SED

...Energy Efficient Engineering

Zero Liquid Discharge Solutions

SPRAY ENGINEERING DEVICES LTD.

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TABLE OF CONTENTS

"SUSTAINABILITY IS THE NEXUS OF SOCIETY, THE ENVIRONMENT AND the economy

WHO WE ARE ?

Spray Engineering Devices Limited (SED) is an "Innovative Technological Solutions" provider for the water, biofuels, sugar, sugar refinery and jaggery sectors, with nearly three decades of expertise in vapourisation, condensation, evaporation, and crystallisation.

SED has revolutionised the water sector by delivering highly efficient, high-quality clean water recovery and recycling solutions from wastewater in a single step, using mechanical vapour recompression (MVR) based low temperature evaporation technology. This technology operates without heat generation unit like boiler & turbine and heat rejection unit like condenser & cooling tower with minimal footprint.

SED has also developed a Boiler-Free Jaggery (solid, semi-solid, powder, cake) Production Unit, which saves 100% bagasse and is commercially available as a sustainable technological solution that ensures a profitable business proposition.

Since 1992, SED has been an engineering company focused on designing/redesigning and engineering processes, manufacturing equipment, and complete automation to ensure the highest energy efficiencies. Today, the company has established its presence in more than 40 countries by providing energy-efficient products and cost-effective solutions for process industries.

SED has emerged as one of the fastest-growing technology-driven company, striving to deliver world-class integrated energy-efficient equipment and innovative solutions globally.

OUR VISION

Dedicated for Sustainable Environment Development to Unlock Perpetual Food and Energy Resources.

OUR MISSION

To become a global integrated player in energy and engineering industries through innovative technologies and energy efficient solutions.

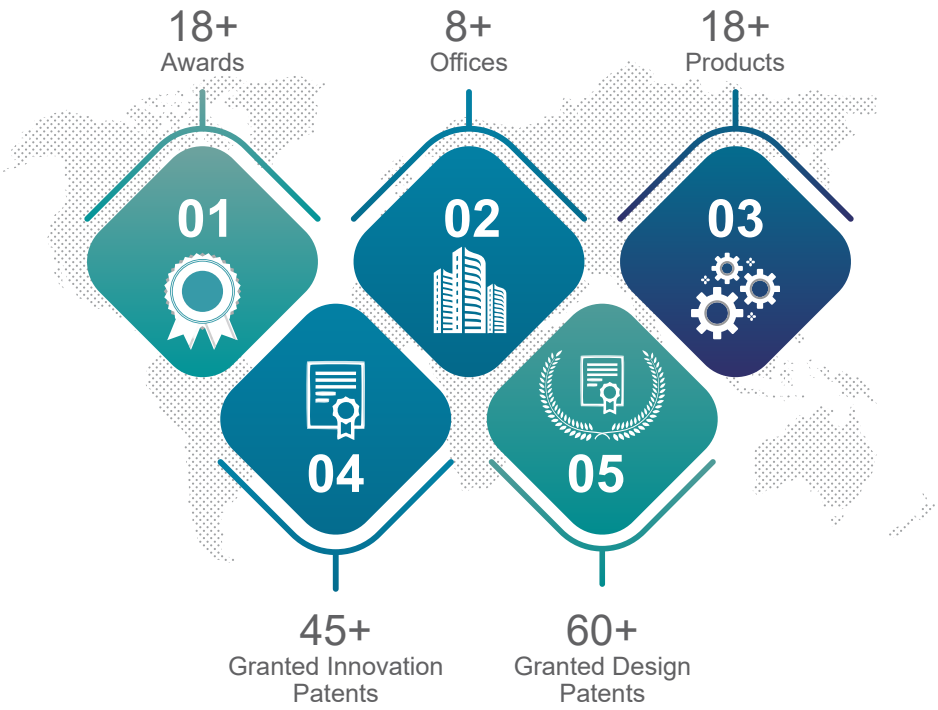
From MD's Desk

The crucial interplay among water, food and energy is the most formidable challenges we face as the world's sustainable future. The alarming crisis and scarcity of clean water at this juncture needs a key attention for developing sustainable water recycling engineering solutions. Due to the ground water scarcity, the limited resource of freshwater has to be protected both in terms of quantity and quality. The discharge of wastewater from industries and domestic sector has done extensive damage to this precious resource. In this context, SED benchmarks for sustainable environment development on wastewater recycling by focusing on energy efficient scientific advancements.

In light of all these factors, we have indigenously developed mechanical vapour recompression based low temperature evaporation technology for recycling of wastewater operating under vacuum with minimal electricity consumption, eliminating the usage of external heating or cooling sources. We have developed this module for wide-scale applications in industrial and domestic sectors for 100% recycling of water back to the process which aims not only to accomplish Zero Liquid Discharge (ZLD) but also Zero Liquid Intake (ZLI). The footprint area required is around 10% of the conventional methodologies with reduced manpower, eliminating the use of chemicals in the process.

Globally, we have pioneered in accomplishing energy efficient technologies for substantial reduction of energy consumption in process and allied industries for the past 30 years. We deliver customized project engineering products to our customers on stipulated time developed with our skilled team supported by strong in-house production facilities. Let us also pledge to reverse the alarming decline in water and sanitation where we should reaffirm our commitment to ending the plight of the need of the hour for the benefit of all mankind.

Vivek Verma I Managing Director



BUSINESS AREAS

SUGAR

Spray Engineering Devices Ltd. (SED) has established various energy-efficient products & solutions with state-of-the-art technology in the boiling house. Recently, SED has developed the most efficient solution for the milling house, aimed at maximising the yield of sugarcane juice while ensuring minimal moisture content remains in the bagasse. This not only enhances the efficiency of juice extraction but also improves the quality of the bagasse, making it an ideal fuel or raw material for ethanol production. SED is continuously developing innovative technologies to reduce steam consumption in the sugar plant.

WATER

Spray Engineering Devices Ltd. (SED) has introduced a state-of-the-art MVR-based low-temperature evaporation technology for up to 99% high-quality clean water recovery from wastewater without the use of external heat sources or heat rejection units. LTE® is highly reliable, robust, and very easy to control, operating automatically. The user-friendly operating conditions make this technology ideal for wide-scale industrial as well as domestic applications.

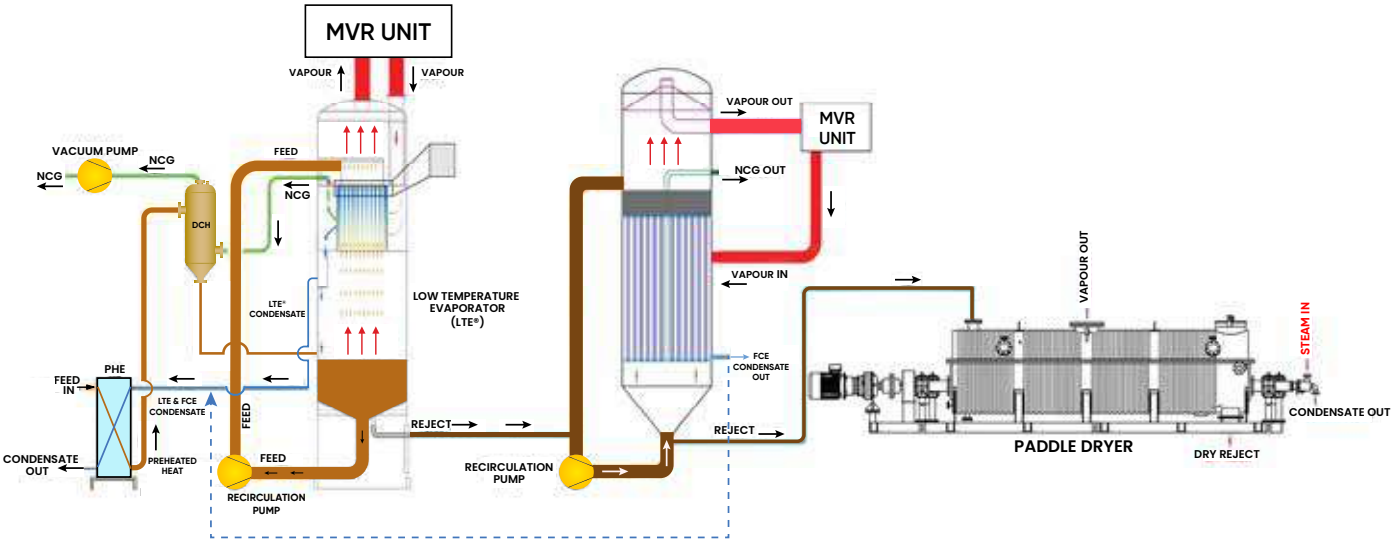
JAGGERY

Spray Engineering Devices Limited (SED) has developed an MVR-based low-temperature evaporation technology for jaggery production that minimises electric energy consumption in a closed cycle, eliminating the need for a boiler. This innovative approach utilises indigenously established modern manufacturing processes, energy-efficient equipment, and advanced systems for extraction, clarification, evaporation, and concentration techniques. These advancements increase jaggery yield and ensure 100% fuel / bagasse savings.

BIOFUELS

Biofuel production has undergone a significant transformation with the development of first-generation (1G) ethanol. Traditionally, 1G ethanol has been produced from sugars and starches found in crops like sugarcane and corn. In contrast, second-generation (2G) ethanol represents an innovative approach, utilising non-food feedstocks such as agricultural residues, wood, and municipal waste. This paradigm shift minimises competition with food crops, promotes sustainability, and provides more diverse and abundant sources for maintaining the carbon balance. Spray Engineering Devices Limited (SED) is "Dedicated for Sustainable Environment Development to Unlock Perpetual Food and Energy Resources".

ZERO LIQUID DISCHARGE SYSTEM



PROCESS FLOW DIAGRAM

Zero Liquid Discharge (ZLD) solutions are advanced wastewater treatment processes designed to completely eliminate the discharge of liquid waste from industrial processes. The goal of ZLD is to recover as much water as possible for reuse, and to concentrate & manage the remaining solid waste in an environmentally sustainable manner.

Key components and features of ZLD solutions include:

- **Pre-Filtration System**
  With minimal pre-treatment processes such as reducing suspended particles, removing oil & grease content, and regulating pH, effluent is delivered to the evaporator to concentrate and recover clean water by evaporating excess water.
- **Evaporation Stage**
  In first stage, an MVR based low temperature evaporator (LTE®) to evaporates excess water and condenses to achieve maximum water recovery at minimum use of utility.

Concentration/Crystallization

- After the maximum recovery achieved at first stage in LTE® the concentrated effluent goes to forced circulation evaporator (FCE) to concentrate it further upto salt saturation point to reduce the moisture load dryer resulting in low drying cost.

Drying Stage

- In the final ZLD stage, excess moisture is evaporated & transformed it into dry powder for disposal.

BENEFITS

ENVIRONMENTAL COMPLIANCE

ZLD solutions aid industries in meeting environmental regulations by minimising liquid discharge into water bodies, thus preventing pollution and safeguarding ecosystems.

COST EFFECTIVE

For many sectors, ZLD is a financially feasible solution due to the long-term cost reductions from decreased water usage, regulatory compliance, and possible resource recovery.

REDUCED POLLUTION

ZLD systems prevent harmful substances in wastewater, safeguarding aquatic environments and promoting ecosystem and human health.

RESOURCE RECOVERY

ZLD processes recover valuable resources from wastewater, providing financial benefits to industries by enabling reuse or sale of materials.

LOWERING FRESH WATER INTAKE

ZLD systems promote industry sustainability by recycling water, minimizing fresh water use, and achieving environmental goals.

CHEMICAL

- Speciality Chemicals
- Petrochemicals
- Fertilizers
- Bulk Chemicals
- Paint Industry

PHARMACEUTICAL

- API's
- Formulation

WASTEWATER

- CETP
- Leachate Treatment Plants
- MSW
- RO Reject

TEXTILE

- Dyeing
- Printng

INDUSTRIAL APPLICATIONS

FOOD

- Roasting of Starch
- Sterilization of Animal Feed
- Liquid Glucose
- Coffee & Meat Processing

STEEL & MINING

- Pyrite Copper Concentrate
- Coal
- Aluminium Hydroxide
- Manganese Dioxide

BASED ON MVR SYSTEM

LOW TEMPERATURE EVAPORATOR (LTE®)

The patented Indigenously developed MVR based low temperature evaporator (LTE®) which operates at very low temperature range by recycling of vapour enthalpy. With such an innovative system, recycling process to get clean water is achieved in a closed loop, resulting in negligible heat loss and minimum extraction of water from earth (for make-up) as well as zero discharge of wastewater to water bodies/earth. In this evaporation technology with a small footprint, the design delivers the best evaporation capacity compared to all other conventional processes.

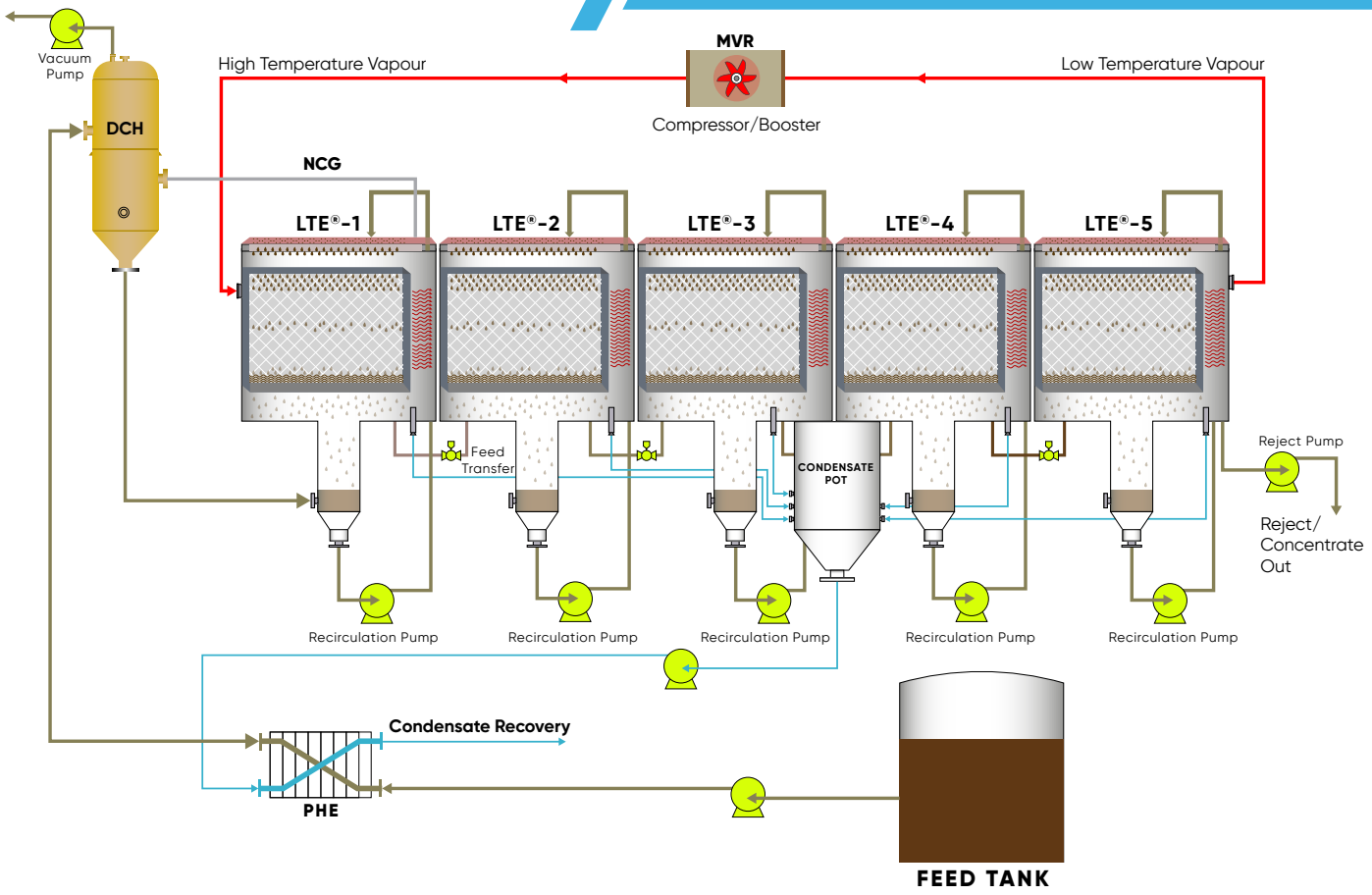
LTE® is highly reliable, robust, and very easy to control, which operates automatically. The user-friendly operating conditions make this technology an ideal for wide scale industrial as well as domestic applications. The operation is based on Mechanical Vapour Recompression (MVR) system under the vacuum for the recovery up to 99% of high-quality clean water from the industrial effluents/ wastewater/ leachate etc.

A significant benefit of our technology is its ability to process direct effluent, Reverse Osmosis (RO) reject, blowdown, and leachates with minimal pre-treatment, if necessary. It operates on lowest operating cost with maximum water recovery that is recycled back to the process.

The above technology is without use of any external heat source like boiler & turbines or heat rejection source like condensers, cooling tower. More than 250 projects are running across the globe and this technology has wide applications in industrial, commercial, and domestic sectors, thus achieving not only Zero Liquid Discharge (ZLD) but also making it Zero Liquid Intake (ZLI) during various processes.

PROCESS

This product is available in all MOC types, including SS304, SS316, and SS316 Ti. This product is available in the range from 0.5 m^3/h to 50 m^3/h for treating various types of industrial effluent and achieving maximum recovery of pure water.

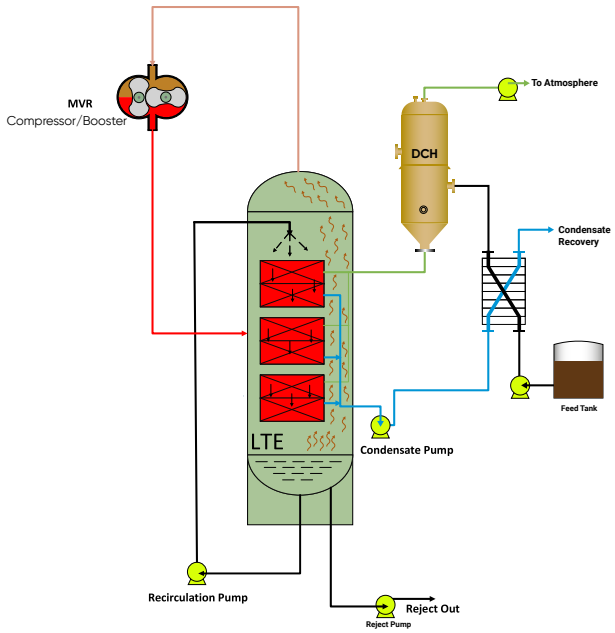


The feed at room temperature goes to the PHE to gain temperature with coming out condensate water and then feed is sprayed over the distribution system. The distributed feed is evaporated in the vacuum in low temperature evaporator (LTE®) with the help of plate packs heat exchanger technology. Concentrated feed is collected at the bottom of LTE® and then sent to the paddle dyer for complete drying for solid or powder form.

The low temperature vapours of LTE® is compressed by compressor for high temperature vapours and then compressed vapours are used for continuous concentration of feed. The very low temperature compressed vapours are condensed and taken out as high-quality clean cold water from the LTE®. This process is working continuously in the closed loop for successive evaporation and concentration of liquids.

SALIENT FEATURES

- Total Heat Integration
- One Step Solution
- Condensate in Pure Form
- Low Electricity Demand
- Fully Automatic
- Compact & Low Foot Print Area



PROCESS FLOW DIAGRAM OF LTE® SYSTEM

FORCED CIRCULATION EVAPORATOR

The forced circulation evaporator (FCE) is suitable for processing liquids that are prone to scaling or crystallising, particularly in the later stages of an evaporator station. Liquid is circulated at a high rate through the calandria, boiling being prevented within the unit by virtue of a hydrostatic head maintained above the top tube plate. As the liquid reaches at the top tube sheet where the absolute pressure is slightly less than in the tube bundle, the liquid flashes to form vapour. The main advantage of the FCE is its suitability for both scaling and non-scaling solutions.

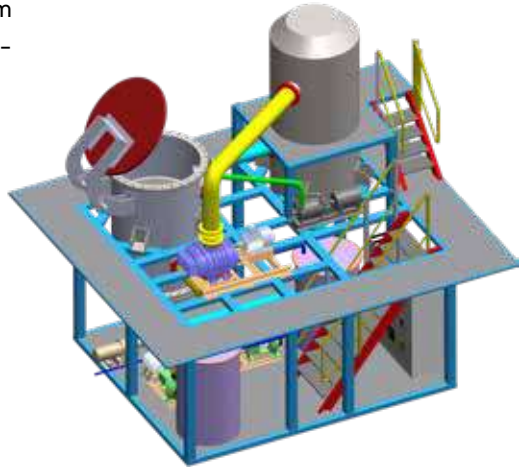
"The circulator employed in our Forced Circulation Evaporator (FCE) is built upon the Merver design, ensuring our commitment to achieve maximum concentration in the solution before the drying phase.

This strategic choice not only enhances the efficiency of the evaporator but also contributes significantly to cost optimisation in the drying process. By maximising concentration prior to drying, we effectively reduce the load on the drying unit, leading to overall lower drying costs.

SALIENT FEATURES

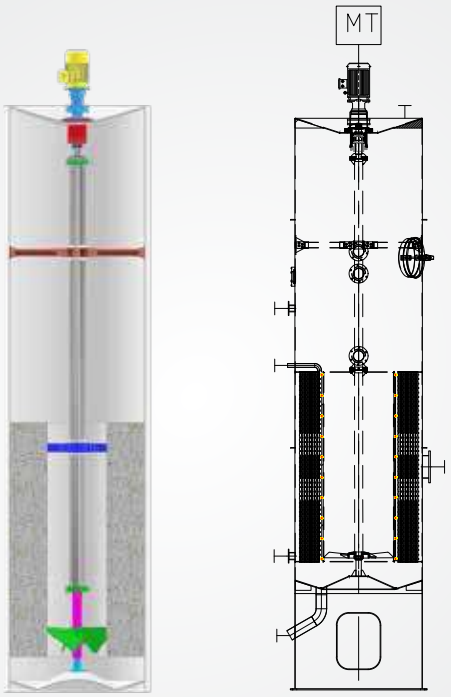
Forced circulation chambers can be superimposed on each other to form a multi-effect concentrator, which can be utilised for increasing concentration in the following process applications:

- Uses low footprint than conventional tubular MEE due to its compact design
- Concentrates wide variety of aqueous solutions
- Compatible with pumps and circulators.



3-D view of Forced Circulation Evaporator

DESIGN FEATURES OF FORCED CIRCULATION EVAPORATOR

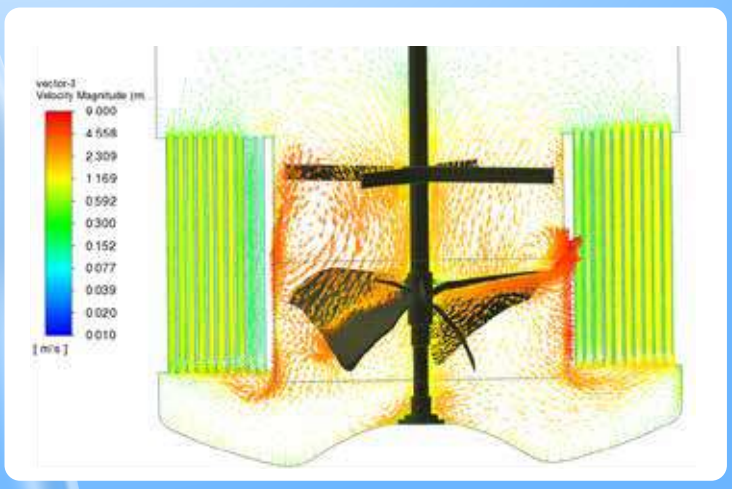


Cross section view of FCE

The forced circulation evaporator has various valuable features such as:

- **Self Supporting Tower**
- **Robust Design**
- **Effective Circulation**
- **Increased Recovery**
- **Maximum Concentration**

- SED's design blades has better circulation than coventional.
- Triangular Pitch Arrangement for:
  - ★ Improved circulation with least friction losses at entry & exit points.
  - ★ Higher heat transfer area.
  - ★ Least deposition.
- Specially designed for high quality mechanical sealing system.
- Effective in arresting any fluid leakage.
- Suitable for high temperature and pressure conditions.
- Extended life & low maintenance requirements.
- Optimally designed W-saucer bottom aiding circulation.
- No dead corners.
- Customised material of construction as per process requirement.
- Process automation feature for optimised results.
- Operational advantage for optimal design to increase heat transfer coefficient, homogeneity, least chances of scaling and ability to handle high viscosity.



Simulation View

PADDLE DRYER

Paddle dryer is an indirect conduction heating type drying device, which is suitable for processing materials with good thermal stability such as paste, powder and granular. After special configuration, it can be used for wide variety of materials to convert them into dry powder form for further use or disposal.

In addition with low operational cost, paddle dryer can be utilised for both sticky and granular materials. Depending on the characteristics of the salts, it can also be tailored using variety of construction materials.

The paddle dryer mainly consists of drying chamber, top cover, gland packing, double rotating shaft with hollow paddle disc, drive system, plummer block, rotary joints, discharge and moisture out arrangements.

DRY POWDER WITH MOISTURE CONTENT <10%

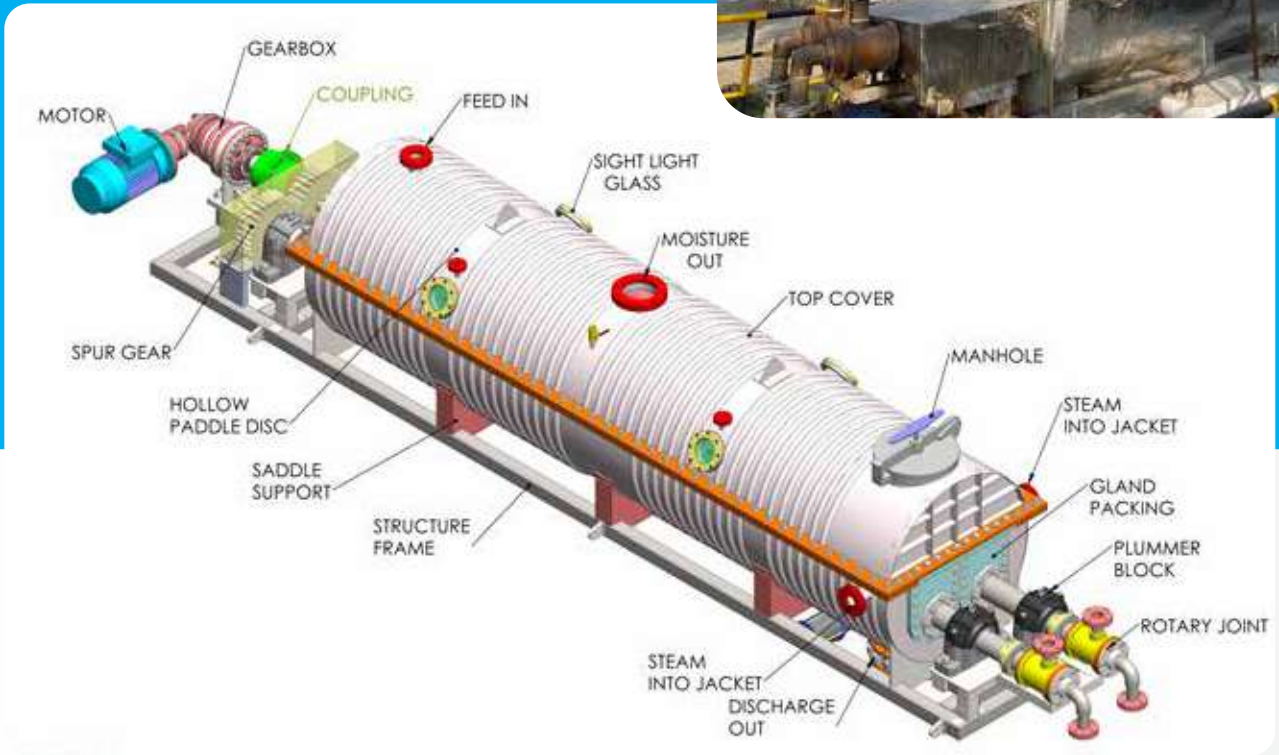
WORKING PRINCIPLE

The drying chamber and hollow discs have heating jackets which are filled with steam. When wet material is fed into the drying chamber, the rotating shafts with paddle disc mix, churn and move the wet material forward to achieve uniform heating. The evaporated moisture is sucked out by the exhaust fan after passing through the cyclone seperator, batch, condenser, and scrubber. The drying process can be either continuous or batch type.

MOISTURE IN FEED	40-50%
WATER EVAPORATION CAPACITY	150-250 kg/h
MOISTURE OUTLET	< 10%

ADVANTAGES

Paddle dryers are a popular choice for sludge drying in the environmental industry due to its efficiency, effectiveness, and sustainability.



- Lowest moisture content interject (5-10%).
- High thermal efficiency & low-speed operation.
- Robust & compact design.
- Large heat transfer area packed in a small volume.
- Uniform and controlled drying.
- Versatile application set.
- Energy-efficient operation reduces overall costs.
- Easy maintenance and cleaning for minimal downtime.
- Ensures uniform drying for consistent product quality.
- Customizable design for specific requirement.
- Versatility in handling various moisture levels.
- Environmental benefits through waste reduction.

USES

- Drying
- Vacuum Drying
- Heating, Sterilisation
- Sludge from Textile

MECHANICAL VAPOUR RECOMPRESSION (MVR)

SED has developed an in-house MVR fan, which is integrated with large-scale low-temperature evaporator, making it the most efficient and cost-effective option. This innovative technology delivers substantial operational cost savings by minimising the need for additional steam once the MVR evaporator is in operation. In the MVR system, a high-pressure fan plays a pivotal role in recompressing the vapour to a higher pressure, leading to an increase in temperature. The recompressed vapour, enriched with thermal energy, serves as the heating medium for the evaporator, reducing the demand for external steam sources. Additionally, the condensate generated in the process is utilised for preheating the feed. This closed-loop system maximises heat energy reuse, making MVR an environmentally friendly and economically viable solution for evaporation processes.

PERFORMANCE PARAMETERS

SPEED RANGE	ΔT	FLOW CAPACITY	COMPRESSION RATIO
2000 to 4500 RPM	3 to 9 °C	5 to 50 m^3/sec	upto 1.3 (IN STANDARD APPLICATIONS)

FEATURES

- Impellers & casings are fabricated from ductile alloy plate.
- Closed face impeller design with reinforced inlet geometry.
- Backward inclined, curve/ full- length radial blades.
- Durable and reliable construction for tough operation.
- Gas tight casing design for under vacuum operation.
- Non-alloy structural steels pedestal.
- Bearing housing with lubrication system.

ADVANTAGES

- Efficiency up to 85%.
- Low Maintenance Costs.
- Less Spare Parts to Consider.
- No Gear with High Speed Motor & VFD.
- Long Experience with High Pressure Applications

MANUFACTURING UNITS

SED has three hi-tech industrial manufacturing units located in Baddi (H.P.). The company boosts its production, equipped with the most sophisticated and modernised equipment, including CNC Machines (CNC Plasma Cutting, Bending, Welding), Fiber Laser Cutting Machine, Testing Machines (Ultrasonic Testing Machine, Spectro Analyzer, Impact Testing Machine, Microscope with Image Analysis, etc.), procured from world-class manufacturers. This facilitates fabrication capabilities with utmost accuracy and quality, allowing SED to provide flexible and cost-effective services to its customers.

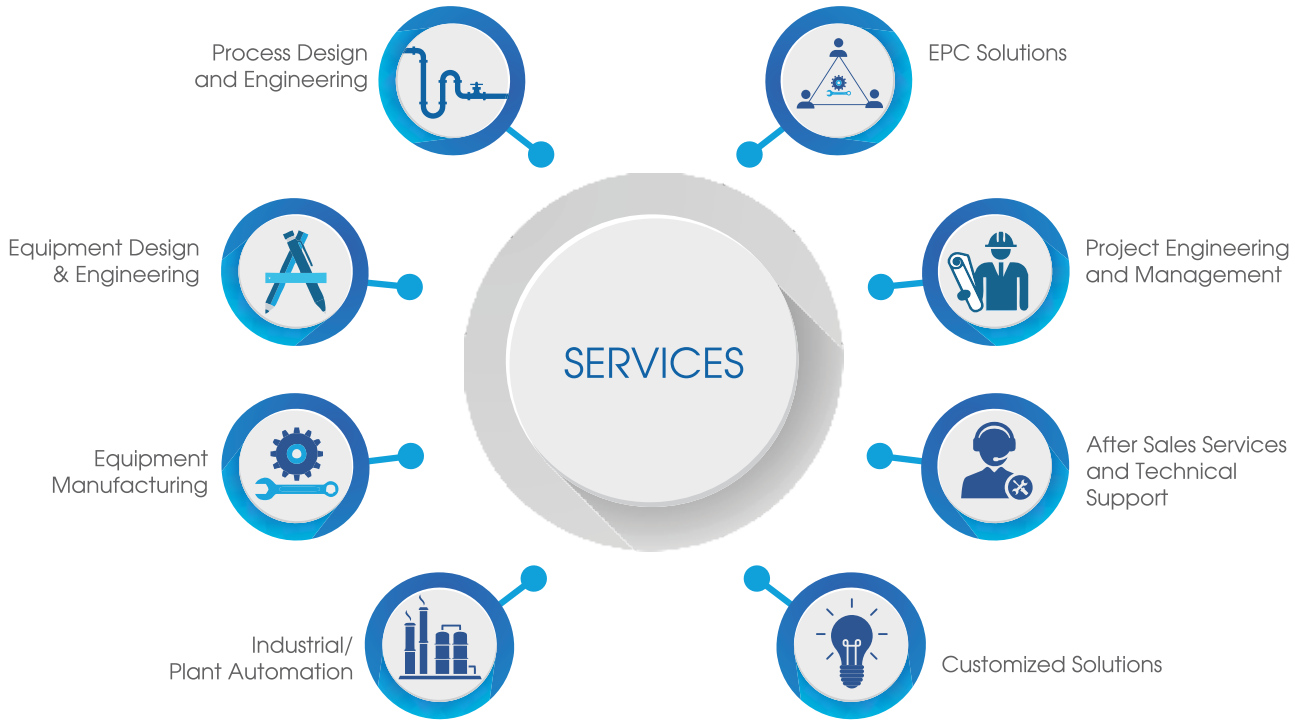

Unit- III


Unit- II

SED is registered as an in-house R&D unit by the Government of India in 2007 and is active with three modern fabrication and automation units in Baddi, Himachal Pradesh, India. Our products are successfully commissioned and performing efficiently in more than 250 waste water treatment plants across the globe.


Unit- I

SERVICES



SED
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OUR CLIENTS

INNOVATIVE TECHNOLOGIES FOCUSED ON SUSTAINABILITY

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Revised Design & Print: July 2024