

Using non imaging concentrator for boiler feed water preheating

*ITC factory,
Bangalore*



pwc

ITC was incorporated on 24 August, 1910 as the Imperial Tobacco Company of India Limited. As the company's ownership increasingly Indianised, the name of the company was changed to India Tobacco Company Limited in 1970 and then to I.T.C. Limited in 1974. The brand got rechristened as ITC Limited on 18 September 2001. The company began in Kolkata and for the first six decades, it primarily focussed on cigarettes and leaf tobacco businesses. The establishment under study here is part of the tobacco division of ITC and is located in Meenakunte Village, Jallahobli, Bengaluru (North). It is one of the four production factories of the tobacco division and had started production in 1999. The production capacity of the factory is 170 million cigarettes a day and it produces around 27 domestic brands and around 57 export brands. This facility has been awarded numerous awards for excellence for their state-of-the-art environment-friendly production facilities.

Technology

The ITC factory has a non imaging collector based system installed. It comprises 200 modules of the SolPac NI30, the non imaging concentrator from Thermax. Each of the 3.4 m² collector area is connected in a series and parallel combination. These non-imaging concentrators installed in an open porch near the utility area of the factory are used for boiler feed water pre heating to 95°C. The total aperture area for these collectors is 680 m². SolPac NI30, caters to industrial as well as commercial applications. Unlike flat plate collectors and evacuated tube collectors which can only deliver temperatures up to 60 °C, SolPac NI30 can deliver temperatures up to 120°C. This product deploys secondary reflectors to ensure that maximum solar radiation is captured across seasonal variations. The critical advantage for these collectors is that they also work in diffused radiation unlike all other classes of concentrator systems. Each module of a Solpac NI30 system has a collector area of 3.4 m² and the shade free area requirement of 4.5 m². It weighs 54 kg and a single module has an output capacity of 0.9 to 1.1 kW_{th}.



SolPac™ NI30 parameters(single non imaging concentrator)	
Heat delivery	7600 Kcal/day
Total aperture area	3.4 m ²
Total shade free area	4.5 m ²
Total weight	54 kgs
Tracking	None

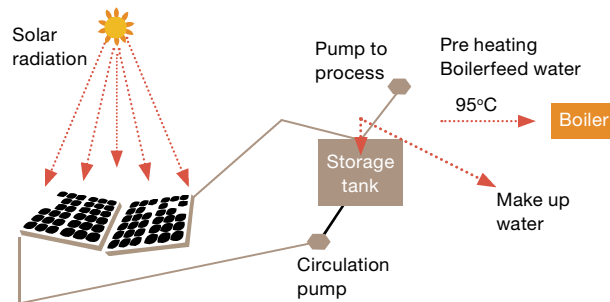
System Details	
No of non imaging concentrators	200
Total aperture area	3.4*200 = 680 m ²
Total shade free area	4.5*200 = 900 m ²
Total weight	54 kgs*200 = 10,800 kgs
Name of manufacturer	Thermax Ltd

Application

Two hundred non imaging concentrators have been installed at the site. The principle application is to preheat boiler feed water to about 95°C. The system provides 3500 litres of hot water per hour for seven hours daily. The water that is preheated in these concentrators is sent to the boiler where it generates process steam to be used for the conditioning of tobacco. Tobacco is subjected to the conditioning process to ensure that it is sufficiently pliable to endure subsequent processes. Various types of tobacco (domestic, off-shore, and reconstituted) are sent through the conditioning cylinders, where steam is added to loosen and moisten it. In some circumstances, additional materials may be added at this stage for flavouring. If flavouring (casing) is added at this point, the tobacco is subjected to a subsequent flash drying operation to ensure that the casing has been absorbed by it. Overdrying is avoided. The conditioned tobacco is then sent to the storage silos, where the blending occurs.



Layout of the plant



Why solar technology

ITC's ultimate goal is to serve society. According to them, the contribution of any business establishment can be measured by the value that they create for society, beyond the profit-and-loss statements ITC, today, is the only company in the world to be 'carbon positive', 'water positive' and 'solid waste recycling positive'.

ITC has always been keen on renewable energy as a source of electricity for their production facilities and has also installed wind based power plants. The management wanted to use renewable energy for their thermal energy requirements as well because the GHG emissions that were resulting from it were not in line with their policy of being 'carbon positive'. The most critical factor being that ITC had been incurring huge costs on furnace oil before the installation of solar concentrator systems. After an analysis of their existing infrastructure, the management realised that the solar concentrator based system would help them save on around 45,000 litres of furnace oil annually. Given current rates, that would directly translate to 2.5 lakh INR every month. Since steam is a specific requirement for the tobacco industry, the management wanted a solution that would cause minimal interference with their existing process as well as help them save on fuel costs. All these factors led them to choose non imaging concentrators for their boiler feed water application.

Fuel savings and project economics

It is essential for industries that project economics is within the acceptable range to take favourable decisions for its implementation. To support industries and to promote solar thermal power, the Ministry of New and Renewable Energy (MNRE) provides a subsidy for the CST based installations based on benchmark costs or 30% of the project costs, whichever is lower.

The parabolic trough collector based system at SKF has been installed by Thermax Ltd. Total project cost is about 140,00,000 INR. This includes the balance of system cost such as piping, civil works, etc. These costs vary and are specific to every installation. Since this is a NICC based system the subsidy based on benchmark costs is at 3600 INR per square metre. The total subsidy applicable for the system based on the MNRE benchmarks for 680 m² is 24,48,000 INR. Thus the overall project cost minus the subsidy available from MNRE is 1,15,52,000 INR. The financial analysis also accounted for; an additional accelerated depreciation benefit of 80% of the project cost is also available for the unit owner. This accelerated depreciation is available under the IT Act and can be availed on 80% of the cost incurred on solar concentrators. This benefit can be availed to reduce the tax outgo during the first year of expenditure. The assumptions for the financial feasibility for the project site are as follows:

Cost of fuel replaced (Furnace oil)	55 INR per litre (bulk purchase cost)
Annual escalation in fuel price	5 %
Debt: Equity for beneficiary's contribution	70:30
Cost of equity	16 %
Operations and maintenance (O&M) as a percentage of the project cost	1%
Inflation in O&M	1 %
Deration	1 %
Days of operation	275

The results of the financial feasibility analysis that are as follows:

WACC	13.41%
Project IRR	27.95%
Equity IRR	55.71%
Payback	3.7 years
Fuel savings (furnace oil)	45000 litres per annum (approximately)

Thus the project results in a payback of 3.7 years and ITC shall have recovered the entire investment made in terms of project expenditure from the savings made in furnace oil purchase costs. The annual savings resulting from the system shall be about 23 lakh INR. Additionally, they shall also be contributing to environment conservation by reducing the GHG emissions that would have otherwise resulted from the usage of fossil fuels for energy generation. Thus it provides for compelling evidence for other industries to adopt CST based systems for meeting their process needs.

Beneficiary's perception

The consumer speaks

“The solar non imaging collector system has been effectively working as per our needs. Initially, though we were a bit sceptical about its performance, since it has been installed we have been getting a consistent supply of hot water as promised. “

- Senior Engineer, ITC Limited

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Data Classification: DC0

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NJ 85- September 2013 Concentrating Solar Technologies.indd
Designed by: PwC Brand and Communications, India