



**IGAWARA CORPORATION PTE LTD**

井河原私人有限公司

**SCREW STEAM HEAT PUMP DIVISION**



## QUALITY POLICY

We deliver bias-free customer satisfaction through the effective implementation of **ISO 9001** and **AS9120** Compliant quality systems

We shall:



Never compromise and put profit above the quality management system.



Conduct stringent check on the reliability of customers and vendors.



Only engage in businesses where long term relations with customers and vendors are sustainable for the mutual benefits of all parties.



Adhered to customer requirements and specifications to achieve total customer satisfaction.

## Service with a Difference

- Delivering service that consistently exceeds expectations
- Providing comprehensive, end-to-end power solutions
- Ensuring reliable performance for critical operations
- Driven by expert engineering and strict quality control
- Manufactured in compliance with global ISO standards
- One trusted partner from concept to completion
- Proven track record across international projects
- Extensive experience in global trade and logistics
- Delivering value through cost efficiency and reliability
- Rapid response with solutions tailored to your needs



# SCREW STEAM HEAT PUMP OVERVIEW

## FROM WASTE STEAM TO SUSTAINABLE PROCESS ENERGY

Global industries are entering a new era of energy transition and industrial decarbonization. Rising energy costs, tightening environmental regulations, and increasing carbon reduction commitments are driving industries worldwide to rethink how thermal energy is generated, utilized, and recycled within industrial processes.

Among all industrial utilities, steam systems remain one of the largest sources of energy consumption and carbon emissions. In chemical processing, petrochemical production, pharmaceutical manufacturing, food processing, and other energy-intensive industries, large amounts of low-grade steam and waste thermal energy are continuously discharged or underutilized, resulting in significant energy losses and operational inefficiencies.

At the same time, global demand for sustainable industrial heating technologies is rapidly increasing. Industries are actively seeking alternatives to conventional fossil-fuel-based steam generation in order to improve energy efficiency, reduce operating costs, and support long-term ESG and decarbonization goals.

## THE ROLE OF SSHP

SSHP (Screw Steam Heat Pump) is an advanced high-temperature industrial steam heat pump platform designed to capture low-grade waste steam and upgrade it into reusable high-value process steam.

Using specialized screw-type vapor compression technology, SSHP provides a highly efficient electrified alternative to traditional fossil-fuel-based industrial steam generation systems.

By recovering and upgrading waste thermal energy that would otherwise be lost, SSHP enables industries to significantly reduce steam production costs, improve thermal energy efficiency, and support long-term decarbonization and ESG objectives.

Unlike conventional HVAC heat pumps designed primarily for low-temperature heating applications, SSHP is specifically engineered for demanding industrial steam systems operating under complex and unstable process conditions.



# SCREW STEAM HEAT PUMP OVERVIEW

## CORE TECHNOLOGY CAPABILITIES

### Wet Steam & Unstable Vapor Handling

SSHP systems are capable of handling wet steam and fluctuating vapor conditions commonly found in industrial processes, where conventional compression technologies often face operational limitations.

### High-Temperature Steam Upgrading

The system is engineered to achieve high pressure ratios and significant temperature upgrading, commonly producing process steam in the range of 120°C to 200°C for demanding industrial applications.

### Circular Thermal Energy Recovery

SSHP extracts low-grade thermal energy from condensate systems, flash steam, cooling loops, and process exhaust streams, converting wasted heat into reusable process energy.

### Electrified Sustainable Steam Generation

By replacing or reducing dependency on conventional gas- and coal-fired boiler systems, SSHP supports industrial electrification and sustainable steam generation strategies.

## APPLICATIONS

### Food & Beverage

Sterilization, evaporation, concentration, and thermal processing systems.

### Chemical & Petrochemical

Distillation systems, solvent recovery, concentration, and process steam optimization.

### Pharmaceutical Manufacturing

Clean steam recovery and temperature-sensitive process integration.

### Pulp & Paper

Drying systems and thermal energy recycling applications.

### Industrial Utility Networks

Flash steam recovery, waste steam recompression, and steam network optimization.



## WHY SSHP MATTERS

Industrial steam systems remain heavily dependent on fossil-fuel-based boilers and are among the largest sources of energy consumption and carbon emissions across process industries worldwide.

As global industries accelerate toward decarbonization, electrification, and sustainable manufacturing, the demand for high-temperature industrial heat pump technologies continues to grow rapidly.

SSHP bridges the gap between conventional steam generation and next-generation sustainable thermal energy systems by transforming low-grade waste steam into reusable high-value process energy.

Rather than treating waste steam as a by-product to be discharged, SSHP enables continuous thermal energy recycling and steam upgrading, allowing industries to improve energy efficiency, reduce boiler steam demand, lower operating costs, and support long-term ESG and carbon reduction targets.

By integrating waste heat recovery with electrified steam generation, SSHP provides industries with a practical pathway toward sustainable industrial energy transformation.

# STEAM SYSTEM CHALLENGES

## MAJOR STEAM ENERGY LOSS POINTS

Industrial steam systems are widely used across chemical, refining, and process industries.

However, conventional configurations still suffer from multiple inherent inefficiencies that lead to significant energy waste and operating limitations.

### 1. Low-Grade Steam Venting Loss

Flash steam and overhead vapors (0.02–0.2 MPaA) are too low-grade for direct reuse and are often vented or condensed, causing energy loss.

#### SSHP Response:

Mechanical compression upgrades steam for reuse in process systems.

### 2. Air Cooler Heat Dissipation

Large amounts of process heat are rejected to the atmosphere during air cooling, resulting in continuous energy waste.

#### SSHP Response:

Waste heat is recovered and upgraded into usable steam.

### 3. High Energy Demand in Distillation Systems

Distillation requires simultaneous heating and cooling, leading to high and inefficient energy consumption.

#### SSHP Response:

Closed-loop heat pump system reduces steam use by 50–90%.

### 4. Centrifuge Sensitivity to Wet Steam

Conventional systems are vulnerable to moisture, causing mechanical damage and unstable operation.

#### SSHP Response:

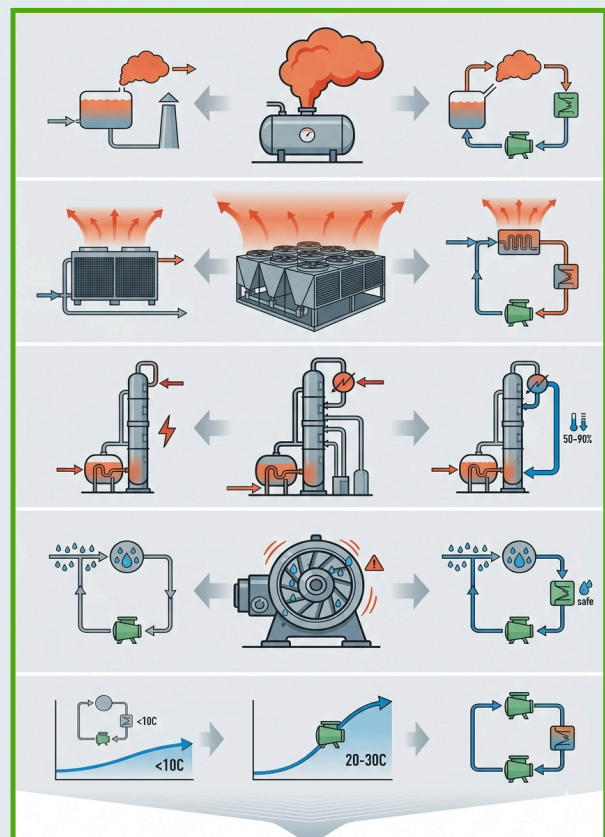
Screw compression enables safe handling of wet vapor.

### 5. Limited Temperature Lift in Conventional MVR

Traditional MVR systems are restricted to low temperature lift (<10°C), limiting industrial applicability.

#### SSHP Response:

SSHP achieves 20–30°C lift for wider process use.



## KEY HIGHLIGHTS

### 1. Untapped Energy Potential

Steam system losses are not unavoidable waste, but recoverable energy resources.

### 2. Energy Recovery

SSHP captures low-grade steam and waste heat, upgrading them into usable process energy.

### 3. Closed-Loop System

Energy is reintegrated into the process, enabling continuous recovery instead of one-way loss.

### 4. Higher Efficiency

This approach significantly reduces steam consumption while improving overall system sustainability.

# SSHP INTEGRATED FRAMEWORK

## CORE APPLICATIONS AND EMERGING USE CASES OF SSHP

SSHP is deployed across a wide range of industrial systems where low-grade steam and waste heat can be efficiently upgraded, recovered, and reused to displace conventional high-pressure steam generation. By integrating steam compression and heat recovery within a unified thermodynamic loop, the technology enables significant energy savings and process intensification across multiple sectors. Its applications can be systematically categorized into four core industrial domains, plus one emerging expansion use case that reflects its future growth potential.

### SSHP VS CONVENTIONAL SYSTEMS

Key Factor	Conventional Systems	SSHP
Energy Source	Fossil fuel / high-grade electricity	Waste steam + minimal power
Energy Efficiency	Moderate to low	High (energy recovery & reuse)
System Structure	Multi-unit, complex installation	Single skid, compact design
Operating Stability	Varies, multiple auxiliary systems required	Stable continuous 24/7 operation
Cooling Water Demand	High	Very low or none
Carbon Emissions	High	Significantly reduced
Investment Return	Long / unclear	Typically less than 1 year

### SSHP CORE FRAMEWORK

#### 1. Process Intensification Systems

- Heat integration
- Vapor recompression efficiency upgrade
- Energy footprint reduction

#### 2. Evaporation & Concentration Systems

- Evaporation upgrade
- Concentration processes
- Vapor recovery & reuse

#### 3. Distillation & Separation Systems

- Heat pump distillation
- Energy integration in separation systems
- Reboiler heating via vapor compression

#### 4. Waste Heat Recovery & Utility Systems

- Industrial waste heat recovery & reuse
- Cooling system energy replacement
- Steam transport & pressure boosting

### SSHP CORE APPLICATION SCENARIOS

#### 1. Flash Steam Recovery

Recovers and upgrades flash steam for reuse.

#### 2. Evaporation Systems

Recycles secondary vapor to reduce steam consumption.

#### 3. Concentration Processes

Improves efficiency through continuous vapor reuse.

#### 4. Crystallization Processes

Enhances crystallization via vapor recompression.

#### 5. Distillation Systems

Reuses overhead vapor for reboiler heating.

#### 6. Air Cooler Replacement

Converts waste heat into reusable process steam.

#### 7. Steam Transport and Booster Stations

Boosts steam pressure for long-distance transport.

# APPLICATION SCENARIOS

## FLASH STEAM RECOVERY

### FLASH STEAM RECOVERY SYSTEMS

#### Process Background

In industrial steam systems, high-pressure condensate is frequently discharged into flash tanks, where pressure reduction generates large quantities of low-pressure flash steam.

Because the pressure level of flash steam is often insufficient for direct reuse, a significant portion is traditionally vented, condensed, or wasted.

Flash steam recovery is especially important in industries with large condensate circulation systems, such as refining, petrochemical processing, chemical manufacturing, rubber production, and power generation.

#### Traditional Process Limitations

Conventional flash steam systems face several major limitations:

- Low-pressure flash steam cannot directly enter medium-pressure steam networks
- Large pressure differences reduce reuse efficiency
- Long-distance steam transportation creates severe thermal losses
- Conventional centrifugal compressors struggle with wet steam conditions
- Excess vapor often requires cooling and condensation treatment

As a result, large amounts of usable thermal energy are wasted.

#### SSHP Working Principle

SSHP systems recover low-pressure flash steam and compress it into reusable process steam.

The compressed vapor is directly returned to low-pressure or medium-pressure steam networks, forming a closed-loop thermal recovery system.

For saturated steam applications with:

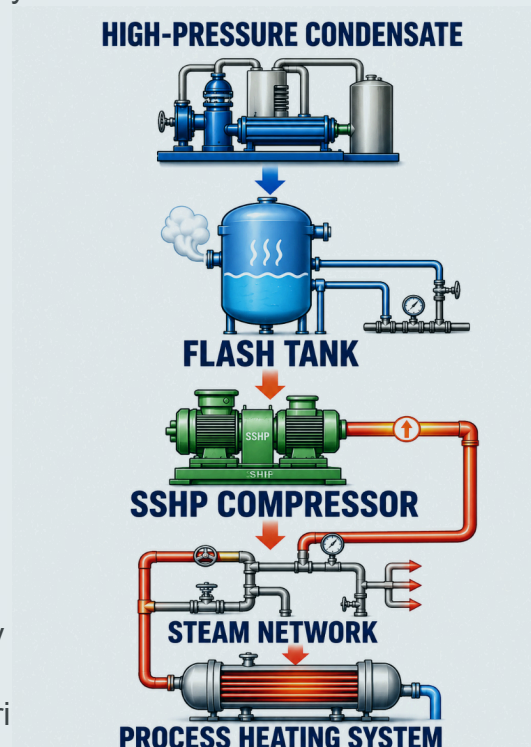
- Wet steam handling capability
- High compression ratio operation
- Stable saturated steam compression
- Fully automatic operation
- Compact skid-mounted structure

The system significantly reduces:

- Fresh steam consumption
- Cooling water demand
- Boiler operating load
- Carbon emissions
- Total operating cost

#### Industrial Benefits

- Significant recovery of wasted thermal energy
- Improved steam network efficiency and stability
- Reduced dependence on boilers and fuel input
- Lower overall CO<sub>2</sub> emissions and carbon footprint
- Short payback period with high economic return



# APPLICATION SCENARIOS

## FLASH STEAM RECOVERY

### PROJECT CASE ANALYSIS

#### Case 1 - Rubber Plant Flash Steam Recovery Project

This project recovers flash steam generated from high-temperature condensate tanks.

The SSHP system compresses flash steam directly back into the steam network, reducing both steam losses and condenser cooling requirements.

##### Key Project Features

- Steam flow: 1.67 t/h
- Compressor power: 147 kW
- Annual operating time: 8000 hours
- Annual cost savings: 1.3 million RMB

##### Technical Highlights

- Handles saturated and wet steam conditions
- Corrosion-resistant and dust-tolerant design
- Compact skid-mounted installation
- Suitable for unstable industrial vapor systems

##### Industrial Value

The project successfully solves the contradiction between low-pressure exhaust steam waste and insufficient medium-pressure steam supply.

#### Case 2 - Ganning Petrochemical Low-Pressure Flash Steam Compression Unit

The project recovers flash steam generated during condensate flashing from 1.3 MPa steam condensate.

The SSHP system compresses flash steam from 0.02 MPaG to 0.15 MPaG for reuse in the plant low-pressure steam network.

##### Key Results

- Recovered flash steam flow rate: 2.2 t/h
- Annual steam savings value: 2.64 million RMB
- Annual cooling water savings: 64,000 RMB
- Fully automatic unmanned operation

##### Technical Advantages

- Two-stage flash with energy cascade utilization
- High energy recovery efficiency
- Short investment payback period
- Stable long-term continuous operation



# APPLICATION SCENARIOS

## FLASH STEAM RECOVERY

### PROJECT CASE ANALYSIS

#### Case 3 - Ganning Petrochemical Medium-Pressure Steam Recovery Unit

This system further compresses flash steam from 0.15 MPaG to 0.6 MPaG and injects it into the medium-pressure steam network.

#### Key Results

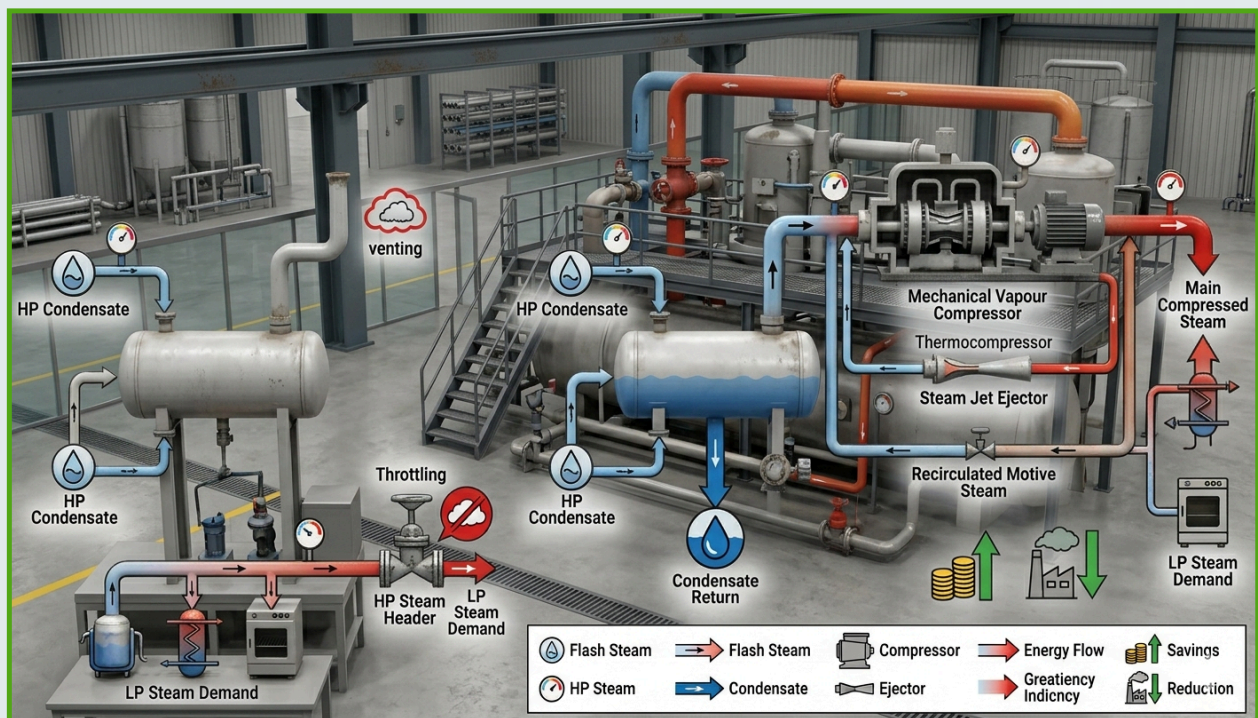
- Steam recovery capacity: 7.6 t/h
- Annual net revenue: 5.328 million RMB
- Significant reduction in pipeline thermal losses
- Improved steam network utilization efficiency

#### Technical Advantages

- Extends economic steam transmission distance from 5–8 km to 10–20 km
- Avoids construction of additional high-pressure steam pipelines
- Improves overall plant thermal integration

#### Typical Industrial Applications

- Petrochemical plants
- Refining systems
- Chemical processing
- Rubber manufacturing
- Power generation
- Industrial steam utility networks



# APPLICATION SCENARIOS

## EVAPORATION SYSTEMS

### MECHANICAL VAPOR RECOMPRESSION (MVR) EVAPORATION

#### Process Background

Industrial evaporation systems generate large quantities of secondary vapor during concentration and solvent removal processes.

Traditional multi-effect evaporation systems reduce steam consumption by cascading vapor through multiple evaporators, but they still suffer from:

- Complex system structures
- Large equipment footprints
- High cooling water demand
- Limited thermal efficiency
- High maintenance costs

Mechanical Vapor Recompression (MVR) technology upgrades secondary vapor into reusable heating steam, greatly reducing external steam demand.

#### Limitations of Conventional MVR Systems

Traditional MVR systems using centrifugal compressors often face several operational challenges:

- Limited temperature lift capability
- Poor adaptability to wet vapor conditions
- Sensitivity to liquid carryover
- Narrow operating range
- Difficulty handling corrosive or dusty vapors

These limitations restrict their application in high-temperature industrial evaporation systems.

#### SSHP MVR Solution

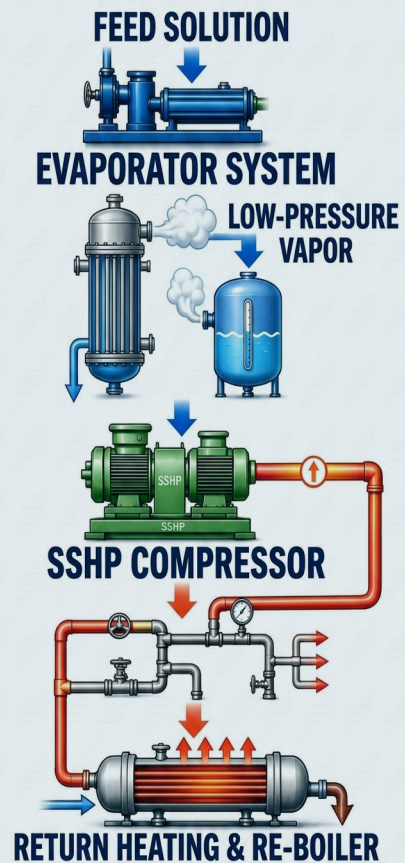
SSHP systems compress secondary vapor generated during evaporation and return it directly to the evaporator heating side.

This forms a highly efficient closed-loop evaporation process.

Compared with conventional MVR systems, SSHP offers:

- Higher compression ratio capability
- Larger temperature lift
- Better wet vapor tolerance
- Stable operation under fluctuating loads
- Improved adaptability for industrial process conditions

#### MVR EVAPORATION PROCESS CYCLE



# APPLICATION SCENARIOS

## EVAPORATION SYSTEMS

### PROJECT CASE ANALYSIS

#### Case - MnSO<sub>4</sub> Evaporation & Crystallization MVR Project

In manganese sulfate evaporation and crystallization systems, large quantities of low-pressure secondary vapor are generated.

The SSHP system compresses the vapor and recycles it back to the evaporator as the heating source.

This creates a fully closed thermal loop.

#### Key Project Parameters

- Steam flow: 3 t/h
- Suction pressure: 0.058 MPaA
- Discharge pressure: 0.362 MPaA
- Saturation temperature lift: >30°C

#### Technical Advantages

- Single-effect with multi-effect efficiency
- Anti-carryover screw compression technology
- Suitable for heat-sensitive materials
- No cooling water required

#### Key Project Parameters

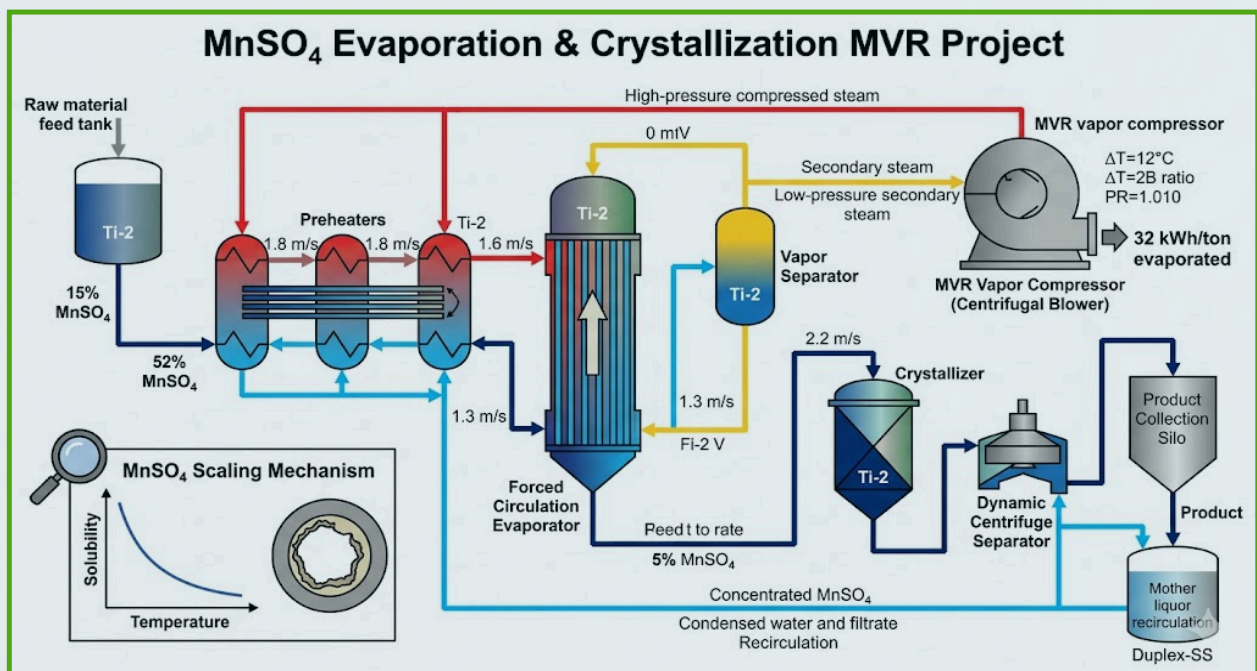
Compared with conventional multi-effect evaporation systems, steam consumption can be reduced by 60–90%.

#### Typical Industrial Applications

- Chemical processing
- Food concentration
- Pharmaceutical production
- Wastewater treatment
- Salt chemical industry
- Fine chemical manufacturing

#### Energy Saving Highlights

- Reuses low-grade vapor as heating energy
- Single-Effect Setup, Multi-Effect COP
- Significantly reduces steam consumption
- Eliminates cooling water requirements
- Lowers operating and maintenance costs



# APPLICATION SCENARIOS

## CRYSTALLIZATION PROCESSES

### INDUSTRIAL CRYSTALLIZATION SYSTEMS

#### Process Background

Crystallization processes are widely used in chemical, pharmaceutical, and fine chemical industries to produce solid crystalline products from solution systems.

Typical processes include:

- Evaporation crystallization
- Forced circulation crystallization
- Cooling + evaporation hybrid crystallization

During operation, large quantities of secondary vapor are generated at low pressure and low temperature.

If not recovered, this vapor is usually condensed and wasted, leading to:

- High steam consumption
- Large cooling water demand
- Low thermal efficiency
- Increased operating cost

#### Traditional System Limitations

Conventional crystallization systems face several challenges:

- Dependence on external steam for continuous heating
- Inefficient utilization of secondary vapor
- Large energy loss through condensation systems
- Poor adaptability to slurry and solid-liquid mixed conditions
- High system complexity in multi-effect designs

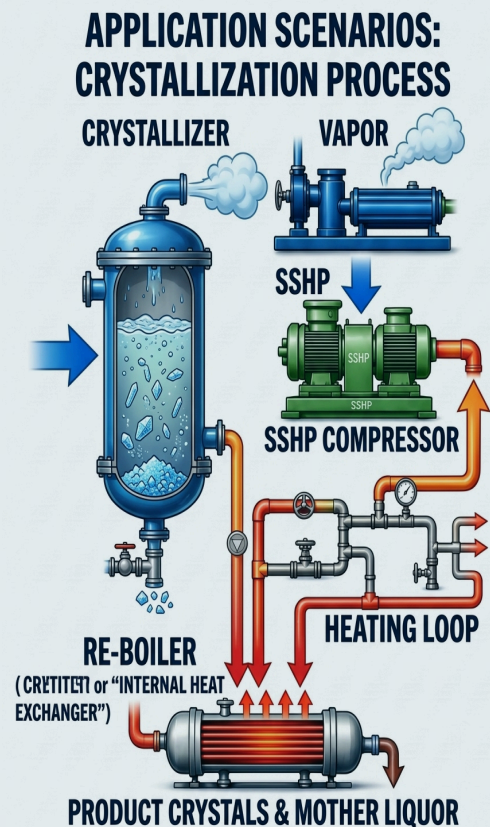
#### SSHP Crystallization Solution

SSHP integrates vapor recompression into crystallization systems.

Secondary vapor is compressed and reused as the heating source for the crystallizer, forming a closed-loop energy cycle.

Key advantages include:

- Stable operation under slurry conditions
- High temperature lift capability ( $>30^{\circ}\text{C}$ )
- Wet vapor compression adaptability
- Elimination of external steam demand
- Reduced cooling water consumption



# APPLICATION SCENARIOS

## CRYSTALLIZATION PROCESSES

### PROJECT CASE ANALYSIS

#### Case - $\text{MnSO}_4$ Evaporation & Crystallization MVR Project

This system operates in a forced circulation crystallizer producing manganese sulfate crystals.

Secondary vapor generated in the evaporator is compressed by SSHP and reused as the heating medium.

#### Key Project Parameters

- Steam flow: 3 t/h
- Suction pressure: 0.058 MPaA
- Discharge pressure: 0.362 MPaA
- Temperature lift:  $>30^\circ\text{C}$
- Operating hours: 8000 h/year

#### Energy Benefits

- Steam savings: 50–70%
- Improved crystal size uniformity
- Reduced cooling load
- Lower overall energy intensity

#### Technical Advantages

- Suitable for slurry containing solid particles
- Screw compressor resistant to corrosion and fouling
- Stable crystallization temperature control
- No external steam required

#### Environmental Impact

- Zero External Steam:
- Carbon Footprint Cut
- Zero Wastewater Flash
- Minimal Water Makeup



# APPLICATION SCENARIOS DISTILLATION SYSTEMS

## INDUSTRIAL DISTILLATION ENERGY RECOVERY SYSTEMS

### Process Background

Distillation is one of the most energy-intensive processes in the chemical industry.

Traditional distillation systems require:

- Continuous reboiler heating at the bottom
- Continuous condensation cooling at the top

This creates a fundamental energy imbalance:

Heat is supplied at low temperature and rejected at higher energy loss.

### Traditional System Limitations

Conventional distillation systems suffer from:

- High steam consumption
- Large cooling water demand
- Heat rejection losses at condenser
- Multi-stage energy inefficiency
- High operating cost in large-scale chemical plants

### SSHP Distillation

SHP compresses overhead vapor from the distillation column and upgrades its temperature and pressure.

The compressed vapor is then reused as reboiler heating steam.

This creates a closed thermal loop:

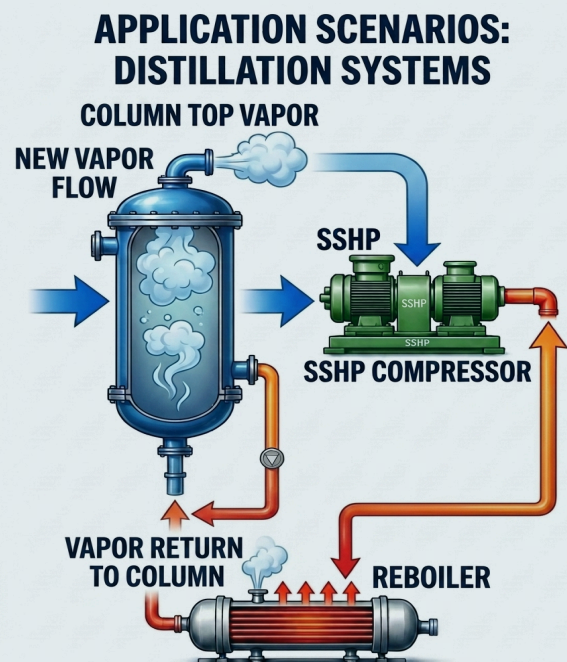
- No external reboiler steam required
- No condenser heat waste
- Internal energy recycling

### Applicability Conditions

- Tower temperature difference  $\leq 80^{\circ}\text{C}$
- High vapor circulation flow
- Continuous production systems
- Strong cooling load imbalance

### Typical Industries

- Bio-Chemicals: Ethanol, methanol, and solvent recovery lines.
- Petrochemicals: Light hydrocarbon separation and splitting towers.
- Pharmaceuticals: High-purity water distillation and concentration.



# APPLICATION SCENARIOS

## DISTILLATION SYSTEMS

### PROJECT CASE ANALYSIS

#### Case 1 - Benzene Stripping Column

- Steam saving: 5.5 t/h
- Power: 400 kW
- Eliminates reboiler steam and condenser load
- Suitable for medium-low temperature separation

#### Case 2 - Cyclohexene Separation Tower

- Steam saving: 28.5 t/h
- Dual-stage compression system
- High pressure ratio operation
- Suitable for high-purity separation

#### Case 3 - Cyclohexane Distillation Tower

- Steam saving: 14.5 t/h
- Medium-high pressure operation
- Stable hydrocarbon separation

#### Case 4 - Cyclohexanol Separation Tower

- Steam saving: 9.0 t/h
- Low temperature operation (52°C top temperature)
- High efficiency vapor recovery

#### Case 5 - Decyclohexene Tower

- Steam saving: 8.5 t/h
- High temperature operation (159°C)
- Suitable for high thermal load systems

#### Case 6 - Light Tower

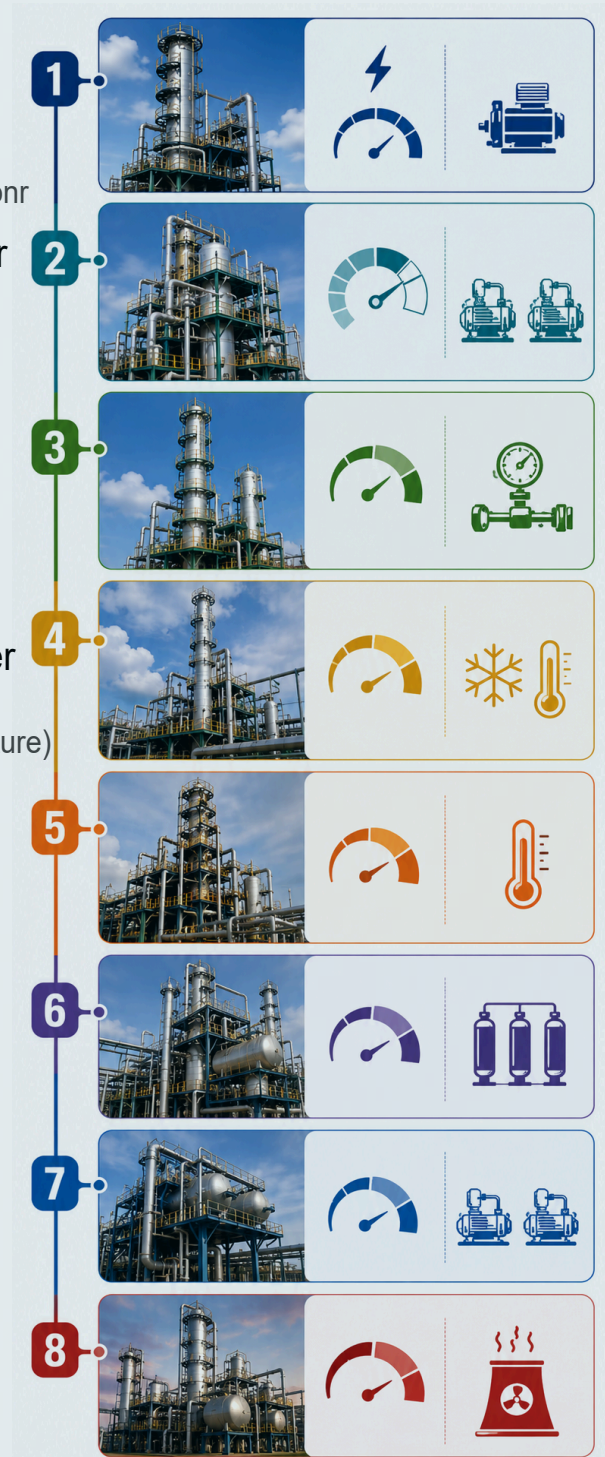
- Steam saving: 14.0 t/h
- Multi-component separation system
- Stable vapor recompression

#### Case 7 - Ketone Tower

- Steam saving: 18.0 t/h
- Large vapor flow system
- Dual compressor configuration

#### Case 8 - Alcohol Tower

- Steam saving: 26.0 t/h
- High thermal load recovery



# APPLICATION SCENARIOS DISTILLATION SYSTEMS

## PROJECT CASE ANALYSIS

### Case 9 - Rearranging Tower

- Steam saving: 6.5 t/h
- Mixed vapor composition system
- Stable medium pressure operation

### Case 10 - Wastewater Stripping Tower

- Steam saving: 5.0 t/h
- Low-grade vapor recovery
- Environmental emission reduction

### Case 11 - Benzene Distillation Tower

- Steam saving: 10.0 t/h
- Standard hydrocarbon separation
- High reliability operation

### Case 12 - Xinjiang Tianye BDO Wastewater Tower

- Steam flow: 42 t/h
- Calculation Basis: 8,000 h/year; Steam Price: RMB 72.69/t; Electricity Price: RMB 0.39/kWh
- Heat Pump Power Consumption: 2,446 kW
- Annual savings: 16.79 million RMB
- Temperature difference only 9°C
- High efficiency heat pump distillation system

### Case 13 - Sichuan Yongying BDO Wastewater Tower

- Steam saving: 13.5 t/h
- Annual savings: 17.3 million RMB
- Fully automated operation

### Case 14 - Hydrogenation Byproduct Steam Recovery

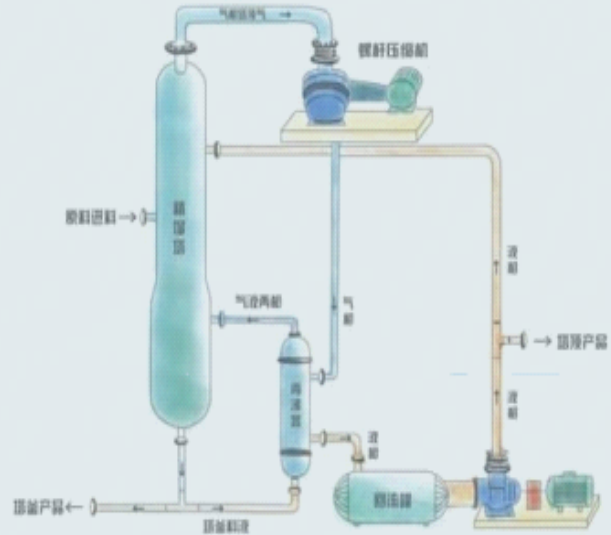
- Steam recovery: 25.7 t/h
- Annual savings: 30.91 million RMB
- Waste heat → medium pressure steam conversion

### Case 15 - DMF Wastewater Distillation

- Steam flow: 0.8 t/h
- Corrosive vapor handling capability
- Payback period < 1 year
- Compact skid-mounted system

### Project Summary:

Based on the performance data of all towers in the Luxi Chemical Caprolactam Project, the total steam saving achieved is 145 t/h, delivering annual economic benefits of approximately RMB 150 million.



# APPLICATION SCENARIOS

## AIR COOLER REPLACEMENT

### INDUSTRIAL WASTE HEAT RECOVERY SYSTEMS

#### Process Background

Industrial air coolers are widely used to remove process heat.

However, they represent a major source of energy loss because:

- Heat is directly rejected to atmosphere
- No energy recovery is achieved
- Large electricity consumption for fans
- High cooling load dependency

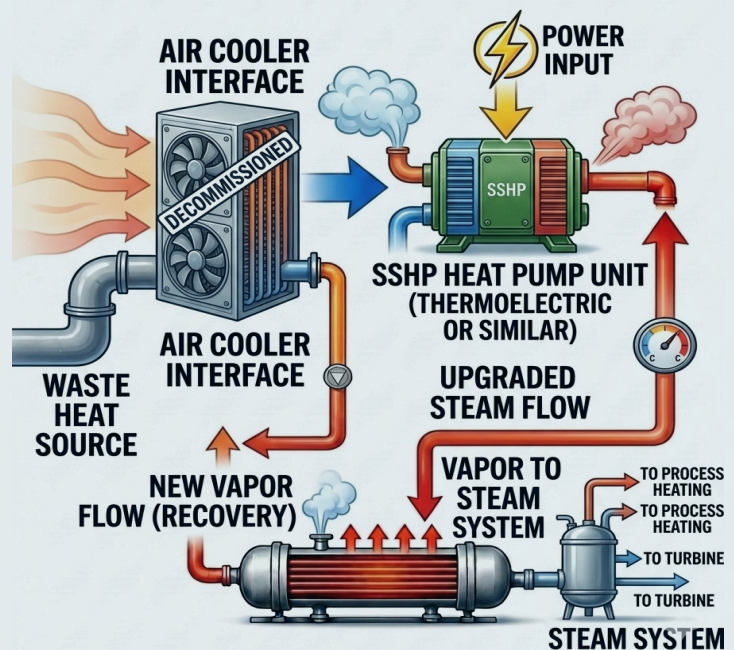
#### Typical Applications

- Aromatics complexes
- Refining units
- Hydrogenation systems
- Petrochemical plants
- Large-scale chemical facilities

#### System Benefits

- Reuses waste heat
- Eliminates heat loss
- Reduces fan power
- Cuts steam demand
- Lowers utility load
- Improves efficiency
- Reduces CO<sub>2</sub> emissions
- Lowers operating cost

### APPLICATION SCENARIO: AIR COOLER REPLACEMENT (WASTE HEAT UPGRADE)



#### SSHP Air Cooler Replacement Concept

SSHP replaces air cooling systems by:

- Captures waste heat from vapor and process streams normally rejected by air coolers.
- Converts recovered heat into stable low-pressure steam for reuse.
- Compresses steam to higher pressure and temperature for process use.
- Feeds upgraded steam back into the plant steam network.

This enables waste heat recovery and reduces air cooling and steam demand.

# APPLICATION SCENARIOS

## AIR COOLER REPLACEMENT

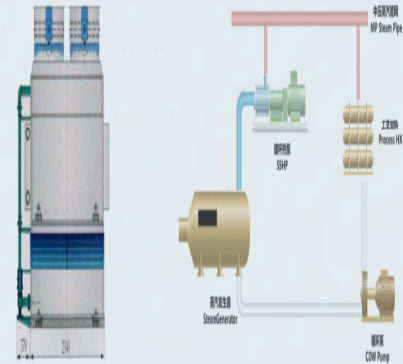
### PROJECT CASE ANALYSIS

#### Case 1 - 600,000 t/y Aromatics Unit

For a single 600,000 t/y aromatics unit, the system achieves a steam saving of 6.5 t/h through a mixed-vapor composition system operating under stable medium-pressure conditions with fully automated control.

Across 11 identical units, the total annual savings reach RMB 234.1 million (based on 8,000 operating hours per year). This includes savings from recovered steam value, the elimination of air cooler systems (reducing fan power consumption and maintenance costs), and lower cooling water demand.

In addition, the application reduces CO<sub>2</sub> emissions by approximately 143,000 t/y, based on an emission factor of 0.25 tCO<sub>2</sub> per tonne of steam saved, significantly improving overall energy efficiency and environmental performance.



#### Steam Compression System Performance Summary

Parameter	Value (Unit)
Steam Flow	200,000 kg/h
Intake Pressure	0.45 MPaG
Exhaust Pressure	1 MPaG
Power Consumption after Compression	9,590 kW
Steam Revenue	33,000 RMB (×10,000)
Operating Time per Year	8,000 hours
Annual Steam Cost Savings	234.1 million RMB for total 11 units

#### Case 2 - Petrochemical Aromatics Unit

- Pressure upgrade: 0.17–0.45 → 1.2 MPaG
- CO<sub>2</sub> reduction: 121,700 t/year
- Annual savings: 78.56 million RMB

#### Case 3 - Caprolactam (CPL, ε-Caprolactam)

- Pressure upgrade: 0.17–0.45 → 1.2 MPaG
- CO<sub>2</sub> reduction: 93,700 t/year
- Annual savings: 63.01 million RMB

#### Case 4 - BDO (1,4-Butanediol)

- Pressure upgrade: 0.17–0.45 → 1.85 MPaG
- CO<sub>2</sub> reduction: 78,700 t/year
- Annual savings: 52.45 million RMB



# APPLICATION SCENARIOS

## STEAM TRANSPORT BOOSTER STATION

### INDUSTRIAL STEAM PRESSURE UPGRADE SYSTEMS

#### Process Background

In industrial steam networks, steam is often generated at central power plants but loses pressure during long-distance transport.

End-users frequently experience:

- Insufficient steam pressure
- Unstable process operation
- Need for additional local boilers
- High fuel consumption

#### SSHP Booster Station Principle

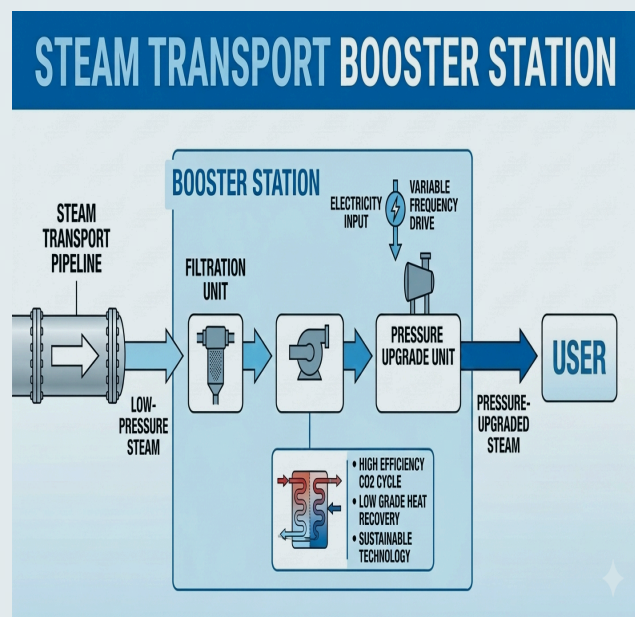
SSHP extracts steam from existing pipelines and compresses it to higher pressure levels.

This enables:

- Steam pressure restoration
- Extended steam supply radius
- Reduced need for new boilers
- Improved network stability

#### Typical Applications

- Industrial parks steam networks
- Power plant steam distribution systems
- Chemical cluster energy supply
- District heating industrial integration



### PROJECT CASE ANALYSIS

#### Case - Changzhou Black Pearl Building Materials

##### Key Parameters

- Steam flow: 6 t/h
- Inlet pressure: 0.8–0.9 MPaG
- Outlet pressure: 1.2 MPaG

##### Technical Features

- Steam extraction + compression system
- Supports fluctuating load conditions
- Modular skid-mounted design

##### Industrial Benefits

- Extends steam supply radius from 5–8 km to 10–20 km
- Eliminates need for new high-pressure pipelines
- Reduces thermal losses in distribution
- Improves industrial park energy efficiency

# GLOBAL OFFICES 全球办事处

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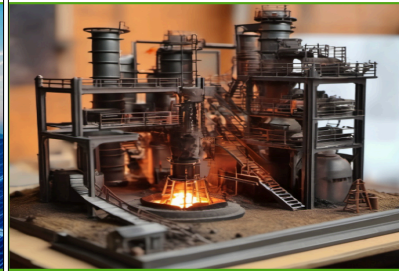
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