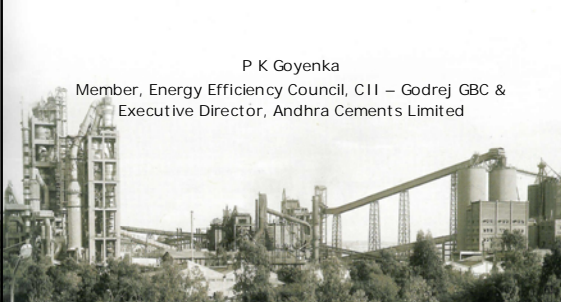


How to Make Indian Cement Plants Green



P K Goyenka
Member, Energy Efficiency Council, CII – Godrej GBC &
Executive Director, Andhra Cements Limited

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Indian Cement Industry - Today

- ✓ Installed capacity : 260 million tons as on 31 March 2010
- ✓ Strengths of Indian cement industry
 - Ø Fast growing with a growth rate of approx 10%
 - Ø Highly energy efficient compared to several other countries
 - Ø Increased production of blended cement
 - Ø Quicker adoption of latest technologies
- ✓ Areas to improve
 - Ø Use of alternative fuels
 - Ø Installation of waste heat recovery systems
 - Ø Implementation of high level automation systems

Ultimate goal is to achieve the status of Greenest among all sectors & Be the role model

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Energy Efficiency

- ✓ Cement manufacturing – highly energy intensive
 - Ø 35 – 45% of total manufacturing cost
- ✓ Energy cost – a major factor in pricing of cement
- ✓ Indian cement plants have taken several initiatives to reduce energy consumption
 - Ø Both electrical & thermal

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Reduction in Specific Energy Consumption

- ✓ Continuous reduction in SEC
- ✓ Specific electrical energy consumption
 - Ø 1994-1995 ~ 110 kWh/ton of cement
 - Ø 2002-2003 ~ 95 kWh/ton of cement
 - Ø 2008-2009 ~ 79 kWh/ton of cement
- ✓ Specific thermal energy consumption
 - Ø 1994-1995 > 800 kCal/kg of clinker
 - Ø 2002-2003 ~ 760 kCal/kg of clinker
 - Ø 2008-2009 ~ 726 kCal/kg of clinker

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Energy Consumption

- ✓ Some of the Indian plants are operating with world's best specific energy consumption values
 - Ø 59 – 60 kWh/ton of cement
 - Ø 665 kCal/kg clinker

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How Was This Achieved?

- ✓ No external/ government pressure
- ✓ Tremendous competition
- ✓ Combination of internal efforts, external assistance, suppliers etc. ,
- ✓ A few units have gone ahead
 - Ø "In search of excellence" in energy management
- ✓ Sharing of knowledge amongst various units
 - Ø Several Platforms for information sharing

Excellent example for other industries

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What should be the future target?

- ✓ Specific Power Consumption
 - Ø 56 to 62 kWh/ton of OPC
- ✓ Breakup (kWh/ton of OPC)
 - Ø Crushing - 1.50
 - Ø Raw mill - 12.00 to 18
 - Ø Kiln and Cooler - 18.00
 - Ø Coal mill - 2.50
 - Ø Cement mill - 18.00
 - Ø Packing - 1.00
 - Ø Miscellaneous - 3.50
 - Total - 56 to 62**

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What should be the future target?

- ✓ Specific Thermal Energy Consumption
 - Ø 650 kCal/kg of clinker
- ✓ Breakup (kCal/kg of clinker)
 - Ø Theoretical : 410
 - Ø Pre-heater loss : 105
 - Ø Cooler loss : 90
 - Ø Radiation loss : 75
 - Ø Heat input : (-) 30
 - Total : 650**

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What should we do to achieve this?

- ✓ Information sharing
- ✓ Benchmarking
- ✓ Continuous Improvement
- ✓ Adoption of latest technologies



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Overall System

- ✓ Streamlined layout
- ✓ All major fans - High Efficiency
- ✓ Mechanical conveying
 - Ø Raw Meal
 - Ø Kiln Feed &
 - Ø Cement transport
- ✓ Optimization of utilities
 - Ø Compressed air, water, pumping system, dust collection systems, etc

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System Selection

- ✓ System selection based on material characteristics
- ✓ For example, for low moisture hard limestone
 - Ø Roller press in finishing mode with dynamic separator much better compared with VRM grinding
 - Ø For high moisture limestone, latest VRMs very efficient



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Pre-heater section

- ✓ 6-stage preheater
 - Ø Governed by raw material drying considerations
- ✓ Installation of Low pressure drop cyclones
 - Ø 4 Stage – 310 to 360 mm
 - Ø 5 Stage – 350 to 400 mm
 - Ø 6 Stage – 450 mm
- ✓ High efficiency Preheater fan
- ✓ High efficiency coolers



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Coal Mills

- ✓ Installation of VRM with high efficiency separator
- ✓ Optimization of coal fineness for kiln and calciner firing
- ✓ Optimization of booster fan and coal mill vent fan



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Cement Mills

- ✓ Cement grinding – All options to be explored

- Ø Best configuration to be chosen

- q Pre-grinder (roller press or VRM) with ball mill (closed circuit)
- q VRM with high efficiency separator
- q Roller press with high efficiency separator in finish mode Auto particle size analyzers



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Cement Mills

- ✓ High level Automation & Expert control systems
 - Ø Avoid over-grinding
 - Ø Productivity & energy benefits
- ✓ Precise control of fineness – Blaine / Residue

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Adoption of latest technologies

- ✓ Advanced control systems with soft sensors
- ✓ All fans (including HT) with variable speed drives, preferably VFD's
- ✓ Integrated computerised quality control systems
 - Ø Mines planning
 - Ø Bulk analyser
 - Ø Raw mix design and blending

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Waste Heat Recovery

- ✓ Huge power generation potential available
 - Ø – 500 MW
- ✓ Various technologies available
 - Ø Conventional Rankine cycle
 - Ø Organic Rankine cycle
 - Ø Kalina cycle
- ✓ Availability of technology & recovery potential increasing
- ✓ Cost of technology coming down
- ✓ Each individual company needs to evaluate suitable mechanism to implement & reap the benefits



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Alternative Fuels

- ✓ Indian cement plants have started utilising alternative fuels
 - Ø Pet coke, biomass, etc.
- ✓ Still needs to explore other opportunities
 - Ø Utilising used tyres, paint sludge, municipal solid waste, etc.

Not only reduces energy cost but also cuts down CO2 emissions

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Employee Involvement

- ✓ Achieving real 'Green' depends on the involvement of employees at all levels
- ✓ This can be achieved through
 - Ø Training
 - Ø Suggestion schemes
 - Ø Employee motivation schemes, etc.

Inculcates the habit of energy conservation & Ultimately leads to the sustainable development

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Spent Mines – Reuse

- ✓ One of the areas cement plants needs to work – utilising spent mines
 - Ø Excellent opportunity for water conservation
 - Ø Green belt development



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Water Conservation

- ✓ Though cement industry is not water intensive, it can be a source of water harvesting

- Ø Can contribute significantly
 - q To meet internal water needs
 - q To benefit local community



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Renewable Energy

- ✓ Few cement plants have wind mills but not integrated with plant operation
- ✓ Majority of the Indian cement plants located at dry & hot areas
- ✓ Huge area available
- ✓ Excellent opportunity to utilise solar energy

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Applications of Renewable Energy

- ✓ Majority of cement plants have captive power plants
 - Ø Solar energy can be used for preheating boiler feed water
- ✓ Solar PV panels to meet the power requirement of CCR & admin buildings and remote lighting applications like mines
- ✓ Hot water requirement at guesthouse, colony, canteen, etc



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Logistics Management

- ✓ Logistics accounts for 25 – 35 % of variable cost
 - Ø Raw material transport
 - Ø Cement & clinker transport
- ✓ Cost of transportation – one of the key parameters of fixing price
- ✓ Indian cement growing at a faster rate
- ✓ Growth is positive but also imposes pressure on logistics

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Logistics Management

- ✓ Poor condition of roads & increase in fuel charges creates increased burden on the cement industry
- ✓ Needs look at logistics in a serious way
 - Ø Increased dependence on rail transport than road transport
 - Ø Bulk transport
 - Ø Ready mix concrete



Reducing the variable costs by all possible means is the key in sustaining profitability & business growth

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To Sum UP

- ✓ Several efforts taken by the industry to make it green
- ✓ Needs to continue the efforts in all areas to achieve the status of 'Greenest'

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Thank You

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