Concentrating Solar Thermal System using Cocoon process in Silk Reeling unit at URFC, Dehradun

Location: Selaqui, Dehradun

Type of Technology: Compound Parabolic Concentrator

Type of Industry: Silk Reeling and Fabric Manufacturing

Technical & Financial Support: Technical support by UNIDO and Financial supports by MNRE & others

Configuration: 90 CPCs with 295.50m^2 of collector area

Supplier: Ultra Conserve Pvt Ltd, Mumbai

Application: Pressurized hot water for cocoon process

Year of Installation: May 2017

Beneficiary Details: Central Silk Board is a statutory body under the Ministry of Textiles, Government of India established for the development of sericulture and silk industry in the country. There are four major types of silk of commercial importance, obtained from different species of silkworms which in turn feed on a number of food plants. These are

- Mulberry
- Oak Tasar & Tropical Tasar
- Muga
- Eri

Uttarakhand Cooperative Resham Federation (UCRF) works under the aegis of Department of Sericulture of Government of Uttarakhand. UCRF is engaged in the development of sericulture in the state. Presently 22 silkworm rearing cooperative societies, 10 reeling cooperative societies, 112 self-help groups and 16 non-government organizations are functioning under the umbrella cover of the federation.

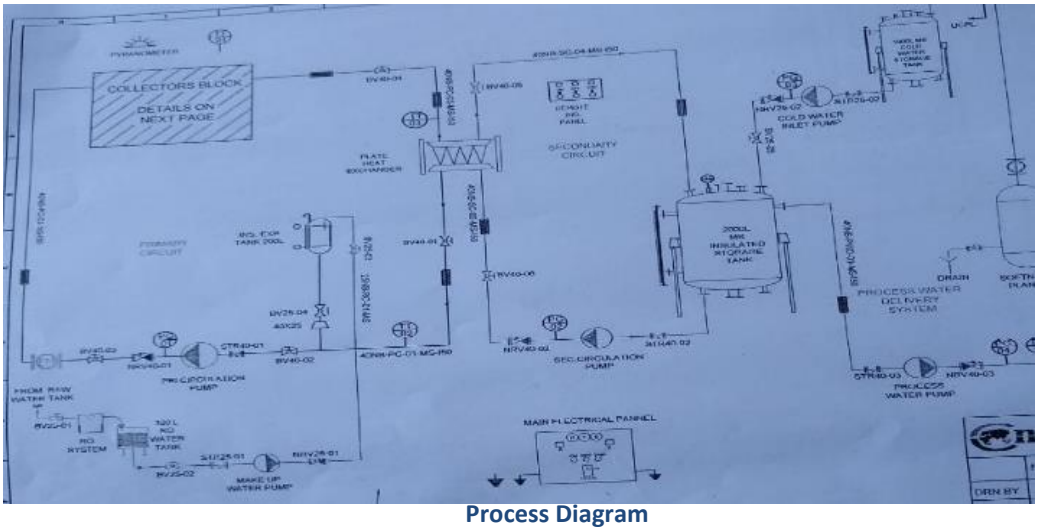
Beneficiary Contact of Uttarakhand Cooperative Resham Federation (UCRF),
Contact Person: Director
Address: Directorate of Sericulture, Premnagar, Dehradun-248007
Landline Number: 0135-2773227 / 2774130

System Details: The Compound Parabolic Concentrator (CPC) is a specific type of solar collector with a reflector fabricated in the shape of two meeting parabolas. It belongs to the non-imaging collector family and is considered to be the collector in this class having the highest possible concentrating ratio. CPC collectors could operate up to 0.5-1.0 bar pressure and the maximum temperature of 120°C, but they are most efficient in the range of 80–100°C. This technology combines the high-efficiency evacuated system plus solar-radiation concentrating system with copper U-tube aluminium fins for heat transfer.

Timings & System Application Details: The timing for operating the installed CST system starting at 8.00 AM to 4.30 PM with an average operating time in between 7-8 hrs during availability of Sun shine.

A 90 CPCs with 290.50 m^2 of collector area are installed on ground space at UCRF. A closed loop with the solar collector array consisting of series and parallel connections with an expansion tank, pump, and other accessories like pressure and air release valve, pressure balancing valve, and so on, are formed closed loop with a Plat Heat Exchanger (PHE). The cold-water line passes through the PHE. The process of reeling with respect to converting silk cooked where the water at room temperature is heated up to 90^{0}C through CST system and further heated up to 120^{0}C through woodfire boiler. They are saving more than 50% of wood consumption including to reduce CO_2 abatement.

CPC with PHE operating for 8 hours/day (during the sunny period) is a viable solution. Based on the actual data collected using through CST, a total savings of 417 kg of wood per day was observed.



Process Diagram

Thermal Output: 1,03,000 kcal/day	**Operating Temperature & Pressure:** 90°C at 0.5 bar
Type of Fuel Saved: Wood	**Quantity of Fuel Saved:** 417 kg of wood/day
Percentage of heat provided by the CST system: The total heat generates from ambient temperature to 90°C through CST system and further temperature raise up to 120°C through firewood i.e the overall percentage using solar to generate heat is 75%.	
Status of Equipment& Key Issues of Non-Operation: Equipment installed at site is working well	
Annual Carbon Savings: 186.75 tCO2eq	**O & M Issues & Beneficiary Perception:** Required training programme for operator
Project Cost: INR 62,30,000	**Financial supports:** INR 28,33,440 (MNRE & GEF)
Loan component: NA	**Overall System Performance:** Satisfactory
IRR & Payback with FA : 4.5 Year	**IRR & Payback without FA:** 8.3 Year
Inspection of project by MNRE, UNIDO & UREDA (SNA of Uttarakhand)	

Other comments by beneficiary/ project developer:

- The installed CST system is operation and maintenance by Indian women workers and it is the first CST UNIDO project in India to fully operated by the women workers.
- The installed system is being used in its partial capacity for the process of cocoon and it's satisfied by beneficiary with system performance.

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