SEEtech

Delivering Profits & Sustainability Together

Adiabatic Cooling System

for 255 TR

Ashirwad Pipes 26'

Plot 26, Attibele

INTELLIGENT SOLUTION

Powered by Advanced Technology

Harnessing cutting-edge engineering and smart systems to optimize efficiency

Digital Twin Technology

Our solution leverages digital twin technology to simulate and optimize system performance before implementation, ensuring maximum efficiency.

Real-time | Predictive

IoT-Enabled Monitoring

Real-time data collection and analysis through IoT sensors for performance optimization and predictive maintenance.

Smart Control | Cloud Connected

Prepared for: Ashirwad Pipes 26'

Date: June 24, 2025

Note: This proposal is generated by the system with detailed energy calculations and technical analysis.

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1. Executive Summary

Ashirwad Pipes 26"s **255 TR air-cooled chiller** currently operates with an average power consumption of **210 kW**. Our analysis using digital twin technology reveals an opportunity to substantially reduce energy consumption through **adiabatic cooling** technology.

Our proposal recommends installing an **SEE-Tech Adiabatic Cooling System** to reduce condenser temperature by **11.7°C (from 47.7°C to 36.0°C)**. Our digital twin technology has validated these projections through detailed simulation of your specific system, and our **IoT-enabled monitoring** will ensure continuous optimization and verification of savings.

The implementation of this system is projected to deliver:

METRIC	VALUE
Chiller Capacity	255 TR
Working Days	320 days
Working Hours	24 hours
Initial Power Consumption	203.8 kW/hr
Actual Power Consumption	210.0 kW/hr
Expected Power Reduction	20.0%
Annual Energy Savings	322,560 kWh/year
Annual Cost Savings	₹20,96,640 (20.97 L)/year
Annual Water Consumption	4,915.2 m^3/year
Project Cost	₹11,50,000 (11.50 L)
Simple Payback Period	7 months
NPV (15 Years)	₹1,96,69,669.56 (1.97 Cr)

The system's performance has been validated through detailed engineering analysis and digital twin simulation, ensuring accurate projections and minimal risk. SEE-Tech Solutions also offers a comprehensive maintenance package to ensure continued optimal performance.

2. System Description

2.1 Adiabatic Cooling Technology

Adiabatic cooling is an energy-efficient method that leverages evaporative cooling principles to reduce the temperature of air entering the condenser. This technology works on the principle that when water evaporates, it absorbs heat from the surrounding air, effectively lowering its temperature.

For refrigeration systems, this means:

- Lower condenser inlet air temperature
- Reduced condensing pressure
- Decreased compressor work
- Improved system Coefficient of Performance (COP)
- Significant energy savings

2.2 System Components

Our adiabatic cooling system consists of the following high-quality components designed for maximum efficiency and durability:

Media Pads

High-efficiency cellulose pads with cross-fluted design for optimal water distribution and air contact

- Cross-fluted design
- Long lifespan material
- Maximum cooling efficiency

Water Distribution System

Precision-engineered water delivery with efficient distribution headers and flow control mechanisms

- Uniform water distribution
- Stainless steel construction
- Low-pressure operation

Control System

Advanced IoT-enabled controls for intelligent operation based on ambient conditions and system demand

- Remote monitoring capability
- Adaptive control algorithms
- Predictive maintenance alerts

Water Treatment

Integrated water conditioning system to maintain optimal TDS levels (<200 ppm) and prevent scaling

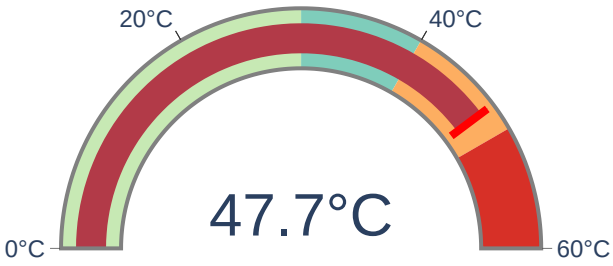
- Automatic bleed-off system
- Anti-scaling technology
- Water quality monitoring

2.3 Expected Operating Parameters

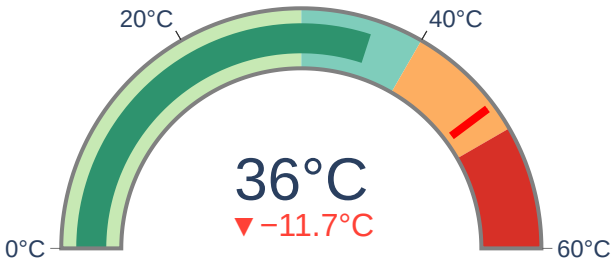
The following table outlines the key system parameters before and after adiabatic cooling implementation, highlighting the significant improvements in operating conditions:

PARAMETER	BEFORE	AFTER	CHANGE
Condenser Temperature	47.7°C	36.0°C	-11.7°C
System COP	2.60	4.30	+1.70
Power Consumption	210.0 kW	168.0 kW	-20.0%

Before Adiabatic Cooling



After Adiabatic Cooling



3. Technical Analysis

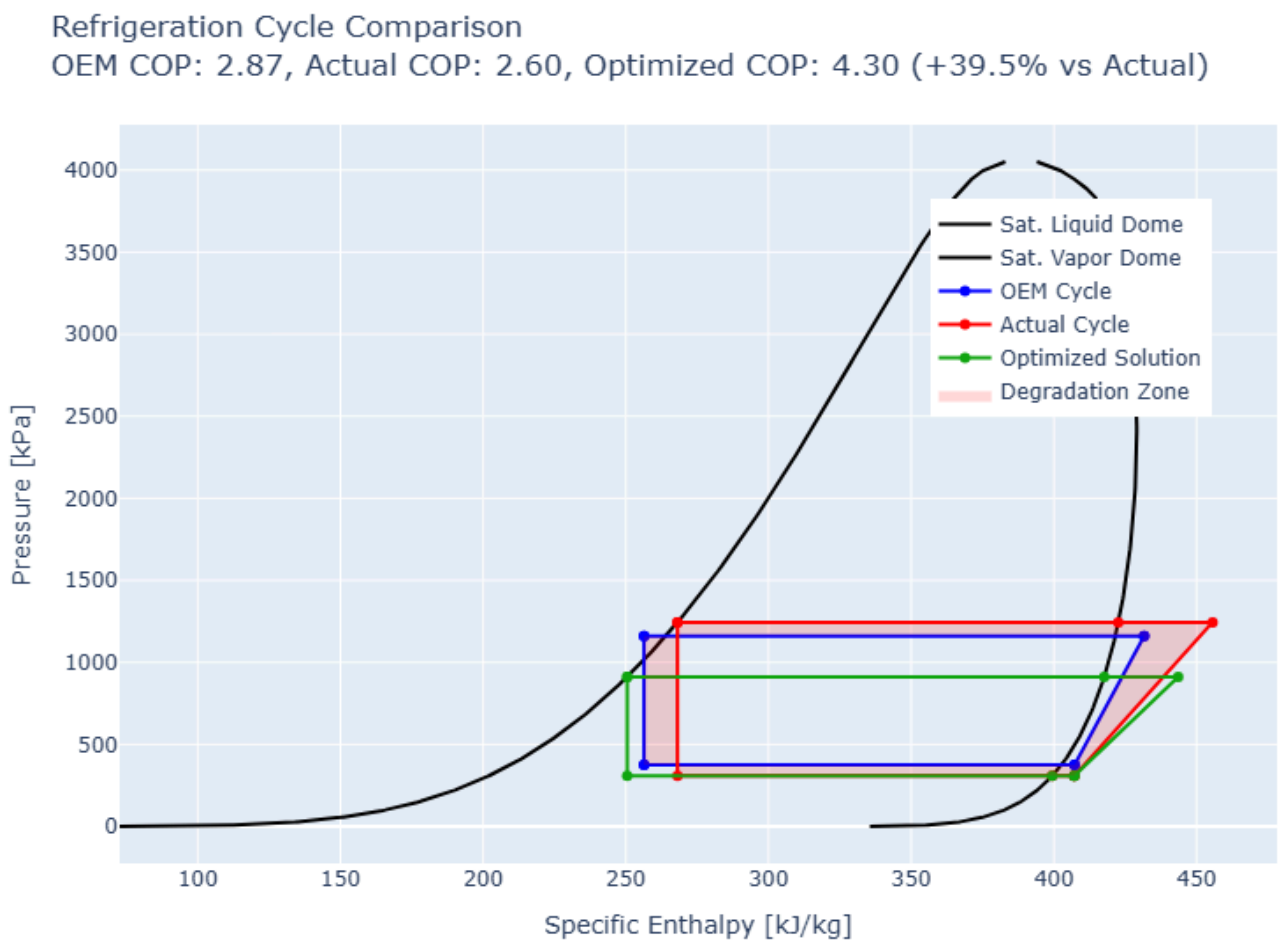
P-H Chart Analysis

The pressure-enthalpy (P-H) diagram below illustrates the refrigeration cycles under different operating conditions and demonstrates the impact of our proposed adiabatic cooling system:

Refrigeration Cycle Comparison

CYCLE TYPE	DESCRIPTION	SIGNIFICANCE
OEM Cycle	Original equipment manufacturer's design cycle under ideal conditions	Represents baseline performance as per design specifications; optimal operating parameters established by manufacturer
Actual Cycle	Current system performance under existing environmental conditions	Shows real-world performance deviation from design specifications; identifies efficiency losses and opportunities for improvement
Optimized Cycle	Projected performance with adiabatic cooling implementation	Demonstrates expected performance gains through condenser temperature reduction; quantifies energy savings potential

3.1 P-H Chart Visualization



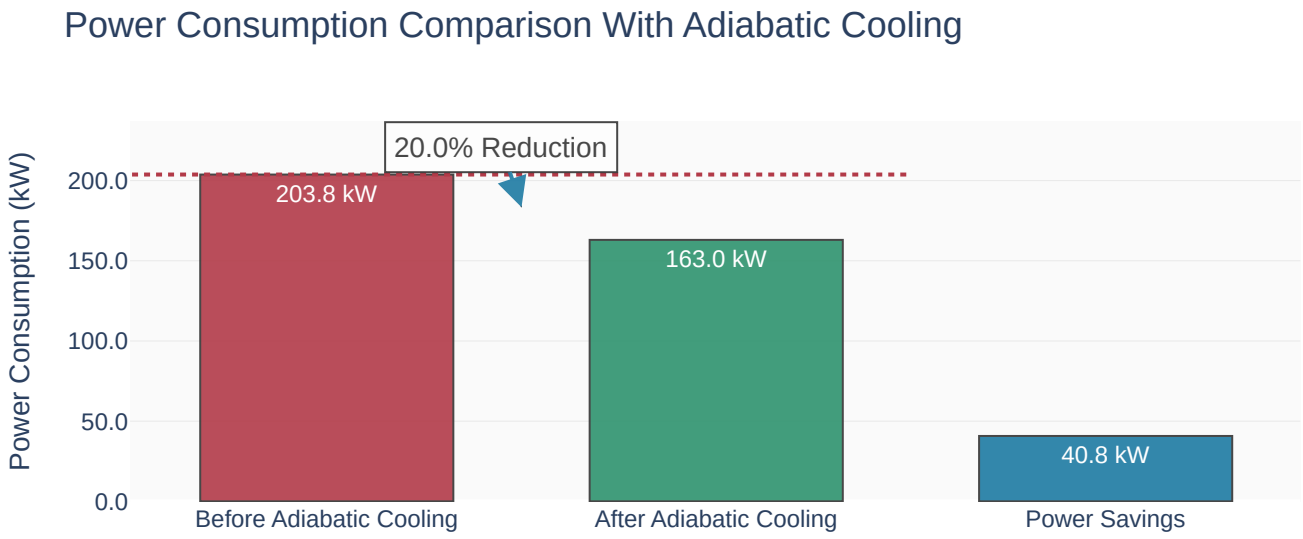
Degradation Zone Significance

The degradation zone represents the operational inefficiency due to suboptimal conditions:

PARAMETER	TECHNICAL IMPACT
High Condenser Temperature	Increases condensing pressure, requiring higher compression ratios. Each 1°C temperature reduction typically yields 2-3% energy savings.
Increased Compressor Work	Greater pressure differential between evaporator and condenser requires more electrical input power, reducing the Coefficient of Performance (COP).
System Reliability Impact	Higher discharge temperatures and pressures increase mechanical stress on compressors and system components, leading to increased maintenance costs and reduced equipment lifespan.
Cooling Capacity Reduction	Elevated condensing temperatures reduce mass flow rate of refrigerant, decreasing the system's ability to remove heat effectively from the process.

3.2 Energy Savings Analysis

Our analysis shows that by implementing the adiabatic cooling system, we can achieve a significant reduction in power consumption:

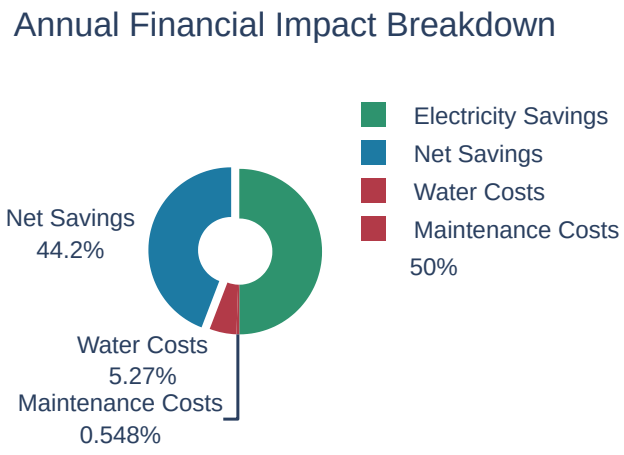


The 20.0% reduction in power consumption translates to annual energy savings of 322,560 kWh, resulting in monetary savings of ₹20,96,640 (20.97 L)/year.

4. Financial Analysis

4.1 Cost Benefit Summary

ITEM	
Project Cost	₹11,50,000
Annual Electricity Savings	₹20,96,640
Annual Water Cost	₹2,21,184
Annual Maintenance Cost	₹23,000
Net Annual Savings	₹18,52,456
Simple Payback Period	**7 months**



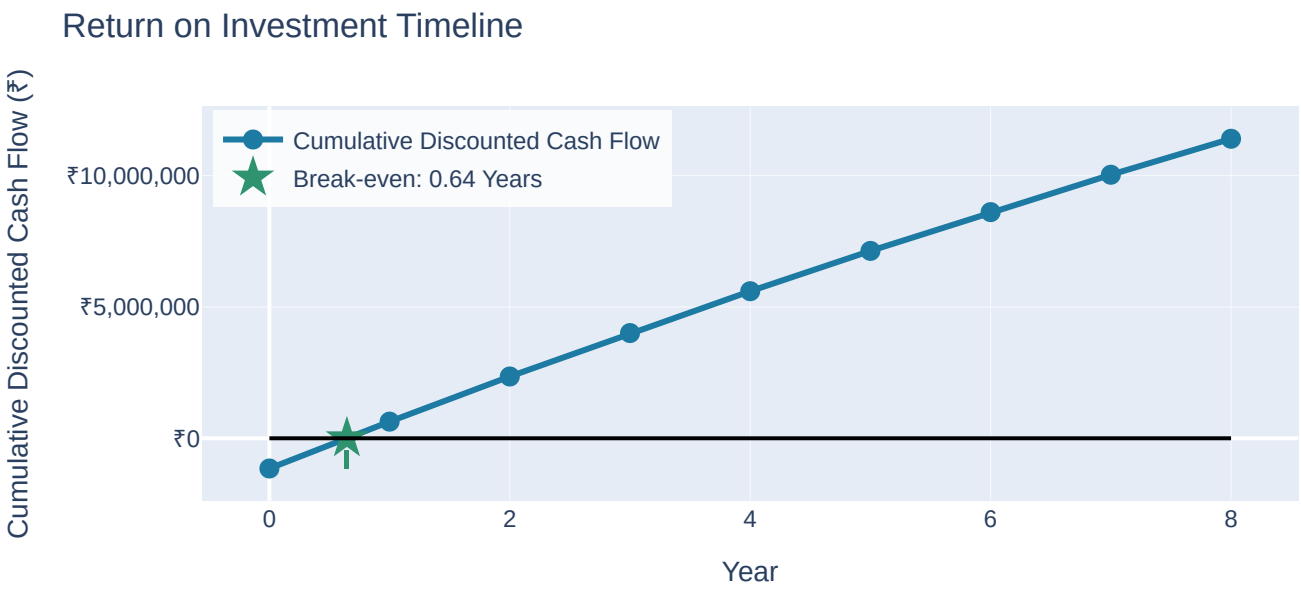
4.2 Life Cycle Cost Analysis (15 Years)

YEAR	CASH FLOW (₹)	DISCOUNTED CF (₹)	CUMULATIVE DCF (₹)
0	-1,150,000	-1,150,000	-1,150,000
1	1,926,554	1,783,847	633,847
2	2,003,616	1,717,778	2,351,625
3	2,083,761	1,654,157	4,005,781
5	2,253,796	1,533,896	7,132,569
10	2,742,087	1,270,117	13,990,813
15	3,336,169	1,051,699	19,669,670

The Net Present Value (NPV) of this project over 15 years is **₹1,96,69,669.56 (1.97 Cr)**, with a discount rate of 8% and inflation rate of 4%.

4.3 Return on Investment Analysis

The chart below illustrates the cumulative cash flow over time, showing the break-even point and long-term financial benefits of the adiabatic cooling system investment.



5. Environmental Impact

5.1 Carbon Footprint Reduction

Implementation of the adiabatic cooling system will significantly reduce the facility's carbon footprint through reduced electricity consumption.

IMPACT	VALUE
Annual Energy Savings	322,560 kWh/year
Grid Emission Factor	0.82 kg CO2e/kWh
Annual CO2e Reduction	264.5 tonnes CO2e/year
Equivalent to Trees Planted	4,364 trees

5.2 Sustainability Benefits

By implementing the adiabatic cooling system, your organization will contribute to multiple UN Sustainable Development Goals and strengthen your sustainability profile:

Direct Environmental Impact

264.5 tonnes CO_2 | **4,364** trees | **322.6** MWh

- Reduced peak electricity demand
- Decreased strain on power infrastructure
- Efficient water use: 4,915 L/year

Strategic Benefits

SDG 7 SDG 9 SDG 12 SDG 13

- Enhanced ESG ratings and reporting
- Compliance with efficiency regulations
- Support for carbon reduction goals

15-Year Impact: 3967.5 tonnes CO_2 avoided

6. Implementation Plan

SEE-Tech Solutions provides a comprehensive turnkey implementation process to ensure minimal disruption to your operations and optimal system performance.

6.1 Project Timeline

1

Site Assessment

Week 1

- Site evaluation
- Data collection

2

Engineering

Weeks 2-3

- System design
- Integration planning

3

Procurement

Weeks 4-5

- Equipment ordering
- Quality validation

4

Installation

Weeks 6-7

- System assembly
- IoT integration

5

Commissioning

Week 8

- Testing & validation
- Training & handover

6.2 Installation Process

Pre-Installation Planning

Comprehensive site survey and installation planning to identify optimal locations and connection points.

Off-Hours Installation

Critical connections performed during scheduled downtime to minimize operational impact.

Modular Implementation

System installed in modules, allowing for phased implementation if required.

Testing & Commissioning

Thorough system testing, performance validation, and operator training.

6.3 Your Project Team

Professional Engineers

HVAC specialists with expert knowledge of evaporative cooling

Project Manager

Dedicated point of contact for timely, on-budget delivery

Installation Technicians

Specialized experts in adiabatic system installation

Support Team

IoT specialists and technical support for system optimization

7. Monthly Maintenance Service & Conclusion

Our commitment to your system's performance extends beyond installation with our comprehensive service program.

7.1 SEE-Tech Professional Maintenance Program

Service Benefits

- Regular system inspection and monitoring
- Preventive maintenance to avoid breakdowns
- Continuous optimization of system efficiency
- Early detection of potential issues
- Extended equipment lifespan
- Guaranteed energy savings

Service Components

- Visual inspection of all components
- Performance data analysis via IoT sensors
- Water quality testing (TDS < 200 ppm)
- Media condition assessment
- Control system verification
- Energy efficiency validation

7.2 Conclusion

SEE-Tech Solutions' adiabatic cooling system offers a proven, cost-effective approach to optimize your chiller's performance and achieve significant energy savings. By implementing our solution, **Ashirwad Pipes 26'** will benefit from:

- Energy savings of 20.0% on chiller power
- Annual savings of 2,096,640 rupees
- ROI period of only 7 months
- Carbon footprint reduction of 264.5 tonnes CO_2 annually
- Extended equipment lifetime and improved reliability
- Ongoing technical support and optimization

Our digital twin technology has validated these projections through detailed simulation of your specific system, and our IoT-enabled monitoring will ensure continuous optimization and verification of savings. We are confident that this solution will deliver exceptional value and look forward to partnering with you on this project.