

STEAM ECONOMY EQUIPMENTS & SYSTEMS FOR SUGAR MILLS

BY

T VENKATA RAMANA

ABSTRACT:

IN THE PRESENT SCENARIO OF SLOWED DOWN GLOBAL ECONOMY, ITS AFFECT IS FELT IN EVERY INDUSTRY. THUS SUGAR INDUSTRIES ALSO IN VICTIM OF THIS GLOBAL SLOWDOWN, AFFECTING THE PROFITABILITY TO A LARGE EXTENDS. IN THIS PROCESS CONSIDERABLE NUMBER OF SUGAR MILL ROUND THE GLOBE ARE AT THE WEDGE OF CLOSED DOWN, UNLESS THERE IS DRASTIC CHANGE IN THINKING AND APPLYING SUITABLE TECHNOLOGIES TO THE EXISTING SUGAR MILLS TO MAKE THEM WORK EFFECTIVELY TO GENERATE ADDITIONAL REVENUE FROM WIRETAPPED AREAS IN THIS SUGAR MILL NAMELY SAVING ON FUEL AND POWER RESULTING IN SAVING OF BAGASSE AS WELL AS PRODUCTION OF QUALITY SUGAR WITH MINIMUM AND AFFORDABLE COST. THE RETURN ON SUCH INVESTMENTS SHOULD BE BIG PAYING BACK THE INVESTMENT IN LESS THAN THREE CROP SEASONS.

VRL ON THIS PART HAS SPECIALIZED IN THIS FIELD AND THE SYSTEM/EQUIPMENT WILL EFFECTIVELY MATCH FOR ACHIEVING THE ABOVE MENTIONED OBJECTIVE.

VRL IS KNOWN FOR THIS NON-CONVENTIONAL AND STEAM/ENERGY SAVING EQUIPMENT LIKE DIRECT CONTACT JUICE HEATERS, VERTICAL CONTINUOUS PAN, HEATERS WORKING ON VERY LOW TEMPERATURE VAPOR, FLASH RECOVERY SYSTEMS ETC., ALL THIS EQUIPMENT/SYSTEM REQUIRES VERY LESS OR NO MAINTENANCE HAVING MANY ADVANTAGES OVER CONVENTIONAL TYPE OF EQUIPMENT/ SYSTEMS USED IN THE SUGAR MILLS AT PRESENT.

INTRODUCTION:

IN SUGAR INDUSTRY, ENERGY IS MEANT AS STEAM. THIS ARTICLE DEALS PREDOMINANTLY WITH STEAM, SPECIALLY THE PROCESS STEAM. HOWEVER IN SUGAR FACTORIES WITH COGENERATION OF POWER, EVERY TON OF STEAM SAVED IN THE PROCESS, RESULTS IN THE GENERATION OF AN ADDITIONAL POWER FOR EXPORT.

PROCESS STEAM DEMAND GETS FIXED BASED UPON THREE FACTORS.

1. PROCESS PARAMETERS
2. OPERATIONAL EFFICIENCY.
3. EQUIPMENT AND THEIR CONFIGURATION

THE AUTHORS ARE FROM VRL ENGINEERING & PROJECTS PVT. LTD, INDIA, VRL HAD BEEN DOING SINCE ITS INCEPTION IN 1993, PROJECTS ON AUTOMATION AND INSTRUMENTATION OF SUGAR MANUFACTURING PROCESS. SINCE THE SUGAR CANE BAGASSE ASSUMED THE STATUS OF NON CONVENTIONAL BIO FUEL FOR COGENERATION OF POWER IN SUGAR FACTORIES IN INDIA VRL STARTED CONTEMPLATING TO FOCUS ON STEAM SAVING PROJECTS. BY VIRTUE OF BEING IN AUTOMATION AND INSTRUMENTATION VRL WAS ABLE TO INNOVATE DEVICES AND EQUIPMENT TO SAVE STEAM AT EVERY STAGE OF THE SUGAR MANUFACTURING PROCESS. STILL THIS TIME VRL WAS FOCUSING THE FIRST TWO FACTORS MENTIONED ABOVE NAMELY PROCESS PARAMETERS AND OPERATIONAL EFFICIENCY. AS THE STEAM SAVING PROJECTS STARTED SEEING SUCCESS IT WAS REALIZED THAT THERE WAS TREMENDOUS SCOPE AND POTENTIAL FOR STEAM SAVING IF ONLY WE FOCUS ON EQUIPMENT AND THEIR CONFIGURATION. THE PROCESS EQUIPMENT AND PROCESS CONFIGURATION ALSO NEEDED INNOVATIVE CHANGES BEYOND CONVENTION IN ORDER TO ACHIEVE EXTRA ORDINARY RESULTS. AT THIS STAGE VRL DECIDED TO TAKE UP FABRICATION AND MANUFACTURING OF EQUIPMENT FOR PROCESS TO COMPLIMENT THE INNOVATIVE THOUGHTS ON STEAM SAVING DEVICES. DURING LAST 15 YEARS VRL HAS SUCCESSFULLY COMPLETED A NUMBER OF ENERGY SAVING PROJECTS. TODAY ALL THE EQUIPMENT ARE MANUFACTURED AT VRL'S MANUFACTURING FACILITIES AT BANGALORE.

MOST OF OUR PROJECTS FOR IMPLEMENTATION OF STEAM AND POWER ECONOMY ARE DONE IN THE EXISTING WORKING FACTORIES. ALTHOUGH THE PROJECT WOULD BE ECONOMICALLY VIABLE ON ITS OWN, WE HAVE MADE IT MORE ATTRACTIVE BY STRUCTURING THE PROJECT AS ONE OF 'INCLUSIVE' COMBINING ENERGY SAVING (STEAM AND POWER), MARGINAL/SUBSTANTIAL EXPANSION, MODERNIZATION, AUTOMATION AND INSTRUMENTATION. FOR EXAMPLE IF A SUGAR FACTORY IS WORKING WITH 150 TPH CANE WITH 70 TPH BOILER ON 45% STEAM ON CANE, THE SAME BOILER COULD SERVE 200 TPH CANE AT 34 % CANE. THE FIRST BODY WITH EVAPORATION CAPACITY OF 67 TPH WOULD CONTINUE TO EVAPORATE THE SAME QUANTITY BUT WITH THE CANE CRUSHING OF 200 INSTEAD OF 150 TONS /HR.

WE HAVE ACCOMPLISHED A NUMBER OF PROJECTS SUCCESSFULLY IN INDIA AND ELSEWHERE FOR WHITE SUGAR AS WELL AS RAW SUGAR MANUFACTURING PROCESS. WE HAVE MANAGED NOT TO DISCARD THE EXISTING UNITS AND TAILOR MADE THE PROJECTS TO YIELD VERY GOOD RESULTS TECHNICALLY AND FINANCIALLY. MORE

IMPORTANTLY, THE PROJECTS AFTER COMPLETION HAVE PROVED TO BE OPERATOR FRIENDLY.

WE HAVE DONE PROJECTS FOR FACTORIES PRODUCING DIRECT CONSUMPTION WHITE SUGAR WHERE THE PROCESS STEAM CONSUMPTION % CANE IS REDUCED FROM THE LEVELS OF 48, 45, 42 TO 36, 34, AND 30, DEPENDING UPON EXISTING CONDITIONS AND CHANGES EFFECTED, IN RAW SUGAR FACTORY THE SAME IS BROUGHT DOWN TO 28%.

WE ARE PRESENTLY IMPLEMENTING A PROJECT IN WHITE SUGAR FACTORY IN INDIA IN WHICH OUR TARGET IS 29 %CANE. AND IN ONE OTHER PROJECT OF INTEGRATED REFINED SUGAR PLANT THE TARGET IS 36 %.

WE GIVE BELOW A BRIEF DESCRIPTION OF THE EQUIPMENT, CONFIGURATION AND THE PROCESS WE INTEND TO FOLLOW IN ORDER TO CALL THE PROCESS HOUSE AS ENERGY EFFICIENT. ALL ITEMS ARE NOT DISCUSSED. ONLY THOSE THAT NEED SPECIAL MENTION ARE FOCUSED.

SHORT TUBE VAPOR LINE JUICE HEATER (VLJH) ON 5TH VAPOUR

SHORT TUBE VAPOR LINE JUICE HEATER (VLJH) FROM VRL IS UNIQUE IN DESIGN, WITH TUBE LENGTH LESS THAN 3 METERS. LOWER LENGTH HELPS IN REDUCING THE RESISTANCE TO HEAT TRANSFER ON ACCOUNT OF CONDENSATE FILM ON THE OUTER SURFACE OF THE TUBES. THE HEAT TRANSFER CO-EFFICIENT IS VERY HIGH IN THESE JUICE EATERS, AS A RESULT THE HEATING SURFACE REQUIREMENT COMES DOWN DRASTICALLY.

THE RESISTANCE TO THE JUICE FLOW ACROSS THE JUICE HEATERS ALSO GETS REDUCED, DUE TO REDUCED HEATING SURFACE. THUS THE LOAD ON JUICE PUMPS ALSO GETS REDUCED. FIRST STAGE OF RAW JUICE HEATING IS DONE FROM ABOUT 35 DEG TO 50 DEG C. NO STEAM IS ATTRIBUTABLE TO BE CONSUMED ON THIS ACCOUNT.

JUICE HEATERS ON CONDENSATE

THESE CONDENSATE HEATERS ONCE AGAIN ARE UNIQUE DESIGN FROM VRL. THE JUICE AND WATER ARE IN PERFECT COUNTER CURRENT PATTERN, CONTRIBUTING TO HIGH HEAT TRANSFER CO-EFFICIENT AND WITH LOW APPROACH TEMPERATURE. THE MODULAR DESIGN MAKES IT USER FRIENDLY WITH EASE OF OPERATION. THESE HEATERS ALSO ARE PURELY HEAT RECOVERY EQUIPMENT, AS THE VAPOR CONDENSATE FROM FLASH RECOVERY SYSTEM IS USED FOR JUICE HEATING.(FROM 50 TO 58 DEG C) THE OUT LET CONDENSATE FROM THE HEATER IS AGAIN HEATED IN A PLATE TYPE HEAT

EXCHANGER AND THE HEATED CONDENSATE IS USED TO FURTHER HEAT THE RAW JUICE FROM ABOUT 60 TO 72 DEG C. HERE AGAIN THERE NO STEAM CONSUMPTION.. THUS THE RAW JUICE HEATING IS ENTIRELY DONE WITHOUT ANY STEAM ON ITS ACCOUNT.

TUBULAR JUICE HEATER

FOR ANY EMERGENCY ONE TUBULAR JUICE HEATER IS RESERVED TO WORK ON IV VAPOR.

DIRECT CONTACT HAETERS.

DIRECT CONTACT HEATERS PLAY MAJOR ROLE IN THE SUCCESS OF STEAM ECONOMY MEASURES. THESE DIRECT CONTACT JUICE HEATERS WORK WITH VERY LOW APPROACH TEMPERATURE. THIS FEATURE ALLOWS UTILIZATION OF LOW TEMPERATURE VAPORS OF HIGH LATENT HEAT. THE DCHS ARE USED FOR HEATING DEFECATED JUICE IN 3 STAGES ON IV, III AND II VAPOR RESPECTIVELY. DCHS ARE ALSO USED FOR HEATING CLARIFIED JUICE IN TWO STAGES ON II AND I VAPOR. ONE DCH IS USED FOR HEATING FILTERED JUICE ON CLARIFIER FLASH VAPOR.

DIRECT CONTACT HEATERS HAVE A NUMBER OF ADVANTAGES AS LISTED BELOW,

- OPERATES WITH VERY LOW APPROACH TEMPERATURE
- CONTRIBUTES TOWARDS STEAM ECONOMY INDIRECTLY
- CONSIDERABLE POWER SAVING AS THERE IS NO PRESSURE DROP ACROSS THE HEATERS
- CONSIDERABLE POWER SAVING AS NO CONDENSATE PUMPS IS NEEDED
- REDUCING MAINTENANCE AND INVENTORY RELATED TO PUMPS AND ACCESSORIES
- ZERO MAINTENANCE WORK OR COST ON JUICE HEATERS.
- NO TUBE CLEANING, NO MAINTENANCE & NO HASSLES OF TUBE LEAKAGES.

VERY IMPORTANT ADVANTAGE IS THAT THE JUICE IS NEVER OVER HEATED. IN TUBULAR HEATERS THE OUT LET TEMPERATURE IS THE AVERAGE FINAL TEMPERATURE. IT IS A MIXTURE OF HIGH AND LOW TEMPERATURES. INSIDE THE TUBE, THE TEMPERATURE IS NEVER HEATED UNIFORMLY. HENCE PART OF THE JUICE IS ALWAYS OVER HEATED WHEREAS THE JUICE IN THE DCH IS UNIFORMLY HEATED AND HEATED TO THE SET POINT. THIS MINIMIZES INVERSION AND COLOR FORMATION.

CLARIFICATION

SHORT RETENTION CLARIFIER:

THE SHORT RETENTION CLARIFIER IS DESIGNED TO PROVIDE CLARIFIED JUICE, FREE OF SUSPENDED SOLIDS, WITH RETENTION TIME OF LESS THAN 50 MINUTES EFFICIENT FLASHING OF JUICE COUPLED WITH THE LOW RETENTION TIME IN CLARIFIER, HELPS MINIMIZING THE SUGAR LOSS,

THE LOW RETENTION TIME ALSO HELPS IN CLEAR JUICE ENDING UP WITH NEGLIGIBLE COLOR DEVELOPMENT. THE CLEAR JUICE TEMPERATURE AT CLARIFIER OUTLET WOULD BE AROUND 97 TO 98 DEGREE C.

FLASH RECOVERY FROM FLASH TANK:

IT IS A 100% HEAT RECOVERY SYSTEM CONTRIBUTING TO STEAM ECONOMY. THE FLASH VAPORS GENERATED AT ABOUT 100 DEG C. INSIDE THE FLASH TANK OF CLARIFIER WILL PASS THROUGH A SPECIALLY DESIGNED DIRECT CONTACT TYPE HEAT EXCHANGER THROUGH WHICH FILTER JUICE IS PASSED. THE LATENT HEAT IN THE FLASH VAPOR IS RECOVERED BY FILTER JUICE AS A RESULT, THE FILTER JUICE TEMPERATURE RISES TO 90C.

CLARIFICATION

THE CLARIFICATION STATION IS PROVIDED WITH FOLLOWING CONTROLS AND FEATURES

- AUTO-PH CONTROL SYSTEM WITH MILK OF LIME CONTROL FOR DEFECATION OF HEATED JUICE.
- DEFECATED JUICE FLOW STABILIZATION TO MAINTAIN UNIFORM JUICE FLOW TO CLARIFIER FLASH TANK
- FLOCCULENT DOSING CONTROL LINKED TO JUICE FLOW TO THE CLARIFIER
- VAPORS FROM CLARIFIER FLASH TANK ARE RECOVERED & UTILIZED FOR FILTER JUICE HEATING USING DIRECT CONTACT HEATERS.
- FILM TYPE CONTINUOUS SULPHUR BURNERS PROVIDED WITH HEAT RECOVERY SYSTEMS
- THIS SYSTEM ELIMINATES USAGE OF MEDIUM PRESSURE STEAM FOR MELTING OF SULPHUR
- ELECTRICAL HEATERS PROVIDED FOR INITIAL START-UP. ONCE GAS GENERATION IS STARTED, THE HEATERS ARE AUTOMATICALLY SWITCHED OFF
- CONSISTS OF LIME SLACKER, LIME CLARIFIER WITH GRIT

EVAPORATORS

VRL ALWAYS RECOMMENDS QUINTUPLE EFFECT EVAPORATOR SYSTEM.

FLASH RECOVERY SYSTEM:

CONDENSATES FLASH RECOVERY SYSTEM IS THE HEART OF STEAM ECONOMY SCHEME SUPPLIED BY VRL,

IT IS A WELL-DESIGNED CENTRALIZED FLASH RECOVERY UNIT. THE CONDENSATE RECEIVED FROM THE EVAPORATOR BODIES, TUBULAR JUICE HEATERS AND PANS ARE FLASHED OUT IN NUMBER OF STAGES. THE FLASH VAPOURS GENERATED ARE SYSTEMATICALLY CONNECTED TO DOWNSTREAM SIDE EVAPORATOR BODIES. THE SYSTEM CONTRIBUTES TO SAVING OF STEAM OF 1.4 TO 1.6 % CANE.

BESIDES DIRECT SAVING OF STEAM AS ABOVE THE SYSTEM HAVE OTHER ADVANTAGES AS FOLLOWS.

ADVANTAGES:

- THE SOURCE OF HEAT IS EXTERNAL TO EVAPORATION SYSTEM. IT CONTRIBUTES TO STEAM ECONOMY WITHOUT SHARING THE WATER FROM THE JUICE SO THAT INDIRECTLY IT HELPS MORE BLEEDING OF VAPORS THUS FACILITATING INCREASED BLEEDING AND INCREASED ECONOMY.
- CONSIDERABLE POWER SAVING, AS THERE IS NO NEED OF CONDENSATE PUMPS AT INDIVIDUAL BODIES,
- ELIMINATION OF CONDENSATE PUMPS, HELP IN REDUCING THE MAINTENANCE AND STORE INVENTORY.

FALLING FILM EVAPORATORS:

WE HAVE PREFERRED TO INSTALL FFES WHEREVER POSSIBLE FOR THE ENTIRE SET. WE HAVE CASES WHERE WE HAVE INSTALLED FFE BODIES FOR THE NEW SET OF QUINTUPLE TO SERVE THE TOTAL CAPACITY. THE EXISTING BODIES ARE MADE INTO A PARALLEL SET WITH NECESSARY MODIFICATIONS AND HANDLE THE EXPANDED CAPACITY. THIS IS A CASE WHERE THE FACTORY WANTED TO RUN THE CAMPAIGN WITHOUT STOPPAGE FOR CLEANING. SOME OTHER CASES WE HAVE ONLY INSTALLED TWO FFE BODIES FOR I AND II EFFECTS AND UTILIZED THE EXISTING BODIES FOR III,IV AND V EFFECTS AND ALSO SPARE BODIES TO FACILITATE CLEANING THE BODIES ONE BY ONE.

WE HAVE SUPPLIED OUR OWN MAKE FALLING FILM EVAPORATORS WHICH ARE COMPACT AND OCCUPY VERY LESS GROUND SPACE, REQUIRING NO HEAVY STRUCTURES AND PLATFORMS.

UNIQUE FEATURE INVOLVES EFFECTIVE VAPOR DISTRIBUTION ACROSS THE CALENDRIA AND EFFICIENT WITHDRAWAL OF CONDENSATE AND NON-CONDENSABLE GASES FROM CALENDRIA.

THESE EVAPORATORS OPERATE WITH VERY LOW TEMPERATURE GRADIENT.

AS THE JUICE IS TRAVELLING DOWN THE TUBE, THERE IS NO INFLUENCE OF HYDRO STATIC HEAD ON HEAT TRANSFER.

THE JUICE DISTRIBUTORS AT THE TOP OF THE FALLING FILM EVAPORATORS ARE UNIQUE IN DESIGN AND ENSURE ASSURED FLOW OF JUICE THROUGH EACH TUBE.

PLC-SCADA AUTOMATION IS PROVIDED TO MAINTAIN REQUIRED RATE OF JUICE RECIRCULATION,

THE JUICE IS NOT OVER HEATED MINIMIZING SUGAR LOSSES AND COLOR FORMATION..

POLY BAFFLE TYPE ENTRAINMENT CATCHERS ARE PROVIDED BETWEEN VAPOR FLASHING ZONE & VAPOR OUTLET

VACCUUM PAN STATION

VERTICAL CONTINUOUS VACUUM PAN (VCP):

WE HAVE RECENTLY INSTALLED VRL MAKE VERTICAL CONTINUOUS VACUUM PAN AS PART OF OUR STEAM SAVING PROJECTS. AFTER VCP OUR TARGET FOR PROCESS STEAM CONSUMPTION HAS BEEN TIGHTENED TO 28 % FROM EARLIER 30% ON CANE. THE RATIO OF HEATING SURFACE TO VOLUME IS LIBERALLY PROVIDED TO FACILITATE USE OF LOW PRESSURE STEAM (90 DEG C AND BELOW) AND CAUSE BETTER CIRCULATION. HOWEVER VRL RECOMMENDS INSTALLATION OF MECHANICAL CIRCULATOR TO IMPROVE THE RATE OF CRYSTALLIZATION IN ADDITION TO THAT OF HEAT TRANSFER.

MULTI CHAMBER CONSTRUCTION FACILITATES THE USE OF DIFFERENT VAPORS FOR DIFFERENT CHAMBERS PREDOMINANT CONTRIBUTION TO STEAM ECONOMY IS DUE TO USE OF LOW TEMPERATURE & LOW PRESSURE VAPOR FOR PAN BOILING. IT NEEDS MENTION THAT LOWER THE PRESSURE HIGHER IS THE LATENT HEAT. MECHANICAL CIRCULATORS CAN EASILY BE INSTALLED IN VCP WHERE AS IT NOT POSSIBLE IN HORIZONTAL CONTINUOUS PAN. THE MECHANICAL CIRCULATORS WITH VARIABLE FREQUENCY DRIVE IMPROVE HOMOGENEITY OF MIXTURE OF MASSECUIE, IMPROVE

CIRCULATION, IMPROVE CRYSTALLIZATION RATE, IMPROVE EVAPORATION RATE AND KEEPS THE MASSECUTE INSIDE THE PAN ALWAYS IN MOTION. MODULAR CONSTRUCTION FACILITATES CLEANING OF COMPARTMENTS BY TURN .WHILE THE PAN IS IN OPERATION

THE PAN IS SUPPLIED WITH DISTRIBUTED CONTROL SYSTEM (DCS) FOR TROUBLE FREE OPERATION. BASED ON OUR EXPERTISE IN INSTRUMENTATION AND AUTOMATION, EVERY OPERATION LIKE SEED FLOW, FEED FLOW, INLET AND OUT LET FLOW, BRUX MEASUREMENTS, CONDENSATE EXTRACTION AND FLOW ETC. ARE MONITORED PRECISELY AND CONTROLLED BY DISTRIBUTED CONTROL SYSTEM. NO WATER IS USED AT ANY POINT OF BOILING.

BATCH PANS:

WE PREFER TO LIMIT BATCH PANS FOR GRAINING AND FOOTING PURPOSES. IN MOST PLACES WE HAVE INSTALLED ON VERTICAL CONTINUOUS PAN SUITING TO THE REVISED/EXPANDED CAPACITY FOR 'A' MASSECUTE BOILING. THE EXISTING PANS ARE MADE TO WORK FOR REST OF THE BOILING WITH OR WITHOUT MODIFICATIONS.

MOLASSES CONDITIONERS (DIRECT CONTACT & STATIC TYPE):

ADVANTAGES:

NORMAL MOLASSES CONDITIONERS UTILIZE MEDIUM PRESSURE STEAM FOR HEATING MOLASSES IN A TANK. THIS RESULTS IN LOCALIZED HEATING, EFFECTING BOTH SUGAR RECOVERY AND COLOR. VRL MOLASSES CONDITIONERS ARE DIRECT CONTACT TYPE WITH VERY MINIMUM CONTACT TIME; HENCE NO LOCALIZED HEATING, AS THE HEATING VAPOR IS AT A TEMPERATURE OF ABOUT 80°C.

NO DRIVES AND STIRRERS, AS A RESULT MAINTENANCE AND POWER REQUIREMENT IS AVOIDED, IN ADDITION TO STEAM SAVING.

INTIMATE CONTACT TYPE CONDENSER ALONG WITH EJECTOR:

IT CONTAINS OF WELL DESIGNED CONDENSER WITH NOZZLES TO COVER ENTIRE CROSS SECTION OF VAPOR SPACE WITH SPRAY WATER WITHOUT EMPTY POCKETS IT HELPS IN REDUCING THE APPROACH TEMPERATURE BETWEEN VAPOR AND TAIL PIPE WATER THE

NON CONDENSABLE GASES ARE EVACUATED BY THE EJECTOR ATTACHED TO THE OUT SHELL OF CONDENSOR. AS THERE IS NO HEAT TRANSFER IN EJECTORS, THE WATER USED IN EJECTOR NEED NOT GO TO COOLING TOWER OR SPRAY POND THERE IS CONSIDERABLE SAVING OF ENERGY IN THIS TYPE OF CONDENSORS. NO VACUUM PUMPS AND NO ASSOCIATED MAINTENANCE.

SUGAR MELTER:

SUGAR MELTER DESIGNED & MANUFACTURED BY VRL UTILIZES NON CONDENSABLE GASES/ VAPORS

FROM THE CALENDRIA OF LAST BODY OF THE EVAPORATORS UNDER VACUUM FOR HEATING SYRUP IS USED AS MELTING MEDIA. IT AVOIDS UTILIZATION OF DIRECT STEAM. IT AVOIDS OVERHEATING AND LOCALIZED HEATING OF MELT, REDUCES CAMELISATION.

HIGH BRIX, HIGH TEMPERATURE CRYSTAL FREE MELT GENERATED IN THE SUGAR MELTER HELPS IN GREATLY IMPROVING BOTH STEAM ECONOMY AS WELL AS PAN FLOOR CAPACITY WITH IMPROVED BOILING.

MASSECUITE RE-HEATER

IT CONSISTS OF VAPORISER WITH THERMIC FLUID AND TRANSIENT HEATER TO HEAT THE MASSECUITE BY LOW TEMPERATURE VAPOUR OF THERMIC FLUID AT ABOUT 800C BEFORE FEEDING TO CONTINUOUS CENTRIFUGALS THE VAPORS FROM VAPORISER WILL PASS THROUGH THE TUBES OF HEAT EXCHANGER TO EXCHANGE THE HEAT TO THE MASSECUITE PASSING THROUGH THE TRANSIENT HEATER. AFTER DISSIPATING THE HEAT TO THE MASSECUITE, THE VAPORS WILL CONDENSE & RETURN BACK TO THE VAPORISER, IN THE FORM OF THERMIC FLUID. THIS TYPE OF EXCHANGER OPERATES AT LOW TEMPERATURE AND AT A FASTER RATE OF HEAT TRANSFER TO AVOID DISSOLUTION OF CRYSTALS.

SUPER HEATED WASH WATER STATION

ELIMINATED MEDIUM PRESSURE STEAM AT SUPER-HEATED WASH WATER STATION SYSTEM WHERE EVAPORATOR II CALENDRIA CONDENSATE IS HEATED BY EXHAUST CONDENSATE TO RAISE THE TEMPERATURE TO ABOUT 115°C HELPS IN REDUCING

CRYSTAL DISSOLUTION IN CENTRIFUGAL AND THEREBY AVOIDING SOLID RE-CIRCULATION. IT DIRECTLY CONTRIBUTES TOWARDS REDUCED STEAM CONSUMPTION AT PANS AND ALSO HELPS IN INCREASING THE PAN CAPACITY AND IMPROVING THE PRODUCT QUALITY.

AUTOMATION

MILL HOUSE

TOTAL MILL HOUSE AUTOMATION IS CARRIED OUT USING DCS OR PLC-SCADA SYSTEM. THE AUTOMATION ENSURES THE FOLLOWING

- MONITORING LOAD ON CANE PREPARATORY EQUIPMENT & CONTROLLING THE SPEED OF CANE CARRIERS TO AVOID OVER-LOADING & TRIPPING
- MONITORING THE LOAD ON ALL MILL DRIVES & CONTROLLING THE MILL SPEEDS TO MAINTAIN UNIFORM LOAD ON MILL DRIVES.
- MONITORING THE CHUTE LEVELS AT ALL THE MILLS & CONTROLLING SPEED OF PRECEDING CARRIERS TO MAINTAIN UNIFORM LEVEL AT MILL CHUTES.
- CONTROLLING THE IMBIBITION WATER FLOW BASED ON LOAD & SPEED OF PENULTIMATE MILL.
- APART FROM ABOVE CONTROLS, ALL IMPORTANT PARAMETERS LIKE THE SPEED OF CARRIERS & MILLS, BEARING TEMPERATURES & MILL HYDRAULIC PRESSURES ARE MONITORED. ALARMS ARE GENERATED, DATA LOGGED & TRENDS GENERATED AS PER REQUIREMENT.
- MONITORING JUICE FLOW RATE FROM MILL HOUSE & MAINTAINING UNIFORM FLOW TO JUICE HEATERS, BY CONTROLLING THE SPEED OF RAW (MIXED) JUICE PUMP.
- TO CONTROL CANE FEEDING TO FIRST MILL, WHENEVER THE JUICE FLOW TO PROCESS EXCEEDS SET FLOW RATE, TO AVOID JUICE OVER FLOWS.
- MONITORING THE PH OF JUICE & AUTOMATICALLY CONTROLLING THE MILK OF LIME (CaCO₃) & PHOSPHORIC
- ACID (P₂O₅) DOSING TO MAINTAIN UNIFORM JUICE PH BEFORE THE JUICE ENTERS CLARIFIER.
- MONITORING THE JUICE FLOW RATE FROM TREATED JUICE TANK & CONTROLLING THE TREATED JUICE PUMP SPEED, TO MAINTAIN UNIFORM JUICE FLOW TO CLARIFIER.

- MONITORING THE JUICE TEMPERATURE & CONTROLLING THE VAPOR FLOW TO JUICE HEATERS WHEREVER CORRECTION HEATERS ARE IMPLEMENTED.

PROCESS HOUSE:

- AUTO DOSING OF FLOCCULENT TO SHORT RETENTION CLARIFIER BASED ON TREATED JUICE INLET FLOW TO FLASH TANK.
- VACUUM CONTROL AT MUD FILTER BY REGULATING THE OPENING OF EJECTOR NOZZLES.
- CONTROLLING THE CLARIFIED JUICE FLOW TO CLEAR JUICE HEATER & THEN TO FIRST EFFECT OF EVAPORATOR, BY REGULATING THE SPEED OF CLEAR JUICE PUMP.
- LEVEL CONTROLS AT EVAPORATOR BY REGULATING THE INLET JUICE FLOW AT EACH EFFECT.
- VAPOR PRESSURE CONTROLS AT EVAPORATORS, BY REGULATING THE VAPOR WITHDRAWAL VALVE FROM EACH BODY OF EVAPORATOR.
- BRIX CONTROLS AT EVAPORATORS BY REGULATING THE EXHAUST PRESSURE AT EVAPORATOR INLET & CLARIFIED JUICE AT EVAPORATOR INLET
- BATCH PAN AUTOMATION FOR CONTROLLING THE FEED LIQUOR BASED ON MASSECUITE BRIX & LEVEL. REMOTE SELECTION OF RATIO FOR FEED COMBINATION FROM SYRUP, MOLASSES & MELT.
- TOTAL AUTOMATION FOR BATCH PAN INCLUDING REMOTE OPERATION OF ALL VALVES LIKE VACUUM BREAK, MASSECUITE DISCHARGE AND WASH WATER & STEAM WASH.
- DCS CONTROLS FOR VERTICAL CONTINUOUS VACUUM PAN.
- AUTOMATION IS PROVIDED FOR FEED, SEED RATIO CONTROL, VFD CONTROL TO FEED PUMPS, BRIX CONTROL AT FEED SUPPLY TANK, MASSECUITE LEVEL CONTROL IN EACH CHAMBER, VAPOR CONTROLS TO EACH CALENDRIA, VACUUM CONTROL. ARRANGEMENT FOR AUTO BYPASSING OF ANY CHAMBER FOR CLEANING, WHEN OTHER CHAMBERS ARE IN OPERATION.
- AUTOMATION FOR SINGLE ENTRY CONDENSERS TO CONTROL INJECTION WATER VALVE BASED ON VACUUM (COURSE CONTROL).
- FINE CONTROL OF INJECTION WATER VALVE BASED ON CONDENSER TAIL PIPE WATER TEMPERATURE.

- PUG-MILL LEVEL CONTROL BY REGULATING CRYSTALLIZER DISCHARGE VALVE.
- AUTOMATION FOR TRANSIENT HEATERS TO CONTROL STEAM TO VAPORIZER.
- CONTINUOUS CENTRIFUGAL MASSECUITE FEED CONTROL TO MAINTAIN UNIFORM LOAD ON MOTOR & TO MINIMIZE SOLID RECIRCULATION.

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