

Cleaner Production Implementation Project
In
Dairy Sector

The Gujarat Cleaner Production Centre (GCPC) has been established by Industries & Mines Department, Govt. of Gujarat under Gujarat Industrial Development Corporation (GIDC) in the year 1998 with technical guidance of UNIDO and since then the centre is actively engaged in the promotion of Cleaner Production (CP)/Clean Technology (CT) through its various activities such as orientation/awareness programmes, CP Assessment Projects and CT Assessment Projects etc.

Contributions of GCPC over the years towards promotion of Cleaner Production in the state of Gujarat to improve the productivity and the environmental problems faced by SMEs have been significant. GCPC had also played active role in framing Industrial Policy 2003, 2004 and 2009 and 2015, also supported in developing many schemes pertaining to CP/CT. Several success stories from implementation of CP have been documented. In appreciation of the efforts of GCPC, though GCPC is a regional CP Centre, UNIDO has recognized it at par with National CPC and included in RECP (Resource Efficiency and Cleaner Production) networking membership. GCPC is also member of Climate Technology Centre and Network (CTCN), a working arm of UNFCCC.

Department of Forests and Environment, Government of Gujarat assigned GCPC a project of CP Implementation in Dairies. The project involves generation of Cleaner Production Opportunities for improving resources efficiency and preventing the release of contaminations to the air, water and land and implementing the same.

As a part of the project five major units from sector were selected from the state of Gujarat. Series of meeting and discussion were held with selected Dairy

industries. Data collection was successfully done by GCPC. Detailed CP Assessment was done in both the sectors, feasible CP options were generated and most of the options were implemented. The results are documented and shown here.

Cleaner Production Implementation in Dairy Sector:

Option No 1: Use of PNG (Piped Natural Gas) instead of diesel in sweet section.

Cost Analysis:

- Cost of the PNG installation : 25000 \$ (Installation cost + material cost , One time Investment) (1,250,000 Rs)
- Saving per Year : 15360 \$ (781500 Rs)
- Pay back period : 19 months

Environmental benefits:

The superior environmental qualities over coal or oil are that emission of sulphur dioxide is negligible and the level of nitrous oxide and carbon dioxide emission is lower, reducing problem of acid rain, ozone layer depletion and green house gases.

Option No 2: Replacement of high speed mechanical packing machine in place of pneumatic pouch packing machine.

Cost Analysis:

- Cost of mechanical packing machine : 12000 \$ (600,000 Rs)
- Saving of milk per year of production : 26128.74 \$ (1,306,400 Rs)
- Pay back period : 6 months

Environmental benefits:

- No weight variation in milk quantity.
- Reduction in packing roll quantity.
- Low maintenance cost.
- No air requirement.

Option No 3: Installation of online oxygen trims control system for boiler efficiency improvement.

Cost Analysis:

- Cost of online oxygen trim control system : 11000 \$ (550,000 Rs)
- Savings : 7180 \$ (359,000 Rs)
- Pay back period: 19 months

Environmental benefits:

- It results in saving energy and fuel.
- It controls the fuel /air ratio which results in complete combustion, due to this it reduces the emission of carbon dioxide and stack heat loss.

Option No 4: Installation of an automatic boiler blow down system.

Cost Analysis:

- Estimated cost of auto-blow down system : 5000 \$ (250,000 Rs)
- Savings in furnace oil : 7040 \$/ annum (352,000 Rs)
- Pay back period : 9 months

Environmental benefits:

- It results in saving of energy. It also saves significant amounts of water.
- It benefits in regulatory, liability and health-and-safety concerns.
- Improve and simplify boiler room cleaning requirements

Option No 5: Installation of level controller for boiler make up water addition.

Cost Analysis:

- Estimated cost of level controller : 500 \$ (25,000 Rs)
- Savings in furnace oil : 2260 \$/annum (113,000 Rs)
- Pay back period : 3 months

Environmental benefits:

- It reduces the wastage of water.
- It reduces the amount of furnace oil required for the combustion.

Option No 6: Installation of Variable Frequency Drive for air compressor.

Cost Analysis:

- Installation cost of VFD : 2500 \$ (125,000 Rs)
- Annual cost saving : 300 \$ /month (25,000 Rs)
- Pay back period : 8.5 months

Environmental benefits:

- By installing VFD drive, it maintain the load of motor which results in saving in power consumption.
- The energy savings reduces the emission of Green House Gases.

Option No 7: Using RO water as cooling water.

Cost Analysis:

- Cost of RO plant : 2800 \$ (140,000 Rs)
- Annual savings: 3320 \$ (166,000)
- Pay back period : 10 months

Environmental benefits:

It makes the water of desired TDS which results in increasing the boiler efficiency and reduces the stack heat loss and carbon emission.

Option No 8: Heat recovery from can washer waste water.

Cost Analysis:

- Cost of heat exchanger : 8000 \$ (400,000 Rs)
- Savings : 37920 \$ /annum (1,896,000 Rs)
- Pay back period : 3 months

Environmental benefits:

Recovered heat through installation of Heat Exchanger from can washer waste water. This results in furnace oil saving used for heating the water.

Option No 9: Installation of desuperheater on the refrigeration compressor.

Cost Analysis:

- Cost of desuperheater : 3000 \$ (150,000 Rs)
- Savings : 19580 \$ /annum (979,000 Rs)
- Pay back period : 2 months

Environmental benefits:

Recovered the heat through desuperheater of compressors in water heating for the boiler operation. This results in furnace oil saving used for heating the water

Option No 10: Insulation of steam line.

Environmental benefits:

By proper insulation, it improves the energy efficiency of industrial steam systems and is a powerful tool for achieving improved productivity and lower production cost.

Option No 11: Installation of crate washer.

Environmental benefits:

- It is used to wash crate at high speed.
- It uses less time to wash crate. It increases the yield of production.
- Saving in water.

Option No 12: Replacement of under loaded motor by smaller capacity motors.

Cost Analysis:

By installing smaller capacity motors, total saving per annum will be 3918.34 \$ (195,917 Rs)

Environmental benefits:

Energy saving.

Option No 13: Reuse of whey by preparing whey powder.

Environmental benefits:

- Valuable protein component
- No preservatives.

Cleaner Production Implementation Project in Dairy Sector

- Whey protein supports the immune system and is one of the most useful types of protein for muscle building.
- Whey protein contains all nine of the essential amino acids the ones that our body needs every day.

Option No 14: Modification in manufacturing process in milk processing - Reducing pasteurization temperature from 78-80⁰ C to 76-78⁰ C.

Cost Analysis:

- Investment in reducing Pasteurization temperature : Nil
- Annual Saving : 1880 \$ (94,000 Rs)
- Payback Period : Immediate

Environmental benefits:

- Reduction in heating temperature resulted in Energy Saving.
- Reductions in energy consumption minimize the emission of green house gases.

Option No 15: Started collecting the condensate of CIP Plate Heat Exchanger which was earlier drained.

Cost Analysis:

- Investment : 500 \$ (one time) (25,000 Rs)
- Annual Saving : 2240 \$ (112,000 Rs)
- Payback Period : 3 months

Environmental benefits:

- Steam condensate recycle reduces fresh water consumption.
- It results into saving of energy.
- Reductions in energy consumption minimize the emission of green house gases.

Option No 16: Started separation of serum obtained after pre-separation to recover fat which was drained earlier without separation in Ghee manufacturing.

Cost Analysis:

- Investment : Nil

Cleaner Production Implementation Project in Dairy Sector

- Operation cost : 300 \$ / annum (15,000 Rs)
- Annual Saving: 26134 \$ (1,306,700 Rs)
- Payback Period : Immediate

Environmental benefits:

Reduced polluting load in the Effluent Treatment Plant

Option No 17: Started salvaging 6% losses of Cassata and Rollcut mixture by disposing the waste ice cream as Scrap in Ice Cream Manufacturing.

Cost Analysis:

- Annual Saving : 4968.86 \$ /year (248,443 Rs)

Environmental benefits:

Reduced pollution load in the Effluent Treatment Plant

Option No 18: Installation of Anaerobic Digester for Treatment of Whey and generation of power from the gas.

Cost Analysis:

- Investment of anaerobic digester installation : 14000 \$(one time)(700,000 Rs)
- Saving of furnace oil : 108 \$/day (54,000 Rs)
- saving : 39420 \$ /year (1,971,000 Rs)

Electrical Saving:

- Saving of units : 45.6 \$ /day (2,280 Rs)
- Saving : 16644 \$ /year (832, 200 Rs)

Environmental benefits:

Reduced polluting load in the Effluent Treatment Plant.

Option No 19: Installation of Vermicompost Plant using dairy waste.

Cost Analysis:

- Investment in vermi-compost plant : 2500 \$ (125,000 Rs)
- Annual saving : 730 \$ /year (36, 500 Rs)
- Payback period : 3.5 yrs

Environmental benefits:

- Vermicompost is an ecofriendly natural fertilizer prepared from biodegradable organic wastes and is free from chemical inputs.
- It does not have any adverse effect on soil, plant and environment.
- It improves soil aeration, texture and tilth thereby reducing soil compaction.

Option No 20: Installing CFL lamp (85 w) in-place of mercury lamp (250 w).

Cost Analysis:

- Saving in Rs. : 988.32 \$ / year (49, 400 Rs)
- Cost of New CFL Fixture : 12 (unit)× 950 : 228 \$ (11,400 Rs)
- Payback period : 2.8 months

Environmental benefits:

It results in energy saving. It results in reduction of GHG gases.

Option No 21: Reuse of ETP treated water crate washing and gardening.

Cost Analysis:

- Cost Water saving : 50 Rs. / day
: 300 \$ / annum (15,000 Rs)

Environmental benefits:

It results in water saving.

Option No 22: installation of desuperheater on kc-6 ammonia compressor.

Cost Analysis:

- Saving : 16340 \$ /annum (817,000 Rs)
- Estimated investment cost : 15000 \$ (750,000 Rs)
- Pay Back Period: 11 months.

Environmental benefits:

The hot water generated can be used as boiler make up water, CIP hot water make up. The excess water can be used for floor cleaning, resulting in steam saving.

Option No 23: Fuel switch-over: natural gas in place of furnace oil (f.o) for all boilers and air heaters.

Cost Analysis:

- The saving in terms of money: 331476 \$ / Year (16,573,800 Rs)
- Investment : 120000 \$ (600,000 Rs)
- Payback period : 4.35 months

Environmental benefits:

Using of Natural Gas as fuel for Boilers and Air Heaters prevent the emission of GHG and it is Eco-friendly.

Prevention / abatement of Noxious gases pollutants like SPM, SO₂ and NO_x.

Option No 24: Installation of solar street light system.

Cost Analysis:

- The total Solar Street Lighting Project Cost: 51000 \$ (2,550,000 Rs)
- Saving : 3650 \$ / year (182,500 Rs)
- Pay back period : 14.0 Years

Environmental benefits:

The implementation of Solar Street Lighting System being environmentally benign in accordance to switch of electric power and become a part of used systems as renewable energy source

Option No 25: Replacement of single stage compressor with two stage compressor.

Cost Analysis:

- Power saving : 2452.8 \$ / year (122,640 Rs)
- Investment : 16000 \$ (800,000 Rs)
- Payback period : 6.54 years

Environmental benefits:

It results in energy saving. It generally eliminates the emission of GHG.

Option No 26: Replacement of spray pond with induced draft cooling tower.

Cost Analysis:

- Power saving : 4204.8 \$ / year (210,200 Rs)
- Investment: 38400 \$ (19,20,000 Rs)
- Payback period : 9.12 years

Environmental benefits:

It results in energy saving.

Option No 27: Installation of PHE type condenser in place of shell & tube type condenser.

Cost Analysis:

- Investment : 34329.12 \$ (1,716,456 Rs)
- Saving : 13920 \$ / year (696,000 Rs)
- Payback period : 30 months

Environmental benefits:

Decrease ammonia leakage hazard.

Option No 28: Installation of PHE type 250TR*2 nos. pre chiller at IBT, PHE type chiller in place of shell & tube type vertical chiller, induced draft cooling tower in place of atmospheric cooling tower and PHE condenser at refrigeration section. This reduces energy and ammonia consumption and improves the safety aspects.

Cost Analysis:

- Investment : 120000 \$ (60,00,000 Rs)
- Saving : 35360 \$ / year (17,68,000)
- Payback period : 41 months

Environmental benefits:

- Decrease ammonia leakage hazard.
- Cooling tower water storage capacity is lower than atmospheric cooling tower. So water consumption at the time of sump cleaning decrease.

Option No 29: installation of new 500tr screw plant

Cost Analysis:

- Investment : 400000 \$ (2,00,00,000 Rs)
- Saving: 81120 \$ / year
- Payback period : 60 months

Environmental benefits:

- Decrease ammonia leakage hazard.
- Decrease noise level as compared to old plant.

