Spray Engineering Devices Limited (SED) is an innovative technological solutions provider for Sugar Sector with specialization in Evaporation, Crystallization, Refining, Cooling & Condensing System. The idea of starting SED was incepted in the year 1992 by Vivek Verma. The journey began from a modest start of manufacturing of spray nozzles & since then there was no looking back for SED. Today, it has presence in more than 38 countries & the brand offers Turnkey and Boiling House Projects for Sugar/Process Industries. SED offers Development and Implementation of innovative ideas/technologies making it a renowned name in the industry.

The brand stands tall as it is ‘Dedicated for Sustainable Environment Development to Unlock Perpetual Food and Energy Resources’. Housed in Mohali, Punjab, India, SED have in-house R & D unit status granted by Govt. of India in 2007. Having three modern fabrication & automation units at Baddi, HP the company has one R & D unit of capacity 500 TPD with complete facilities at Bidar, Karnataka, India.

**ABOUT SED**

We are living in the era of Green Energy. We strongly believe that energy is of utmost significance for the development of any society and is the most sought-after resource. Search and exploitation of alternative resources of energy, quintessentially from renewable resource tops the priority list for the entire world. Keeping in mind the same, we aggressively pursue our mission “Dedicated for Sustainable Environment Development to Unlock Perpetual Food and Energy Resources.” We offer Modern Designed, Engineered Equipments, project management consultancy for green as well as brown field sugar & allied projects, complete plant automation, EPC Solutions & turnkey projects.

SED is committed to sustainable business growth through its energy efficient processes and the optimized use of resources. SED takes the social & environmental responsibilities in a great spirit and action. Since beginning, the brand has always focused to develop its product & services relevant to Sustainable Environment Development. Sustainability is embedded in our business strategy.

We continuously strive to achieve efficiency and accomplish benchmarks for steam & power consumption in the process industry. Our in-depth analysis of industry requirement enables us to deliver a reliable and cost effective solution in shortest possible time. Our team leaves no stone unturned to upgrade the capacity and technology to the International Standards. Having assessed the vast scope of Bio-energy, we are all set to promote co-generation from renewable sources of energy and have achieved a lot in this area also.

**Looking forward for a lasting relationship!**

**FROM MD’s DESK**
Falling Film Evaporators are generally used to concentrate heat sensitive materials where the stability of the original product & its properties is very important. They are generally used to handle non-fouling and relatively non-viscous products.

**Tubular Falling Film Evaporator:**
Patented juice distributor design and optimized tube diameter & thickness, heat transfer coefficient has improved to better level. Vapour separator fitted with demister pads ensures zero entrainment that make it distinguished from others.

**Features:**
- Patented Distribution System.
- High-heat transfer rate.
- Flow Uniformity in each tube ensuring high wetting rate and increased heat transfer coefficient.
- No Entrainment due to highly efficient Entrainment Separator.
- Configurations available with single effect heating surface area ranging up to 10,000 m².
- Easy process control with fully automatic system.
- Easy to clean and maintain.
- Top cover with hinge assembly for easy maintenance and distributor alignment.
- Self-supporting structure requires less foot print area.
Plate Type Falling Film Evaporator

Features:
• High Heat Transfer Rate enables insertion of more number of effects within same ΔT.
• Distributed heating surface for easy cleaning and maintenance.
• Very Low ΔT operation.
• Highly compact design.
• Lower retention time due to less quantity of circulation liquor.
• Lower recirculation power consumptions.
• Lesser destruction, inversion and colour formation.
• Configurations available with heating surface area ranging from 10 m² to 10,000 m².
• Compatible to work with Mechanical Vapour Recompression (MVR) technology.
• Patent technology.

Distributed heating surface, uniform liquid distribution and entrainment separator make SED plate type falling film evaporators extremely efficient for juice concentration.
Stupendous combination of concept, technology and engineering in the field of crystallization has opened the gateway to the highest steam economy in Sugar processing by minimizing the demand of pressure & $\Delta T$ of heating vapors. SCP® is the amalgamation of uniform crystallization & steam economy.

**Vertical Continuous Vacuum Pan (SCP®)**

**Features:**
- Lowest conglomeration and false grain formation.
- Least colour inclusion during crystallization to produce 100% Bold Crystals.
- Minimal dry seed generation and its use for seeding.
- High steam economy by use of high syrup brix and low temperature vapours.
- Highest crystal growth.
- Operates at 25 -100% capacity without using movement water.
- Efficient forced circulation using least power to save steam.
- 100% automated state-of-the-art process monitoring and control.
- Continuous operation with online cleaning arrangement.
- Honeycomb calandria for improved circulation.
- Device with variable speed circulation provides flexibility in process and optimizes power consumption.
- Top/Bottom mounted mechanical circulator with higher pumping capacity assists sucrose molecules to deposit faster on the crystals.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total height</td>
<td>25-35 m</td>
</tr>
<tr>
<td>Diameter of calandria</td>
<td>4 m</td>
</tr>
<tr>
<td>Heating surface per chamber</td>
<td>250-400 m²</td>
</tr>
<tr>
<td>No. of chambers</td>
<td>2-6 Nos.</td>
</tr>
<tr>
<td>Provision for graining</td>
<td>2 bottom chambers</td>
</tr>
<tr>
<td>Total holding volume</td>
<td>240 m³ (40 x 6)</td>
</tr>
<tr>
<td>Total residence time</td>
<td>3-24 Hrs.</td>
</tr>
<tr>
<td>Designed heating steam temperature/pressure</td>
<td>70-80°C/ 30-60 kPa A</td>
</tr>
<tr>
<td>Designed outlet vapour temperature/pressure</td>
<td>40-60°C/ 8-20 kPa A</td>
</tr>
<tr>
<td>Feed liquor concentration</td>
<td>60-85 % Total Solids</td>
</tr>
<tr>
<td>Heating steam temperature</td>
<td>60-95°C</td>
</tr>
<tr>
<td>Temperature difference between boiling massecuite and heating steam</td>
<td>5-25°C</td>
</tr>
<tr>
<td>Operating vacuum</td>
<td>5-30 kPa A</td>
</tr>
<tr>
<td>Massecuite temperature range</td>
<td>35-80°C</td>
</tr>
<tr>
<td>Crystal content range</td>
<td>25-60%</td>
</tr>
<tr>
<td>Steam consumption on massecuite</td>
<td>0.1-0.35 Ton/Ton</td>
</tr>
</tbody>
</table>

*Actual data may vary from site to site*

**Mechanical Circulator**

**Features:**
- Enhanced circulation capacity due to more number of blades.
- Reduced/Minimized boiling time.
- Variable speed circulation compatible with crystallization rate trend.
- Uniform circulation and better heat transfer rate.
- Uniform and improved crystal size with sparkling luster.
- Reduced centrifugation time and wash water quantity.
- Unique compact design mechanical circulator.
- High heat transfer rate due to higher circulation.
- Lower hub size with higher sweeping volume.
- Easy installation due to direct mounting without any structure or platform.
- Highest efficiency with inline planetary drives.
- High quality mechanical seals.
- Effective to protect any air / fluid leakages.
- Suitable for high temperature and pressure conditions with extended life & low maintenance.
- Detachable impeller blades for additional flexibility.
- Low power consumption.
- Fully automated control system.
- Available in various sizes.
Low Temperature Evaporator Module (LTEM®)

Features:

• Efficiency enhancement due to reduction of heat loss through pan/evaporator/exhausted steam.
• Efficient utilization of low temperature and low pressure vapours.
• Operates with low temperature differences across heating surface.
• Reduction of scaling due to low temperature / pressure evaporation.
• Reduction of colour formation in juice.
• Reduced consumption of steam.
• Elimination of complicated bleeding schemes.
• Low pumping cost due to low wetting required by plates.
• Improves final product quality due to low temperature operation.
• Less energy & water requirements.
• Modular compact design.
• Easy maintenance.
• Fully automated operation.

Low Temperature Evaporator Module (LTEM®) is an energy efficient technology by which various waste sources of heat like vapour from pans or exhausted steam from turbine going to condenser, can be used for the concentration of juice. Evaporation by these sources also reduces the effect of high temperature on sucrose and scaling of the vessel.
Spray Electrical Dehydrator

Spray Electrical Dehydrator comprises of highly energy efficient plate type falling film evaporator and mechanical vapor re-compression (MVR), to evaporate water by the use of compressed vapors generated from solution itself. It is highly cost effective, energy efficient, substitute of multi-effect evaporation system.

**Features:**
- Capabilities to process viscous fluids.
- Plate type evaporator for better heat transfer coefficient (HTC) with optimal energy consumption.
- MVR to eliminate continuous use of external heating source.
- Suitable for handling wide variety of fluids.
- High flexibility & precise control over process parameters.
- Operation at Low $\Delta T$.
- Low-power consumption.
- Elimination of thermal injury to heat sensitive materials.
- Elimination of heat rejection system.
- High energy efficiency.
- Peripheral ductless vapour entry to plate heat exchanger.
- Efficient feed inlet distribution system to ensure proper wetting of the entire heating surface.
- Compact design with less foot-print area.
- Fully automatic with control panels.
- Low Capex and Opex.
- Plug and play system.
- Eco-friendly.

Condensate Flashing System (Flash Cigar®)

Multi-chambered Energy Efficient Condensate Flash Vessel

**Features:**
- Patent design.
- Waste heat recovery from hot condensate.
- Horizontal multi-chambered flash vessel.
- Sparged tube entry for pre-flashing of condensate.
- Efficient separation of vapours from condensate.
- Condensate transfer to next chamber with control valve & ‘U’ Siphon provision.
- Hinge type manholes for easy maintenance and inspection.
- Pressure/temperature monitoring along with re-circulated condensate flow control.
- Single Pump serves for withdrawal of condensate & plant water supply.
- Eliminates condensate pumps, sealing tanks & piping, promoting power economy.
- Steam economy due to maximum flash vapour generation reducing steam consumption.
- Exhaust condensate heat recovery.
- Improves water management of the plant by reducing the final condensate temperature to level required for different processes.
- Reduces the congestion at evaporator station of boiling house.

Flash Cigar® is a patented design horizontal condensate flash vessel comprises of multi flash chambers to recover heat from condensate streams. It improves energy efficiency and simplifies plant water pumping system by eliminating all condensate and other hot water pumps.
Direct Contact Heater

Direct Contact Heater (DCH) is a hassle-free heating solution with less than 0.5 approach temperature. It takes heating vapors from 2-3 stage succeeding effect than that of shell and tube types. It improves energy efficiency with zero maintenance & downtime without any standby arrangement.

Features:
- Patented Design.
- Corrugated shell and rib supported deflectors design.
- High turndown ratio (operational between 30% - 100% of designed flow without compromising its efficiency).
- Effective NCG removal due to compact size.
- Inbuilt entrainment separator.
- 0-1°C approach temperature.
- Designed for pressure as well as sub-atmospheric vapour conditions.
- Optimized engineering.
- Low-piping & valve requirements.
- Light-weight structural layout as compared to tubular heaters with low-floor space requirement.

Automated Control:
- Controlling, monitoring and data logging for process parameters.
- Efficient measurement of temperature, pressure and level.
- Alarming for critical parameters (level and body pressure).
- Default switch-over to manual mode.

Trouble free operation:
- Precise level control ensures no backflow in case of sudden fluctuation.
- Operates in fluctuating vapour conditions without compromising efficiency.
- No cleaning or maintenance required.
- Power economy.
- Low head-pumps are required due to negligible pressure loss as compared to tubular / plate heat exchanger (PHE) thereby reducing power consumption.
- Steam economy.
- Utilizes heat content of NCG (otherwise going waste).
- Utilization of low grade vapours improves steam economy of the plant.
Molasses Conditioner

SED has designed innovative & efficient direct contact molasses conditioners ensuring perfect dissolution of crystals without addition of water and by using heat content of NCG / low pressure vapours and achieved major savings in steam and power in sugar plants.

Features:
- Patented Design.
- Compact inbuilt static mixer.
- Corrugated shell with strong structured deflectors design.
- 0-1°C approach temperature.
- Variable applications (vacuum or pressure).

Operational Benefits:
- No stirrer required thus no troubles associated with using mechanical stirring system like motor alignment, tripping of motor, lubrication etc.
- Consistent operation with fluctuating vapour pressures.
- No water addition but only low pressure vapours required for conditioning.
- Efficient direct contact with vigorous mixing.
- Monitoring of process parameters with full automation.
- Default switch over to manual mode.
- Utilizes heat content of NCG / low temperature vapours.
- Reduces the exhaust steam consumption by 1% on cane.
- No or low pumping power requirements.
- Flexible installation; for pan-floor or at centrifugal station.
- No cleaning required.
Sugar Melter

Vacuum Sugar Melter is energy efficient melting solution, replaces the high pressure heating vapour from low press 4th-5th effect vapour with auto control of brix, temperature and level.

Features:
- Patented Design.
- Cylindrical vessel having capability to handle melt up to 70-72 Brix.
- Horizontal stirrer with paddles ensures no short-circuiting & crystals undissolved.
- Optimized Paddle Angle for agitation leaving no dead pockets.
- Compact and highly efficient shaft mounted planetary drive.
- Sealing system to work under sub-atmospheric pressure.

Highly Competitive Operation:
- Operation under vacuum / low pressure.
- Accurate brix and temperature controlling.
- Melting by syrup/water.
- Variable retention time possible.

Low Steam Consumption:
- Utilization of low temperature vapours of 70-80°C in vacuum.
- Reduced steam consumption due to melting with syrup instead of water.
- Minimal power consumption.
- Efficient in-line planetary drive consuming less power.

Automated control:
- The flow of melt, syrup and hot water can be put on automation to achieve controlled output brix & temperature (optional).
- Brix sensors to ensure constant brix of melt.
- Auto-alarming indication for level fluctuation.
SED Finned Tube Heater save optimally designed the extended surface heat exchanger with maximum efficiency.

Features:
• Modular and compact design.
• Very easy cleaning instead of having a number of passes.
• Flexibility to increase the heating surface as per requirement.
• Very easy to dismantle.
• Fin material - Aluminum fins.
• Tube material - Carbon Steel, Stainless Steel, Copper etc.
• Optimized fin area with improved heat transfer coefficient.
• Fewer shutdowns for maintenance due to long life of heaters.
SED introduces the improved mill drive system with compact high efficiency shaft mounted planetary drives of to lower power consumption. In SED mill drive system, top roller of the mill has a drive at either end, directly mounted on its shaft. Each of the other rollers have one drive directly mounted on its shaft. This system is equipped with variable frequency drives to control the mill speed very precisely.

### Advantageous Features of SED Planetary Mill Drives (Comparative Analysis)

<table>
<thead>
<tr>
<th>Features</th>
<th>Conventional Mill Drives (Steam Turbine/DC Drives/Hydraulic drives)</th>
<th>SED Mill Drive System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compactness</td>
<td>A huge package system with large and bulky items with more Complications.</td>
<td>Compact &amp; concise with less weight in comparison to conventional system.</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>High</td>
<td>Very low</td>
</tr>
<tr>
<td>Noise Pollution</td>
<td>High</td>
<td>Very low</td>
</tr>
<tr>
<td>Mill Speed Control</td>
<td>Limitation for mill speed control</td>
<td>Easy to run the mill at 1-4 rpm for better results</td>
</tr>
<tr>
<td>Maintenance Time &amp; Cost</td>
<td>More &amp; precise maintenance due to various interlinked systems involved.</td>
<td>Less &amp; easy maintenance, due to compact &amp; less systems involved.</td>
</tr>
<tr>
<td>Inventory Cost</td>
<td>Higher inventory cost for number of precise spares.</td>
<td>Less number of equipments and spares result cost saving.</td>
</tr>
<tr>
<td>Gearing / Efficiency</td>
<td>Multi stage enclosed gearing with open gearing train means less efficiency.</td>
<td>Inline planetary gear box gives higher efficiency +90%.</td>
</tr>
<tr>
<td>Oil Lubrication System</td>
<td>External</td>
<td>No External Gearing &amp; Plummer block/Bearings required.</td>
</tr>
<tr>
<td>Space Area Requirement</td>
<td>Require more space to accommodate entire system.</td>
<td>Directly mounted on the roller shaft, no space required.</td>
</tr>
<tr>
<td>Civil Construction</td>
<td>High Cost civil work involved.</td>
<td>Minimum civil / steel structure required. Mill drive foundation totally eliminated.</td>
</tr>
<tr>
<td>Manpower Requirement</td>
<td>Highly skilled manpower is essential for the system.</td>
<td>Less skilled man power is required for operation / maintenance.</td>
</tr>
<tr>
<td>Alignment</td>
<td>Precise workmanship to align.</td>
<td>Easy to Align.</td>
</tr>
</tbody>
</table>

### Performance Parameters of Mills (Comparative Analysis)

<table>
<thead>
<tr>
<th>Mill Parameters</th>
<th>Conventional Mill</th>
<th>Modernized Mills by SED Mill Drive Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption in kW / T of cane (complete tandem including cane handling, preparation, crushing &amp; bagasse handling)</td>
<td>-</td>
<td>12.5 (1.2-1.5 per mill)</td>
</tr>
<tr>
<td>P.M.E. (Primary mill extraction)</td>
<td>60-65%</td>
<td>73%</td>
</tr>
<tr>
<td>R.M.E (Reduced mill extraction)</td>
<td>+95%</td>
<td>+96%</td>
</tr>
<tr>
<td>Final Bagasse pol</td>
<td>1.6-2%</td>
<td>1.4-1.8% (In case of diffuser 1.2%)</td>
</tr>
<tr>
<td>Moisture in Bagasse</td>
<td>51-52%</td>
<td>Up to 47-48%</td>
</tr>
<tr>
<td>Smooth crushing at variable loads without any effect of low crushing.</td>
<td>Can run at 4-5 rpm.</td>
<td>Easy to run at 1-4 rpm.</td>
</tr>
<tr>
<td>Breakdown / shutdown time towards drive side</td>
<td>Significant due to lot of components &amp; controls involved.</td>
<td>Nil (only few components involved).</td>
</tr>
</tbody>
</table>

Cane Mill Drive Mechanism
**Cooling & Condensing System**

**AUTOMATED CONDENSING SYSTEMS:**
- Rapid initial vacuum generation.
- Constant vacuum.
- Lower Water-Vapour ratio.
- Least power consumption.
- Optimum water quantity.
- Maximum inlet-outlet water temperature difference.
- Best efficiency even at 25% of designed load.
- Self-diagnostics in case of vacuum fluctuations.
- Provision for variable set point during operation process.
- Efficient air leak management.
- ON/OFF switch to regulate water supply to condenser.

SED Multi-Jet Multi-Spray Condenser is designed to reduce energy and water consumption of the condensing / vacuum system to minimize electrical power expenditure. Spray Pond with “Zero Depth Design” is the most efficient design with compare to the conventional spray pond designs.

More than 6000 installations worldwide. Approximate power saving achieved in a standard 2500 TCD white sugar plant is indicated.

**Cooling Station / Spray Pond**

The increased efficiency of Spray Pond is achieved by improving and redesigning Spray Pond Nozzles working very efficiently with variable quantity of water and changing weather conditions. SED spraying system is most economical and efficient method of cooling injection water utilizing naturally available wind energy and draft created by water.

**Features**
- Low Civil Cost.
- High Durability and Long Life.
- Highest Temperature Drop.
- Low Head Spraying System.
- Variable Spraying Capacity.
- Low Drift Losses.
- Least Choking.
- Easy to Maintain.

With the introduction of fully Automated Condensing System, the average power consume by Sugar Industry has now been brought down to 1.3-1.84 kW-hr/Ton of cane from 6kW/ Ton of cane. Performance in term of power saving has achieved by SED’s Automated Condensing System.
MULTI-JET MULTI-SPRAY CONDENSER

Multi-jet Multi-spray Condensers are optimally designed as per the air / vapour load and velocity to avoid pressure losses and better condensation. They consist of multiple Spray and Jet nozzles divided in different stages. Spray nozzles disperse water mainly for condensation of vapours. Jet nozzles evacuate non-condensable gases and air by entraining it with water flowing at high velocity through the tail pipe to maintain vacuum.

Nozzle design & arrangement:
- Hydro-dynamically designed jet & spray nozzles made of engineering thermoplastics.
- Nozzles are categorized into stages, where the number of operational stages depend upon the air/vapour load.

Lesser power and water consumption:
- Perfect combination of spray and jet nozzles for high capacity vapours/air entrainment.
- Low pumping head requirement.
- Smooth operation in hot and humid conditions.

JET EJECTOR

We design Multi-jet Water / Liquid Jet Ejectors with less initial vacuum generation time achieved by hydro-dynamically designed jet nozzles. Our ejectors have high ejection capacity with low water consumption at only 0.2-0.3 kgf/cm² water inlet pressure.

Features:
- Compact design with fast evacuation.
- Hydro-dynamically designed Jet Nozzles with amplified suction effect.
- Optimally designed size and tail pipe of jet ejector as per the air / NCG / vapour load.
- Easy and quick maintenance.
- Hinge type top cover.
- A hand hole for cleaning and maintenance of the jet nozzles.
- Corrosion resistant stainless steel and engineering thermoplastics material of construction.
- Reduced friction losses due to shining smooth nozzle surface.
- Low water consumption.
Services

SED offers high quality turnkey projects & services. It provides comprehensive solution to its valued customers with Project Management systems of international standards and know-how involving the Plant data collection; monitoring & controlling of project using software applications like Primavera; Project Management & Scheduling; Resource Planning; Erection & Commissioning; Preparation of detailed start-up, commissioning, and validation schedule; Development of plant automation and controlling; Trouble shooting; Post Analysis of the project parameters after commissioning etc.

EPC Solutions

EPC projects diverge from plant improvements / modernization / expansions to new plant installations. From initial planning to project closure, we encompass a complete set of skills to complete project beyond the expectations. SED serves to a range of process industries including raw sugar plants, white sugar plants, sugar refineries, distilleries, ethanol plants, dairy, food industry, energy & power plants and pharmaceuticals etc.

Process Design and Engineering

With an unparalleled expertise in providing effective & reliable solutions in the process industry, the team of highly skilled & committed process engineers is involved in following activities like meticulous designing of energy efficient processes; mass-energy balance calculations, preparation of (P&ID’s) and (PFDs)process simulation and optimization; enthalpy balance of complete power plant including boilers and power turbine station; thermal designing & sizing of the heat transfer equipment etc.

Equipment Design & Engineering

With advanced technology, precision tools, and complex mechanical design expertise, our team of engineers provide a complete range of mechanical design services to test, analyze, improve and simplify the most complicated process machinery & equipments. Our unique products / equipments represent quality, efficiency & reliability in the global market. Our equipment design & engineering section forms the core of our detailed engineering involving a range of activities like product market research, marketing analysis and translating customer needs into winning product concepts.

Equipment Manufacturing

SED production division has world class infrastructure to facilitate the fabrication capability of more than 300 tonnes/day for manufacturing the equipments of process industry. An advanced production and control technology allows us to provide flexible and cost effective service to our customers. All the SED production units are ISO 9001 & 14001 certified and strictly adhere to the eco-friendly norms achieving international standards in environment protection & other parameters.

Industrial / Plant Automation

Our instrumentation and automation wing is fully responsible for maintaining maximum efficiency of the equipment/process to increase the competent performance of the system by taking care of the process fluctuations & monitoring field parameters. We have fully equipped instrumentation calibration and testing laboratory to confirm & provide utmost precision & accuracy of instruments. We provide service like application software development; detailed automation project planning, engineering& execution; design and supply of electrical & automation system; instrument selection, procurement, testing, inspection & maintenance etc.

Project Engineering & Management

Engineering information developed with years of experience for project use has become an important strategic asset for us. Thus, we provide project execution through best-of- best project delivery that efficiency uses engineering information.

After Sales Services and Technical Support

Support is available 24x7 by email at support@sprayengineering.com

Customized Solutions

It is the technical upgradation & discussion which is necessary, where we assess needs and decide the best way to work.
SED has expertise in analysis and evaluation of sugar and process industry's problems. It offers best possible solution by providing consultancy services, process design and engineering, equipment design & engineering, equipment manufacturing and procurement, industrial/ plant automation and project engineering & management/ execution. We undertake projects of upgrading or modifying the plant in terms of capacity and technology or reinstalling itself and turnkey/EPC based projects worldwide.

Few of the renowned international projects commissioned are:

- **AL KHALEEJ SUGAR CO. (LLC), DUBAI (Season 2014-15)**
  ‘Live case of Innovation, Development & Execution.’
  SED has supplied Largest Plate Type Evaporator of Heating Surface Area of 34,000 m² to the world’s largest stand-alone sugar refinery.

- **PFEIFER & LANGEN POLSKA, S.A., POLAND (Season 2007-08)**
  Vertical Continuous Vacuum Pan (SCP)³ (Single SCP³ with 9 chambers) for the capacity C - 25 TPH.

- **PT D.U.S. SUGAR REFINERY, CILACAP, INDONESIA (Season 2006-07)**
  Vertical Continuous Vacuum Pan (SCP)³ (Two Nos. of SCP³, 9 chambers each) of the capacity R1 - 40 TPH & R2 - 40 TPH.

- **ETHIOPIA**: Metahara Sugar Factory, Dire Dawa.
  (a) Falling Film Evaporator (FFE)
  (b) Cooling & Condensing System

- **NIGERIA**: Golden Sugar Refinery, Lagos.
  (a) FFE (b) Batch Pan (c) Flashing System (d) Cooling & Condensing System (e) Mechanical Circulator

- **FIJI**: Sugar Mill, Labasa, Lautoka and Rawawa, Fiji. (Cooling & Condensing System)

- **SUDAN**: White Nile, Sudan. (FFE, Cooling & Condensing System, Flashing System, Sugar Melter, Molasses Conditioner, Direct Contact Juice Heater)

- **JAPAN**: Hitachi - Nippon Beet Sugar, Japan. (Cooling & Condensing System)

- **USA**: Louisiana Sugar Refinery, Louisiana. (Cooling & Condensing System)

- **PHILIPPINES**: San Carlos Bio Energy Project, Philippines. (Cooling & Condensing System)

- **THAILAND**: Mitrphol Sugar Corporation, Thailand. (Cooling & Condensing System)

- **SOUTH KOREA**: CJ Corporation, South Korea. (Cooling & Condensing System)

- **SRI LANKA**: Gel-Oya Plantations, Sri Lanka. (Pan Automations, Cooling & Condensing System)

- **KENYA**: Nzoia Sugar Company Ltd., Kenya. (Cooling & Condensing System)

- **INDONESIA**: PT. PG. Gorontalo, Indonesia. (Cooling & Condensing System)
  PT. Sentra Usahatama Jaya, Indonesia. (Cooling & Condensing System)

- **PAKISTAN**: Madina Enterprises Ltd., RYK Mills Ltd., Ramzan Sugar Mills Ltd., Al Abbas Sugar Mills Ltd., Kashmir Sugar Mills Ltd., Colony Sugar Mills Ltd., Habib Sugar Mills Ltd., Iteffaq Sugar Mills Ltd. etc. (Energy Saving Equipments and Cooling & Condensing System)
Major Projects (National) (Turnkey Projects)

**VENKATESH KRUPA SUGAR MILLS LTD., MAHARASHTRA (Season 2010-11)**
- Plant capacity: 2500 TCD.
- Sugar Crystallization in 3 numbers of Vertical Continuous Vacuum Pan (SCP®), 8 Chambers each, [A - 45 TPH, B - 35 TPH, C 20 TPH].
- Single number of (SCP®), 6 Chambers.
- Seven nos. of Tubular Falling Film Evaporator (Total Heating Surface Area: 15,000 m²).
- Power Generation Unit, Sugar Boiling Unit.
- Direct Shaft Mounted Planetary Gear for Mill.

**JAY MAHESH SUGAR INDUSTRIES LTD., (J M S I L.), MAHARASHTRA (Season 2007-09)**
JMSIL showcases SED’s engineering skills with all the latest equipment and energy efficient technologies developed by SED.
- Plant capacity - 5000 TCD.
- Turkey Project.
- High-tech Cogeneration plant -30 MW.
- Distillery of Capacity - 100 KLPD.

**VENKATESH KRUPA SUGAR MILLS LTD., MAHARASHTRA (Season 2015-16)**
- Plant capacity: 5500 TCD.
- Quadruple Evaporator station with three identical Tubular Falling Film Evaporators (Total Heating Surface Area = 12,000 m²).
- All crystallization part is taken by Vertical Continuous Vacuum Pan (SCP®) which is operating with 4th effect vapour of falling film evaporator.
- 3 nos. of Vertical Continuous Vacuum Pan (SCP®) [A-100TPH, B-50TPH and C-35TPH].
- Steam Consumption of the Plant 28-30% on cane.
- Sugar Colour < 45 IU.

**DHANALAKSHMI SRINIVASAN SUGARS PVT. LTD. (DSSPL), TAMILNADU (Season 2009-10)**
- Plant capacity: 3500 TCD.
- DSSPL is a showcase of SED’s engineering skills with all the latest equipments and energy efficient technologies developed by SED.
- Quintuple Evaporator station with seven identical Tubular Falling Film Evaporators (Total Heating Surface Area = 10,500 m²).
- All crystallization part is taken by Vertical Continuous Vacuum Pan (SCP®) which is operating with 4th effect vapour of FFE.
- Power export 100-110 kWh/Tons.
- Steam Consumption of the Plant 31-32% on cane.
- Sugar Colour < 35 IU.
Projects (National)

- **VISHWARAJ SUGAR INDUSTRIES LTD., KARNATAKA** (Season 2015-16)
  - Plant capacity: 8000 TCD.
  - Quintuple Evaporator station with five identical Plate type Falling Film Evaporators [Total Heating Surface Area = 15,000 m²).
  - Single no. of Vertical Continuous Vacuum Pan (SCP) which is operating with 4th effect vapour of evaporator.
  - Steam Consumption of the Plant 25-27% on cane.

- **MAAREWA SUGARS PVT. LTD., M.P.** (Season 2014-15)
  - Plant capacity: 2000 TCD.
  - Falling Film Evaporators [Total Heating Surface Area = 7000 m²].
  - Top Mounted Mechanical Circulators.
  - Flash Cigar®
  - Molasses Conditioner.
  - Condensers.

- **NARMADA SUGAR PVT. LTD, MP** (Season 2014-15)
  - Plant capacity: 6000 TCD.
  - Top Mounted Mechanical Circulators.
  - Tubular Falling Film Evaporator (Total Heating Surface Area: 11,500 m²).
  - Single no. of Vertical Continuous Vacuum Pan (SCP) which is operating with 3rd effect vapour of evaporator.

- **HEMARUS TECHNOLOGIES LTD., MAHARASHTRA** (Season 2009-10)
  - Plant capacity: 3500 TCD.
  - Electrical Drive Milling Station.
  - Falling Film Evaporators. [Total Heating Surface Area = 10,500 m²].
  - 3 nos. of Vertical Continuous Vacuum Pans.

- **SHIRAGUPPI SUGARS WORKS LTD., KARNATAKA** (Season 2010-11)
  - Plant capacity: 5000 TCD (expandable up to 7500 TCD).
  - Electrical Drive Milling Station.
  - Falling Film Evaporators [Total Heating Surface Area = 13,500 m²].
  - 3 nos. of Vertical Continuous Vacuum Pan for Sugar Crystallization.
  - Steam consumption 30-32% on cane.

- **NSL SUGAR LTD., KOPPA, KARNATAKA** (Season 2010-11)
  - Plant capacity: 3500 TCD.
  - Two numbers of Vertical Continuous Vacuum Pan.
  - FFE [Total Heating Surface area: 10,500 m²].
SED is the leading technology provider offering “Integrated energy efficient, cost effective turnkey solution” for processing industry. Our industry specific expertise allows us to provide our clients with innovative strategies and solutions for a synergistic implementation of various technologies. This synergy is best displayed in the engineering and designing of turnkey projects of various capacities/utilization.

Steam consumption has always been played a vital role in the economics of sugar industry. Modern sugar plants are now acknowledging the potential as well as the need of conserving energy due to continuously growing competition and pricing pressure. Energy conservation in the sugar and allied industry contributes to steam, power, fuel and water management.

SED has identified several potential areas for energy conservation of sugar and allied industries. It targets to achieve increased productivity at reduced cost with optimum utilization of resources. The energy balance of sugar industry indicates that steam consumption has resulted in 25-26% on cane using whereas SED’s innovative technologies & solutions have potential to bring down to the level of 18-20% on cane instead of 40-50%. Power (40 kW/ton) consumption can be reduced up to 22-24 kW/ton of cane. Factory can be managed to operate without fresh water consumption.

Extensive know-how gained in a vast range of products and based on client’s collaborations with world renowned partners, we have developed optimum solution for all plant areas. We offer complete EPC solution to sugar and allied industries ranging from plant improvements/ modernization/ expansions to new plant installations.

From initial concept to project closure, SED encompass a complete set of skills to complete your project beyond your expectations. Our competence in providing necessary engineering and advisory services in this sector along with our collaborator which may span from initial feasibility studies, analysis, basic and detailed engineering, approval procedures, assistance in tendering, procurement, site supervision, environmental compliances, commission, customized training opportunities to develop complete services for the entire life cycle. SED is fully competent to offer complete solution from a single source ensures higher end-to-end quality solutions with lower life cycle costs.
Infrastructure

To offer the best products & services to the clients, SED has three hi-tech industrial manufacturing units equipped with state of art facilities located at Baddi, Himachal Pradesh, India. The brand is on its way to expand its offices globally either independently or through joint ventures.

Engineers & technicians work relentlessly for offering the best technologies by using advanced European technical skills and know-how to make the designed process/equipment quality for the global market. SED team includes experienced & dedicated team of more than 350 automation, process & mechanical engineers from sugar and allied industries. Our technology and committed staff are the backbone of our business, empowering us to assist and improve efficiency.

SED takes pride in saying that its production division by highly-skilled technologies, equipped with most sophisticated and modernized equipment fabricating CNC machines (CNC plasma cutting, bending, welding) and testing machines (Ultrasonic Testing Machine, Spectro Analyzer, Impact Testing Machine, Microscope with Image Analysis etc.) procured from world-class manufacturers of France, Sweden; fabricating capacity to the utmost accuracy and quality that allow SED to provide flexible and cost effective services to the customers. Strictly adhering to the international quality standards and eco-friendly norms, all our fabrication is done in-house in production facilities spanning more than 22,000 sq. m. area.

SED upgrades all its divisions with latest technology available in the market. Implementation of ERP has further resulted in optimizing the business operations, thus enhancing services & cutting short the delivery time. SED instrumentation & automation division has its own testing laboratory to ensure utmost precision and accuracy of its instruments.
Best Original Paper in the field of Engineering and Technology for Sugar Sector:

Gold Medals
- Noel Deerr Gold Medal 2005
- Dr. Bansi Dhar Gold Medal 2006
- Noel Deerr Gold Medal 2006

Silver Medals
- STAI Silver Medal 2001
- SISSTA Silver Medal 2010
- SISSTA Silver Medal 2015

Sugar Technologists Association of India (STAI) in August, 2008 conferred the LIFE TIME ACHIEVEMENT AWARD to the revered founder of SED Mr. N. K. Verma.

HARYANA RATAN AWARD to Honorable MD Mr. Vivek Verma at the All India Conference of Intellectuals, 26th Annual Celebration Year 2007, Punjab & Haryana State Intellectuals Conference.

INDUSTRY EXCELLENCE AWARD by Sugar Technologies Association of India (STAI) to Mr. Vivek Verma in August 2010, for his outstanding contribution in the field of Designing Equipment for the Sugar Industry.
Intellectual Assets

SED has filed total 63 numbers of patent applications till date, out of which 12 are filed at the National (Domestic) Level, and the rest 51 applications are filed at the International level. The patent applications are filed for Vertical Continuous Vacuum Pan (SCP®); Vacuum Pan Mechanical Circulator Assembly; Improved Jet Nozzle for Multi-jet Multi-spray Condenser; Improved Distributor for Falling Film Evaporator; Heat Exchanger Assembly; Improved Falling Film Heat Exchanger; Improved Diffuser for Cane or Bagasse; Composite Header; Cold Juice Clarification Process; Spray Modular Evaporator; Modular Heat Exchanger Assembly; Improved Mechanical Circulator; Utilisation of Low Grade Heat for Juice Concentration. The Patent for SCP® has been granted in India, USA, Australia, Japan, China, European Patent Organization (EPO), Cuba, South Africa, EAPO, Pakistan, Ukraine, Vietnam, Indonesia and the Patents/Utility Model for Mechanical Circulator has been granted in Pakistan, Ukraine, China, Russia, Japan, Australia, Indonesia, Thailand and Vietnam. The patent applications Improved Distributor for Falling Film Evaporator and Improved Jet Nozzle for Multi-jet Multi-spray Condenser have been granted in India and Pakistan. Heat exchanger assembly patent application has been granted in Pakistan.

The company has total 38 granted industrial designs (4 granted in Pakistan and 34 granted in India), 9 registered trademarks and 11 registered copyrights.

IPR & Technology Division

SED is one of the very few engineering companies in India to establish an exclusive IPR & Technology division for managing its intellectual assets and improving the quality for managing its intellectual property and improving the quality of R&D efforts being made by the company. SED has filled various patents, industrial designs, trademarks and copyright applications at national and international levels.
Major Patent Certificates

South Africa, Russia, Pakistan, Australia, Vietnam, China, India, Indonesia, Japan, USA, Eurasia