

## **FLUID-DENSITY-BRIX ANALYZER AND CONTROL SYSTEM AND FLUID-DENSITY SENSOR**

**ONE SOLUTION FOR ALL SUGAR MANUFACTURING AND  
REFINING PROCESS AUTOMATION**

**EVAPORATORS  
BATCH VACUUM PANS OF A, B, OR C MASSECUIE  
VERTICAL CONTINUOUS PANS  
CONTINUOUS VACUUM PAN  
SUGAR MELTERS  
MOLASSES CONDITIONERS**

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

BASED ON YUTECH'S A15 INTELLIGENT ANALYZERS AND SYSTEMS PLATFORM



**YUTECH**



## FLUID-DENSITY-BRIX ANALYZER AND CONTROL SYSTEM AND 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 Fluid-Density, m is the Mass and V is Volume. The unit to measure Fluid-Density is **kg/m<sup>3</sup>** (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**.

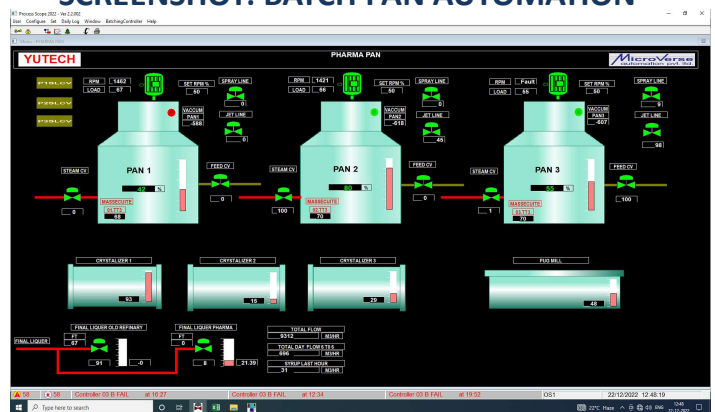
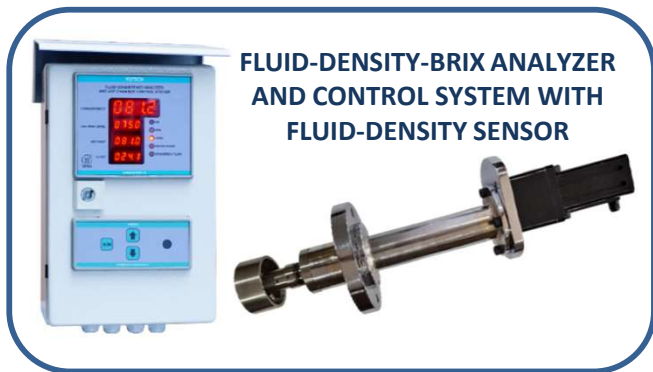
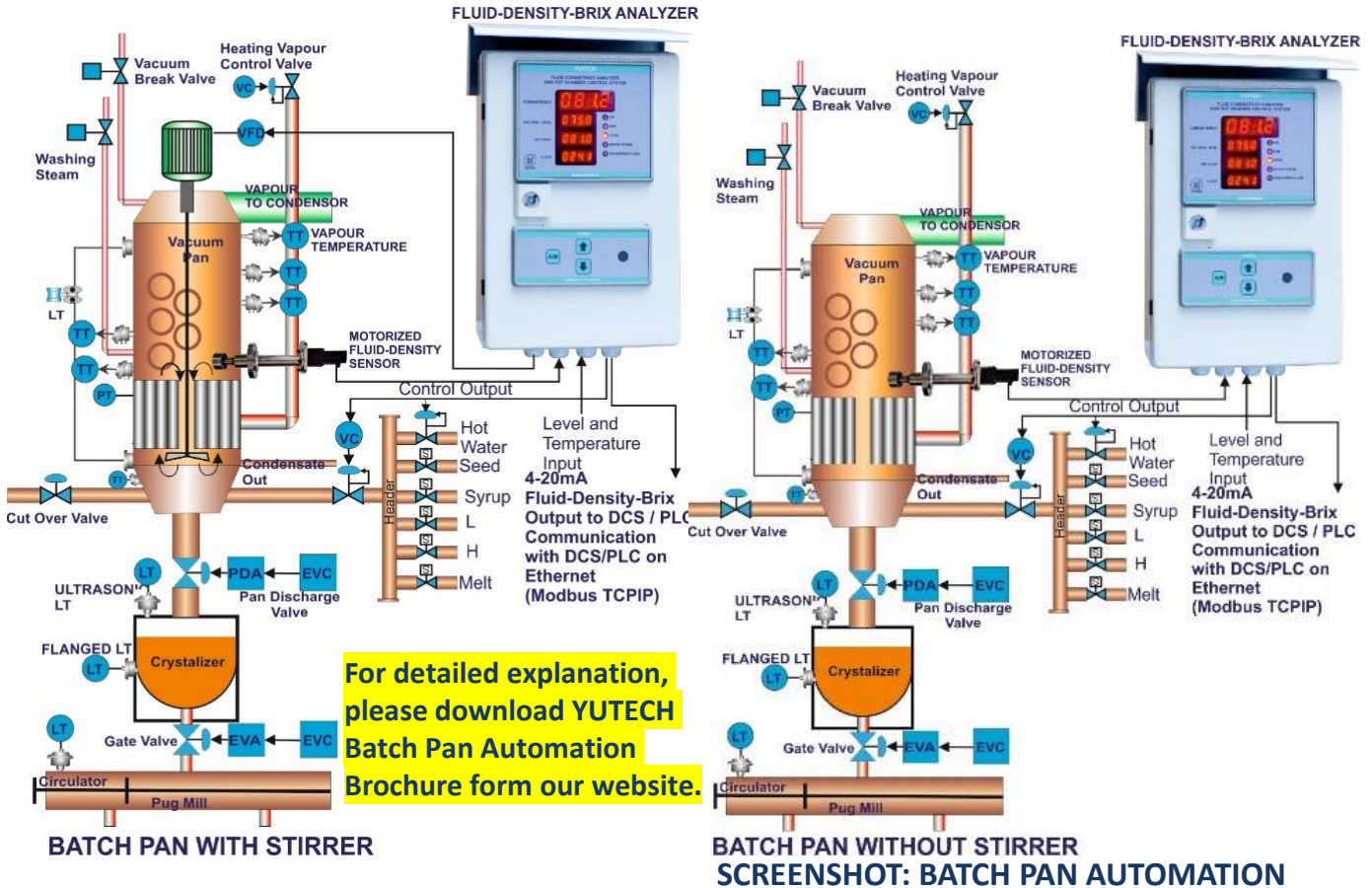
### SALIENT FEATURES:

- 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.

# YUTECH FLUID-DENSITY-BRIX ANALYZER CUM CONTROL SYSTEM AND MOTORIZED FLUID-DENSITY SENSOR BASED SUGAR PROCESS AUTOMATIONS BATCH PAN AUTOMATION



## SCHEMATIC DIAGRAM: BATCH PAN AUTOMATION



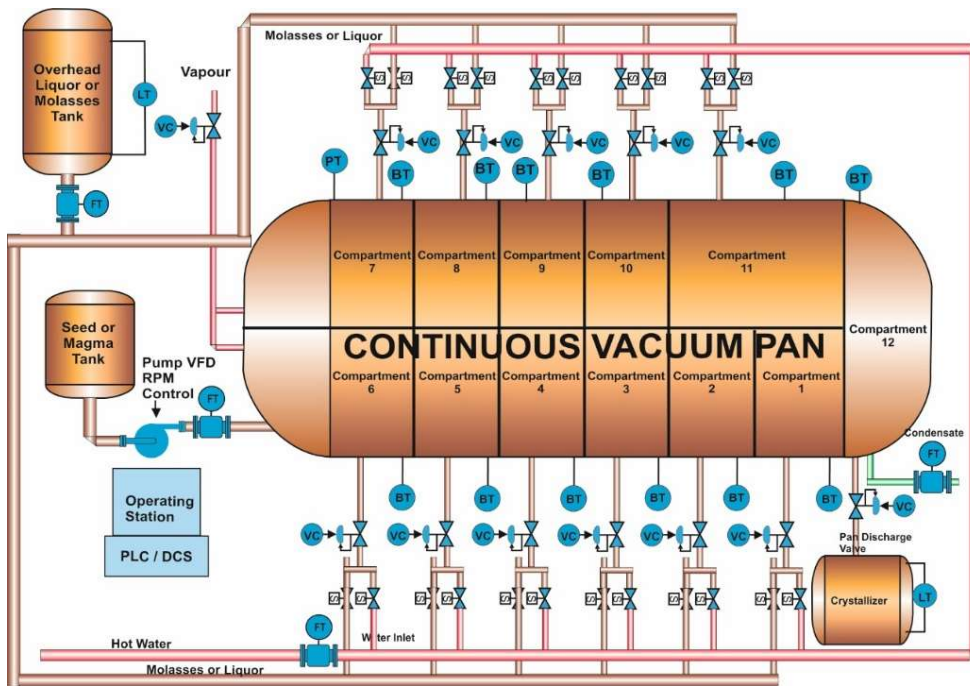
### Fluid-Density-Brix Sensor and Analyzer's role in Batch Pan Automation:

- Fluid-Density-Brix Analyzer senses the Brix and YUTECH Fluid-Density-Brix Logic takes over at this point to Control Seed / Syrup / Magma / Molasses Intake and achieve Grain Stabilization.
- This intake is with respect to Fluid-Density-Brix and Concentration Time.
- Fluid-Density is sensed by YUTECH Motorized Fluid-Density Sensor and YUTECH Fluid-Density-Brix Analyzer combination. Masecuite Density-Brix Control with respect to Level is a part of Consistency Logic which is in effect throughout the Build-up process.
- When the max level is reached and Fluid-Density-Brix grows to a preset value, an Indication with an Audio-Visual Alarm is given to charge the slurry, after seeing this Alarm and confirming the process conditions and parameters, the Operator will charge the slurry and then initiate the Pan Drop / Cut-Over operation.

# YUTECH FLUID-DENSITY-BRIX ANALYZER CUM CONTROL SYSTEM AND MOTORIZED FLUID-DENSITY SENSOR BASED SUGAR PROCESS AUTOMATIONS CONTINUOUS PAN AUTOMATION (PAN CHAMBER BRIX CONTROL)

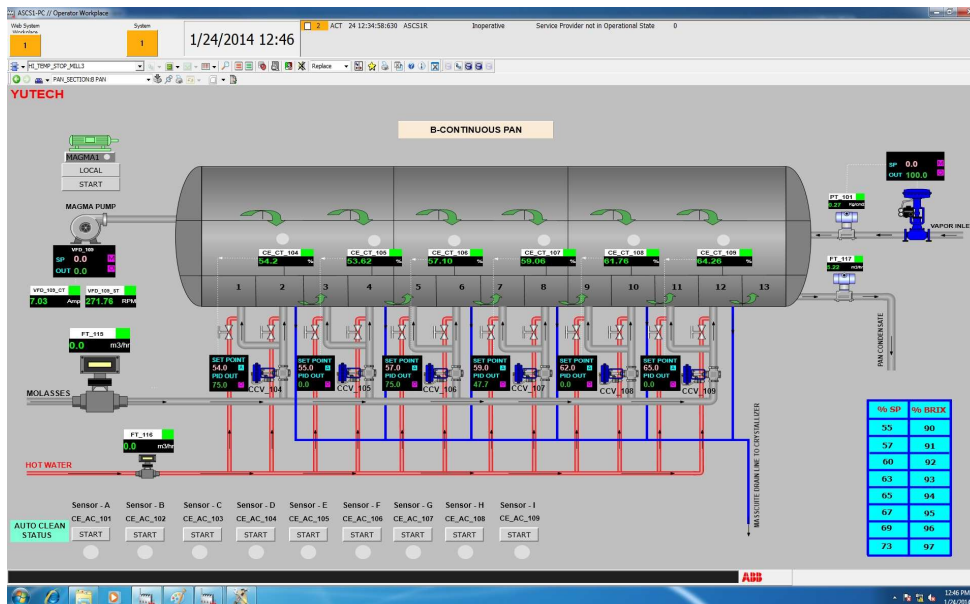


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## CONTINUOUS PAN AUTOMATION FEATURES:

- SEED OR MAGMA FLOW CONTROL WITH RESPECT TO MOLASSES OR LIQUOR FLOW ENSURES MAINTAINED MOLASSES-TO-SEED RATIO
- YUTECH FLUID-DENSITY-BRIX OR YUTECH BRIX SENSING AND MOLASSES / WATER INTAKE CONTROL FOR EACH COMPARTMENT
- TEMPERATURE SENSING THROUGHOUT THE CV PAN ENSURES UNIFORM TEMPERATURE INSIDE THE CV PAN BODY
- CALENDRIA VAPOUR PRESSURE CONTROL
- STANDALONE SYSTEM FOR CV PAN HAVING COMMUNICATION WITH MAIN PLC / DCS SYSTEM



## CONTINUOUS VACUUM PAN AUTOMATION:

### Seed or Magma Flow Control with respect to Molasses or Liquor Flow:

- Molasses and Seed Flowmeters sense Flow.
- Ratio of Seed to Molasses Flow is Controlled in the required proportion by Controlling Seed / Magma Pump VFD.

### Individual Compartment Brix Control by Auto Feeding Molasses or Water into each Compartment:

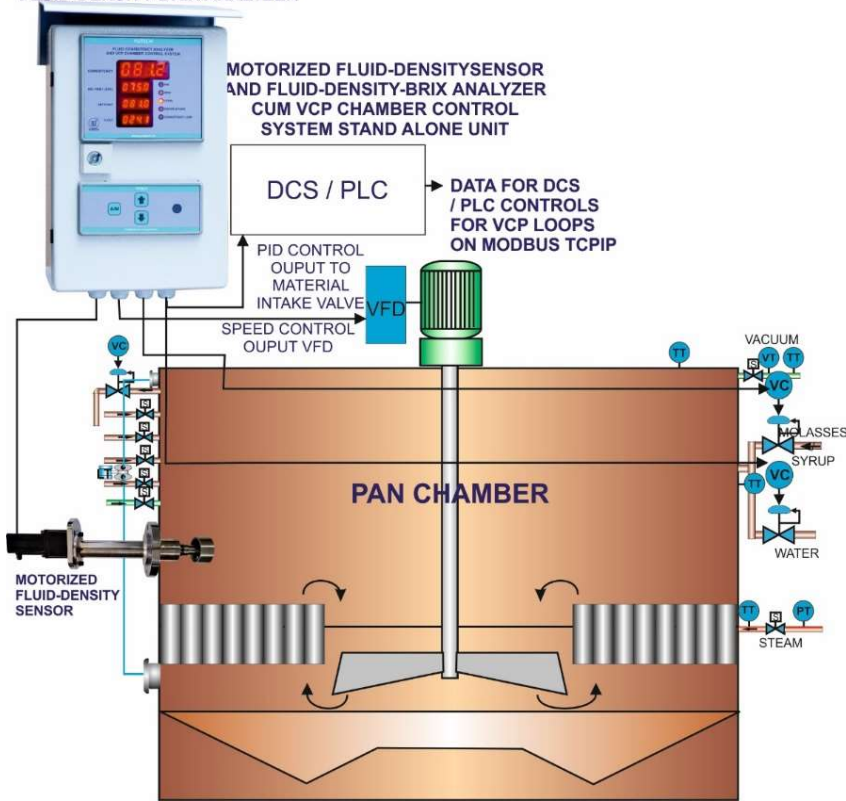
- Fluid-Density-Brix OR Brix Sensing of each Compartment by YUTECH Fluid-Density-Brix Analyzer OR YUTECH Brix Analyzer
- Control of Molasses Intake Valve with Brix Set Point, and Fluid-Density-Brix as Process Value in a PID Mode
- Addition of Water only if required as per Process Dynamics.

# YUTECH FLUID-DENSITY-BRIX ANALYZER CUM CONTROL SYSTEM AND MOTORIZED FLUID-DENSITY SENSOR BASED SUGAR PROCESS AUTOMATIONS VERTICAL CONTINUOUS PAN AUTOMATION (PAN CHAMBER BRIX CONTROL)



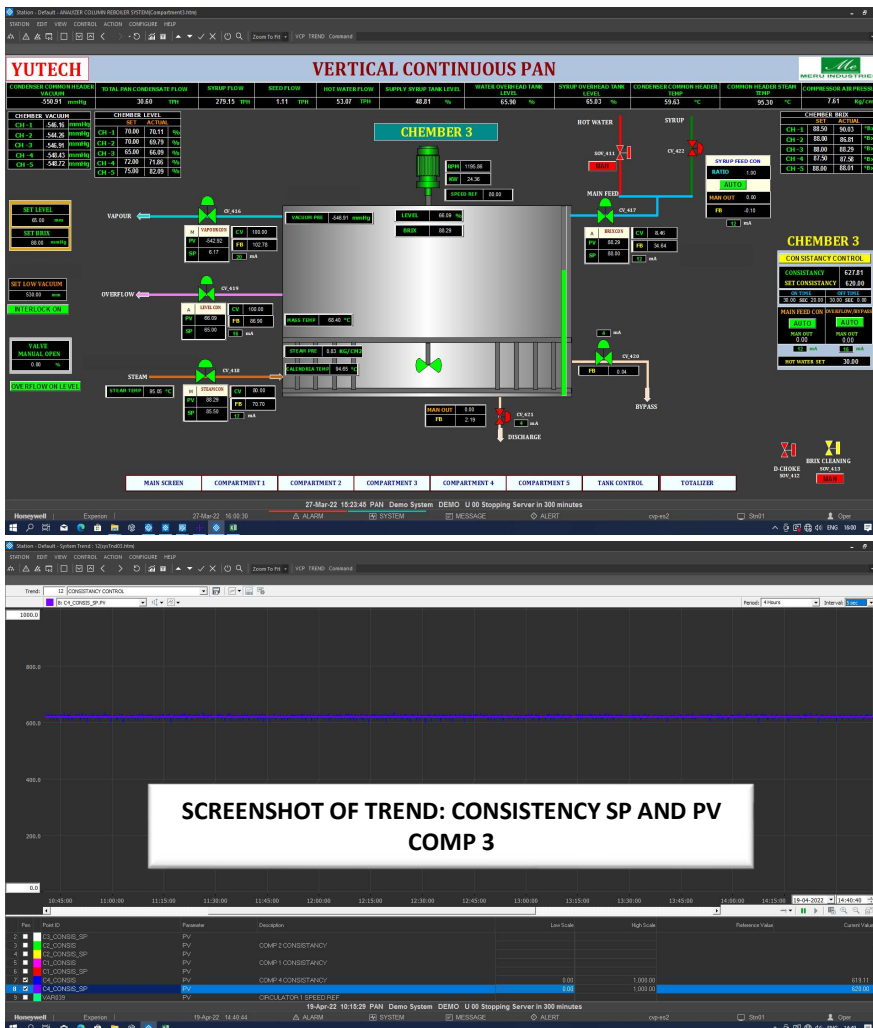
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## FLUID-DENSITY-BRIX ANALYZER



## VERTICAL CONTINUOUS PAN AUTOMATION:

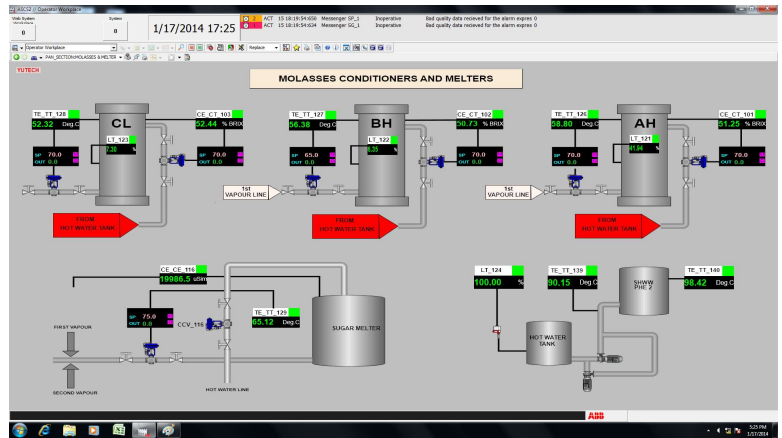
- SEED / MAGMA AND SYRUP / MOLASSES FLOW SENSING
- SEED OR MAGMA FLOW CONTROL WITH RESPECT TO MOLASSES OR LIQUOR FLOW ENSURES MAINTAINED MOLASSES-TO-SEED RATIO
- FLUID-DENSITY-BRIX SENSING AND SYRUP / MOLASSES INTAKE CONTROL
- AUTO WATER INTAKE IN THE CHAMBER IF PROCESS CONDITIONS DEMAND IT WITH RESPECT TO FLUID-DENSITY-BRIX
- HEATING STEAM / VAPOUR CONTROL WITH RESPECT TO FLUID-DENSITY-BRIX
- VFD SPEED CONTROL AS PER PAN CHAMBER LEVEL
- TEMPERATURE SENSING THROUGHOUT THE PAN CHAMBER TO ENSURE UNIFORM TEMPERATURE INSIDE THE CHAMBER
- SEMI-AUTOMATIC / AUTOMATIC DROP CONTROL IN ABNORMAL CONDITIONS
- STANDALONE SYSTEM FOR PAN CHAMBER FLUID-DENSITY-BRIX CONTROL AND COMMUNICATION WITH MAIN VCP PLC / DCS SYSTEM



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



**SCREENSHOT: SUGAR MELTER AUTOMATION MOLASSES  
CONDITIONER AUTOMATION**



**Sugar Melter Automation Advantages:**

- Streamlined Process due to Constant and Maintained Outlet Brix and Temperature.
- Ensure Constant Quality of Melt Feed to Pans.
- Reduce Heat Waste, due to Overheating or Under Dilution or Over Steaming.
- Reduce Process Time by avoiding Extra Dilution.
- Thus Save Time, Steam, and Water and Ensure more throughput in less time.
- Increase Profitability.

**Control Loops:**

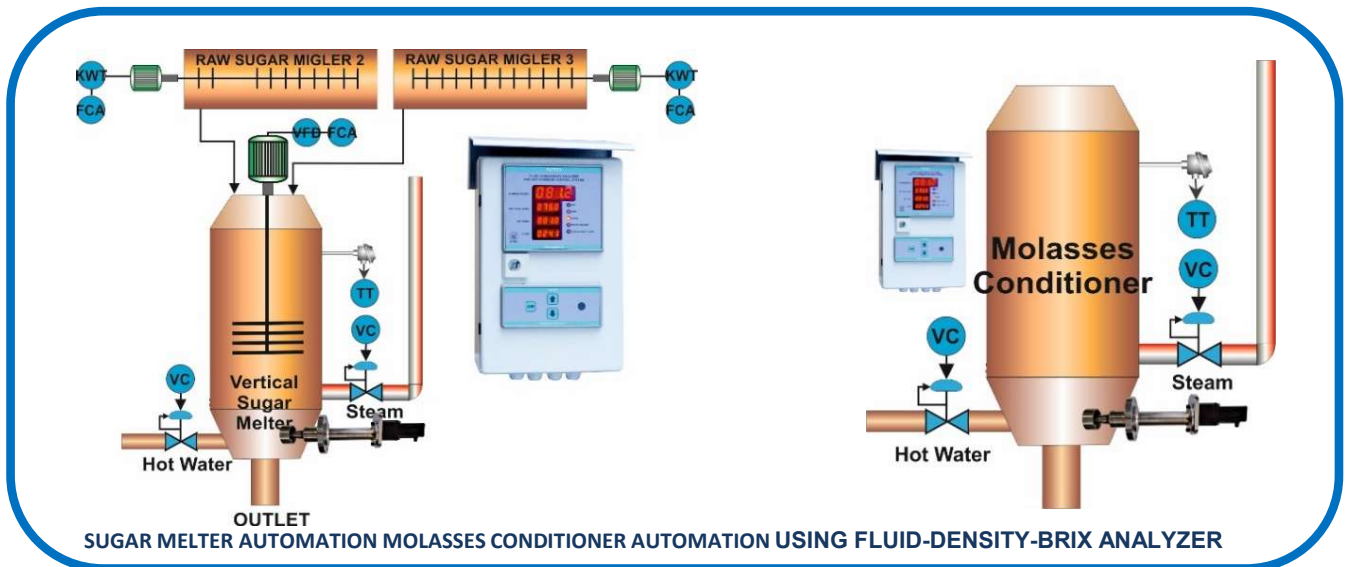
Controlled intake of Heating Media (Steam), and Diluting Media (Water) as per Process Dynamics of Raw Sugar Intake.

**Brix Control using Brix or Fluid-Density-Brix Analyzer:**

- Sugar Melt Brix are maintained by the controlled addition of Hot Water using a Control Valve in a PID Loop with Sugar Melt Fluid-Density-Brix / Brix sensed by a Fluid-Density-Brix Analyzer or High-Frequency Brix Analyzer as a Process Variable.

**Temperature Control:**

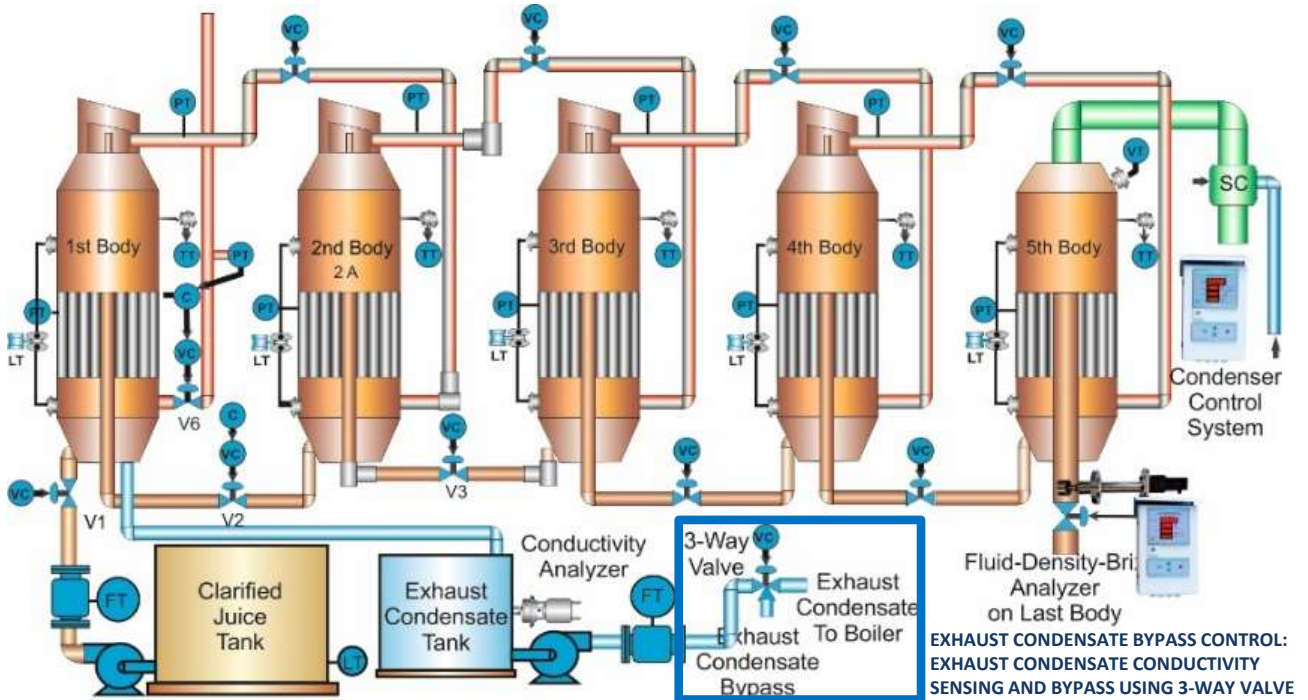
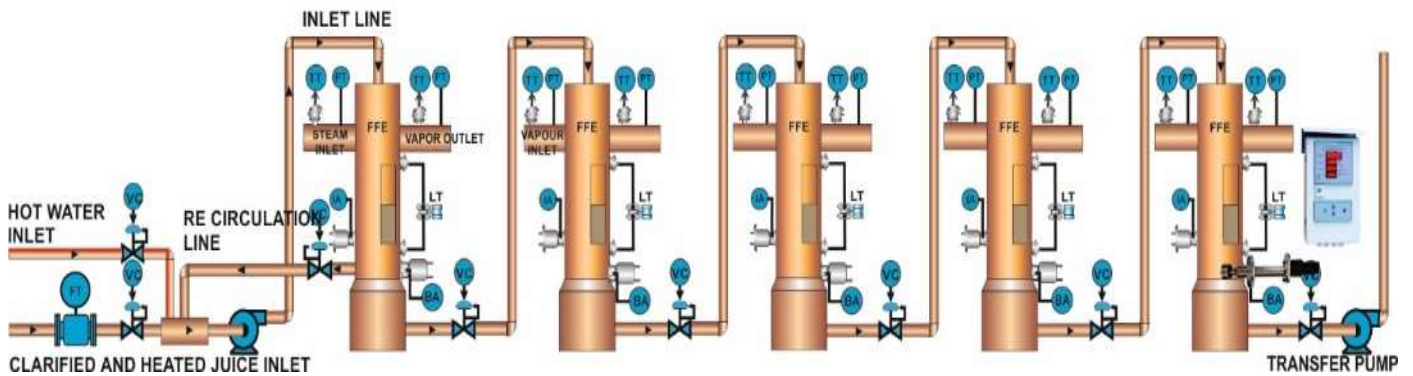
- Sugar Melt / Molasses Temperature is maintained constant by controlled application of Steam using a Control Valve in a PID Loop with Sugar Melt / Molasses Temperature as a Process Variable.



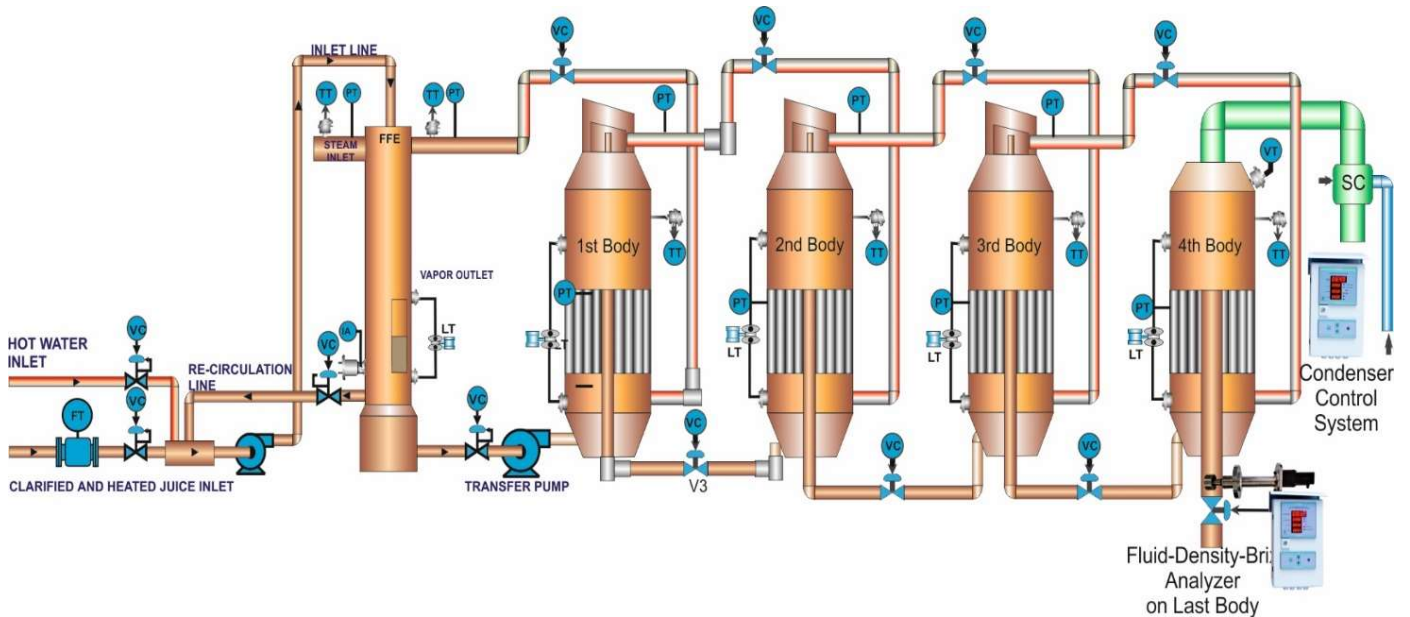
**YUTECH FLUID-DENSITY-BRIX ANALYZER CUM CONTROL SYSTEM AND  
MOTORIZED FLUID-DENSITY SENSOR BASED SUGAR PROCESS AUTOMATIONS  
FFE, ROBERT, SEMI-KESTNER TYPE EVAPORATOR AUTOMATION (LAST BODY  
BRIX CONTROL)**



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**EVAPORATOR AUTOMATION**



**FLUID-DENSITY-BRIX SENSING AND CONTROL OF LAST BODY BY CONTROLLING OUTLET CONTROL VALVE OR TRANSFER VALVE OR VFD OF TRANSFER PUMP.**

## **BATCH PAN AUTOMATION**

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



**FLUID CONSISTENCY-BRIX ANALYZER AND CONTROL SYSTEM WITH FLUID-DENSITY SENSOR  
DATASHEET AND PRESENTATION CAN BE DOWNLOADED FROM OUR WEBSITE.**

**PLEASE ALSO CHECK YUTECH'S OTHER PRODUCTS LIKE:**

**BRIX ANALYZER**

**BRIX ANALYZER AND CONTROLLER**

**pH ANALYZER**

**pH ANALYZER AND CONTROLLER**

**INFRA-RED TYPE DONNELLY CHUTE LEVEL SENSING AND TRANSMISSION SYSTEM FOR SUGAR MILLS**

**CAPACITIVE TYPE DONNELLY CHUTE LEVEL SENSING AND TRANSMISSION SYSTEM FOR SUGAR MILLS**

**CANE BLANKET LEVEL SENSING AND TRANSMISSION SYSTEM FOR CANE CARRIERS**

**TOP ROLLER LIFT SENSING AND TRANSMISSION SYSTEM FOR SUGAR MILLS**

**INFRA-RED TYPE BAGASSE SILO LEVEL SENSING AND TRANSMISSION SYSTEM FOR BOILER**

**CONDENSER AUTOMATION**

**IRIS VALVE BASED CONTINUOUS CENTRIFUGAL MACHINE AUTOMATION**

**A24 SERIES ETHERNET INPUT-OUTPUT CARDS (MODBUS TCP/IP / ETHERNET TCP/IP)**

**A24 SERIES FIELD-MOUNTED 16-AI ETH SCANNER (MODBUS TCP/IP / ETHERNET TCP/IP)**

**A15 SERIES FIELD-MOUNTED 16-AI ETH SCANNER (MODBUS TCP/IP / ETHERNET TCP/IP)**

**A12 SERIES FIELD-MOUNTED DISPLAYS, TRANSMITTERS AND CONTROLLERS**

**A10 SERIES MODBUS RTU CARDS**

**A10 SERIES PROCESS INDICATOR, JUMBO DISPLAY, TRANSMITTER, ISOLATORS, AUTO-MANUAL  
STATION AND CONTROLLER**

**AUTOMATION SYSTEMS EXECUTED ON PLC / DCS:**

**SUGAR MILL AUTOMATION**

**pH CONTROL AND JUICE LIMING AUTOMATION**

**BATCH PAN AUTOMATION**

**CVP AUTOMATION**

**VKT OR VCP AUTOMATION**

**SUGAR MLETER AND MOLASSES CONDITIONER AUTOMATION**

**IRIS VALVE BASED CONTINUOUS CENTRIFUGAL MACHINE AUTOMATION**

**CONDENSER AUTOMATION**

**BOILER AUTOMATION**

**SUGAR PROCESS AUTOMATION**

**TURNKEY PLANT AUTOMATION SYSTEMS EXECUTED ON PLC / DCS:**

**TURNKEY SUGAR PLANT, REFINERY, AND PHARMA GRADE SUGAR PLANT AUTOMATION**

**TURNKEY JAGGERY AND KHANDSARI PLANT AUTOMATION**

**TURNKEY CO-GEN POWER PLANT AUTOMATION**

**TURNKEY DISTILLERY PLANT AUTOMATION**

**CHEMICAL PLANT AUTOMATION**

**OIL EXTRACTION PLANT AUTOMATION**

**TURNKEY PHARMA PLANT AUTOMATION**

**FOR MORE DETAILS, PLEASE SEE THE PRESENTATION ON OUR WEBSITE [www.yutechautomation.com](http://www.yutechautomation.com).**

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