp



Discussion details

About us

Case Studies on Ammonia compressor heat recovery

More details

Investment and ROI

For 100 TR system

Hours of operation : 6000 hours per year

Hot water temperature : 60 C

Total Heat recovery : 40 kW = 35000 kCal/hr

Annual savings ~ 8 Lakh INR

Investment = 5-6 Lakh INR

ROI = 8 months

Summary

ChillerMate recovers heat from compressors

- *Low hanging fruit, easy to generate savings*
- *Power consumption of chiller expected to be better*
- *Much more reliable than existing systems, heat can be used directly in process*

Future improvements

- *Data logging during power outages*
- *Engineering improvements to squeeze out more energy*
- *Streamlining operations to make installations faster*



Applicability and Next Steps

Low hanging fruit applicable to most processing and chilling centers – fast paybacks, improves system performance.

Lots of downstream benefits

Thank you

