INTRODUCTION LETTER

Envision Engineering Solutions
Solution with a Vision

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➢ ABOUT ENVISION ENGINEERING SOLUTIONS

Envision Engineering Solutions is established with a vision to provide detailed technical and professional service; optimized for performance and cost, in a timely and efficient manner.

Envision Engineering Solutions has a team of experienced and dedicated professionals well versed in their respective fields. The EES team *(as we call it)* has it all: the capability to design, develop, manufacture, install, commission and provide after sale service. So, just discuss your problem and EES will provide a solution!

Equipped with the highly qualified and experienced engineering workforce, latest CAD/CAE/CFD tools, Envision Engineering Solutions provides high quality engineering services, which can include all or some of the following activities:

- Plant layout drawings
- Process flow diagrams
- Piping Layout & Routing
- Piping Layout in 3D
- Plant Walkthroughs
- Self Supporting Steel Stack Design
- Design of Storage Vessels
- Industrial Steel Structure & Foundation Design
- Fabrication drawings of equipment's & Components
- Load Data Drawings
- Assembly and Erection drawings
- Bill of materials
- 2-D to 3-D conversion of drawings
- 3D Modelling of Components
- Documentation – Operation & Installation Manual

➢ RESOURCES FOR ENGINEERING SERVICES

Apart from highly skilled and experienced workforce, EES has latest technologies, infrastructure and software for providing high quality, time oriented output. Major Software with EES is:-

- AutoCAD
- Solid Works
- ANSYS Workbench
- ANSYS Fluent
- COSMOS Works
- STAAD
- MS Office Excel
- Visual Basic

➢ SERVICES OFFERED

1. 2D DRAFTING

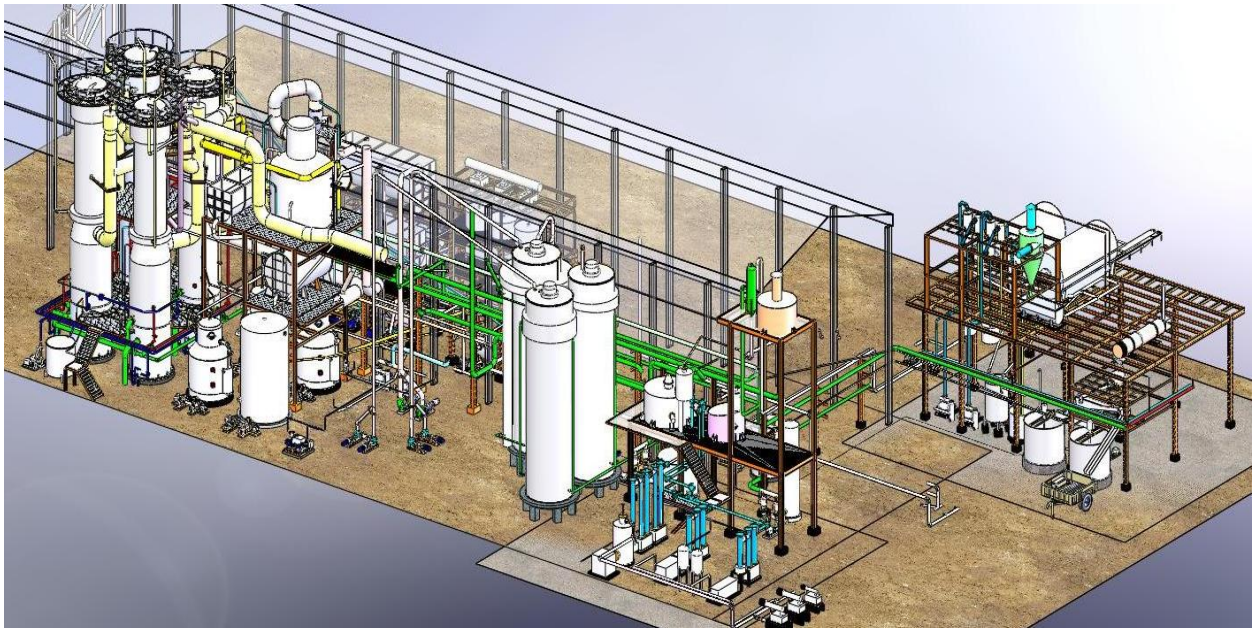
EES offers detailed 2D drawings for:-

- Plant layout
- Fabrication drawing of equipment's
- Fabrication drawing of Structure
- Pressure Vessels
- Storage Vessels
- Load Data Drawings
- Assembly and Erection drawings
- Piping Layout & Routing
- PFD and PID's

2. 3D MODELLING

With a team of highly trained and experienced professionals, EES offers parametric modelling, part & assembly modelling, re-engineering of complex surfaces & solids and piping layout. Piping layout in 3D gives real life output and ensures optimized route and no fouling with equipment's. Our team has vast experience of handling complex assemblies of more than 10,000 components efficiently.

- 3D Modelling of Components
- Conceptual design
- Piping Layout in 3D
- 2D to 3D conversion of drawings
- Plant Walkthroughs & Animations
- Sales, service and assembly illustrations
- Model for Brochures & presentations
- Model building for computer simulation



3. EQUIPMENT DESIGN SERVICES

With all the infrastructure, high end software, highly skilled & experienced engineering team, EES offers complete design services for various equipment's. With vast experience of equipment design & development, EES can provide an optimized, efficient & reliable design in a single go. The design can include manual calculations as well as computer simulation as per requirements.

- Direct Contact Heaters
- Flash Heat Recovery System
- Design of Self Supporting Steel Stacks
- Design of Pressure Vessels
- Storage Vessels with/ without agitators
- Agitators for mixing tanks
- Shell & Tube Heat Exchangers
- Pipe sizing, layout & pipe supports along with valve sizing

4. STRUCTURAL DESIGN AND STRUCTURAL ANALYSIS

Envision Engineering provides complete design solutions for the structural design and structural analysis of the following :

- Pipe racks
- Equipment support structures
- Technological structures
- Stack and duct support structures
- Piping supports

Analysis is done considering the equipment and pipe support loadings, wind loads, seismic loads, etc. Foundation load data for all cases required for doing civil foundation design will be provided.
In addition, we also provide 3D modelling services for the above structures which facilitate a walk through review of the complete model to ensure that all connection details are modelled, there is no fouling between structural members, resolve possible clashes between piping and structure, plan a proper erection sequence, etc. This also makes it possible to generate a structural general arrangement drawing and complete fabrication drawings from the same model thus eliminating any chances of errors.

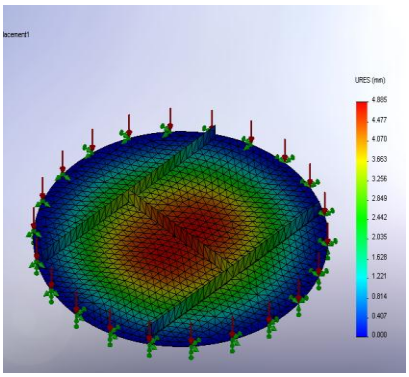
5. COMPUTER AIDED ENGINEERING (CAE)

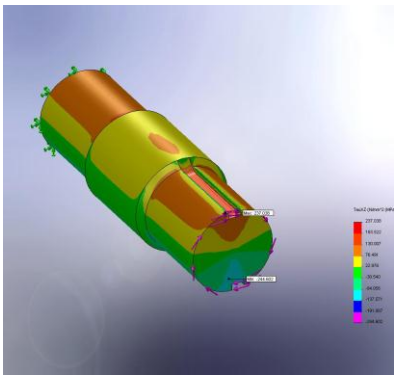
CAE tools gives an edge to any design concept by providing an insight which otherwise would not be possible or will be very costly. CAE Professionals in EES work closely with design & development engineers to give recommendations that not only optimize the cost, weight or the overall design but are optimized for production process as well.

a. Finite Element Analysis (FEA)

FEA is used to predict the behaviour of components / parts under various real time loading conditions. It provides an insight into the design thereby providing a chance to FEA engineer to suggest the modifications. EES provides FEA services for:

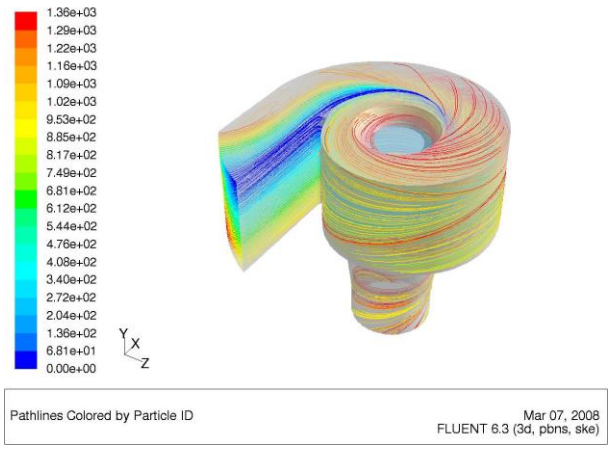
- Mechanical Analysis / Structural Design of components
- Optimization of components by analysing Strain Energy Distribution, Stress & Deflection.
- Design of rotary components for combined bending & torsion like shafts
- Buckling Analysis
- Vibration Analysis





b. Computational Fluid Dynamics (CFD)

CFD is used to simulate flow of gases and liquids, heat and mass transfer, moving bodies, multiphase physics, chemical reaction, fluid-structure interaction and acoustics through computer modelling. CFD gives a 'virtual prototype' of the system or device by providing images and result data which predict the performance of that design. It gives an insight into even those phenomena which would not otherwise be visible.



- Analysis of flow of fluids through components for design improvement
- Prediction of vapour & liquid interaction in the process vessels
- Prediction of velocity gradients, flow distribution, dead zones & power consumption for agitators in mixing tanks & mechanical circulators EES in pans
- Used to predict forces acting on the blades of an impeller / agitator, which can be further be used for FEA of blades
- Flow prediction/ analysis of components like spray pattern of spray nozzles, head loss prediction through customized components like NRV etc.

EQUIPMENT DESIGN FOR SUGAR INDUSTRY

1. FALLING FILM EVAPORATER

The Multiple effects evaporator set operates with reducing pressure from first to last effect, similarly the condensate temperature. Hot condensate from one effect can be flashed to the following effect thereby recovering the associated heat content. This additional heat recovery reduces the amount of exhaust in first effect.

Falling Film Evaporators the liquid to be evaporated is evenly distributed on the inner surface of each tube, the liquid will flow downwards forming a thin film, from which the boiling/evaporation will take place because of the heat applied by the steam from outside of tube. The steam will condense and flow downwards on the outer surface of the tube. A number of tubes are built together side by side. At each end, the tubes are fixed to tube sheets, and finally the tube bundle is enclosed by a jacket for uniform steam distribution throughout the calandria. The steam is introduced to calandria through steam jacket. The space between the tubes is thus forming the heating section.

The inner side of the tubes is called the boiling section. Together they form, named calandria. The concentrated liquid and the vapour leave the calandria at the bottom part, from where the main proportion of the concentrated liquid is discharged. The remaining part enters the entrainment separator together with the vapour. The separated concentrate juice is discharged (usually by means of the same pump as for the major part of the concentrate from the calandria), and the vapour leaves the entrainment separator from the top. The heating steam, which condenses on the outer surface of the tubes, is collected as condensate at the bottom part of the heating section, from where it is discharged.

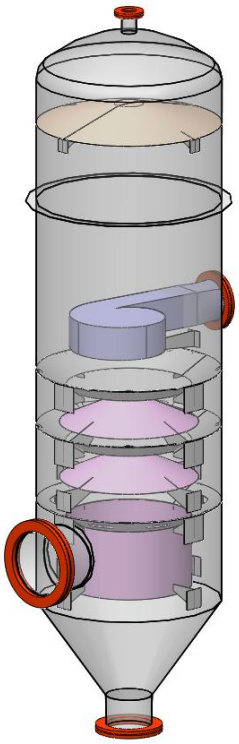
a. Advantages

- Steam and juice flow remains just apposite In Falling Film Evaporator to the Robert / Raising film evaporators.
- Juice quantity to be circulated for evaporation pumped through circulation pumps from bottom to top via juice distributor.
- Uniform juice distribution in each tube is THE MOST IMPORTANT feature of Falling Film Evaporator.
- Stainless steel Wigand distributor for uniform flow in each tube.
- Juice forms a thin film at inner surface of the tube.
- Increased heat transfer coefficient due to formation of thin film of juice.
- Juice heated by supplying steam on shell side.
- Adequate automation control system.

b. Important Feature

- 10 meter long Stainless steel tubes.
- Cascade type juice Distribution with serrated stainless steel tubes.
- Mild steel robust construction.
- Expanded heating tubes with top and bottom tube sheet for easy replacement.
- Efficient baffle design for better steam distribution.
- Segment type baffles to avoid vibrations in heating tubes.
- Self-supporting structure.
- Higher wetting rate.
- Less floor space requirement.
- Fully automated.

2. DIRECT CONTACT JUICE HEATER



EES Direct Contact Heater is simple in design, having no moving parts. Heating is continuous and fast. Inspection and routine maintenance are greatly facilitated by conveniently placed access ports. Because of high heating efficiency, a relatively small, lightweight size can be used to deliver a large supply of heated liquid. Heat transfer in direct contact heaters is better than shell and tube heaters because heat transfer resistances like film, fouling, and wall, are not present. Since heat transfer is more effective, a small direct contact heater can be used thereby minimizing cost. Maintenance is low when compared with costly shut-downs needed to clean tube bundles that act like strainers, when tube pitch is sacrificed for surface area in shell and tube heat exchangers.

a. Types Of Direct Contacts Juice Heaters :-

- Raw Juice Heater
- Sulphited/Defecated Juice Heater
- Syrup/Melt Heater
- Clear Juice Heater

b. Advantages:-

- 0 – 5°C temperature approach.
- Operates on lower pressure vapours.
- Lower piping and valves requirements.
- Low pumping power requirement.
- Compact in size and light in weight.
- Better steam economy.
- Stainless steel construction.
- Variable applications vacuum or pressure.
- Simple way to operate.
- No periodical cleaning required.

3. MOLASSES CONDITIONERS

The molasses conditioners are installed at boiling house to condition the molasses to suitable conditions for further processing. They replace traditional open to atmosphere molasses conditioners which normally consume exhaust vapour's and also have mechanically operated stirrers. The massecuite is fed to the centrifugal to separate the molasses from the sugar crystals. The molasses coming out from the centrifugal machine will be at low temperature and contains some crystals.

The crystals should be dissolved and temperature should be increased to minimum of 75^{o}C before it is fed to the Pan for boiling. This reduces the chances of false graining and reduces the water requirement at pan.

EES Direct Contact Molasses Conditioners uses lower temperature vapors for heating & conditioning of molasses. The entry of the vapors is designed to provide bubble agitation for conditioning of the molasses. This avoids the use of mechanical agitator and provides effective agitation.

a. Types Of Molasses Conditioners:-

- A /Heavy Molasses Conditioners
- B /Heavy Molasses Conditioners
- C /Light Molasses Conditioners
- R1/R2 Molasses Conditioners

b. Advantages:-

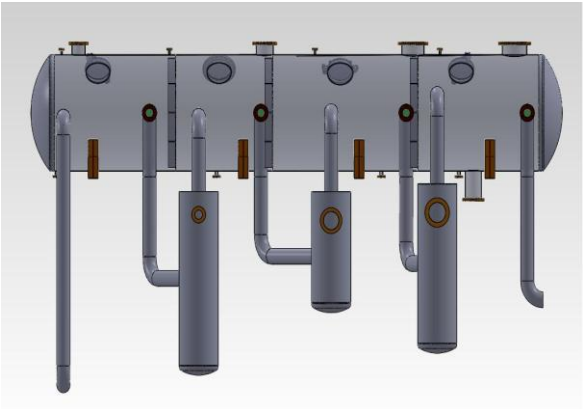
- High heat transfers efficiency
- Temperature approach of 0-5 °C is possible
- It can be operated on lower-pressure vapours
- Least radiation heat losses
- No stirrer required thus no troubles associated with using mechanical stirring system like motor alignment, tripping of motor, lubrication etc. which is a big problem with traditional molasses conditioners
- Lowest floor space due to small size.
- Better steam economy
- Reliable and long life due to stainless steel construction

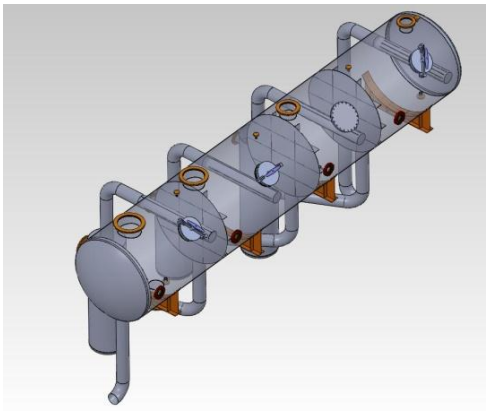
4. CONDENSATE FLASH VESSEL (CFV)

The Multiple effects evaporator set operates with reducing pressure from first to last effect, similarly the condensate temperature. Hot condensate from one effect can be flashed to the following effect thereby recovering the associated heat content. This additional heat recovery reduces the amount of exhaust in first effect.

The exhaust condensate is approximately at same temperature of exhaust steam. Normally exhaust condensate is sent to the feed tank at boiler station for regeneration of steam.

The excess heat associated with this condensate is flashed to atmosphere since the feed tank is normally vented. This waste heat is recovered by suitable heat exchanger, which reduces the equivalent quantity of exhaust/high pressure steam.



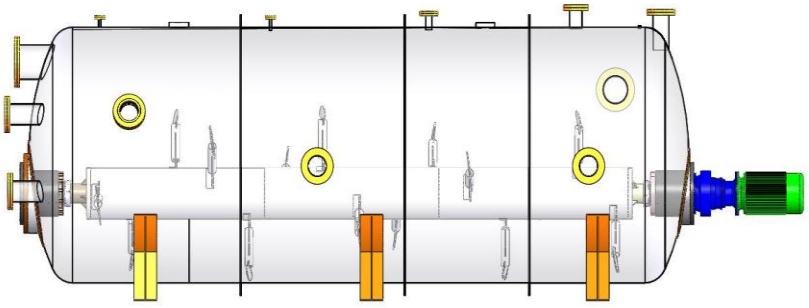


a. Advantages

- It reduces the steam consumption in the boiling house by 2.0–3.0% on Cane depending on the operating conditions of the Boiling House.
- It improves the water management of the Plant.
- The system can run with one condensate pump each for exhaust and vapour which results in electrical energy saving a minimum 0.5 – 0.6 kWh/ton of cane.
- It is a single unit comprising of different Flash chambers so that it can be installed in the boiling house. Thus, it reduces congestion at Evaporator Station.
- It is in horizontal construction so no overhead area is required.

5. SUGAR MELTER

Sugar melting is a common process in sugar Boiling House and refineries. Depending on the boiling system adopted, some or all of the B/C and Raw sugar may be melted. The requirement of a melter is to provide sufficient residence time for dissolution to occur and stirring of the contents to promote dissolution and ensure that no solids settle out.



a. Advantages:-

- In-line planetary drive which consumes less power than conventional drives.
- Designed for variable retention times.
- It can be operate under vacuum and low vapour pressure (70°C to 80°C).
- Equipped with Brix sensor and temperature control system to ensure the constant brix and temperature of melt.
- Reduced steam consumption due to melting with syrup instead of water.

6. TOP / BOTTOM MOUNTED MECHANICAL AGITATOR

Circulation of Massecuite in the pan while boiling play a prime role in proper growth of crystals and exhaustion of molasses. Mechanical agitator gives a marked improvement in the boiling and improves the quality of the product .It permits a valuable gain in purity of molasses and renders possible work with tighter massecuite. Correctly hydro dynamically designed propeller ensures the best fit calculations at lowest power consumption test. It provide the option of achieving an acceptable heat transfer with temperature difference as low as 20°C, compare to at least 45-50°C in the absence of stirrer. The use of low pressure vapour becomes possible, allowing reductions in the factory steam requirements. Mechanical agitator assembly consists of the following elements:-

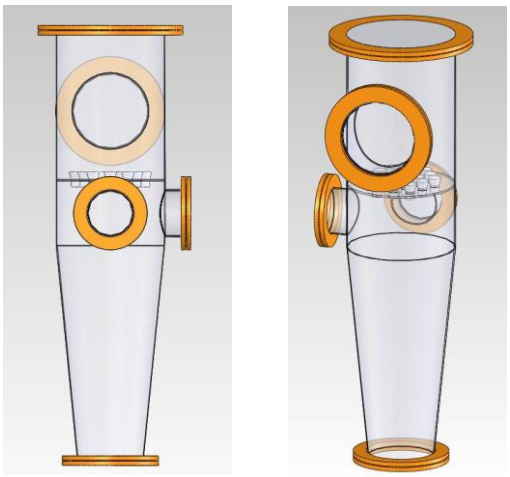
- An agitator carrying vanes or other propelling means
- A driving system connected with the shaft. The driving system usually consists of the shaft, coupling, bearings, gearing, pulleys and belts. The power is supplied by an electric motor

a. Advantages:-

- Saving in strike time of up to 30%.
- Good circulation maintained through the strike.
- Provide more uniform grain.
- Increased pan capacity by 20-30%.Increase in crystal yield up to 5%.
- The color removal has improved from 88% without agitator to 92% with agitator.
- Sugar conglomerates counts have been reduced by about 80%.
- Strike level in pans can be raised by 30-40 cm with the use of stirrer.

7. EJECTOR

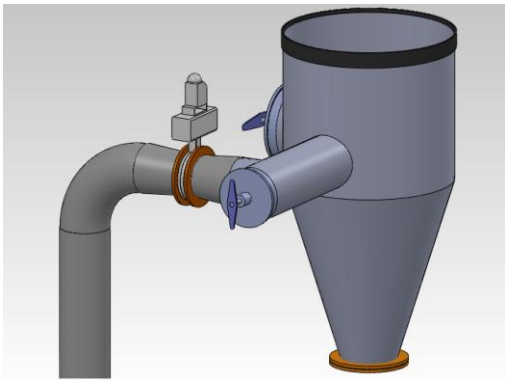
EES Ejector is designed after complete analysis of operating conditions to optimum safety margins and minimum energy losses. Each Ejector operates with close condensing approach and generate initial vacuum rapidly. It maintains good condensing efficiency and non-condensable gas evacuation rate to keep vacuum and pan temperature at desirable level. The Ejector is designed for easy and quick maintenance. The Jet Nozzles can be opened for inspection & cleaning very quickly. Use of corrosion resistant material ensures that Ejector remains unaffected by all kinds of acidic or basic environment.



a. Advantages:-

- EES Ejector is compact in design with fast evacuation.
- Hydro –Dynamic designed JET nozzle with amplified suction effects.
- Optimally designed size and tail pipe of jet ejector as per Air /NCG/Vapor Load.
- Easy and quick maintenance.
- Low water consumption.
- No moving parts.

8. JET CONDENSER WITH AUTOMATION (CONTROL VALVE BASED)



Single Entry Condenser is a customized design for more robust applications. Here the vacuum is controlled via controlling the water flow to Condenser. Nozzles are particularly designed for least maintenance as Nozzles are not spring. The Condenser Automation will have control valves at water inlet for the Nozzles. The Parameters such as vacuum, tail pipe temperature, Massecuite Temperature & Spray Box Pressure will be the analog inputs for the Condenser. The Logic will be defined in PLC (Siemens) and SCADA (Win CC of Siemens) will be for human Interface. The Valves will be controlled as per the requirement of the water in the Condenser to maintain the desired vacuum. The junction box near the Condenser will terminate the all the signals. The signals from this junction box will be connected to PLC Panel through 12-pair cable to Control room.

Following information shall be available through our system:

- Absolute vacuum, header pressure, tailpipe temperature, massecuite temperature, inlet water temperature, water consumption by the condenser and Vapor condensation in each condenser.

a. Advantages

- Inlet water Flow control through Control Valves.
- Least maintenance.
- Each condenser is equipped with individual strainer.

b. Main Features

- Condenser's Automation shall be designed to work as manual in default mode.
- Vacuum in each Condenser can be set separately.
- Water supplies to individual Condenser can be controlled (ON/Off) by a Toggle switch provided in operator Panel at Pan Floor.
- Vacuum generation time will be reduced further and shall be maintained at constant level. Condenser will adjust quantity of water automatically so as to maintain same vacuum level with variable inlet water temperature from 25°C to 40°C

9. RADIATOR (AIR HEATER)

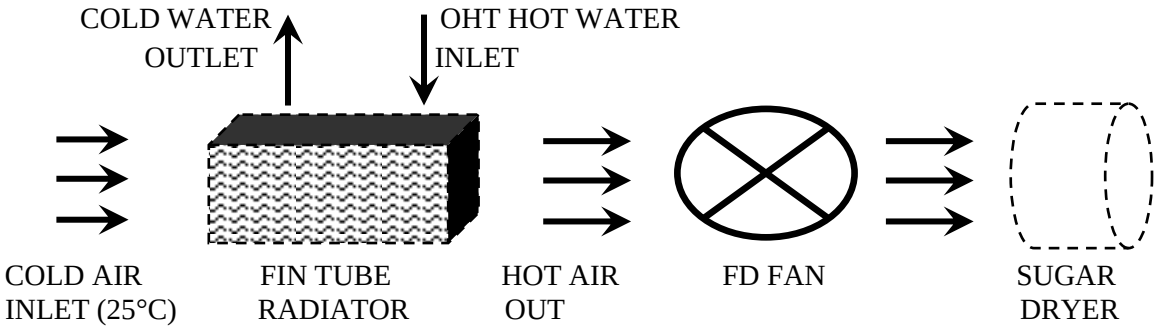
We cater finned tube heat exchangers which are designed as per the international standards and requirements of the clients. These exchangers can be employed for cooling or heating of air or other gases which flow in a duct or cooling of water and other liquids using air. Also, these units are provided with Aluminum extruded finned tubes. These finned tube heat exchangers are manufactured with copper, aluminum, stainless steel, admiralty brass, carbon steel. In this type finned tubes the fin gets mechanical bond with base tube. And there will not be any air gap between the fin and the base tube. It results there is no heat loss in this type finned tubes and heat transfer will be 100%. So the performance of the heat exchanger will be increased. Finned tube heat exchangers are used in the following industries:

Food processing industries, Textile industries, Sugar Industries, Drier industries, Cement plant industries.

Following are the main Features of Radiator:

- Higher heat transfer performance
- Temperature approach of 5-7 °C is possible
- Easy to clean with a high pressure water jet without deforming the fins
- 100% fin-to-tube bond providing exceptional efficiency and longevity
- Excellent corrosion protection on the base tube

APPLICATION IN SUGAR INDUSTRY



10. SUPER HEATED WASH WATER (SHWW) SYSTEM

In order to eliminate the use of 7 kg steam at centrifugal, EES proposes to use a Condensate of Exhaust. Hot water at high temperature and relevant pressure is applied on the Massecuite layer for washing the molasses film. The SHWW is generated by boiling point reduction principle, So that water remains in liquid stage even at temperatures above 100°C when left to atmosphere (in the centrifugal) through nozzles. A soft washing by water at 100°C and steam at +20°C (temperatures of SHWW kept at 120°C) achieves efficient washing of molasses of sugar crystals.

Salient features of Superheated Wash Water System:

- Early release of molasses layer from Sugar Crystal.
- Reduction in total cycle time.
- Optimized spraying water
- Less Quantity of molasses.
- Better Lustre to Sugar.
- Reduction in Quantity of steam consumption

We shall therefore be grateful if we may be registered as consultants for consideration of award of contracts in your organization in view of your position as client.

Looking forward to meet you in-person and having a pleasant association in the future.

Yours Truly

For Envision Engineering Solutions

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