EnConTea

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

Issue - 14 September 2011

EDITORIAL

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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

As I write the editorial for the current edition of the EnCon newsletter, the bright light of the newly installed solar LED light illuminates the Tea Board premises. A solar water heater has been installed for the guest house. An additional initiative taken is to renovate the Tea Board office to become a green building to the extent possible. It is a good demonstration for the many guests and visitors who come to the Tea Board and also showcases the commitment of the Tea Board towards green initiatives.

Last week I visited a biogas plant installed in the Highfield tea factory and witnessed how it was creating an energy resource while addressing issues of sanitation for the labour colonies on the estate. I learnt that it could generate sufficient biogas to replace 7 kg of LPG everyday which is about half a domestic cylinder. To me it was a win-win situation. There are other win-win options for renewable energy in tea gardens that need to be exploited. The current issue carries an interview with Dr. Praveen Saxena of MNRE inviting tea gardens to adopt hydel power and offering MNRE support for the same.

In the second week of September, I was at Goa to participate in the Global Environment Facility's National dialogue organized by the Ministry of Environment and Forests. I met several officials of MoEF, Bureau of Energy Efficiency and others and was happy with their very positive response to the Encontea project. The project has shown very good implementation of energy conservation measures and many other agencies were keen to learn from us about our implementation approach. The partnership between the Tea Board, UPASI, Tea factories and TIDE with technical support provided by Anna University and PSG Tech Coimbatore has been a symbiotic relationship and must be nurtured for greater environmental impact in the Tea gardens.

Finally, Tea Board will very soon, release the video tutorials on energy conservation produced by the project. Several of the tea stakeholders have spared their time for the video footage and I am grateful to them for their support. The tutorial CD would be mailed freely to all tea factories in the country. I have seen the first version of the films and I think that they would trigger a renewed interest in energy conservation not only in South India but also in other tea clusters in the country.

INSIDE

(For Internal Circulation Only)

VIEWPOINT

INTERVIEW WITH DR. PRAVEEN SAXENA

Scientist F, Ministry of New and Renewable Energy (MNRE), Government of India

i) The tea industry all over India has very high unexploited potential for hydro and we want to promote hydro in the tea sector. Can you tell us which sector and which region has best exploited hydro power and why?

The Ministry of New and Renewable Energy (MNRE) is responsible for the promotion of small hydro projects (SHP) (upto 25 MW). Projects generating power of 5 kW or less are classified as watermills. Small hydro is popular in all hilly areas where water falls from a height. So region wise, Himachal Pradesh and the Western ghats in Karnataka have best exploited small hydro potential so far but much more needs to be done. There is also very high potential for hydro power in Arunachal Pradesh. The MNRE has assessed that power generation is also possible from canal drops when water falls from a height of even one metre. The response from the private sector partners for development of hydro power has been very good. In Himachal Pradesh, there are good examples of private sector grid connected small hydro power projects. The MNRE has in the past worked with two tea gardens in Darjeeling - Pussimbing and Chamong and with the Rani Tea Estate in Assam for implementing 100 kW small hydro projects. Decentralized power generation in the captive mode is perhaps best suited for tea gardens but the MNRE is open to all proposals from tea estates.

ii) What do you think the project must do to motivate the tea industry to adopt hydro power?

For a long time now the MNRE has believed that the tea sector located in a hilly region with several streams is most ideally suited for adopting hydro power. It is useful to look at why this has not happened. Perhaps there are barriers in obtaining permissions for hydro power and the need to interface with different departments. If the project can dialogue with different state governments and with the tea planters and understand the permissions required for implementation of a hydro power project, then the MNRE would step in and do all it can to remove these barriers. I would be happy to meet the industry representatives and find a way for adoption of hydro power in all tea gardens.

iii) What in a nut shell are the typical schemes of the MNRE for hydro power?

MNRE supports installation of small hydro power projects both in the public and the private sector. The pattern of Central Financial Assistance is different for private sector and community hydro projects. There are special packages for the north eastern states and border districts. Details of the MNRE schemes are available at the MNRE web site www.mnre.gov.in. Look for grid interactive and off grid distributed renewable power under programmes / schemes.

You can also see the draft recommendations for the 12th plan on the opening page of the web site under requests for suggestions on 12 th plan. Tamil Nadu and Kerala would be the focus states from south India for hydro capacity addition and we are very keen to see more projects being developed from these states. Realizing that the capital costs have increased and that subsidy plays a very important role in covering risk and making SHP projects economically viable, the 12th plan has recommended increase in MNRE subsidy. It has also recommended that the scope of the water mill and the micro hydel projects be enlarged. There is also a recommendation for direct support for tea / coffee garden owners. We hope that more projects would now become viable. The MNRE is also open to discussions with tea industry representatives to suitably amend the provisions if required.

iv) In tea estates the streams are usually at least 1 - 2 kms from point of consumption. Would you recommend that even remote streams be exploited for hydro power?

Yes, they must be and this is not an issue. But it is important that hydel projects be taken up for implementation only after the preparation of a detailed project report (DPR) and with a complete understanding of what is possible and at what cost. This report should contain information about the head, flow rate, the power generation potential during lean and peak seasons, the detailed designs for implementation of the project, the costs broken up into equipment costs, civil works costs etc. The techno economics must to be worked out for different options e.g. if the hydel power is replacing grid electricity, diesel gensets etc., for informed decision making.

v) Tea estates are generally not comfortable in going to different departments of the government. There is a general impression that New Delhi is very far and not approachable.

We have interacted with several private sector partners in the past without any problem. We are very approachable and flexible if the situation requires. You can call or mail us with your queries, clarifications. We do not delay release of subsidies. We are very keen to promote hydel power in tea gardens and open to discussions, clarifications. You can contact me at 011-24362706 or on email at psaxena@nic.in

(comments / suggestions can also be sent to the project office in Tea Board, Coonoor and these would be forwarded to Dr. Praveen Saxena)

BIOGAS PLANT AT HIGHFIELD TEA FACTORY COMMISSIONED

ARTICLE

The Encontea project has motivated the Highfield Tea factory Coonoor to install a biogas plant. The plant is producing rich methane from kitchen waste, dung waste (from the horse and sheep yards) and night soil from the labour colonies.

A biogas plant is an anaerobic digestor (fermentation reaction happens in the absence of air) that can convert organic wastes into biogas through bacterial action. The digestion process consists of 3 stages (i) Hydrolysis, (ii) Acidification and (iii) Methanization.

The biogas plant has been installed with twin purposes of:

(a) Generating methane rich biogas for cooking in the labour quarters to substitute/ supplement LPG which is costlier and has to be transported over long distances. Surplus biogas can also be used for withering tea leaves in the factory

(b) To produce carbon – nitrogen rich bio-manure for the tea gardens.

The capacity of the biogas plant installed is $10m^3$ of gas generation per day that can replace 7 kg of LPG. When biogas is used in kitchens, special biogas burners must be used. Biogas burns cleanly with a blue flame with no smoke released.

The biogas plant has been constructed as a concrete underground structure both to make the plant rugged and insulate it from the atmospheric temperature. (The night temperature in Coonoor falls to 10 C or less. But with the underground construction, the cool temperatures does not have any detrimental effect on plant performance or gas production). The raw material fed to the biogas plant being perennial, there are no fluctuations expected in biogas generation.

As the biogas is a product of anaerobic digestion, and the residence time of the digester is designed for complete digestion, the gas and the surrounding areas do not have any distasteful odours. The raw materials are fed through the inlet at the bottom of the digestor and go to the bottom of the tank thus giving adequate time for the fermentation reaction to take place. The residence time of the waste inside the tank is about 40 days and during this period, most of the fermentation reaction has been completed.

The cost of this biogas plant was Rs 5 lakhs. With an LPG equivalent of 7 kg saved per day, the revenue generation because of the plant is about Rs 400/day.

Figure 2 The Executive Director, Tea Board visiting the biogas plant at Highfield tea factory

(commercial rate of LPG is Rs 50/kg). The simple payback period works out to 3 years against the expected plant life of more than 20 years.

These types of plants are ideally suited for tea estates where there is no sanitation facility. At least 100 installations are working satisfactorily in Tamil Nadu alone in educational institutions, hospitals, labour quarters of textile mills etc.

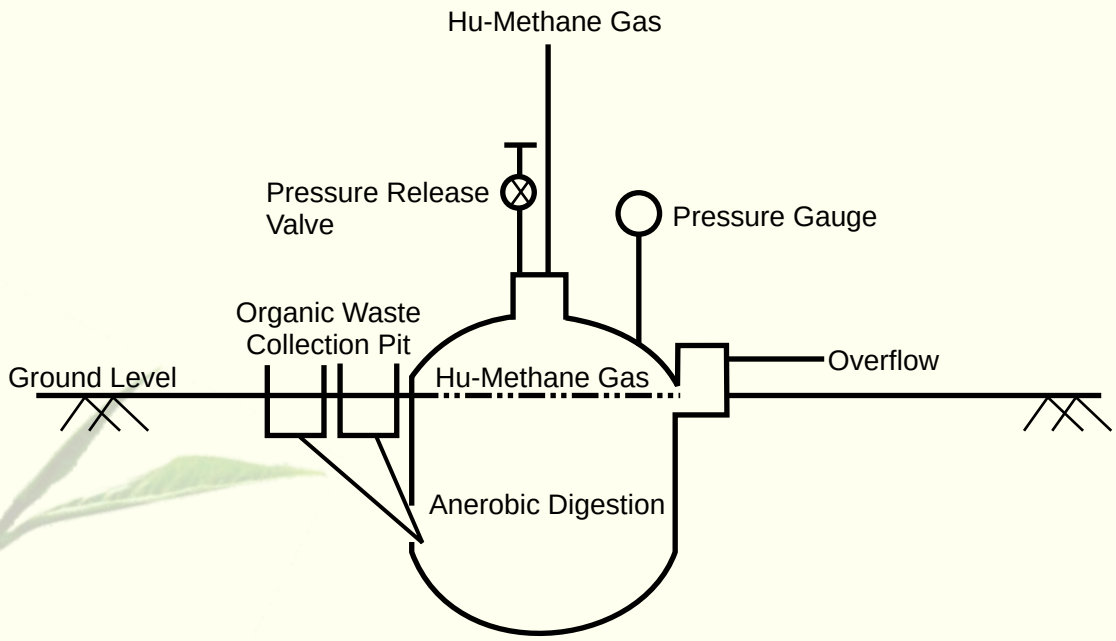

Figure 1 Schematic of a typical biogas plant

ARTICLE

QUALITY UPGRADATION OF BRIQUETTES AT SRI RA RA BIOFUELS

The Encontea project had motivated the creation of Sri Ra Ra Biofuels, a dedicated briquetting facility for supplying quality briquettes to the tea industries. Like any other start up, Sri Ra Ra biofuels had experienced a few constraints in its initial period. Raw material supply is the most critical need of a briquetting unit and it had secured the same. During the commissioning phase production was slow and standardization of the quality of the briquettes was a problem. The calorific value of the briquette was inconsistent. Sri Ra Ra biofuels also wanted the competitive advantage of being identified as a reliable supplier of quality briquettes.

It quickly identified the problems and took corrective action. Production of briquettes, especially in the rainy months was a problem because the raw materials like saw dust etc. were wet and took a long time to dry. There were many days when the unit was not functioning because of high moisture content in the raw material. The moisture was also bringing down the calorific value of the briquettes.

The raw materials saw dust, coffee husk etc. were in different sizes and also had several foreign materials like sand, stones, iron filings etc. This was the major reason for poor binding in the briquettes and they could crumble during handling and transportation.

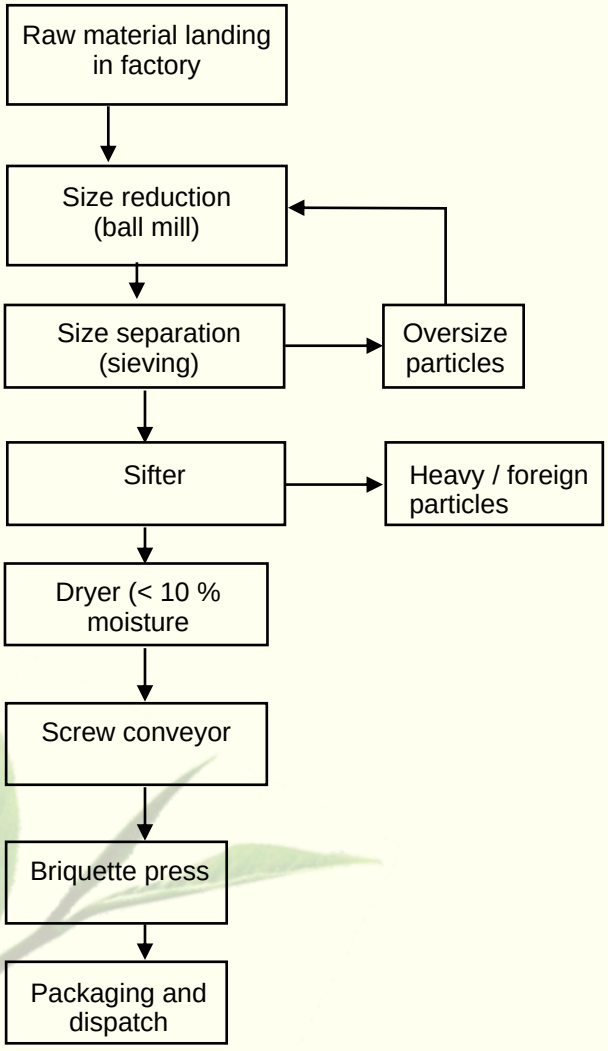

Figure 1 Flow chart for production of briquettes at Sri Ra Ra biofuels

To overcome these problems and also to offer high quality briquettes Sri Ra Ra Biofuels installed new equipment for pre processing the raw material prior to briquetting. This now consists of size reduction followed by size separation and heavy / foreign material removal through a sifter, drying in a drier (unlike open air drying) and pneumatic conveying of the loose biomass to the briquette press. These additional steps in processing ensure that only dried (< 10 % moisture) loose biomass without any heavy / foreign particles are briquetted.

Figure 2 Pulverizer of the briquetting unit

Figure 3 Sifter sifting the heavy/foreign particles

Calorific value of the fuel pellets has been measured at fuel labs at Coimbatore (indag), Valparai (BBTC Fuel Lab) and Coonoor (UPASI). All tests show a minimum CV of 4 000 kcal / kg. Sri Ra Ra Biofuels has gained valuable insights in these early stages and is now willing to provide turnkey solutions for new briquetting units and rejuvenate sick briquetting units and enter into agreements to operate briquetting facilities installed by tea factories.

ARTICLE

GASIFIER FOR GREEN TEA PANNING AT GLENMORGAN

The gasifier for green tea panning installed at Glenmorgan is presently being commissioned. The gasifier supplied by NSP Green Energy operates in the thermal mode to generate producer gas of combustible quality. The flame speed and temperatures are extremely good and it is very rare to obtain such high flame temperatures when the ambient temperature is low. Photographs of the gasifier - the flame obtained when producer gas is ignited and the pipes in which the producer gas is moved to the burner prior to ignition, shown below exhibit the working of the gasifier.

Figure 1 The wood gasifier installed at Glenmorgan tea factory for panning of green tea

Figure 2 Producer gas produced in the gasifier is transported through the pipes and ignited

Figure 3 Flames from the gasifier burners provide the required thermal energy

A detailed monitoring of the gasifier has yet to be conducted.

SOLAR LED LIGHTS UP TEA BOARD LAWNS

The Tea Board lawns are now illuminated by an LED light powered by a solar panel. The spread of light in terms of general visibility is about 25 feet in the front and about 15 feet on either side. The light is comfortable enough for reading and writing.

Installed on	: 26th Sep 2011
LED Light	: 12 Watt LED street light
Battery	: 40 Ah battery
Solar Panel	: 50 Wp
Hrs of Operation	: 2 nights – Dusk to Dawn autonomy
Fixture Ht	: 12 feet from the ground.
Lux levels	: 140 to 150 Lux directly below the light at 6 feet from the ground 80 to 85 Lux at 3 feet from the ground 40 to 50 Lux at ground level 60 Lux at 5 feet on all three sides i.e., left, right and front.

This light is highly recommended for large homes, guest houses, hotels etc. in hilly areas.

ARTICLE

TEA PROJECT PRESENTED IN GEF NATIONAL DIALOGUE

The Global Environment Facility's (GEF) National Dialogue was organized by the Ministry of Environment and Forests (Govt. of India) (MoEF) along with the GEF secretariat, Washington DC from September 8 – 10 2011 at Holiday Inn, Goa. Such dialogues are organized once in a four year GEF cycle to provide an opportunity to the partners of GEF India network within India and abroad to come together. The meet facilitates the participants to deliberate on critical issues and agree upon the way ahead. A key item for discussion in the Goa meet was the strengthening of engagement with the private sector in India. Mr. R Ambalavanan, Executive Director Tea Board and Ms. Svati Bhogle, TIDE and Project Manager of the Encontea project participated in the deliberations.

Mr. T Chatterjee, Secretary of the Ministry of Environment and Forests inaugurated the meeting. Where most projects were presented in the break out groups, the Encontea project was chosen in the climate change portfolio to be presented to the Secretary and senior officials of the MoEF, the Bureau of Energy Efficiency,(BEE), the GEF, World Bank and UNDP in the plenary session. It was rated as one of the best implemented projects supported by GEF in India. The project presentation received a good response from the audience. In the feedback received following the presentation made by Ms. Svati Bhogle, it was said that the project must be showcased internationally for good work and high impact. The Encontea project was identified as one where generation and dissemination of knowledge was used as a tool influencing investment by private sector in energy efficiency. The approach was thought to be unique and deserved to be developed further for deployment in other sectors.

The Tea Board and the project team gratefully acknowledge its association with UPASI, the Bought Leaf Association and the leading tea factories in south India for the acclaim received at the meet. The project team is initiating a detailed documentation of project processes to share its experiences with a larger audience.

A REPORT ON THE DELIBERATIONS OF THE TECHNICAL ADVISORY COMMITTEE OF THE PROJECT

The technical advisory committee (TAC) of the project consisting of representatives of Tea Board, project, industry, academic institutions and UNDP met on August 28, 2011 at the Committee Room of PSG College of Technology, Coimbatore. The committee discussed several technical, and techno-economic issues concerning energy conservation in tea factories.

One of the forthcoming recommendations of the project was in the area of green tea panning. Conventionally the panning of tea leaves for green tea preparation is done on an open fire ignited below the rotating drum. The project had recommended a shift to a biomass gasifier. The TAC reviewed the progress in the installation and commissioning of the gasifier and requested for data from the installation once the gasifier was commissioned.

The TAC gave a serious thought to whether it should recommend adoption of combined heat and power gasifiers. The technology had the potential to generate both electricity and heat within a range of options. The proportion of heat and electricity could be altered to meet the entire energy needs of a tea factory. The TAC considered that although the technology was proven in other sectors, there would still be risks in a tea factory context. The investment required would be high (about Rs 1.5 crores as a first estimate), the factory would have to make arrangements for power generation from firewood instead of grid electricity, the operators would have to be trained and outside expertise for operation and maintenance would be required for the initial period. But the techno economics would be very good especially when the estate adopts energy plantations and the factory could benefit from a green branding. The TAC recommended that the project approaches the Ministry of New and Renewable Energy (MNRE) for a research grant to understand all the issues, collect data and operationalize a combined heat and power gasifier.

The TAC reached a similar conclusion and recommended identifying a research grant for exploring ultra clean gasifiers in the tea sector. In this technology, the wood is converted into producer gas which is then cleaned to such a level that it is good enough for direct firing in the same way as CNG is directly fired in tea factories in Northeast.

The TAC discussed the constraints to adoption of hydro power in tea factories. In the south Indian context of small non perennial streams, the TAC felt that there was not adequate information for estates to take a decision. The location of the stream, its head and flow rate, the distance from the power house to the factory or a labour colony all needed to be understood. The TAC recommended that a ready reckoner be developed on small hydro as a decision making tool for tea factories.

As the Encontea project is in its final stages of implementation, the TAC discussed ways to capture the knowledge and experiences of the project and make it available to all stakeholders in an easily understood form. The templates for the preparation of a 100 audit report and case studies of model tea factories were presented.

Finally the TAC discussed the project spin offs, especially the creation of several student projects in the area of energy for tea processing building on the knowledge created by the project. The PSG college of technology and Anna University both with distinguished departments on energy studies could be motivated to work on newer issues arising with increasing adoption of energy conservation technology.

ARTICLE

REPORT ON UPASI ENERGY SERVICE FACILITY FROM APRIL TO SEPTEMBER 30, 2011

The UPASI energy lab is now fully operational. In the last six months it has tested 72 fuel samples of coal, wood and briquettes. The tables below give a brief report of the data from the facility.

Total number of samples analysed monthwise

Month	No. of factories / traders	No. of samples				
		Wood	Coal	Briquette	Made Tea	Total
April	1	2	-	-	-	**2**
May	3	1	3	3	-	**7**
June	-	-	-	-	-	**0**
July	9	12	7	-	2	**21**
August	5	19	-	-	-	**19**
Sept	9	20	1	2	-	**23**
Total	**27**	**54**	**11**	**5**	**2**	**72**

Regionwise, sampleswise details

Region	Total number of samples analyzed				
	Wood	Coal	Briquette	Made Tea	Total
Coonoor	6	2	3	-	**11**
Kotagiri	9	8	1	-	**18**
Kundah	16	-	-	-	**16**
Ooty	9	1	-	2	**12**
Gudalur	10	-	-	-	**10**
Coimbatore	2	-	1	-	**3**
Tirupur	2	-	-	-	**2**
Total	**54**	**11**	**5**	**2**	**72**

Parameter range in samples analyzed

Type of samples	Calorific Value (kcal/kg)		Moisture %		Ash content %	
	Range					
	Lowest	Highest	Lowest	Highest	Lowest	Highest
Coal	3128	4772	15.85	41.95	2.17	62.30
Briquette	3816	4099	-	-	8.90	-
Made Tea	-	-	12.95	13.00	-	-
Wood						
Coonoor	2633	4313	17.83	55.81	0.82	2.27
Kotagiri	2089	4087	11.03	47.39	1.27	3.62
Kundah	2352	4084	20.08	45.82	0.96	6.63
Ooty	2121	4314	12.50	52.88	0.75	2.74
Gudalur	2131	3847	27.06	55.29	2.14	5.58
Coimbatore	3567	3580	16.53	18.23	-	-
Tirupur	3307	3600	35.18	19.34	2.02	3.26

ANNOUNCEMENT

OUR DUE APPRECIATION

The Encontea project staff would like to thank each one who offered time to shoot with us for the video tutorials. The video tutorials contain information on all the energy conservation equipment recommended by the energy audits and promoted by the project team. We are considering dubbing them into different regional languages. We shall provide a copy of the film to every tea factory in India after its official release. Our special thanks to our industry partners:

No.	Name	Company	Designation
1	K Dhananjayan	Nankemp	Partner
2	S R Shilajit	Dunsandle	Manager
3	D. Hegde	Chamraj Group	Director
4	G. Ramamoorthy	UPASI	Scientist
5	N.K. Krishnamoorthy	Dodabetta Tea Factory	Managing Partner
6	K Rajmohan	Glenworth Estate	Gen. Mngr
7	C. Shreedharan	Woodbriar Group	Director
8	M. Surendra Mohan	Havukal Tea Compony	C.O.O.
9	P. S. King	Chulika Estate	Senior Manager
10	K Kandhavadivel	Highfield	M. D.
11	A. Arunachalam	Kaikatty Indco Tea Factory	Special Officer
12	Sunil Goyal	Akshaya	Managing Partner
13	R. Muralikrishnan	Concept 4E	CMO
14	V Benjamin Bino	Highfield	Manager
15	B. K. Mani	Highfield	Tea Maker
16	K. Selvam	Highfield	Furnace Operator

HOT WATER GENERATOR COMMISSIONED AT SUSHIL SHIV TEA FACTORY

The hot water generator has been commissioned in Sushilshiv Tea Factory the bought leaf factory located on the Kotagiri - Ooty highway in September 2011. It is the third bought leaf tea factory to install the hot water generator. The Havukal and Rosedounmulay bought leaf tea factories had earlier adopted the hot water generator. Purchase decisions for high cost equipment are difficult in the bought leaf sector.

Figure 1 Photo taken during the commissioning of the hot water generator at Sushil Shiv tea factory.

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