Annexure 'A' to Directors' Report

Section 217(1)(e) of the Companies Act, 1956, read with the Companies (Disclosure of Particulars in the Report of Board of Directors) Rules, 1988.

Sustainability is at the core of ACC's business philosophy and has become a part of its DNA. In this direction, as a part of manufacturing excellence, ACC implements many initiatives in the areas of Energy and Environment. Few initiatives in these areas are as given below:

A: CONSERVATION OF ENERGY

(a) Energy conservation and efficiency measures were undertaken in various areas of the cement plants:

- Thondebhavi Plant commissioned Medium Voltage (6.6 KV) Variable Speed Drives for Bag House Fan & Low Voltage Variable Speed Drives for Compressors and Bag Filter Fans.
- Madukkarai Plant commissioned Medium Voltage (6.6 KV) Variable Speed Drive for Kiln Exhaust fan; commissioned Low Voltage Variable Speed Drives for forced draft fans of cooler, and vacuum pumps; replaced impeller of cooler fan 3 & 4 with energy efficient impellers, replaced compressor with PD blower for Side Line Calciner firing.
- Jamul Plant commissioned Low Voltage Variable Speed Drives for Raw Mill 2 Dust Collector Fan, Coal Mill 1 & 2 Circulating Fan, Coal Mill 2 Dust Collector Fan, Cement Mill 7 & 8 Dust Collector Fan.
- Lakheri Plant commissioned Medium Voltage (6.6 KV) Variable Speed Drives for the Calciner Fan and E-Mill Fan; commissioned Low Voltage Variable Speed Drives for Cooler Fans, Cement Mill Compressors, Process Dust Collector Fans in plant and Primary Air Fans, Auxiliary Cooling Water Pump in Captive Power Plant; Reduced cooler exhaust gas flow from 1.2 to 1.0 Nm3/kg Clinker by attending cooler plate to plate gaps, inter & under compartment sealing & Use of Pneumatic Double flap gates for arresting false air from cooler. This helped to reduce cooler exhaust gas temprature from 240 deg C to 220 deg C, which resulted in better heat recuperation in cooler;
- Bargarh plant commissioned Low Voltage Variable Speed Drives for clinker cooler Forced Draft fans and 2 Nos Primary & Secondary Air Fans for CPP.
- Chanda Plant commissioned Medium Voltage (3.3 KV) drives for Cement Mill 1 & 2 Separator Fans; commissioned Low Voltage Variable Speed Drives for Compressors & Installation of VFD for Belt Conveyors:
- Kymore Plant replaced Kiln 1 bag house fan Impeller with energy efficient impeller and modified ducting from bag house outlet to fan inlet to reduce fan consumption. Medium voltage (6.6 KV) variable speed drive has been installed which will be commissioned during next stoppage; 3.3 KV motors were converted to 415 V along with Low Voltage Variable Speed Drives for Separator Fans of Cement Mills 1 & 8. Low Voltage Variable Speed Drives were also commissioned for vent fans of Cement Mills 1, 8 & 9; Kiln 1 Clinker Cooler was modified from Controlled Flow Grate (CFG) to Reduced Fall Through (RFT) to improve Cooler Heat Recuperation.
- Gagal Plant retrofitted existing GRR controls by installing Medium Voltage (6.6KV) Variable Speed Drives for Pre-heater Fan, VRM Fan, Bag House Fan and Separator Fans for Gagal 2; Replaced VRM Fan, Kiln String Fan, Cooler Forced Cooling Fan, Separator Fans for Cement Mills 1,2 & 3 with energy efficient fans; Commissioned Low Voltage variable speed drives for separator fans of Cement Mill 3,4 & 5. bag house fan for Cement Mill 3 & 4; dust collector cleaning operation converted from timer based to Differential Pressure based cleaning to avoid excessive cleaning and optimising compressed air consumption. It also commissioned the 8.0 MW Waste Heat Recovery Power Generator during the year. It is expected to generate 7.2 MW (Net) at full load.

- Wadi Plant improved Raw Mill #2 Production Rate Index (PRI) from 515 to 540 by Installation of FOL (force oil lubrication system) system for Main Motor bearing cooling, increasing the roller lifting height from 200 mm to 250mm, stage wise reduction of dam ring from 85 mm to 65 mm WG and partial blocking of nozzle ring for desired velocity profile; high Vibration Level in separator of Raw mill was corrected by Increasing the clearance between feed chute & Separator rotor from 5 mm to 75 – 80mm; Low Voltage Variable Speed Drive was installed for Lime Stone Stacker bogie drives and modified logic of stacker for running in auto mode fully whereby plant is able to maintain the homogenous limestone pile; Variable Speed Drives were installed for Raw Mill Vent Fan 1,2,&3, Cement Mill Vent Fans and 4 Nos Primary Air Fans.
- Tikaria Plant commissioned VFD for Coal Handling Bag Filter Fan; Modified water circulation line of Pregrinder (PG) circuit to stop the complete cooling tower along with circulation pump of PG circuit.
- Chaibasa Plant commissioned Medium Voltage (6.6KV) variable speed drive for Bag House fan, it commissioned variable speed drive for reverse air fan and revived PID Loop control of RA fan speed with respect to Bag house Differential Pressure; commissioned Medium Voltage (6.6KV) variable speed drive for Coal Mill Fan; Reduced Raw Mill Fan Power by changing of fan impeller and also individual cyclone study and modification; Improved the reliability of cement mill separator and Elevator by seperator Cone replacement, Gear box base plate replacement & Elevator modification to increase mill output.
- Sindri Plant converted the 3.3 KV motors to 690 V and commissioned Low Voltage Variable Speed Drives for VRM ID Fan
- Kudithini Plant commissioned Low Voltage Variable Speed Drives for Packing plant Bag Filter Fans, Compressor and Water pump. Replaced Reciprocating compressor (150 kW) with PD blower (55 kW) along with VVFD for fine coal conveying to Hot Air Generator; stopped operation of two compressors of 90 KW by integrating compressed air line with main compressor (132 KW)
- Vizag Plant installed 24W Solar Lights to replace 250W MV street lights; installed 45 KVA Lighting Transformer for optimisation of lighting voltage.
- A detailed Energy Audit was conducted at Tikaria, Madukkarai, Thondebhavi, Bargarh and Chanda plants, and detailed compressed air audit was conducted at Kudithini plant.
- Energy Monitoring System was commissioned at Sindri & Tikaria
- Capacitor banks have been added to the system across ACC plants to improve plant power factor and also to reduce harmonics.
- Replacement of conventional lamps with Compact Fluorescent Lamps & LED light for plant and colony lighting was done across ACC plants.
- ISO 50001 certification audit was conducted for Thondebhavi, Kudithini and Wadi Plants.
- Thondebhavi Plant was awarded Certificate of Merit by BEE as part of National Energy Conservation Award's 2013; Jamul, Lakheri Kymore and Thondebhavi Plants were awarded by Confederation of Indian Industries; Jamul and Gagal Plants were felicitated by National Council for Cement & Building Materials.

Green power –

- ACC Renewable Energy Portfolio consists of 19 MW in the form of Wind Farms across 3 states viz. 9 MW in the state of Tamil Nadu, 7.5 MW in the state of Rajasthan and 2.5 MW in the state of Maharashtra. Cumulatively, we have generated 32.53 Million Units of green power. (Rajasthan - 11.02 Million Units, Tamil Nadu - 18.12 Million Units, Maharashtra - 3.39 Million Units).
- These units helped ACC to meet the Renewable Purchase Obligation (Non-Solar) for Madukkarai Plant

(TN) & Lakheri Plant (Rajasthan) fully. In Maharashtra, we were issued Renewable Energy Certificates (RECs) besides meeting the Thane complex power needs and also part requirement of BCCI Kalamboli.

- The Renewable Power Obligation (Non-Solar) of other plants (Wadi in Karnataka, Kymore in Madhya Pradesh, Bargarh in Orissa, Tikaria in Uttar Pradesh, Jamul in Chhatisgarh were met by purchasing Renewable Energy Certificates.
- We are in advanced talks to consume Green Power in Karnataka state (Kudithini and Thondebhavi plants), to meet our Non-Solar RPO for Wadi plants. Likewise, we are pursuing Power Purchase Agreement (Green Power) for other states, besides exploring options of setting up Wind Farms.

(b) Additional Proposals being implemented to further the drive for energy conservation

- Installation of Medium Voltage and Low Voltage Variable Speed Drives.
- Replacement of existing fans with high efficiency fans
- Replacement of pumps with high efficiency pumps
- Replacement of multiple compressors with single compressors
- Replacement of Motors with high efficiency motors
- Improve Air Conditioning and Lighting loads
- Install additional capacitors to improve power factor
- Process optimisation

This will ensure further saving in electrical energy during 2014, as well as achieve better process controls.

(c) Impact of the above measures for reduction of energy consumption and consequent impact on cost of production -

The measures stated in points (a) and (b) above would further improve the thermal and electrical energy efficiency of the Plants. During the year 2013, the electrical energy reduced by 3.55% and thermal energy reduced by 0.33 %.

Environmental Performance:

CO_2 Performance:

- ACC's overall Specific CO_2 emissions excluding emissions from CPP are 538 Kg CO_2 / T of Cement.
- ACC's Specific CO_2 emissions for Portland Pozzolona Cement: 529 Kg CO_2 /T of Cement.
- ACC's Specific CO_2 emissions for Portland Slag Cement: 368 Kg CO_2 /T of Cement.

This performance is better than the country's average CO_2 performance of 2010 - 719 Kg CO_2/T of Cement as indicated in Low Carbon Technology Roadmap 2050 developed by CSI-WBCSD.

Clean Development Mechanism (CDM):

Blended Cement Project: Realized 72714 CERS in 2013. Also submitted verification reports to UNFCCC recommending for issuance of 846313 carbon credits

9 MW Wind project in Tamil Nadu: Realized 21745 CERs in 2013.

Kiln Stack Emissions & Fugitive Emissions:

ACC has implemented various initiatives/measures for improving the environmental performance of the plants. Our specific kiln dust emissions per tonne of cement has been decreased by ~18% when compared with last year. This reduction has been achieved through various measures like conversion of ESP's to Baghouse, changing the maintenance practices, by installing PTFE membrane glass fibre filter bags in place of ordinary filter bags etc. Across ACC, many initiatives have been undertaken to minimize fugitive as well as stack emissions. ACC is having one of the best stack emission performance in the country.

Water Intensity & Metering System:

A lot of initiatives have been undertaken in water management like installation of water meters, minimizing the leakages, modification of the process etc which has resulted in saving of freshwater consumption. Huge amount of rainwater has also been harvested in & around plant premises.

During the year 2013, ACC's specific water consumption / T of Cement is reduced by 2% in Cement manufacturing. ACC is implementing many initiatives to achieve the country's best specific water consumption of 80 ltrs/cement.

Water Positivity: We are implementing all possible measures like water harvesting in mines, colony, plant, implementing water metering system and water conservation measures to become water neutral at first and then aiming to become water positive.

Discharge of Effluents: We adhere to Zero discharge of our process waste water.

A Green belt has been developed in & around the plant premises. During the year 2013, we have planted about one lakh trees under our afforestation programme.

During the year 2013, we have installed Continuous Ambient Air Quality Monitoring Stations at 3 plants and started uploading the ambient air quality data of 3 plants on CPCB website continuously.

Sustainability Roadmap: The existing road map is for the period 2009-2013 and we are in the process of consolidating the inputs for roadmap for the period 2014-2017.

During 2013, the following awards have been received by ACC as a Corporate, towards its sustainability performance:

1. CII - ITC Sustainability Prize
2. "Eco - Corporate" Yes Bank - Saevus Natural Capital Award
3. Parivartan Sustainability Disclosure Leadership Award

Individual plants have been recognised by various environmental awards in various categories.

Form A

Power and Fuel Consumption – Cement

	Current Year			Previous Year		
	Lakh Units (Kwh)	Total Cost (₹ Lakhs)	₹ per Unit	Lakh units (Kwh)	Total Cost (₹ Lakhs)	₹ per Unit
Electricity (Gross)						
a) Purchased :	5407	31,678	5.86	6152	32,949	5.36
b) Own Generation :						
i) Through Diesel Generator	6	224	36.49	43	570	13.28
ii) Through Steam Turbine / Generator	17639	77,555	4.40	17876	76,829	4.30 **

	Quantity (Lakh Tonnes)	Total Cost (₹ Lakhs)	Average Rate (₹/Tonne)	Quantity (Lakh Tonnes)	Total Cost (₹ Lakhs)	Average Rate (₹/Tonne)
Coal (for kiln)*	22.75	13,2465	5822	23.29	1,32,094	5672

* Does not include other fuel / alternative fuels used in kiln.

** Excluding impact due to change in Depreciation method.

Waste Heat Recovery System commissioned in Nov-2013 and under stabilisation.

Consumption per unit of Production

	@ Standard	Current Year	Previous Year
a) Electricity Kwh/T of Cement * Semi-dry / Dry Process	98-110	81	84
b) Coal for kiln K.cal/Kg of clinker Semi-dry / Dry Process	720-990	733	736

@ Source : Publication of Confederation of Indian Industries

* Excludes non-process power consumption.

(B) TECHNOLOGY ABSORPTION

Research & Development

1. Specific areas in which R & D is carried out by the Company:

a) Improving quality of blended cement through innovative processing utilizing industrial by-products for improved quality performance of ACC Plants

b) Conservation of resources through maximization of use of low-grade limestone for cement manufacture

c) Development of application oriented Cements with decreased CO_2 emissions

d) Development of new products or discovering new methods of analysis

e) Productivity research for increased efficiency in use of resources

f) Recycling of wastes and research for efficient use of scarce materials

g) Characterization of Industrial wastes and looking into possibilities environmentally friendly of co-processing wastes in cement manufacture leading to thermal substitution and conservation of natural resources

h) Development and use of Cement Grinding aid and accelerators for PPC & PSC for improved performance in Concrete and reduced clinker factor in Blended Cements
i) Evolving optimum fuel Mix and Maximization of ashless fuels like Petcoke.
j) Development of Cements tailored for specific market clusters and application segments
k) Development of one of its kind cement in India for reducing water seepage
l) Development of cement based niche products
m) Quality benchmarking exercise for different market clusters of ACC products

2. Benefits derived as a result of above R & D:

a) Effective use of marginal quality raw materials and fuels with improved clinker quality
b) Increased absorption of blending materials like flyash and slag in blended cements
c) Effective replacement of the costlier natural gypsum by a cheaper by-product phospho-gypsum without affecting the quality of cement
d) Maintain a lead position in all the market clusters of the country
e) Launch of special high performance premium brands like F2R, Concrete Plus, Coastal Plus ACC Plus+, ACC Gold for specific Market segments / Market climatic conditions for improved Performance and Durability of Resultant Concrete
f) Reduction in Sp. Power consumption for grinding
g) Effective use of statistical Quality Control & Quality tools at each stage of Cement Manufacture for Process improvements leading to improvements in consistency of Operations and consistency in Quality of the Product
h) Fuel efficiency

3. Future plan of action:

a) Exploratory research works on the above specific areas
b) Focus on development of products aimed at enhancing use of cement in various applications and development of application oriented Cement based cementitious material
c) Use of waste / byproducts in cement manufacture as alternative materials
d) Improve product quality particularly with respect to long term durability and reduction in cost of manufacture

4. Expenditure on R & D:

		2013 ₹ Lakhs	2012 ₹ Lakhs
a.	Capital	106	172
b.	Recurring (Gross)	743	652
c.	Total	849	824
d.	Total R&D expenditure as percentage of total turnover (%)	0.07	0.07

5. Foreign Exchange Earnings & Outgo:

	2013 ₹ Lakhs	2012 ₹ Lakhs
Foreign exchange earned	78	-
Foreign exchange used	18,803	7,830