EnConTea

A Quarterly Newsletter of the Project -
Energy Conservation in Small Sector Tea Processing Units in South India

Issue - 13 June 2011

EDITORIAL

Mr. R. Ambalavanan, IA & AS,
Executive Director, Tea Board
National Project Director

PROJECT IN BRIEF

The project - Energy Conservation in Small Sector Tea Processing Units in south India, has been initiated by the Tea Board to remove barriers to energy conservation and energy efficiency that inhibit the realization of large energy saving potential in the tea sector. This 4-year project is supported by the United Nations Development Programme - Global Environment Facility. The project's objective is to remove barriers and to develop replicable strategies for energy efficiency and energy conservation interventions in the tea processing industry in south India. The objective would be achieved by:

a. Awareness creation among the target sector about energy efficiency/renewable energy technologies and their relation to profitability

b. Elimination of financial barriers that inhibit investment in energy conservation equipment

c. Adoption and procurement of energy efficiency/renewable energy equipment /practice

d. Learning, knowledge sharing and replication

In this issue, for the first time we share with our readers in south India the views of tea stakeholders in Assam. Although the process of tea making is similar everywhere, the energy sources and their usage are very different in other regions and so is their approach to energy conservation. Darjeeling has abundant potential for hydro power and Assam has CNG. Wind energy, which is relatively abundant in south India, is almost completely exploited, although the tea sector is not sufficiently benefitting from this renewable resource. The use of biomass seems to be a long term sustainable option and our project has generated data and created awareness about the use of biomass energy. We are currently looking into all aspects of its availability, for the south Indian tea industry to secure its energy need at a relatively low cost.

After taking decisive steps towards energy efficiency the time has come to show an initiative in finding a way ahead with renewable energy, especially biomass and hydro. I have recommended that the project organize a stakeholder consultation in the coming months to discuss this issue. To ensure that the cost of tea manufacture does not increase with the rising cost of energy, it is important that options for energy security be discussed, gaps identified and the way ahead defined. The industry has very progressive, forward thinking stalwarts and I am sure that they would explore and critically assess new thoughts and ideas. This issue carries an article on one such emerging concept - combined heat and power (CHP) using biomass gasifiers for power generation to meet the energy requirements of tea drying and withering, in addition to elements of waste heat recovery in combination with energy plantations.

In May we had a meeting of the Technical Advisory Committee (TAC) of the project, where we discussed collaborations between the tea industry and academic institutions like PSG College of Technology, Coimbatore. This would create options for the industry to have students working in tea factories, collecting, consolidating and analyzing data. I was also happy with the participation of the tea industry at the renewable energy conference organized by the TEDA in Ooty, which took place on a weekend late in May. We can also build on our association with TEDA.

Finally, as we head into the final stages of the project, there is so much more that needs to be done not only in the area of energy but also for water conservation, issues of man-animal conflict, etc. I think they are all inter-related. We have found that working in the project mode with dedicated resources, in addition to the business as usual scenario, has been effective. I look forward to your inputs in taking these other issues forward as well.

INSIDE

(For Internal Circulation Only)

VIEWPOINT

INTERVIEW WITH MR. ATMARAM KASERA

Managing Director, Durgapur Tea Company and Chairman, Assam Tea Planters Association

Can you tell us something about the tea industry in Assam?

In Assam, tea is grown both in the Brahmaputra and Barak valley. Tinsukia, Dibrugarh, Sibsagar, Jorhat, Golaghat, Nagaon and Sonitpur, Cachar are the districts where most tea gardens are found. In Assam, tea is grown in the plain regions, unlike in Darjeeing and the Nilgiris, where tea is grown in the hilly area. Assam accounts for 51% of the tea produced in India and for about a sixth of the tea produced worldwide. The tea industry has contributed substantially to the economy of Assam, with nearly 17% of population engaged as workers in the tea industry.

You are taking several initiatives to create awareness on energy conservation among tea planters in Assam. What is the response of the Assam tea industry to your efforts?

The North Indian Gardens / Factories first started realizing the importance of energy conservation. The cost of both thermal as well as Hydel energy has increased substantially and this is expected to rise further in the coming years. In the past, many estates had modernized or replaced old machinery under the Tea Board Quality Up-gradation Scheme, but this was not primarily done with the intention of conserving energy costs. The situation is now changing and we need good reports, data and expertise to be able to convince more estate owners to take energy conservation more seriously. I am convinced that this would encourage them to consciously conserve energy and save costs.

As the energy for tea drying comes largely from CNG, do you think that having your own energy plantation and shifting to the usage of wood as a fuel would interest Assam tea planters?

Most of Factories in Assam use either piped natural gas or coal for thermal energy requirements and would be keen on reducing the consumption of this costly fuel. Most of the gardens in Brahmaputra Valley do not have excess land for use as an energy plantation. However, gardens of Barak Valley do have surplus land, where tea plantation and alternate fuel trees can be grown in that land. But again there is a need for experts to visit Assam and offer guidance on energy conservation practices.

How does the Assam tea industry compare to or differ from the tea production in south India?

In Assam, unlike in south India, tea leaves are plucked from March to December and most of the factories are closed from mid December to early / mid March. July to October are the peak cropping months. During this period of four months, estate factories complete nearly 60 - 65% of the annual production. Reprocessing is generally not done in Assam as most of the time green leaves are much softer than they are in south India. In Assam, CTC outputs are higher compared to the south and lower HP motors are used. The maximum electrical energy is consumed in the withering sections of tea factories in Assam. The liquor character of the Assam tea is because of the geographical and climatic conditions / good plucking standards. The climate of Assam has important role for the character of the Assam tea.

Are tea companies in Assam willing to accept that energy conservation measures are real and here to stay?

As mentioned earlier, companies have already started realizing the enormous potential and importance of energy conservation and the Tea Board as well as the TRA have initiated the process. The main bottleneck is non-availability of expert personnel that can conduct energy audits and suggest corrective measures. Hence, making energy conservation viable or popular will not be difficult once we are able to provide the right services to the industry. We have requested the Tea Board to include energy audits in the subsidy scheme and to offer Assam the same facilities for energy conservation that are being given to south Indian Tea Estates. With support from the Tea Board, energy conservation schemes would become very popular.

Do you think the Assam tea industry is affected by climate change?

I do not think any major changes have taken place as of today but of course we have faced uneven distribution of rainfall and also high temperatures in 2010.

Performance Studies conducted by TIDE TECHNICAL TEAM (T T T) - March to June 2011

#	Electrical Energy				Thermal Energy	
	House - keeping (Factory Maintenance)	Implementation of ENCON Schemes	Flat Belt Performance Evaluation	Star Connection for Lowly Loaded Motors (Energy Optimization)	Transformer Study	Thermal Study (Hot Water Generator + Drier)
1	Darmona	Devon Plantations	Sri Bathma	Nankemp	Highfield	BBTC - Thaymudi
2	Devashola	Devashola	Ripon	Devashola	Kaikatty Indco	
3	Cross Hill				Mercunad Indco	
4	Kannavarai				Chamraj	
5	Karodaiya				Ripon	
6					AVT – Chulika	
7					Devashola	

ARTICLE

OPTIONS FOR THE USE OF BIOMASS GASIFIERS IN THE TEA INDUSTRY

By Mr. B.K. Agarwal, Ankur Scientific

A gasifier is a piece of equipment that generates renewable energy by converting biomass materials like firewood, briquettes or rice husk into a combustible gas. This can either be burnt in an appropriate burner or fed into an engine genset for the production of electricity. Gasifiers come in a range of designs for different applications. The smallest gasifier rating is 4 kWe (electrical) / 15,000 Kcal (thermal) per hour and the largest single unit is 2000 kWe / 55,00,000 Kcal per hour.

Cummins Natural Gas Engine Model Gta-1710-G duly modified for operation on 100% producer gas.

When gasifiers are used for power generation, one liter of diesel oil can be saved by using 3.5 to 4.0 kg of wood or 5.0 - 6.0 kg of rice husk. A gasifier requires biomass of a specific size and moisture content - less than 20% (on wet basis) for wood biomass and around 10% (on wet basis) for rice husk. Depending on engine parameters and genset condition, a gasifier can replace 60% - 80% of the diesel requirement in dual fuel mode. When engine gensets run on 100% producer gas, the consumption of wood-based biomass is about 1 to 1.2 kgs / kWe.

Gasifiers are currently being used for a range of applications. In the power generation mode it is used for irrigation / pumping, captive power in industries and grid fed power from energy plantations. Thermal applications include hot air generators, dryers, boilers, ovens, furnaces, etc. where the required flame temperature is upto 1100 °C.

With respect to the range and utility of biomass gasifiers, they can be extensively used in the tea factories. If tea estates can grow and sustainably harvest their own biomass, then the economics of operation of the gasifier also becomes very viable. We are working closely with the Encontea project and understand the needs and constraints of the tea sector. We are exploring techno-economically attractive options for the use of gasifiers.

There are three distinct areas for gasifier application:

(i) Thermal gasifier for green tea panning

(ii) Combined Heat and Power (CHP) gasifier to meet all the heat and electricity needs of tea factories through captive biomass-based power including waste heat recovery

(iii) Use of gasifiers with ancillary equipment to produce ultra clean producer gas that could be directly fired in the same manner as CNG

Ankur Biomass Gasifier Model WBG-400 in Ultra Clean Gas Mode

This article broadly discusses design issues involved in using a gasifier in the CHP mode. The needs would vary from one factory to another and factory specific applications could be customized at later stages when the idea develops.

The following parameters are typical for a tea factory:

Power - The maximum load in a tea factory is around 120 kWe, including the load of gasifier accessories (for likely gasifier model), the required power would be about 145 - 150 kWe.

Thermal (dryer load) - The typical firewood consumption is currently 220 kg / hr with an average moisture of 30% and an assumed CV of 3300 Kcal / kg.

Key components in the gasifier system:

"ANKUR" BIOMASS GASIFIER MODEL WBG-400 (ULTRA CLEAN GAS MODE, FOR CHP IN A TYPICAL TEA INDUSTRY)	
Sl. No.	Item Description
	A
1	Gasifier
2	Dry ash char removal with water cooled screw conveyor
3	Skip charger with double door feed assembly
4	Heat exchanger
5	Chiller
6	Waste Water Treatment Plant
7	Wood cutter
8	Gasifier cooling tower
9	Moisture meter
	B
1	Hot air generator & gas burner
	C
1	Exhaust heat exchanger and remote radiator (with associated valves, etc.)
	D
1	Genset – 160 kWe in producer gas mode

ARTICLE

Taking into consideration the air heater efficiency, a gasifier would need to deliver approximately 620 kW (thermal). It would be possible to recover about 220 kW thermal from jacket heat and the exhaust, the latter being used in an indirect mode. Thus, additional gas firing will be required to make up for the remaining 400 kW thermal.

Heat recovery through remote radiator for generating hot air at around 60-70^{0} C

Waste heat recovery - The scheme will therefore involve exhaust leaving the heat exchanger at about 120°C and jacket heat being fully recovered in a close loop system.

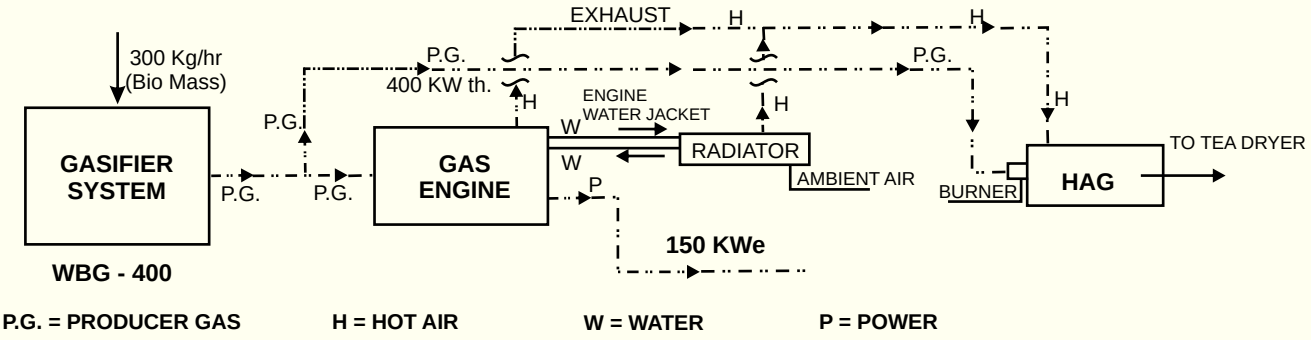
Gasifier rating – a typical gasifier fulfilling the CHP requirement would be the Ankur Gasifier Model WBG-400, that has a wood consumption of about 300 kg / hr at 20% moisture. 100% producer gas engines are typically available for the 225 – 250 kW range and engines required by the tea industry would be in the range of 150 kW. This suggests unnecessary additional investment and part load operation, but more options are expected to emerge as the idea develops. There is need to find a solution to this mismatch and one option would be to explore Chinese engines.

Exhaust cooler specially designed to extract around 80% of the thermal energy from exhaust gas

There are two possible formats to design the thermal energy component of the load. In one scheme, jacket water first gets heated using the exhaust and then a remote radiator is used to heat air for the dryer. The water thereafter returns to the engine jacket. In the second method, only the jacket heat is transferred through a radiator and the exhaust is directly mixed in this air. Thereafter, the mixture goes to the dryer. Since the exhaust is extremely clean, in both cases, ultra-clean gas is directly burnt and mixed with dryer air to provide the remaining 400 kW thermal.

The schematic for the second option is shown below:

Indicative diagram on using the gasifier in Combined-Heat and Power mode:



The Ministry of New and Renewable Energy (GOI) gives subsidies for gasifier systems.The pattern of Central Financial Assistance (CFA) for various components is given below:

Sl. No.	Items	Pattern of CFA
i	Distributed / off grid power projects in rural areas and grid connected power projects with 100% producer gas engines or biomass based combustion projects.	Rs.15,000 per kW
ii	Biomass gasifier systems retrofitted with duel fuel mode engines.	Rs. 2,500 per kW
iii	Captive power projects (captive power less than 50%) and / or feeding surplus power to grid in rice mills (with 100% producer gas engines or biomass based combustion projects).	Rs.10,000 per kW
iv	Projects involving installation of 100% gas engines with an existing gasifier.	Rs.10.00 lakh per 100 kW

ARTICLE

Tea Industry and Combined Heat and Power (CHP)

Indicative production	:	1200 million kilograms of MT / year (All India)
Fuel consumption (withering + drying)	:	280,000 tons of fuel wood (south India)
		30,000 tons of coal (Darjeeling)
		480 million m3 of natural gas (Assam)
Indicative power consumption	:	700 million kW-hrs / year
Indicative connected load	:	150 MW

Biomass based Co-Gen Mode Operation could produce the entire power and also meet thermal energy needs merely with a 30% increase in current fuel consumption. Biomass could be sustainably grown on the plantations and tea production could become totally self-sufficient and sustainable with the captive Biomass Co-Gen System, which could also lead to greater viability. However, support for the initial investment is critical for promotion of the concept.

SECTION-WISE ENERGY METERS - A DIAGNOSTIC AND MONITORING TOOL

By Mr. Leonit Shaji, Factory Engineer, BBTC Group of Companies, Mudi's Valparai

The Thaimudi factory at Mudi's estate had initiated investments in energy conservation after the completion of the energy audit process. It was important for us to know whether the energy efficient equipment installed was actually realizing the expected energy and cost savings as mentioned in the audit report. TIDE then suggested that installing section-wise energy meters would also be strongly advisable, as it would serve as a diagnostic and a monitoring tool. We were quite convinced that this was a good idea and installed section-wise energy meters. Although not directly an energy conservation measure, what made this scheme especially appealing was that we could measure energy consumption on a daily as well as on a monthly basis and thereby identify problem areas.

We now maintain data on energy consumption patterns and identify periods of high power consumption. What we did not anticipate and this came to us as a very pleasant surprise, was that we were also able to identify energy guzzling motors and focus our attention on sections where power was consumed in unnecessarily high quantities.

For instance, one of our CTC banks recorded much higher power consumption data than the other two CTC banks. On scrutiny, we found that one of the higher HP motors in the CTC cut was consuming abnormally high power compared to its rating. This motor was quite old and we had got its coil rewound several times. On realizing this issue, we immediately replaced this motor with a new and EE motor. We now had an instant picture of the energy savings because of the before and after data recorded with the energy meters.

The opportunity to identify sub optimal equipment performance, especially in an old piece of equipment, was an unexpected but important discovery for us. I am confident that the implementation of this EnCon measure will be a very important diagnostic tool and beneficial to all tea factories. I therefore strongly recommend its installation in all tea factories without any hesitation.

ADVANCED BIOMASS GASIFIER TECHNOLOGY - A BOON FOR THE TEA SECTOR

A. Nazeer Baasha, A. Saravanakumar and K. Vinoth Kumar
NSP Green Energy Technologies (P) Ltd., Chennai

The existing practice of using firewood as a source of thermal energy, the current stressful situation with regard to procurement and the rising price of firewood in the tea industry call for clean and environment-friendly technology to meet energy needs. The biomass gasifier technology reduces firewood consumption by at least 25% and is a boon for the tea sector. In recent years, NSP Green Energy had the fortune of being the first to introduce this to the tea sector for green tea panning. Gasification converts solid fuel into a clean gas that can be substituted in conventional combustion systems. The technology has attributes of energy recovery from waste heat, process optimization and thermal energy generation

Producer gas can burn with a flame of high intensity

from producer gas, thus contributing to reduced energy consumption and factory modernization. Gasification is now an established renewable energy technology and recommended for overcoming many limitations of conventional combustion systems.

Producer gas flame replaces 4 TPH Furnace oil-fired boiler

Features

The process description of the indigenous developed gasifier by M/s NSP Green Energy Technologies, Chennai, is described below:

The gasifier design has several unique features. The system can process multiple fuel options with high and low cut bulk density (i.e. firewood, wood branches, twigs, coconut shell, agro residues like sugarcane tops, trash, bagasse, briquette or pellets) and increase the flexibility of operation. Other features include high flame temperatures, gas with low tar content, proficient removal of ash and particulates. This reactor operates on stratified downdraft mode under slightly higher atmospheric pressure (below 30 cm of water column) for flexible rating with multi-bed gasification and single reduction bed. The gasification zone temperature is maintained at 1200°C and above, to produce gas with minimal tar. Maintenance of optimum porosity and reduction of load on the char bed avoids clinker formation and provides efficient stir of the char bed. Uniform distribution of air for partial combustion and heightened performance is achieved through the use of an air nozzle duct at the centre of the gasifier and a rotating grate mechanism. The grate is designed to minimize the generation of ash in the char and to thus achieve very high gasification efficiency. This system is fully insulated to achieve maximum thermal efficiency as well as cold gas efficiency with minimal tar. The pressure drop across the grate can be uniformly maintained to gasify even small particles and biomass pellets.

For green tea panning, the gasifier system has been designed to use firewood as feedstock for the generation of producer gas. This is fed into the existing furnace with a multiple gas burner arrangement.

Advantages and environmental benefits of using a gasifier:

- Generation of hot air for the process of green tea panning and steam generation
- Energy efficient process optimization and firewood conservation
- Clean working environment
- Zero SOx emission
- Reduced NOx emission
- CO2 neutral model
- Clean Development Mechanism (CDM) compliant
- Around 20% conventional fuel replacement achieved

ECONOMICS OF USING A GASIFIER FOR GREEN TEA PANNING

Cost of the project	:	10 - 12 lakhs depending on the quantity of green leaves
CFA from MNRE	:	Rs. 2.4 - 2.5 lakhs
Fuel used in conventional operations	:	360 tons / year
Fuel saving from shift to gasifier	:	70 - 80 tons / year
Payback period	:	Less than 3 years

RENEWABLE ENERGY CONFERENCE FOR THE TEA SECTOR IN OOTY

The Tamil Nadu Energy Development Agency (TEDA) organized a two-day national conference on renewable energy at Udhagamandalam in The Nilgiris district on 28th and 29th of May (Saturday and Sunday), in association with the Tamil Nadu Tea Exporters' Association and the Tea Board of India. The focus of the conference was renewable energy for process heat applications in industry, especially in the tea industry.

The conference was inaugurated by Mr. Osamu Hisaki, Director of Japan External Trade Organisation (JETRO), Chennai. In his inaugural address he said that in India, Tamil Nadu was now the most preferred investment destination for Japan. He complimented

Picture taken at the inaugural function of the RE conference in Ooty, organized by TEDA

the State Government for its proposal to encourage the use of solar power by creating a number of solar energy parks and for the leadership position taken by the State to promote 'green energy'. JETRO's activities also focus on alternative energy and environment, and Japan was playing a leading role in developing new state of the art technologies to improve energy efficiency and the development of new energy resources.

A section of the audience at the RE conference

Mr. R. Christodas Gandhi, Chairman and Managing Director of TEDA, noted that Tamil Nadu was the first Indian state to harness wind energy. The Nilgiris Collector, Mrs. Archana Patnaik, said that the immense potential for promotion of alternative energy in the district should be tapped. The Secretary-General of UPASI, Mr. Ullas Menon, explained that energy formed a sizeable part of the cost of production in tea factories, coming second after labor cost. Executive Director of the Tea Board, Mr. R. Ambalavanan, welcomed the gathering.

The main topics discussed at the conference included government support and financing aspects of renewable energy, case studies on solar driers, solar thermal systems for process heat applications, bio mass gasifiers for industrial application and pico hydro power. Chairing the session on biomass gasifiers on the second day, Dr. D K Khare explained that biomass gasification is now an established technology and is in use for different applications in several industries. He urged the tea sector to strive for energy security by opting for energy plantations on surplus land in their estates. A field visit was organized to the Golden Hills Tea Factory where solar air preheating has successfully been saving fuel for over a decade. The tea industry participated at this conference in large numbers and managers as well as owners had the opportunity to learn about the latest developments in renewable energy and clarify their doubts.

REPORT ON THE MEETING OF THE TECHNICAL ADVISORY COMMITTEE (TAC)

The Technical Advisory Committee (TAC) of the EnConTea project meets thrice a year to discuss technical issues of the project. On 27th May 2011, the TAC meeting took place at the Tea Board of India, Coonoor, with opening comments from Mr. Ambalavanan. He said that while there was no doubt that the project made a positive impact on the sector, some gaps still remained and these could also be deliberated upon. Prof Rudramurthy emphasized the importance of creating a link between the various institutions working in the area of energy and tea research.

The TAC discussed the consolidation of the energy audits carried out in close to 100 tea factories, including five factories from the north east, to provide a comparative assessment. It was decided to bring out a publication on results and inferences from 100 energy audits and circulate the same among tea factories and stakeholders. Readers are invited to share their views on the contents and structure of the report before 31st August 2011. Mr. S N Srinivas said that a process documentation report capturing the approach of the project also be developed, as it could show the way ahead to deepen and widen efforts towards energy conservation in the tea and allied sectors.

Mr. Saaminathan shared his experiences of working with the biomass pelletization plant set up by him. He said that even in biomass pelletization, technology was rapidly evolving. He also mentioned that screw-type briquettes are superior, because they are denser and have a hole in the core for better burning. There was extensive discussion on the renewable energy options that were technically and economically feasible for the sector and the way ahead for the same.

On the subject of biomass gasifiers, Prof Madhavan offered a brief on three probable options for the tea sector: (i) A thermal gasifier for green tea panning. To use a gasifier was a very appropriate intervention because of the uniform quality of heat and the high potential for fuel saving (almost 25%). (ii) Combined heat and power (CHP) gasifiers to meet all the heat and electricity needs of the tea factories through captive biomass-based power, including waste heat recovery, and (iii) The use of gasifiers plus ancillary equipment, to produce ultra clean producer gas that could be directly fired, in the same manner as CNG. There was a consensus that using CHP gasifiers was a powerful idea, especially in combination with energy plantations, as this would lead to energy security for tea factories. However, a cautious approach was advised. Although the gasifier with a capacity of around 200 KW was not a new concept, there was need to adapt it to the tea factories and assess the techno economics in a likely business as usual scenario. Currently trials with gasifiers for green tea panning are underway.

The TAC also viewed the first of 9 films proposed to be used as video tutorials on each of the energy conservation measures of the energy audits and expressed satisfaction with the contents. Prof Rudramurthy also said that there were several spin offs from the project, such as opportunities for research and student projects, replication in other areas and sectors, etc. He recommended that as the project nears its final stage, it would be advisable to develop such possibilities and work towards linkages.

ANNOUNCEMENT

LED LIGHTING AT THE TEA BOARD OF INDIA, COONOOR

By Mr. Muralikrishnan, Concept 4E

When the going is green, encouragement and participation comes from within, ideally making the maxim – Charity to start at Home – a reality. When the Tea Board office at Coonoor went through a major overhaul, the Executive Director, Mr. Ambalavanan. IA&AS took the call to set an example by migrating to energy-efficient LED lighting in the Tea Board office and on campus in Coonoor.

The task of evaluating the options for energy efficient lighting on the Tea Board premises and suggesting optimum lights and wattage was given to Concept 4E, who have been assisting TIDE with the EnConTea project. A lighting audit was conducted and Lux measurements of conventional lights were taken. Demo lights were tried out and the actual light output and effect was measured. Data was tabulated and replacement wattage requirement of LED fittings was derived, taking into account the task area, usage hours and application types.

Existing conventional tube-lights and CFLs, with wattages amounting to 1.75 KW, have been replaced with LED ceiling / bulbs / decorative lighting, equalling 390 watts. LED 12w / 15w / 18w “down-lighters” have been installed in the hallways, executive cabins and 5w LED bulbs and hanging lights in the corridors, visitors' waiting room and portico. It was also ensured that the light fittings are of highest standards, to match the 50,000 hr long life of the LEDs, while matching the grandeur of ambience and décor at the Tea Board office.

The cost of the products varied between Rs. 650/- and Rs. 5,800/- according to the application and usage. The overall energy and cost savings is estimated to be 79% with a payback period of less than 3 years, as opposed to standard 4 to 5 years required for similar retro-fit solutions. Since LEDs are maintenance free and have a long operating life, substantial OPEX expenses like replacement cost of bulbs, cost of HR, turn-around-time, installation charges and other administrative expenses have also been eliminated, thus further reducing the payback period.

LED lights glowing brightly in the tea board premises

The LED lights with a better colour rendering index also provide a natural light which emphasizes the current colour schemes of the building and is expected to increase productivity among staff members due to less glare and evenly distributed luminance.

4 Nos of outdoor lighting totalling 96w have also been installed near the entrance gate (24w), outside the main building (24w) and staff quarters (12w) and on the compound wall (36w) of the Tea Board premises.

The Tea Board campus in Coonoor now showcases energy-efficient lighting to industry related visitors, thus encouraging them to opt for similar measures in their own factories and estates.

ANNOUNCEMENT ON SERVICES OF DR. R. SETHUMADHAVAN

Prof R. Sethumadhavan, Director of Implementation and Monitoring, with the Encontea project and an expert in renewable energy and energy conservation has returned to Anna University, School of Energy Studies in Chennai, after completion of one year of deputation to the Tea Board. Prof Madhavan would therefore not be available in the project office at the Tea Board premises, Coonoor, from 1st July 2011.

The project is however working out an alternate consulting assignment with him and we anticipate his availability for project related activities, especially for advisory services to tea factories for about 10 – 12 days in a month, largely on weekends. He will continue to be reachable on his mobile phone no. 9444454625 and respond to mails addressed to him at madhavanies@gmail.com .

The project team is grateful to him for the intensity and passion that he brought to the job and the manner in which he led the team. His knowledge on energy issues has always been extensive. In this last year he developed expertise on energy conservation in tea factories, understood the decision making process of factory managers and advised the sector, keeping in mind their needs and priorities.

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