Technical Paper on **Building sector (Issue # 30)** submitted by

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1. Profile

	1. Power Plant Name 2. Location 3. State/UT 4. Power Plant Capacity	Reliance Energy Dahanu thermal Power Station Dahanu Maharashtra 500 MW
A.	Photograph	
B.	Personal Details: 1. Name : 2. Regd. No. (EM/EA)/ Year of passing: 3. Designation: 4. Qualifications: 5. Email Address: 6. Complete postal address 7. Fax No:	Santosh Mahadeo Mestry EM/EA- 4760 Year:2006 Sr. Manager MBA(Finance), BE(Instrumentation) Smmestrry74@yahoo.com C-8/5, Staff qtrs, REL colony, Dahanu Road Thane, Maharashtra-401608 +912528222576
C.	Total experience in years Energy Management related experience details	10 years 5 years
D.	Area of Specialization	Six Sigma project, Energy audit. ENCON proposal
E.	Major Achievements	Implemented various ENCON projects
F.	Details of Energy Management Projects undertaken, if any	VFD installation in CEP, PA fan. Use of turbo ventilators, Coal Optimizer software. Reduction in Unburnt carbon in ash.

2. Introduction:-

Govt. of India set a target of power for all by 2012. National electricity policy is formulated to provide electricity to every home. GOI has already initiated rapid accelerated power development program to meet the target. However in spite of capacity addition, our nation can face peaking shortage of 12.7 % & energy shortage of 5.6%. To nullify demand & supply gap, GOI has formulated policies & act, national electricity policy, EC act 2001, Electricity act 2003.etc. India is developing country & hence energy demand is rising day by day due to factor like urbanization, change in lifestyle & consumption pattern. Bridging supply & demand gap is difficult since generation is not increasing in same ratio as demand increases. As power generating plant is capital intensive & need long gestation period for construction & modification, only solution remain is to reduce energy intensity & to increase energy productivity by means of energy conservation & energy efficiency.

To provide power for all (reliable & quality power) bureau of energy efficiency launches various step like launching of Energy Conservation Building Bode (ECBC), standard & labeling program, awards to increase awareness for EE & conservation. Due to rapid growth of population & urbanization, construction sector is booming sector today. Efforts are necessary to construct green building which not only take care of energy conservation but also look into water & waste management, environmental impact, minimum destruction of natural resources & various other aspects in integrated way.

3. Suggestions:-

Following are the steps & efforts required for green Building.

1. Urgent need for education and training to address the problem of climate change & environmental degradation.

2. Brainstorming is required in building sector for new technology adoption, engineering, planning, finance & incentives. Breakthrough energy productivity only comes through integrating energy efficiency, new technology, energy distribution and changed energy sourcing.

3. Reducing carbon footprint by adopting **renewable energy resources**. Wind, solar, hydro power is more beneficial than nuclear, oil or coal based electricity generation in terms of carbon reduction.

For example use of solar water heaters, solar lantern in home, solar street light, solar air conditioning system, solar cooker, wind turbine or hybrid turbine in building sector.

Solar Street Light

Solar Lantern

Wind Turbine

Solar Heater

4. Providing more efficient appliances (**BEE rated star** labeled) in home.

5. Instead of conventional bricks, **autoclave aerated concrete block** made up of fly ash can be used which have better quality & better fire resistance property. Also switchover to latest concrete technology. For example **Build Fast** product from Citadel company which save labor cost & steel cost.

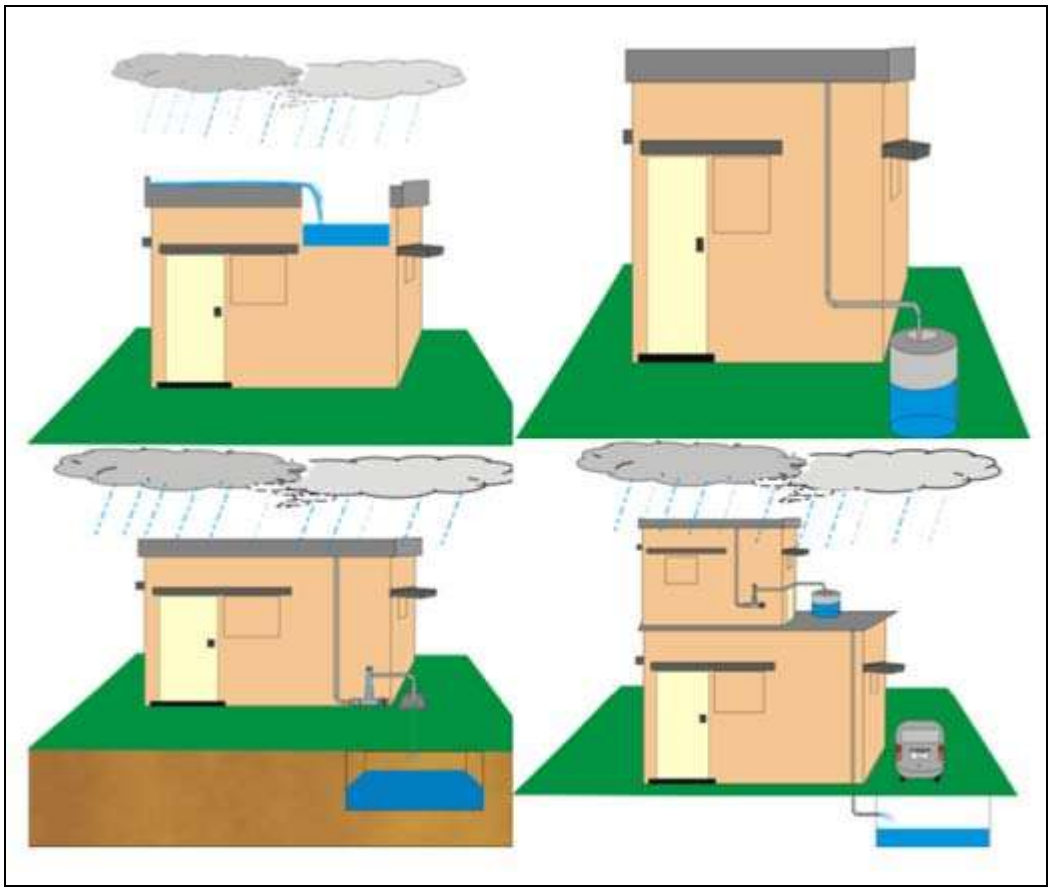
6. More **Energy saving potential observed in HVAC** system & lighting. Use of VAM, more efficient correct size pump & installing modern HVAC system performance monitoring software system. In case of lighting, LED based lighting is most efficient. Use of T8 fluorescent tube light is always beneficial than conventional TFL.

7. Use of **3 R (Reduce, Recycle, Reuse) Approach.** – Urban waste management become challenging due to more use of plastics, Inadequate land for dumping & landfill, Improper segregation of waste, & lack of experience in waste management.

   Use of latest technology like use of algal to treat waste water & recycle the same to minimize water scarcity & water pollution problem.
   Installation of biogas plant to handle kitchen waste is best option today. Now days latest technology like Nisargaruna from BARC, biogas model developed by ARTI (Appropriate rural technology institute- Pune) are available. Photograph shown below is portable unit developed by ARKA technology Pune. & can be used for flat system too,

Portable Biogas Unit

8. Use of **rain water harvesting** to minimize burden on water supply authority.



9. To minimize **vehicular pollution** use of battery operated vehicle is best option.

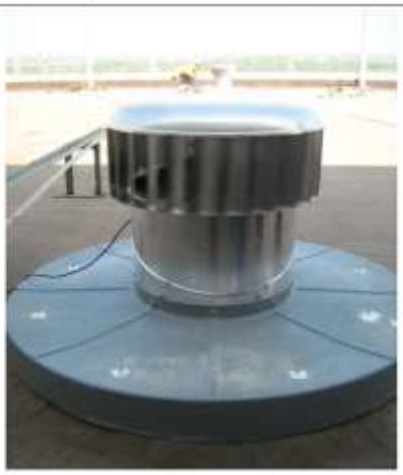
10. **Use of polybutene-1(PB-1) piping material** in HVAC system which maximize energy efficiency due to its no characteristics like flexibility, good creep resistance & minimum environmental impact while manufacturing.

11. **Regular energy audit & planning: -** Regular comprehensive energy audit of building to identify, quantify and prioritize improvement opportunities is must. This can be useful in the development of energy policies such as design guidelines for new construction and new equipment, or for establishing preventive and predictive maintenance practices that address gaps the energy audit identified.

4. Case Study:-

4.1 Installation of turbo wind ventilators:-

By considering the today's scenario of conservation of energy, DTPS have installed and commissioned the TG roof Wind Ventilators, the analysis of effectiveness of Hybrid type Wind ventilators (eCO600) carried out, and found out the benefits of this new technology against existing electrical exhauster.

Old-Electric Exhauster	New- Hybrid Wind Ventilator(eCO600)
	

Payback Period:- 9 Months

Benefits:-

1. 97% saving in electricity consumption.

2. Noise free operation

5. Easy to install and handle.

6. Hybrid operation i.e. with and without power.

8. Lesser cost in comparison with electric operated TG roof ventilators.

11. Eco-friendly.

4.2 Installation of VAPOUR ABSORPTION MACHINE (VAM):-

The vapour absorption machines are becoming popular. Conventional vapour compression machines use secondary energy in the form of electricity which is normally costly and these machines use CFC based refrigerant which may cause environmental pollutions like warming up or ozone depletion. On account of power shortage and with increasing availability of natural gas the vapour absorption machines are becoming popular and attractive. The absorption system uses **Lithium bromide as absorbent and water as Refrigerant**. These machines have no moving parts and are thus noiseless and vibrationless.The maintenance costs are negligible as compared to vapor compression machines.

COST BENEFIT ANALYSIS FOR VAPOUR ABSORPTION MACHINE

STEAM FIRED VAM			RECIPROCATING CHILLERS		
OPERATIONAL COST ANALYSIS			**OPERATIONAL COST ANALYSIS**		
CAPACITY	500	TR	CAPACITY	500	TR
TYPE OF ENERGY	STEAM		TYPE OF ENERGY	ELECTRICITY	
SPECIFIC STEAM CONSUMPTION	4	Kg/hr-TR	SPECIFIC ELECT CONSUMPTION	0.9	KW/TR
TOTAL STEAM/ HR	2000	Kg/ hr	TOTAL ELECT/ DAY	450	KW
DAILY OPERATION	22	HRS	DAILY OPERATION	22	HRS
TOTAL STEAM CONSUMPTION PER DAY	44000	Kg	TOTAL ELECRTICITY CONSUMPTION PER DAY	9900	KWH
COST OF STEAM	0.35	Rs/Kg	COST OF ENERGY	3.5	Rs/KW
TOTAL COST OF ENERGY/ DAY	15400	Rs.	TOTAL COST OF ENERGY/ DAY	34650	Rs.
POWER REQD. FOR M/C PER DAY	127	KW			
COST OF POWER	3.5	Rs/KW			
COST OF POWER REQD. FOR M/C	444	Rs			
TOTALOPERATING COST PER DAY	15844	Rs	TOTALOPERATING COST PER DAY	34650	Rs.
TOTAL COST OF OPERATION PER YEAR	**5782885**	Rs.	TOTAL COST OF OPERATION PER YEAR	**12647250**	Rs.
MAIINTAINANCE COST	25000	Rs.	MAIINTAINANCE COST	50000	Rs.
TOTAL OPEATIONAL COST	**5807885**	Rs.	TOTAL OPEATIONAL COST	**12697250**	Rs.
ANNUAL SAVINGS	**6889365**	Rs.			

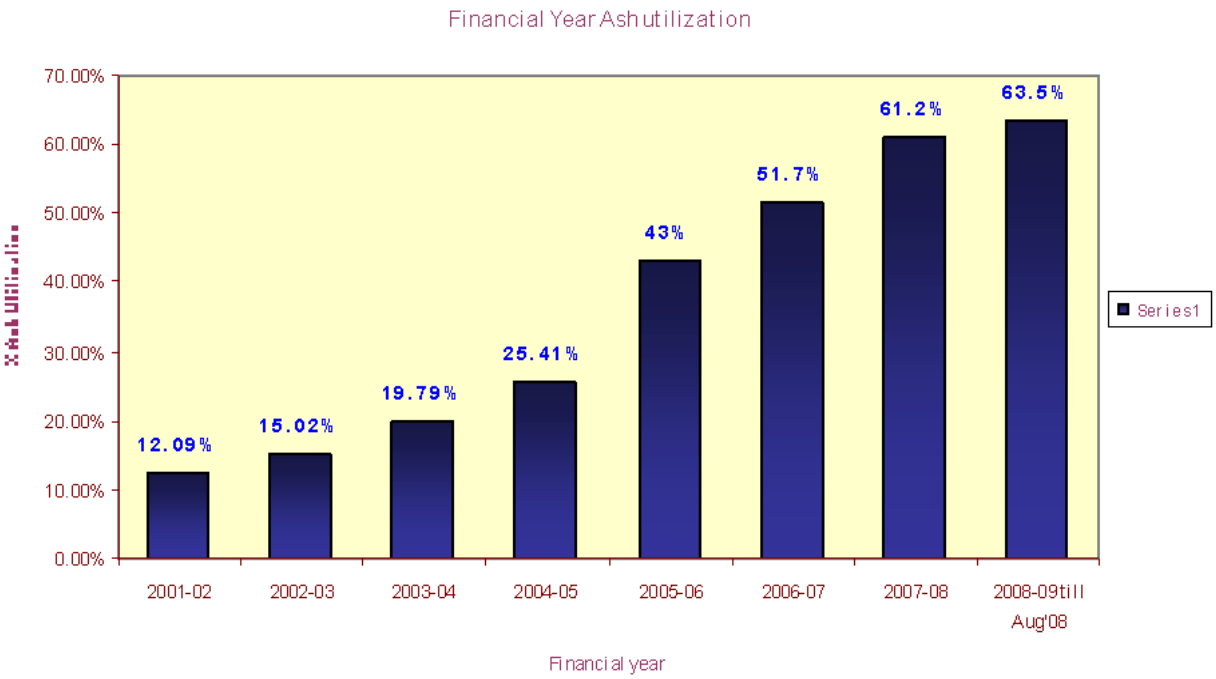
4.3 Fly Ash Utilization:-

Earlier coal ash was considered as *waste*. Hence ash was evacuated from Bottom ash hoppers, Economiser hoppers, APH hoppers, duct hoppers, ESP hoppers by means of hydro ejector and ash slurry was pumped to ash dyke nearly 1.5-2.5 Kms away from plant. Further various uses of ash were revealed like bricks manufacturing, ready mix concrete, sheets manufacturing, cement mixing due to inherent bonding properties. Consequently ash was considered as *by-product* of a coal based thermal power utility and a need of dry ash collection arose. As per GOI notification for 100% ash utilization. DTPS installed & commissioned state of art dry ash evacuation plant well before the time schedule

Presently fly ash is used in manufacturing Portland pozzolana cement (FAPPC), building materials such as clay-fly ash bricks, fly ash lime/cement bricks, light weight aggregates, aerated concrete blocks, ready mix concrete and mortar, paving materials, roofing tiles etc. Bottom ash and pond ash on the other hand are good fill material. They are relatively lighter and well-compacted ash exhibit good shear strength comparable to normal soils. It can be used in construction of road embankment, back fills, low lying area development & back filing of mines.

DTPS has also set up fly ash brick manufacturing plant

Graph below is showing year wise fly ash utilization at DTPS.



5. Challenges & Barriers:-

1. To maintain balance between economic growth & sustainability is difficult.

2. Since latest green technology are expansive one, one of challenge is to provide maximum benefit at minimum cost. Also cost effectiveness of technology need improvement.

3. Waste management

4. Regulatory uncertainty

5. Absence of Financial incentives for builders

6. Conclusion:-

Instead of only creating concrete jungle, builders need to develop environmentally conscious model which include solar power, solar heating, wind mill, rainwater harvesting & vermin composting. Global warming & environmental degradation are major threats to our mother earth. To fight climate change problem builders must follows green practices which help to reduce pollution level. Everybody must take green path of sustainable development through implementation of green technology. Green is color of growth & India is developing country. Challenge ahead is to maintain balance between growth & sustainability. One of solution is call for strict enforcement & compliance of building code & integrated management policy.

In spite of problems & barrier discuss above, climate change represents an enormous opportunity for businesses for builders. By providing green building with the help of green efficient technologies, they can provide satisfaction to eco coconscious consumers. One can have competitive edge by gaining brand value.

Manufacturing & construction process should think of minimum material use, selection of better material (e.g. PB-1), product lifecycle approach, product design for ease of disassembly which will minimize the demand of natural resources & hence environmental impact.

Power for all every household by 2012 is only possible through Energy conservation & constructing green buildings which have following lasting **benefits**:-

1. Reduce impact on environment, reduce climate change
2. Use of clean technology
3. Minimum Use of natural resources
4. Minimum waste
5. Minimum pollution