NEXT GENERATION DAIRY PLANTS

WHAT IS NEXT GENERATION DAIRY

THE NEXT GENERATION DAIRY

- STATE OF THE ART INSTALLATION
- STRICT HYGIENE & FOOD SAFETY
- CONSISTENT QUALITY
- MATERIAL & RESOURCE EFFICIENT
- SUSTAINABLE.

WHY NEXT GENERATION DAIRY

- A LARGE NUMBER OF DAIRY PLANTS WERE ESTABLISHED IN ‘70S AND ‘80S
- PLANT CAPACITIES RANGING FROM 1 TO 4 LLPD
- THESE WERE BASICALLY MANUALLY OPERATED PLANTS BUILT WITH CONTEMPORARY TECHNOLOGY
- SOME OF THESE PLANTS HAVE ADOPTED MODERN TECHNOLOGY WHILE EXPANDING
- MANY OF THE PLANTS, HOWEVER, HAVE EXPANDED BUT DID NOT SWITCH OVER TO MODERN TECHNOLOGY AVAILABLE TODAY

WHY NEXT GENERATION DAIRY

- DAIRY PLANTS TODAY ARE FACING CHALLENGES IN THE FORM OF
  - COMPETITION FROM GLOBAL PLAYERS
  - CHANGING CONSUMER PREFERENCES
  - STEADILY RISING PRICES OF RAW MATERIALS AND ENERGY
- DAIRY PLANTS MUST ADDRESS THE FOLLOWING FOUR KEY FACTORS TO REMAIN COMPETITIVE
  - REDUCE COST OVER THE ENTIRE LIFE CYCLE OF THE PLANT
  - IMPROVED FLEXIBILITY, IN REGARD TO CHANGEOVER OF PRODUCTS
  - ENSURE A CONSISTENTLY HIGH LEVEL OF QUALITY
  - ACHIEVE HIGHEST POSSIBLE EFFICIENCY

WHY NEXT GENERATION DAIRY

- IN A MANUALLY OPERATED PLANT, OPERATIONS ARE DEPENDENT ON SKILL & JUDGEMENT OF THE OPERATORS LEADING TO **CONCERNS** LIKE
  - NON-UNIFORM PRODUCT QUALITY
  - IMPROPER PLANT HYGIENE
  - HIGH CONSUMPTION OF ENERGY & SERVICES
  - EXTENSIVE REQUIREMENT OF SKILLED LABOUR
  - NON-GENERATION OF PLANT DATA & REPORTS
- THEREFORE, TO MEET THE PRESENT CHALLENGES, DAIRIES NEED TO BE MODERNISED WITH INTRODUCTION OF LATEST TECHNOLOGY

OLD & MODERN DAIRY PROCESSING AREAS

CHALLENGES – ENVIRONMENTAL

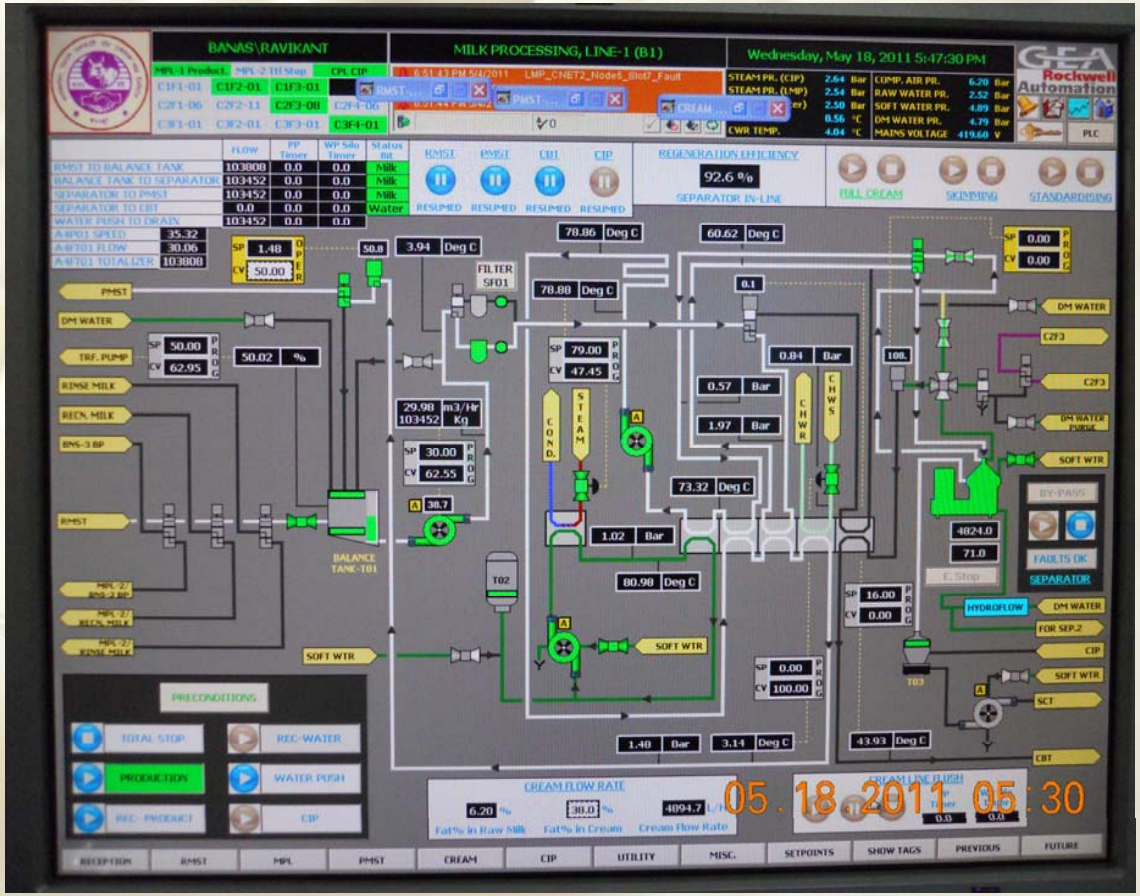
- GOVT OF INDIA IS COMMITED TO REDUCE EMISSION INTENSITY BY 30-35 % AS COMPARED TO 2005 LEVELS.
- BY 2030, IT IS ESTIMATED THAT INDIA WILL BE THE 4TH LARGEST EMITTER OF GREEN HOUSE GASES IN THE WORLD .
- EMISSIONS EFFECT THE ENVIRONMENT WHICH IN TURN HAS IMPACT ON COUNTRY'S GDP & HENCE MIGRATION TO RENEWABLE ENERGY SOURCE IS INEVITABLE.
- ADVERSE EFFECTS OF EMISSION HAVE BEEN RECOGNIZED BY SUPREME COURT, WHO HAS PASSED ORDER IN OCT 2017 TO RESTRICT THE USE & SALE OF FURNACE OIL, PET COKE IN 5 NORTHERN STATES.

RENEWABLE ENERGY OPTIONS

- USE OF AGRI WASTE BRIQUETTE MULTI FUEL BOILER TO TAKE ADVANTAGE OF LOWER STEAM GENERATION COST & FUEL COST VARIATION. PAYBACK IN 24 – 30 MONTHS.
- BRIQUETTE BEING CARBON NEUTRAL IS REPLACEMENT ALTERNATIVE TO FURNACE OIL, PET COKE .
- INTEGRATION OF BOILERS WITH CONCENTRATED SOLAR THERMAL SYSTEM (CST) HELPS TO REDUCE THE OVERALL OPERATING COST
- INTEGRATION OF CST WITH BRIQUETTE FIRED BOILER RESULTS IN PAYBACK OF 5 TO 6 YEARS FOR CST (BIDRI , KOLHAPUR)

PROCESS AUTOMATION

- MAXIMISATION OF PRODUCTION, CONSISTENT TROUGHPUT WITH MINIMUM BREAKDOWN
- REDUCTION IN MILK SOLID LOSSES.
- SAVINGS IN WATER
- CONSISTANT AND SAFE PRODUCT QUALITY
- OPTIMISE PRODUCTION COST
- ADVANCED PROCESS CONTROL



COST SAVINGS IN A 5 LLPD AUTOMATED PLANT

				Rs in Lakh
COST TOWARDS AUTOMATION OF A 5 LLPD DAIRY				840
SAVINGS IN MILK SOLIDS PER ANNUM				305
SAVINGS IN WATER PER ANNUM				20
TOTAL SAVINGS				325
SIMPLE PAYBACK PERIOD				2.58
		SAY		3 YEARS

EMERGING TECHNOLOGIES -WASTE WATER TREATMENT

- ONLINE MONITORING OF TREATED WATER- HOOKED UP TO CPCB / SPCB SERVERS.

  IT HAS RECENTLY BEEN MANDATORY IN SOME NORTH INDIAN STATES. THE REAL TIME DATA NEEDS TO BE HOOKED UP 24X7 TO THE SPCB & CPCB SERVERS.

- MEMBRANE BIO- REACTOR (MBR) SYSTEM

  ADVANCED ULTRA FILTRATION MEMBRANE BASED SYSTEM GIVES CONSISTENT TREATED EFFLUENT QUALITY PARAMETERS BETTER THAN THE STATUTORY REQUIREMENTS.

Sl.no	Parameter	As per PCB Norms	MBR system
1	COD	< 100	10-15
2	BOD	< 30	< 5
3	TSS	< 100	NIL
4	OIL & GREASE	< 10	NIL

EMERGING TECHNOLOGIES -WASTE WATER TREATMENT

- BMCU WASTE WATER TREATMENT :

  PRESENTLY NO TREATMENT DONE FOR BMC WASTE WATER.

- PACKAGE TYPE SKID MOUNTED OZONATION TREATMENT :

  FOR A CAPACITY OF 600 L/DAY WASTE WATER SUITABLE FOR 2 KL BMCU -

  FOOTPRINT IS ONLY 1.5 SQ M

  POWER REQUIREMENT IS 1.5 KW

- TERTIARY TREATMENT OF WASTE WATER (ZERO LIQUID DISCHARGE)

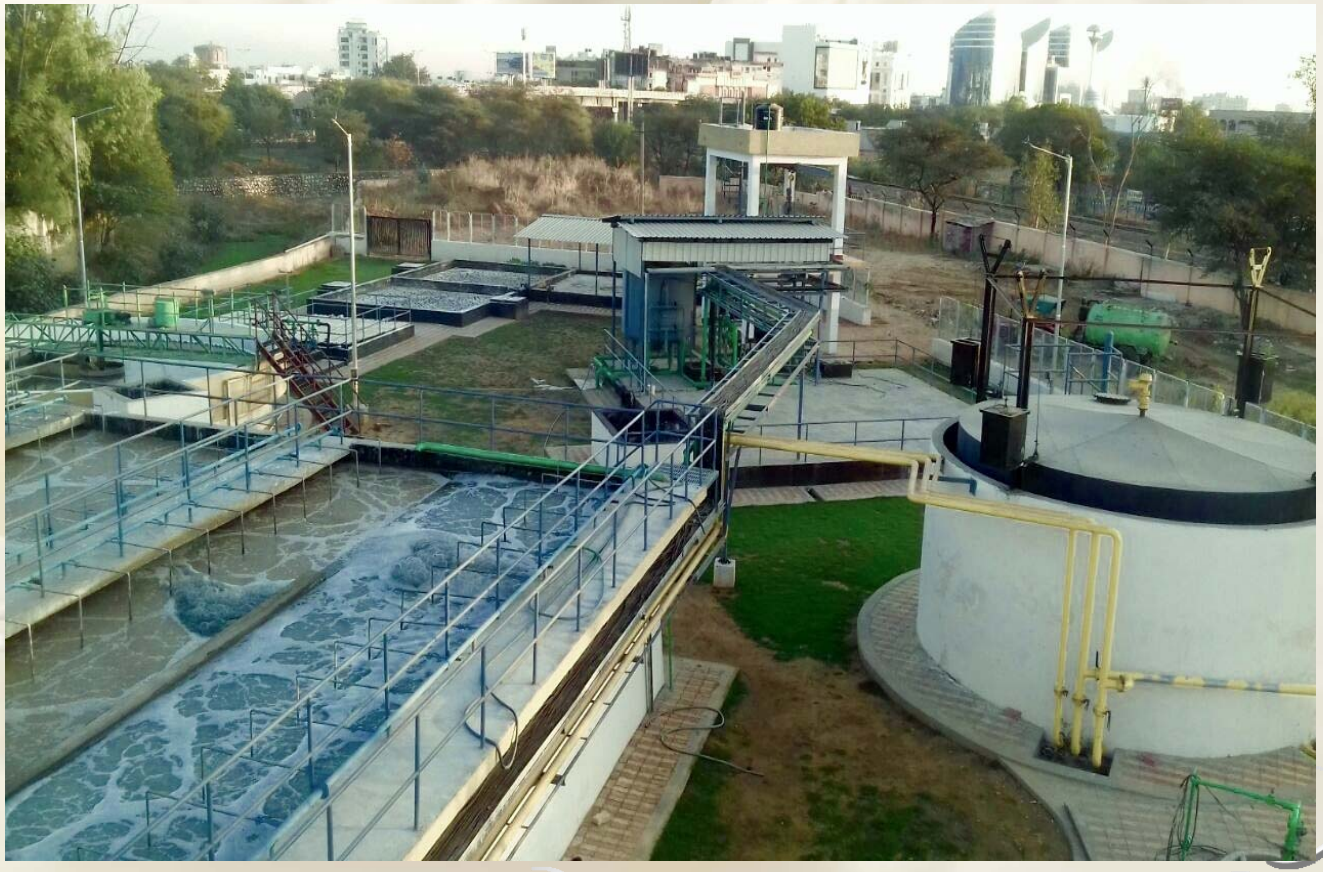
  MEET POTABLE WATER STANDARDS USING MBR, ACF (ACTIVATED CARBON FILTER), RO, MEE (MULTIPLE EFFECT EVAPORATOR).

  THE OPERATING COST WOULD BE ABOUT RS. 150/KL OF TREATED WATER.

EMERGING TECHNOLOGIES -WASTE WATER TREATMENT

OZONATOR

OXIDATION REACTOR



2000 TLPD MODERN WASTE WATER TREATMENT PLANT

MANPOWER FOR NEXT GENERATION DAIRY

- WITH INTRODUCTION OF NEXT GENERATION TECHNOLOGIES, THE MANPOWER QUALITY GAINS LOT OF IMPORTANCE
- THE PREVAILING MANPOWER OF MANUAL DAIRIES WOULD REQUIRE EXTENSIVE TRAINING AND EXPOSURE TO MODERN PLANTS FOR EFFECTIVE OPERATION OF AUTOMATED PLANT
- INTRODUCTION OF YOUNG QUALIFIED ENGINEERS AT THE ENTRY LEVEL WOULD BENEFIT THE PLANT IN THE LONG RUN
- THE MANPOWER REQUIREMENT FOR A TYPICAL 10 LAKH LITRES AUTOMATED DAIRY WOULD BE 54 OFFICERS AND OPERATORS EXCLUDING CONTRACT WORKERS.

PREVAILING SCENARIO & MODERNISATION

PREVAILING SCENARIO

- HIGH PASTEURISATION TEMPERATURE UPTO 84 DEG C

  LEADS TO PLATE FOULING, HIGHER DOWNTIME, MORE NUMBER OF CIPS, HIGHER UTILITY CONSUMPTION

- OLD MILK PASTEURISERS HAVING REGENERATION EFFICIENCIES 80-85%

  THE OPERATING COST FOR A 10 KLPH PASTEURISER CAN BE HIGHER BY RS 20 LAKH PER YEAR COMPARED TO PASTEURISERS WITH 93% REGENERATION.

- AUTO CONTROLS (STEAM PID, FDV, TEMP. RECORDERS ETC.) OF THE CRITICAL EQUIPMENT ARE GENERALLY NOT IN WORKING CONDITION AND BYPASSED

  INCONSISTENT PRODUCT QUALITY AND COMPROMISED FOOD SAFETY.

DAIRY PLANT STUDIES – OBSERVATIONS

- MANUAL CLEANING IS BEING CARRIED OUT IN MOST OF THE PLANTS. CIP SYSTEM IS EITHER NOT AVAILABLE OR IS BEING OPERATED MANUALLY

  PROPER CIP PARAMETERS NOT ATTAINED/ MAINTAINED AFFECTING PLANT HYGIENE AND HEAT TRANSFER COEFFICIENT IN HEAT EXCHANGERS.

- RINSE RECOVERY SYSTEM IS NOT AVAILABLE

  RESULTS IN MILK SOLIDS LOSS TO THE TUNE OF 0.25 % AND HIGHER LOAD ON ETP.

- VARIATIONS IN WEIGHT OF MILK POUCHES ON LOWER SIDE BEYOND PERMISSIBLE LIMITS

  VIOLATION OF STATUTORY REQUIREMENT.

DAIRY PLANT STUDIES – OBSERVATIONS

- JAW COOLING WATER OF POUCH FILLING MACHINES IS DRAINED AND NOT RECYCLED

  MONETARY LOSS OF RS 1.1 LAKH PER MACHINE (5000 PPH) PER YEAR FOR 16 HRS OPERATION PER DAY.

- STEAM CONDENSATE IS DRAINED, NO RECOVERY SYSTEM IN PLACE

  EVERY 6 DEG C RISE IN BOILER FEED WATER TEMPERATURE REDUCES THE FUEL BILL BY 1%.

- FOR RECONSTITUTION GENERALLY AMBIENT WATER/CHILLED MILK IS BEING USED

  BY INCREASING WATER/MILK TEMPERATURE TO 40 DEG C, THE MILK SOLID LOSS CAN BE REDUCED BY APPROX. 2%.

- LACK OF RECORD KEEPING OF CRITICAL PROCESS PARAMETERS

  IN AUTOMATED PLANT MIS REPORT FOR ALL CRITICAL PARAMETERS IS GENERATED EVERY 15 MINUTES.

DAIRY PLANT STUDIES – OBSERVATIONS

- SS LINES NOT BEING CLEANED PROPERLY DUE TO FREQUENT CHANGES IN PIPING TO SUIT IMMEDIATE REQUIREMENT

  PRODUCT QUALITY COMPROMISED.

- POOR CONDITION OF UTILITY PIPING AND LEAKAGE OF STEAM, WATER, AIR ETC.,

  RESULTS IN UTILITY LOSSES.

- LEAKAGES DUE TO IMPROPER/MAKE SHIFT SS PIPING

  MILK SOLID LOSS.

DAIRY PLANT STUDIES – OBSERVATIONS

- MOST REFRIGERATION PLANTS ARE STILL RUNNING WITH LOW SPEED RECIPROCATING COMPRESSORS, FLOODED REFRIGERANT DISTRIBUTION, ATMOSPHERIC CONDENSERS

  MORE POWER AND WATER CONSUMPTION, REFRIGERANT LEAKAGES, OIL CARRY OVER, INCONSISTENT SUCTION PRESSURE, LIQUID CARRY OVER, HIGHER DOWNTIME

- IN MOST DAIRIES THE CHILLED WATER PUMPS ARE BEING OPERATED CONTINUOUSLY IRRESPECTIVE OF THE LOAD REQUIREMENT

  15 TO 20 % POWER SAVING CAN BE ACHIEVED BY OPERATING THE PUMPS THROUGH VFD.

DAIRY PLANT STUDIES – OBSERVATIONS

- THE QUALITY OF COMPRESSED AIR BEING USED IN PLANTS IS POOR, LADEN WITH OIL AND MOISTURE

  FOOD CONTAMINATION AND LONGEVITY OF PNEUMATIC PARTS OF EQUIPMENT IS COMPROMISED.

- WATER CONSUMPTION MONITORING IS TO BE IMPLEMENTED. THE MILK TO WATER RATIO IS HIGH.

  IN A DAIRY OF 1 LLPD REDUCING WATER CONSUMPTION BY 10 % CAN RESULT IN SAVINGS OF RS 4.4 LAKH PER YEAR.

- DEPLETED INSULATION (HOT/COLD)

  RESIN BONDED PIPE SECTIONS FOR HOT INSULATION AND CAST-IN-SITU PUF FOR COLD INSULATION ARE RECOMMENDED FOR LOWER THERMAL LOSSES.

DAIRY PLANT STUDIES – OBSERVATIONS

- OIL FIRED BOILERS CAN BE REPLACED WITH SOLID FUEL FIRED (AGRI WASTE BRIQUETTE) BOILERS FOR LOWER STEAM COST

  30 % SAVINGS IN COST OF STEAM GENERATION ENVISAGED. THIS ALSO REDUCES DEPENDENCE ON DEPLETING FOSSIL FUELS.

- GENERALLY THE PRS AND STEAM TRAPS FOUND LEAKY IN MOST OF THE PLANTS

  ANY MAJOR LEAKAGE OF STEAM (5-6 MM DIA) AT 3.5 BAR PRESSURE RESULTS IN LOSS OF 465 TONNES OF STEAM PER YEAR AMOUNTING TO RS 5.4 LAKH.

- STEAM CONSUMED IN PLANTS IS NOT MONITORED

  STEAM FLOW METERS ARE BEING INSTALLED IN NEW/ UPGRADED PLANTS FOR MONITORING THE BOILER PERFORMANCE FOR TAKING NECESSARY CORRECTIVE ACTIONS .

DAIRY PLANT STUDIES – OBSERVATIONS

- POWER FACTOR LESS THAN 0.95 HAS BEEN OBSERVED IN SOME PLANTS

  RESULTS IN LESSER AVAILABILITY OF ACTIVE POWER AND PENALTY.

- OLD INEFFICIENT MOTORS /REWOUND MOTORS ARE INSTALLED IN MOST OF THE PLANTS

  FOR EVERY REWINDING THE EFFICIENCY OF MOTOR REDUCES BY 8 %. AS PER INTERNATIONAL STANDARDS MOTORS SHOULD BE DISCARDED AFTER 3 REWINDING. IE-3 MOTORS HAVE 2-4 % HIGHER EFFICIENCY THAN IE -1 MOTORS.

- OFFLOAD TAP CHANGING TRANSFORMERS HAVE LIMITED VOLTAGE REGULATION

  ONLOAD TAP CHANGING TRANSFORMERS HAVE LOW FLUCTUATION IN VOLTAGE OUTPUT ($\pm$ 1.25%) THEREBY INCREASING THE LIFE OF MOTORS.

CHALLENGES IN PLANT UP-GRADATION

- UP-GRADATION REQUIREMENT IS UNIQUE FOR EACH PLANT AND NEEDS COMPREHENSIVE STUDY AND INTEGRATED PLAN FOR IMPLEMENTATION
- IMPLEMENTATION IN PIECE MEAL BASIS MAY NOT YIELD DESIRED RESULT
- SPACE CONSTRAINTS IN EXISTING PLANTS
- PLANT SHUT DOWN ISSUES FOR IMPLEMENTATION
- DEFINITE TIME SCHEDULE FOR UP-GRADATION MAY BE DIFFICULT TO PREDICT DUE TO UNFORESEEN
- NEW TECHNOLOGY ADOPTION BY EXISTING OPERATORS/STAFF
- NON-AVAILABILITY OF COMPETENT MANPOWER
- THE NEW STATE OF THE ART MACHINES ARE SENSITIVE TO POWER FLUCTUATIONS AND NEEDS STABILISED POWER SOURCE WITH CONTROLLED HARMONICS

UPGRADED TECHNOLOGIES

- PROCESS AUTOMATION
- AUTOMATED REFRIGERATION PLANT (ENERGY SAVINGS)
- IMPROVED THERMAL EFFICIENCIES (BOILER)
- USE RENEWABLE / NON-CONVENTIONAL SOURCES OF ENERGY
  - BOILERS WITH AGRI WASTE BRIQUETTES
  - SOLAR ENERGY FOR THERMAL APPLICATION
- EFFICIENT WASTE WATER TREATMENT SYSTEMS

PROCESS AUTOMATION

- **1. CONTROL MILK/PRODUCT LOSSES.** (AUTOMATED LMP SOLID LOSSES AROUND 0.8 %)
  - PRODUCT STANDARDIZATION WITH AUTOMATED & ACCURATE CONTROL OF FAT AND SNF
  - ACCURATE (TIMER / VOLUMETRIC BASED) WATER FLUSHING/ PURGING OPERATION
  - RECOVERY OF MILK SOLIDS THROUGH RINSE MILK RECOVERY SYSTEM
- **2. ENSURE FOOD SAFETY & CONSISTENT QUALITY**
  - FINER MONITORING & CONTROL OF PROCESS PARAMETERS
  - AUTOMATIC CIP SYSTEM TO ENSURE CLEANING EFFICACY WITH CHOICE OF RECIPES
  - CLOSED LOOP CIRCUIT CONTROL WITHOUT HUMAN INTERVENTION
  - MAINTAIN HYGIENE WITH MINIMAL CONTAMINATION E.G. PRODUCT STREAM MAINTAINED AT HIGHER PRESSURE THAN UTILITY IN PHE

PROCESS AUTOMATION

- **HIGHER PLANT EFFICIENCIES**
  - IMPROVED PLANT CAPACITY UTILISATION
  - LOW UTILITY CONSUMPTION - (IN AUTOMATED LMP WATER CONSUMPTION IS 0.6 TO 0.7 LITRE PER LITRE OF MILK PROCESSED)
  - LOWER ETP REQUIREMENT DUE TO CONTROLLED PRODUCT LOSSES – (PARTIAL TREATMENT OF SLUDGE FROM SELF CLEANING SEPARATOR)
- **DAILY MIS REPORTS**
  - RELIABLE/ACCURATE DAILY REPORTS
  - QUICK DECISION ENABLING FAST ACTION
  - HISTORICAL ANALYSIS
- **LESS MANPOWER REQUIREMENT –** (FOR THREE SHIFT OPERATION OF A 5 LLPD AUTOMATED LMP, MANPOWER REQUIREMENT WOULD BE 21 INCLUDING RELIEVERS)

ADVANCED PROCESS CONTROL (APC)

ADVANCE PROCESS CONTROL SYSTEM CONSIST OF THREE COMPONENTS

- A COMPUTER-SIMULATION MODEL THAT INTEGRATES PROCESS KNOWLEDGE AND HISTORICAL DATA,
- CONTROL AND OPTIMIZATION ALGORITHMS,
- CURRENT, REAL-TIME PROCESS INFORMATION.

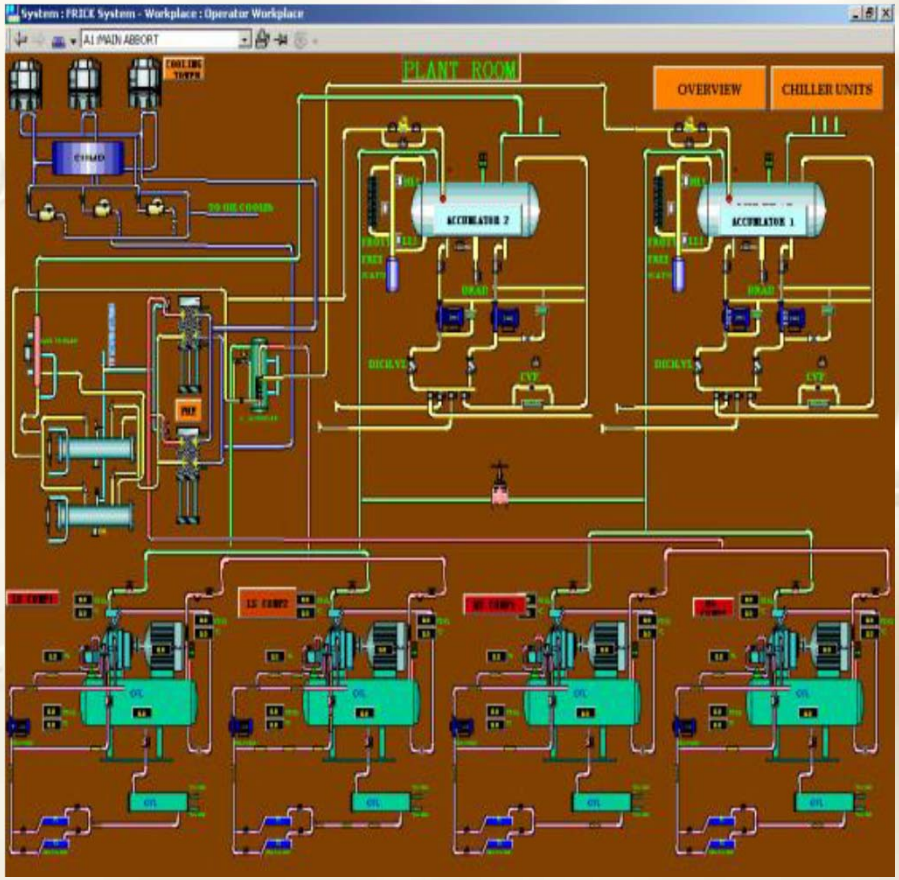
APC RELATES MANIPULATED VARIABLES AND CONTROL VARIABLES, PROVIDES MULTIVARIATE CONTROL, AND ALSO PROVIDES ADAPTIVE TUNING AND PREDICTIVE/PROCESS DIAGNOSTICS.

REFRIGERATION PLANT UP-GRADATION

AUTOMATION OF REFRIGERATION PLANT OPERATION

- CENTRALISED PLANT CONTROL WITH DATA LOGGING AND SAFETY INTERLOCKS
- STEP LESS CAPACITY CONTROL (SCREW COMPRESSORS)
- RELIABILITY & OPTIMIZED PLANT OPERATION
- MINIMUM MAINTENANCE AND REDUCED DOWN TIME
- VFD FOR COMPRESSOR MOTORS LEADS TO ENERGY SAVING
- REDUCED OIL CARRYOVER
- USE OF ECONOMIZER TO IMPROVE THE COP BY 5 -10 %
- REFRIGERANT BASED THERMO SYPHON OIL COOLER ELIMINATES WATER CIRCULATION PUMP AND IS MAINTENANCE FREE. (SAVINGS OF RS 1.65 LAKH PER YEAR FOR 150 TR COMPRESSOR).

SCADA CONTROL –AUTOMATED REFRIGERATION

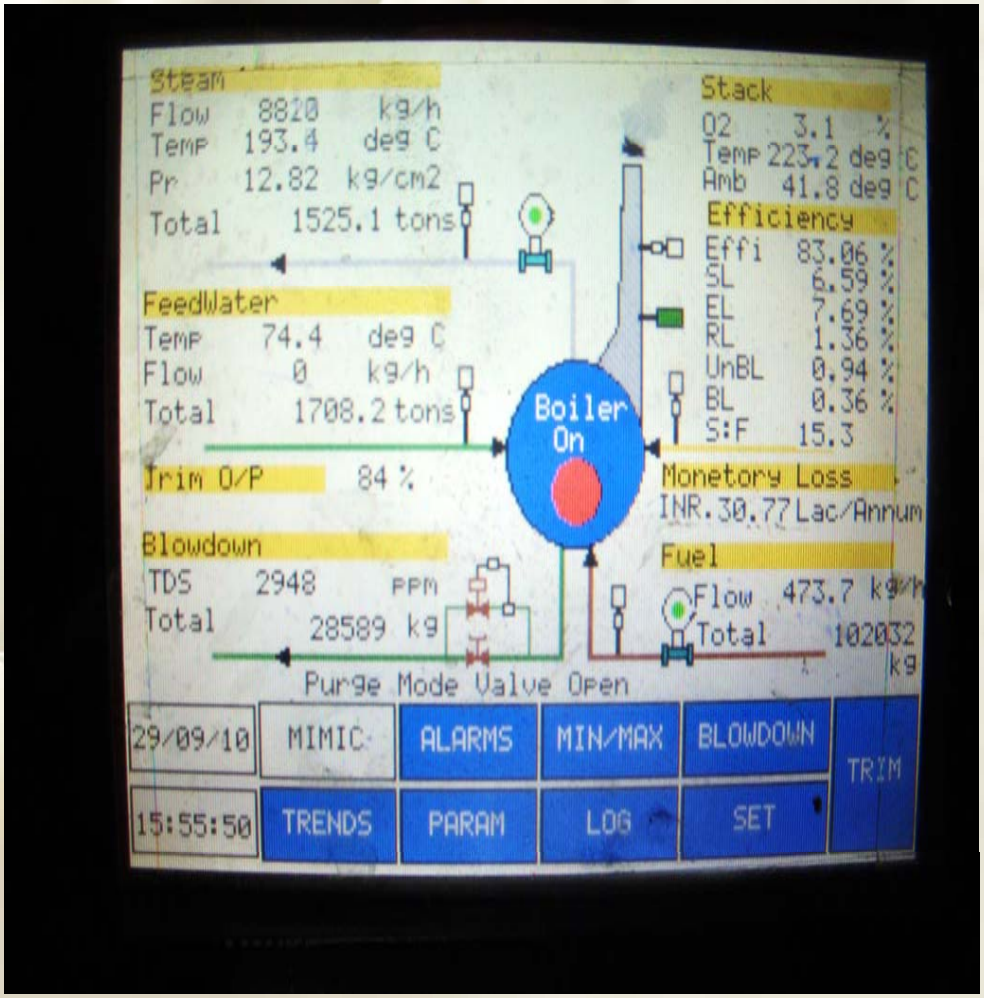


OTHER UPGRADATIONS IN REFRIGERATION PLANT

- USE OF PRE CHILLER FOR PROCESS RETURN WATER (@-2 DEG C EVAP TEMP) IMPROVES COP BY ABOUT 25 %.
- EVAPORATIVE CONDENSER INSTEAD OF ATMOSPHERIC CONDENSERS. RESULTS IN LOWER POWER & WATER CONSUMPTION.
- LIQUID OVER FEED SYSTEM WITH CENTRALIZED LP ACCUMULATOR . IMPROVES HEAT TRANSFER COEFFICIENT, ELIMINATES LIQUID CARRYOVER ISSUES AND FACILITATES UNIFORM ICE THICKNESS IN IBT COILS
- VFD CONTROLLED CHILLED WATER PUMPS TO SAVE ENERGY ENERGY SAVING OF 15-20%
- USE OF ICE SILOS FOR ICE STORAGES
  LESSER FOOTPRINT
- USE OF PACKAGE CHILLER UNITS REDUCES STORAGE VOLUME OF REFRIGERANT, THERMAL STORAGE & IMPROVED COP

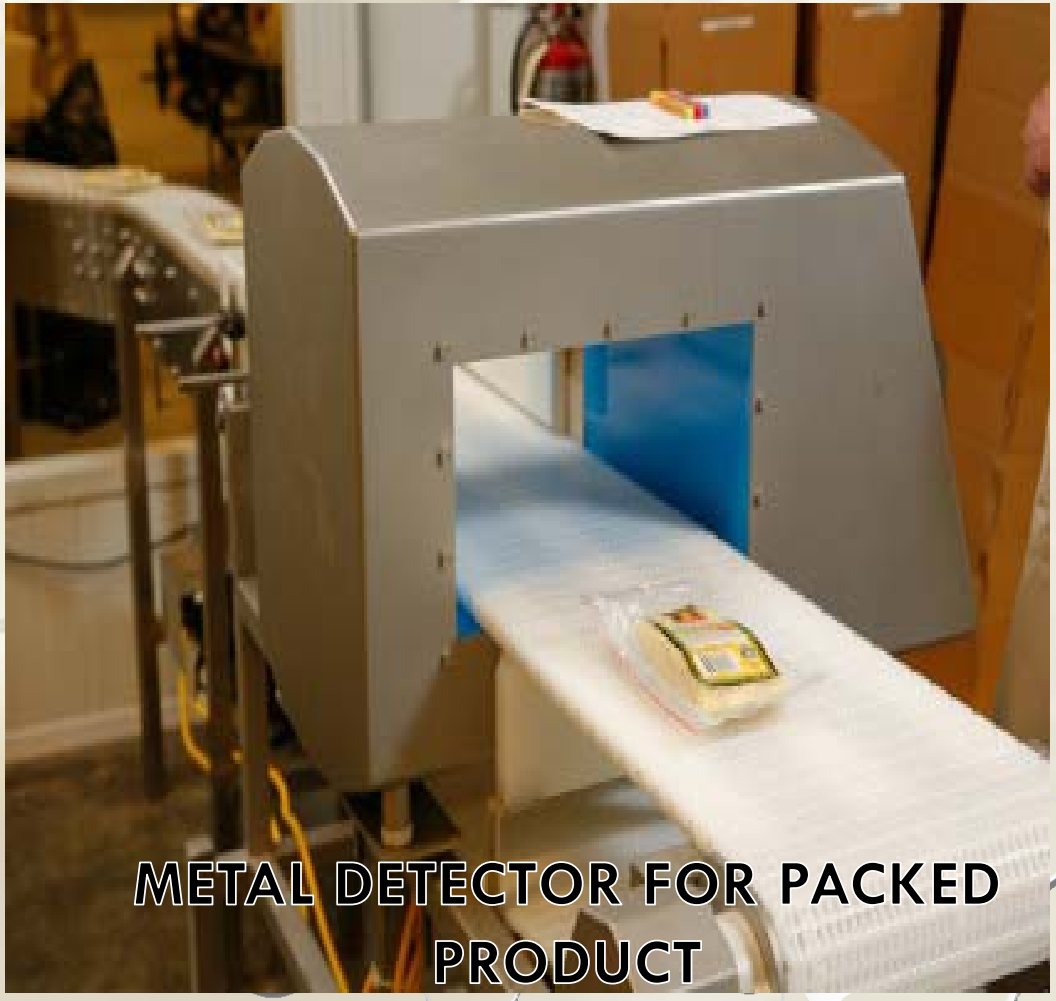
IMPROVED THERMAL EFFICIENCY

- AUTO RECOVERY OF MAXIMUM STEAM CONDENSATE FROM PLANT AND PUMP IT TO BOILER FEED WATER TANK USING MOTIVE STEAM.
- AUTOMATIC BLOWDOWN SYSTEM TO REDUCE BLOWDOWN LOSSES AND BETTER TDS CONTROL OF BOILER WATER.
  TO MAINTAIN BOILER WATER TDS CONSTANT AT 3500 PPM (FIRE TUBE)
- CONTINUOUS FLUE GAS ANALYSER AND CONTROL OF AIR TO REDUCE HEAT LOSSES THROUGH FLUE GASES.
  INCREASE IN FUEL COST BY RS 4.5 LAKH/YEAR FOR EVERY 5% INCREASE IN EXCESS AIR IN 8TPH FO FIRED BOILER OPERATING 20 HRS/DAY
- INSTALLATION OF HEAT RECOVERY UNITS LIKE AIR PREHEATER, ECONOMIZER, WATER PREHEATER TO RECOVER WASTE FLUE GAS HEAT.



MODERN PACKAGING MACHINERY

AUTOMATED 25G CHEESE PORTION PACKING MACHINE



METAL DETECTOR FOR PACKED PRODUCT

CONCENTRATED SOLAR THERMAL

IMPLEMENTATION OF CONCENTRATED SOLAR THERMAL-(CST)

- CST SYSTEM HAS BEEN CONCEPUALIZED TO MIGRATE FROM THE CONVENTIONAL TO RENEWABLE ENERGY SOURCES TO REDUCE THE IMPACT ON ENVIRONMENT.
- NDDB HAS TILL DATE IMPLEMENTED IN 13 CST PROJECTS ACROSS 4 STATES I.E. KARNATAKA, MAHARASHTRA, GUJARAT, PUNJAB.
- CST SYSTEM IS DESIGNED TO GENERATE 80°C HOT WATER FOR PROCESS REQUIREMENTS FOR CLEANING APPLICATIONS LIKE CAN, CRATE WASHING, CIP & BOILER FEED WATER.
- THE TOTAL INVESTMENT FOR 13 PROJECTS IS INR 16.9 CRORES WITH MNRE, UNDP SUBSIDY AMOUNTING TO INR 5 CRORES.
- PAYBACK FOR CST SYSTEM ON NET INVESTMENT IS BETWEEN 5-6 YEARS WITH FURNACE OIL AS FUEL.

SHORTLISTED TECHNOLOGIES FOR 85° C WATER GENERATION

PARABOLOID DISH (DUAL AXIS TRACKING)

PARABOLIC TROUGH (SINGLE AXIS TRACKING)

COMPOUND PARABOLIC CONCENTRATOR (NON TRACKING)

ACHIEVEMENT

- OPEN TENDERS INVITED FOR CST FOR THE FIRST TIME IN INDIA, WHICH RESULTED IN THE BEST COST TO THE BENEFICIARY.
- IMPLEMENTATION OF PROJECTS DONE ON 6-10 MONTHS.
- AFTER IMPLEMENTATION IN CHILLING CENTRES NEAR KOLHAPUR, THERE HAS BEEN A FUEL SAVINGS OF AROUND 25% DURING WINTER AND AROUND 30 % IN SUMMER.
- FOR LARGER CST PROJECTS IN DAIRIES ,THE FUEL SAVINGS OBSERVED IS 5-7 %.
- CST SYSTEM OPERATION IS AUTOMATIC WITH MINIMAL MANUAL INVOLVEMENT AND RESTRICTED TO REGULAR CLEANING OF COLLECTORS, REGENERATION OF SOFTENER ETC.
- SUBSIDY FROM UNDP FULLY RELEASED (~10% OF PROJ COST)

PROCESS FLOW DIAGRAM OF CST

PHE

MAKEUP WATER

BOILER FEED WATER TANK

BOILER

THERMAL STORAGE TANKS

CIP TANKS

PUMP

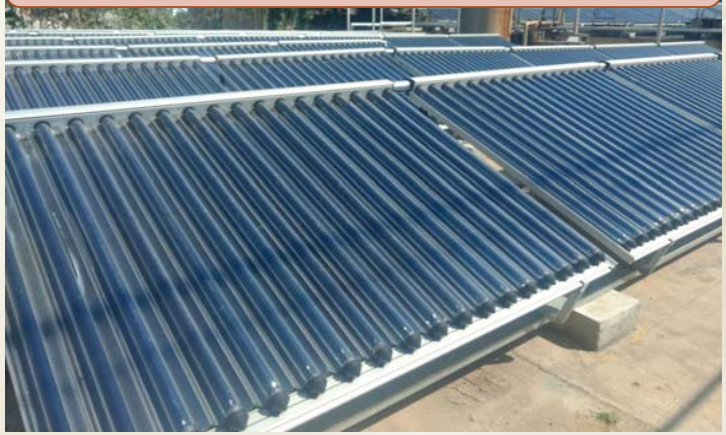
SOLAR FIELD

CRATE WASHER

PHOTOS OF BANGALORE DAIRY INSTALLATION

15 LAKH KCAL/DAY – 2 AXIS TRACKED DISH

5 LAKH KCAL/DAY – NON TRACKED CPC



20 LAKH KCAL/DAY – NON TRACKED CPC

CST INSTALLATION AT BIDRI CC

DESIGN AVERAGE HEAT DELIVERY : 5 LAKH KCAL/DAY

NET CST INVESTMENT : INR 41.65 LAKH

BRIQ. SAVINGS IN NOV 17 : 17.1 MT

SAVINGS IN NOV 17 : INR 0.92 LAKHS

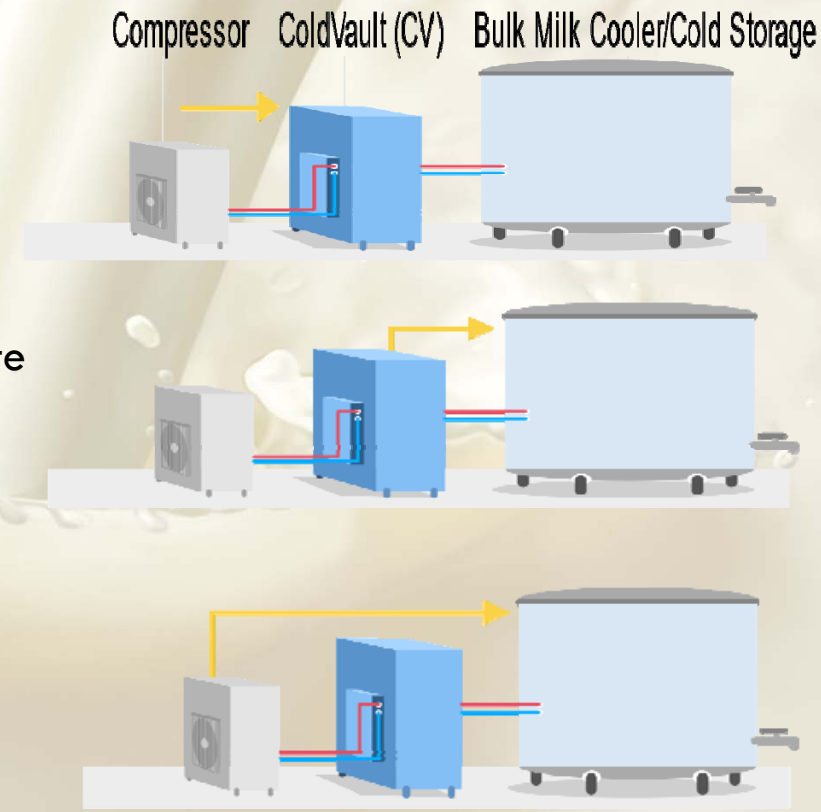
PAYBACK : 5.6 YEARS (CONSIDERING HEAT OUTPUT ONLY IN 8 MONTHS OF YEAR)

BULK MILK COOLER INITIATIVE

BULK MILK COOLER (INITIATIVE)

TSS IS A TANK CONTAINING HELICAL COILS WITH REFRIGERANT. ANNULAR SPACE IS FILLED WITH WATER MIXED WITH ANTI-FREEZE COMPOUND. THE TSS GETS CONNECTED TO A BMC THROUGH A CONTROL SYSTEM.

- **Charging Mode (Electricity Available & Cooling Required)** Cold Vault stores cooling in phase change material generated by refrigeration system through electricity.
- **Discharging Mode (Electricity not Available & Cooling Required)** Cold Vault provides cooling from storage. during discharging operation, the compressor does not operate but refrigerant is passed through the BMC evaporator to cool the milk. The evaporated refrigerant returns to TSS tank and gets cooled with ice. This cycle continues till milk is chilled to 4 deg. C.
- **Direct Cooling Mode (Electricity Available & Cooling Not Required)** ColdVault bypassed to directly provide cooling from compressor



BULK MILK COOLER (INITIATIVE)

THERMAL STORAGE SYSTEM (TSS) FOR BMC - TSS IS AN INTERVENTION TO REPLACE DG SET AND PROVIDE COOLING IN BMC.

DESIGN CRITERIA – FOR 1000 L BMC.

FIRST MILKING (~6:30 AM TO 9:30 AM) – IN MORNING, 500L FRESH MILK WILL BE DELIVERED AT 35°C FROM THE CATTLE OWNERS. MILK WILL BE COLLECTED IN AN EMPTY 1000L BMC AND TEMPERATURE OF THE MILK NEED TO BE REDUCED TO 4°C PER ISO STANDARD. ELECTRICITY FOR BMC OPERATION MAY OR MAY NOT BE AVAILABLE. TSS SHOULD BE ABLE TO PROVIDE COOLING BACK FOR THE OPERATION IN CASE ELECTRICITY FROM THE GRID IS NOT AVAILABLE.

SECOND MILKING (~6:30 PM TO 9:30 PM) – IN EVENING ANOTHER 500L MILK WILL BE COLLECTED FROM THE FARMERS. THIS MILK WILL TOO BE AT 35°C BUT MILK COLLECTED EARLIER WILL BE AT 4°C. THUS, AVERAGE TEMPERATURE OF THE COMBINED MILK WILL BE ~19.5°C. AS PER ISO STANDARD, BMC WITH OR WITHOUT BACKUP NEED TO BRING THE TEMPERATURE OF THE COMPLETE 1000L MILK FROM 19.5°C TO 4°C.

BULK MILK COOLER (INITIATIVE)

BULK MILK COOLER – POWER & DIESEL REQUIREMENT

- TSS WOULD BE ABLE TO CHARGE ITSELF WITH ~8 HOURS (DEPENDS ON AMBIENT TEMPERATURES) OF ELECTRICITY AVAILABILITY AND IT WOULD BE READY TO ACT AS COOLING BACK UP FOR BOTH MILKING OPERATIONS EACH DAY
- TOTAL POWER REQUIRED FOR A DAY IS 20 KWH CONSIDERING START UP PERIOD DURING MILK POURING AND OTHER SMALL LOADS.
- FOR 1 KL BMC, RATED CAPACITY OF DG SET IS 10 KVA.
- DIESEL CONSUMPTION IS 3 LPH (100% LOAD), 2.4 LPH (75% LOAD) AND 1.8 LPH (50% LOAD).

BULK MILK COOLER (INITIATIVE)

THERMAL STORAGE SYSTEM (TSS) FOR BMC - ADVANTAGES

- TSS REPLACES A DG SET OF 10 KVA (CAPITAL COST 2.80 LAKH).
- DIESEL SAVING WITH 50% LOAD (QTY. 2000 L; RS. 1.2 LAKH/YEAR) (MAINTENANCE COST IS NOT CONSIDERED HERE).
- ESTIMATED COST FOR TSS SYSTEM IS RS 4.20 LAKH.
- REMOVAL OF DG SET WILL ALSO ELIMINATE THE ASSOCIATED POLLUTION (MAINTENANCE COST IS NOT CONSIDERED HERE).
- DIFFERENTIAL COST FOR TSS (RS 1.40 LAKH) WILL BE RECOVERED WITHIN 15 MONTHS.
- EVENTUALLY THE SYSTEM WOULD BE INTEGRATED WITH THE SOLAR PV SYSTEM.

A TYPICAL INSTALLATION

BULK MILK COOLER (INITIATIVE)

BMC + TSS: INTEGRATION WITH SOLAR PV SYSTEM

- AFTER ESTABLISHING SATISFACTORY OPERATION OF BMC WITH TSS, IT IS ALSO CONCEPTUALIZED TO PROVIDE A SOLAR PV SO THAT DURING DAY TIME, WHEN THE SOLAR ENERGY IS AVAILABLE, IT WILL BE USED TO CHARGE THE TSS. THE GRID POWER WILL BE USED TO OPERATE THE BMC DIRECTLY (MOSTLY FOR THE MORNING SHIFT).

- PRESENTLY, PER YEAR GRID POWER CHARGE TO OPERATE 1 KL BMC IS RS. 47,450 (=20 KWH/DAY* RS. 6.5/KWH*365)

- EVEN IF ONE SHIFT IS OPERATED ON TSS THROUGH SOLAR PV, THEN THE REDUCED CHARGE WILL BE RS. 20,000 P.A.

SOLAR PV FOR BMC

WASTE WATER TREATMENT

NEW TECHNOLOGIES
EFFLUENT TREATMENT PLANT

- DISSOLVED AIR FLOATATION SYSTEMS - FOR EFFICIENT REMOVAL OF FAT, OIL & GREASE , SCUM FROM DAIRY EFFLUENT

  ABOUT 80-90 % REDUCTION IN OIL & GREASE LEVELS OBTAINED COMPARED TO CONVENTIONAL OIL SKIMMER.

- MEMBRANE BIO- REACTOR (MBR) TREATMENT SYSTEM FOLLOWED BY AERATION SYSTEM

  TO OBTAIN CONSISTENT AND VERY GOOD TREATED EFFLUENT QUALITY PARAMETERS .

- FINE BUBBLE DIFFUSED AERATION SYSTEMS WITH RETRACTABLE GRIDS AND SILICON MEMBRANES INSTEAD OF FIXED SURFACE AERATORS AND EPDM MEMBRANES.

  THE RETRACTABLE GRID ENABLES EASY MAINTENANCE OF DIFFUSERS.

  THE SILICON DIFFUSES SHOW BETTER RESISTANCE TO FOULING THAN EPDM MEMBRANES.

NEW TECHNOLOGIES
EFFLUENT TREATMENT PLANT

- DISSOLVED OXYGEN (DO) METER INTEGRATING WITH AIR BLOWERS WITH VFD DRIVE IN AERATION TANKS FOR ENERGY EFFICIENT OPERATIONS.

THE RPM OF BLOWERS CAN BE REDUCED BY VFD IF THE DESIRED LEVEL OF DO IS ATTAINED IN THE AERATION RESULTING IN ENERGY SAVINGS.

- MECHANISED SLUDGE DE-WATERING SYSTEMS INSTEAD OF SLUDGE DRYING BEDS FOR EFFICIENT HANDLING OF THE SLUDGE ALL THROUGHOUT THE YEAR.

THE SLUDGE DRYING ON SLUDGE DRYING BEDS IS NOT POSSIBLE DURING RAINY SEASON.

MECHANISED SLUDGE DE-WATERING SYSTEMS PRODUCE A SLUDGE CAKE WITH 20 % SOLIDS WHICH CAN BE EASILY HANDLED .

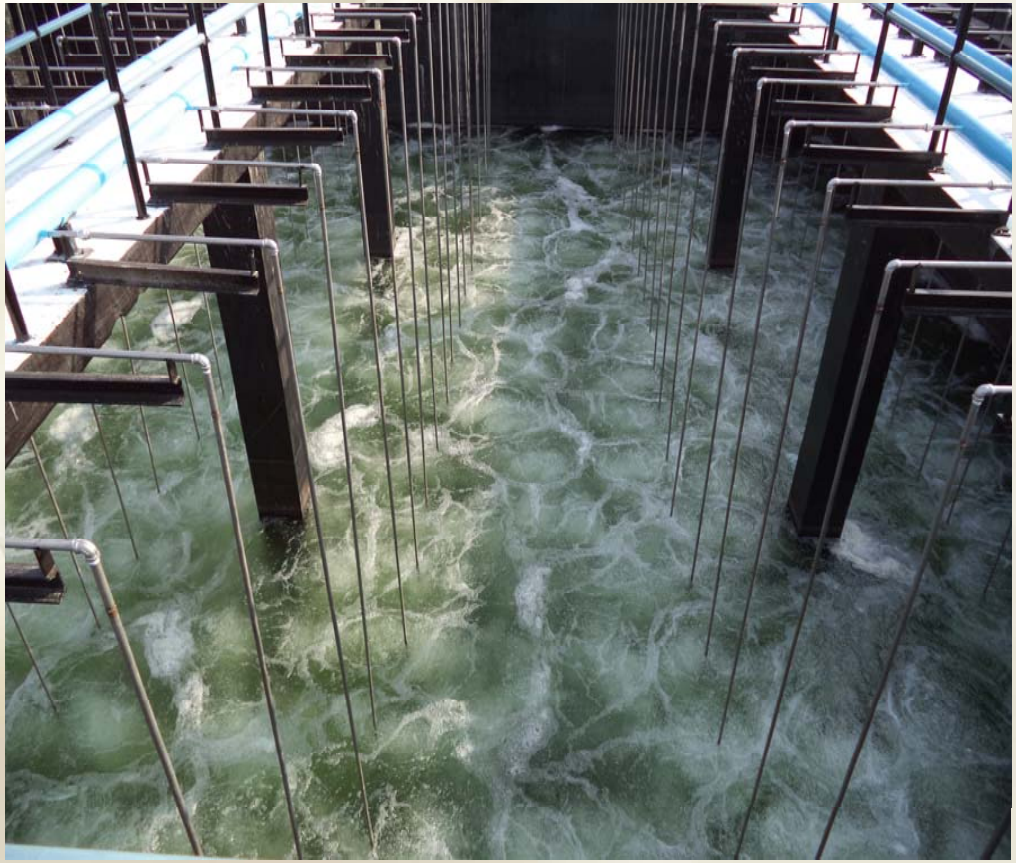
ONLINE MONITORING SYSTEM

Water Quality Monitoring System (CPCB)

Company Name	Zila Dugdh Utpadak Sahakari Sangh Ltd				
Station Name	ETP_1_Outlet				
Parameter Name	pH (pH)	BOD (Mg/l)	COD (Mg/l)	TSS (Mg/l)	FLOW (M3/hr)
Permissible Range	6.5 - 8.5	30	250	100	-
17-01-2018 12:00:00	8.4	8.0	26.2	3.3	54.0
17-01-2018 11:00:00	8.4	7.5	24.7	2.1	25.0
17-01-2018 10:00:00	8.4	6.8	22.4	1.0	34.0
17-01-2018 09:00:00	8.4	7.3	23.8	2.4	31.2
17-01-2018 08:00:00	8.4	7.1	23.3	1.9	25.0

MBR & FINE BUBBLE DIFFUSED AERATION

BANAS ETP-MBR SYSTEM



MECHANISED SLUDGE DEWATERING

THANKS !