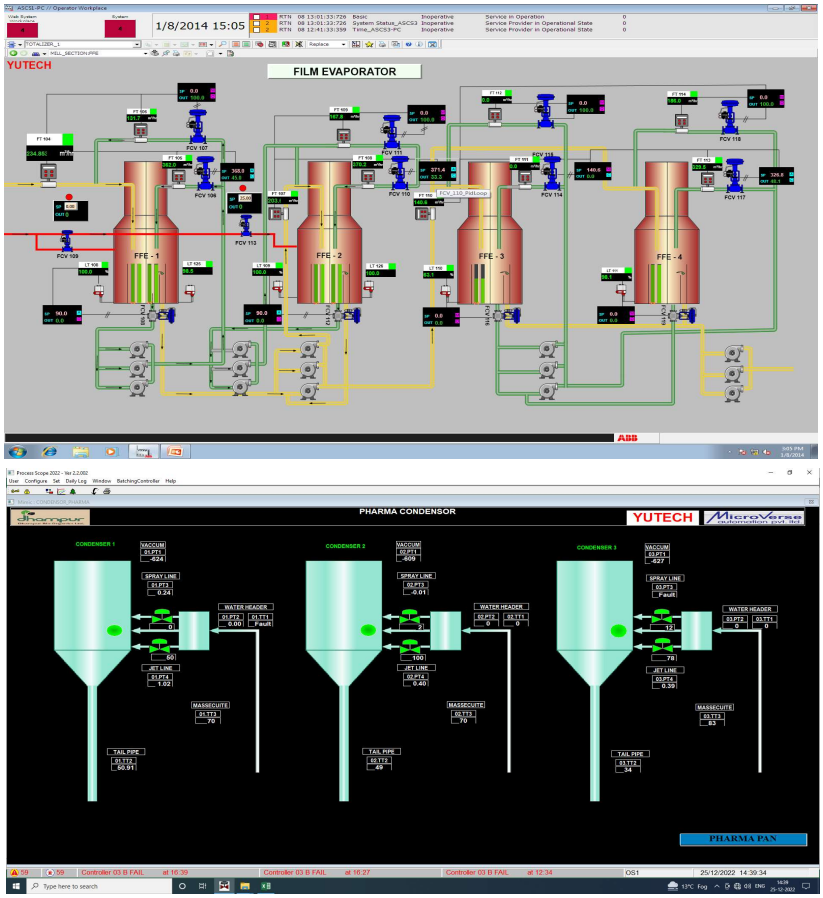
EVAPORATOR AND FALLING FILM EVAPORATOR AUTOMATION

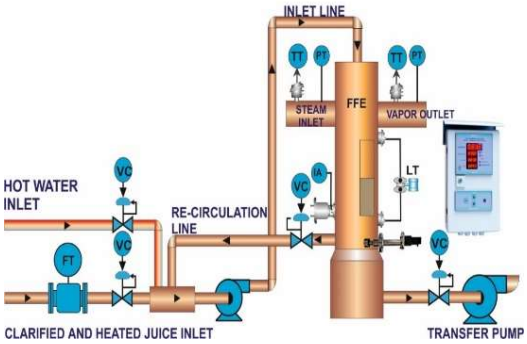
FFE AND CONVENTIONAL EVAPORATOR CONTROL PHILOSOPHY, AND CONDENSER PERSPECTIVE

YUTECH SINCE 1978



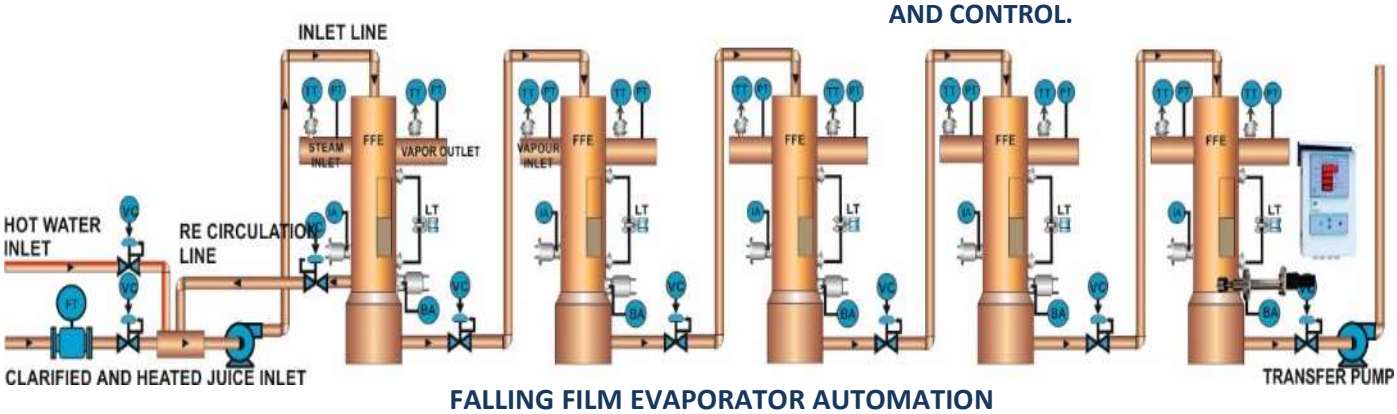
SCREENSHOT: FFE AND CONDENSER AUTOMATION

SCHEMATIC DIAGRAM:
SINGLE FALLING FILM EVAPORATOR AUTOMATION AND CONDENSER AUTOMATION



FALLING FILM EVAPORATOR (FFE) AUTOMATION:

- EVAPORATOR LEVEL MAINTAINED FOR PROPER EVAPORATION AND VAPOUR GENERATION BY CONTROLLING TRANFSER VALVE OR TRANSFER PUMP VFD.
- AUTOMATIC WATER INTAKE IF REQUIRED.
- INLET FLOW TO THE FFE BODY AND RECIRCULATION IN EQUAL OR IN PRESET PROPORTION.
- OPTIONAL INLET, RECIRCULATION, AND BYPASS FLOW MEASUREMENT AND CONTROL.



FALLING FILM EVAPORATOR AUTOMATION

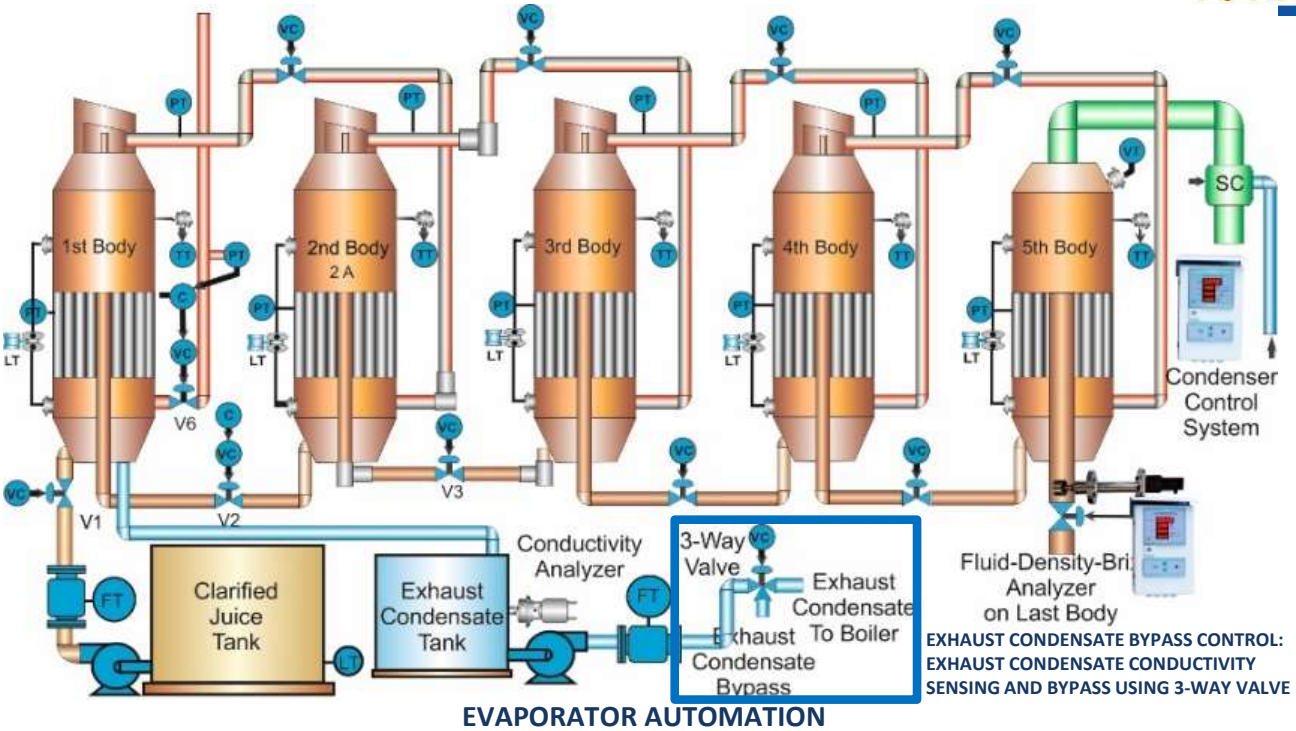
EVAPORATOR / FALLING FILM EVAPORATOR AUTOMATION ADVANTAGES:

- MAINTAINED LAST BODY BRIX HENCE EFFICIENT FURTHER PROCESSING AND PAN BOILING PRODUCES BETTER SUGAR YIELD
- MAINTAINED BODY LEVEL AND TEMPERATURE OF EACH BODY HENCE EXCELLENT MASS BALANCE ACHIEVED
- CONSTANT EVAPORATION RATE IS MAINTAINED, THIS INCREASES OVERALL EFFICIENCY
- AUTO EXHAUST STEAM CONDENSATE BYPASS PREVENTS ENTRAINMENT
- SYNCHRONIZATION FOR ALL BODIES INCLUDING JUICE TANKS AND CANE CARRIERS AVOIDS JUICE AND STEAM WASTAGE
- INTELLIGENT DATA ANALYSIS WITH MAINTENANCE AND CLEANING ALARMING SYSTEM REDUCES INVERSION AND IMPROVES SUGAR RECOVERY
- GENERATES HUGE MONETARY BENEFITS

EVAPORATOR AND FALLING FILM EVAPORATOR AUTOMATION

FFE AND CONVENTIONAL EVAPORATOR CONTROL PHILOSOPHY, AND CONDENSER PERSPECTIVE

YUTECH



EXHAUST CONDENSATE BYPASS CONTROL: EXHAUST CONDENSATE CONDUCTIVITY SENSING AND BYPASS USING 3-WAY VALVE

EVAPORATOR AUTOMATION

EVAPORATOR AUTOMATION:

- FLUID-DENSITY-BRIX SENSING AND CONTROL OF LAST BODY BY CONTROLLING OUTLET CONTROL VALVE
- LEVEL AND TEMPERATURE SENSING OF EACH BODY
- HEATING STEAM / VAPOUR TEMPERATURE AND PRESSURE SENSING
- LEVEL MAINTAINED IN EACH BODYBY CONTROLLING EACH BODY'S OUTLET CONTROL VALVE
- FLUID-DENSITY-BRIX MAINTAINED IN THE LAST BODY AND TREATED AS THE MASTER CONTROL FOR PREVIOUS BODIES
- PRECEDING BODY LEVEL SYNCHRONIZATION FOR ALL BODIES INCLUDING JUICE TANKS AND CANE CARRIERS
- INTELLIGENT DATA ANALYSIS WITH MAINTENANCE AND CLEANING ALARMING SYSTEM

EXHAUST STEAM CONDENSATE BYPASS SYSTEM:

- EXHAUST STEAM CONDENSATE CONDUCTIVITY SENSING TO DETECT ENTRAINMENT
- 3-WAY VALVE FOR EXHAUST STEAM BYPASS
- IF ENTRAINMENT IS DETECTED, 3-WAY VALVE IS OPERATD TO BYPASS THE STEAM CONDENSATE TO OTHER LINE AND NOT ALLOW CONTAMINATED CONDENSATE TO ENTER THE BOILER FEED WATER

CONDENSER AUTOMATION ADVANTAGES FROM AN EVAPORATOR PERSPECTIVE:

- AVOID ENTRAINMENT ESPECIALLY IN SEMI-KESTNER DUE TO UNEVEN VACUUM SHOCKS AND AVOID TIME AND RESOURCES WASTED IN REWORK
- CONSTANT VACUUM
  - MAINTAINED VACUUM ENSURES GOOD PAN BOILING AND EVAPORATION EFFICIENCY
- STABILIZED VAPOUR LOAD
  - MAINTAINED VACUUM ALSO ENSURES STABILIZED VAPOUR LOAD THUS HEATING EFFICIENCY IS INCREASED

OTHER BENEFITS:

- HUGE SAVINGS DUE TO MAINTAINED SUGAR QUALITY AND CONDENSATE QUALITY
- UNNECESSARY ERRORS LEADING TO PROCESS DISTURBANCE AND STOPPAGES ARE AVOIDED
- HUGE WATER SAVING AS WATER QUANTITY IS OPTIMIZED
- HUGE POWER SAVING POWER AS POWER WASTAGE IN EXCESS WATER PUMPING IS AVOIDED
- HUGE MONETARY BENEFITS DUE TO THESE SAVINGS

EVAPORATOR AND FALLING FILM EVAPORATOR AUTOMATION

FFE AND CONVENTIONAL EVAPORATOR CONTROL PHILOSOPHY, AND CONDENSER PERSPECTIVE

CONDENSER AUTOMATION:

- Separate Water Entry for Different Sets of Spray Nozzles and Spray Jet and Water Quantity is Automatically Controlled by ON/OFF Valve for Respective Nozzle Set Valve wrt Vacuum and Temperature difference between the Vapour and Condensate Tail Pipe
- Number of Jets & Nozzles and Jet & Nozzle Diameters designed as per Condenser Capacity
- Complete Stainless-Steel Construction, Strainer provided for each Condenser Header
- Water Pressure in the Common Injection Header maintained by Controlling Injection Pump VFD
- Jet Compartment Controlled by Separate Valve
- Vapour and Tail Pipe Temperature Measured

CONDENSER AUTOMATION PHILOSOPHY:

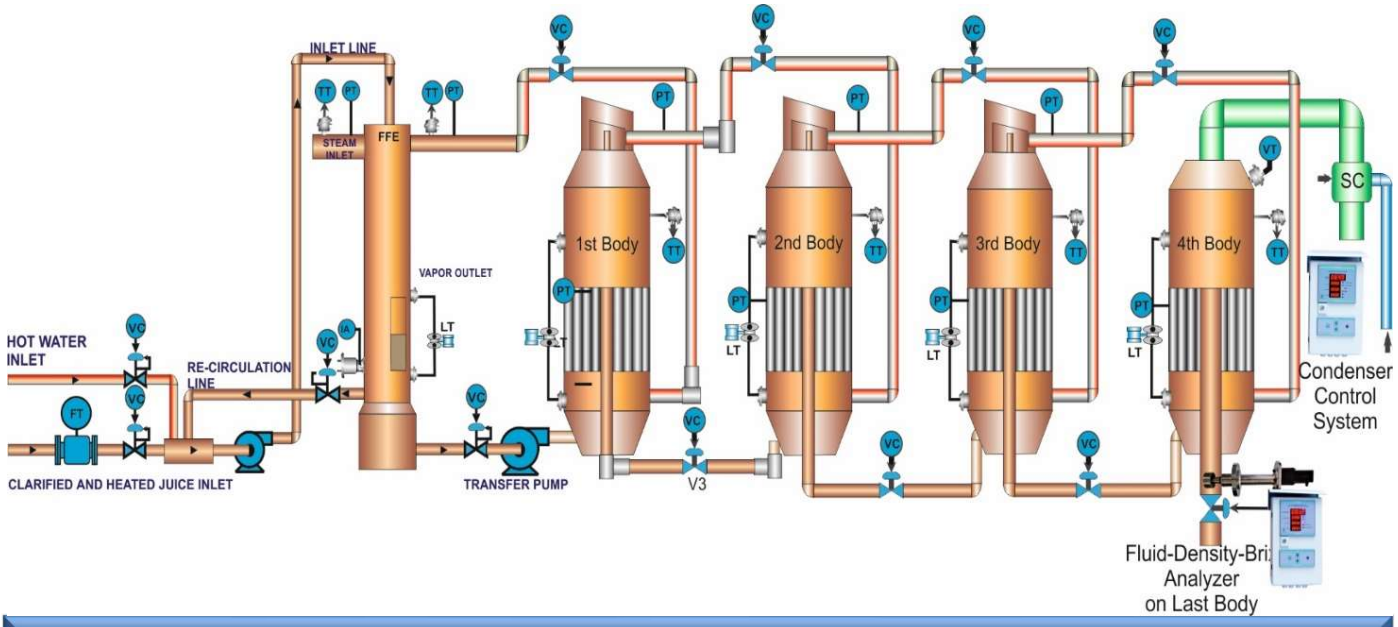
- Vapour Vacuum and Temperature sensed
- Condensate Temperature Sensed in Tail Pipe
- Temperature Difference Calculated
- Vacuum and Temperature Difference are both Analyzed to derive Remote Dynamic Set Point
- Spray Water is controlled as below:
  - Multi-Entry System:
    - Spray Jets are controlled by separate ON/OFF type Control Valves as per the Remote Dynamic Set-Point
    - 2, 3, or 4 Sets of Nozzles for Spray as per Design
    - 1 or 2 Sets of Jet Nozzles as per Design are controlled only if necessary
  - Single-Entry System:
    - Spray Jets are controlled by a Control Valve in PID Action as per the Remote Dynamic Set-Point
    - 1 or 2 Sets of Jet Nozzles as per Design are controlled only if necessary

AUTOMATION FOR COMBINATION OF FFE AND ROBERT OR SEMI-KESTNER BODIES:

OLD ROBERTS OR SEMI-KESTNER BODY AND NEW FFE COMBINATIONS HAVE BEEN AUTOMATED USING COMBINATION OF BOTH LOGICS.

New installations for factory expansion often have FFE installed as a first stage prior to the existing Conventional Roberts or Semi-Kestner Bodies. In such cases, our Hybrid Solution works very well.

The following Schematic Diagram shows that a Falling Film Evaporator is installed before the Quad Set of Conventional Rising Film Evaporators. In such cases, FFE Logic will be applied to FFE and Evaporator Logic to the following Evaporator Bodies.



EVAPORATOR AND FALLING FILM EVAPORATOR AUTOMATION

YUTECH FLUID-DENSITY-BRIX ANALYZER CUM CONTROL SYSTEM AND MOTORIZED FLUID-DENSITY SENSOR

BASIC SCIENCE BEHIND FLUID-DENSITY-BRIX:

- **Fluid-Density:** the Density of a particular Fluid.
- **Density:** is defined as "**Mass per unit volume**", which means it is the Mass contained in a fixed volume. It is denoted by "**ρ**" which is a Greek Letter called "Rho".
- **Density** can be derived using the formula "**ρ = m/v**" where ρ is the Fuild-Density, m is the Mass and V is Volume. The unit to measure Fluid-Density is **kg/m^3** (Kilogram per cubic meter).
- **Brix:** the measurement in percentage by weight of sucrose in pure water solution.
- Online Direct measurement of Brix in a Process Fluid is difficult, so indirect methods are used.
- **The most popular ways of measuring Brix are:**
  - **Hygrometric and Refractometric (Lab Methods)**
  - **High-Frequency or Radio-Frequency Conductivity type Brix Sensing**
  - **Microwave Type Brix Sensing**
  - **Fluid-Density Type Brix Sensing**
- While Conductivity or Microwave methods are very successful in measuring Brix of "B and C" Massecuite in CVP, Brix of Sugar Melt, and Brix in a Molasses Conditioner unit, they cannot measure Brix of "A" Massecuite as we measure the Fluid's electrical quality which is variable.
- Fluid-Density Measurement using a Motorized Stirring Sensor proves very successful as it directly measures the Fluid's mechanical quality irrespective of its electrical characteristics. Thus, measured Fluid-Density Value is further processed in the **Fluid-Density-Brix Equation,** to derive **Fluid-Density-Brix.**

SALIENT FEATURES OF FLUID-DENSITY-BRIX ANALYZER:

- Fluid-Density Type Brix Analyzer System targets sensing the Fluid-Density of Liquids, Slurries, or Syrups like Sugar Massecuite, Sugar Syrup, Sugar Melt, Liquors, and Molasses.
- The Motorized Fluid-Density Sensor is specially designed to be inserted in a vessel to stir the Fluid Media and Measure its Fluid-Density which can be expressed in simple terms as the Tightness or Thinness of a Fluid Media. It can also be informally referred to as the Consistency of the Fluid and is a Mechanical Property of a Fluid which in Liquids is directly proportional to its Viscosity.
- Motorized Sensor's torque and power which is required to stir the Fluid varies with varying Fluid-Density.
- The Motorized Fluid-Density Sensor's Power Consumption is directly proportional to the Fluid's Density.
- The variation in the Motorized Fluid-Density Sensor's Power Consumption is sensed by the Fluid-Density Type Brix Analyzer's highly accurate Sensing Circuitry, this deviation is further processed to Derive the Raw Fluid-Density Value.

FLUID CONSISTENCY-BRIX ANALYZER AND CONTROL SYSTEM WITH FLUID-DENSITY SENSOR

FOR MORE DETAILS, PLEASE SEE THE PRESENTATION ON OUR WEBSITE www.yutechautomation.com.

CHANNEL PARTNER:

YU Technologies Pvt. Ltd.

HO & Works: B 8/5, MIDC, Miraj, 416 410, Distt: Sangli, Maharashtra, India.
T: +91 233 2644042, +91 916 832 4851, +91 916 832 5127 / 8.
E: info@yutech.in; sale@yutech.in W: www.yutech.in; www.yutechautomation.com