

## **Hindalco Industries Limited, Renukoot**

## **ENERGY MANAGEMENT SYSTEM**



#### Renukoot DT-24/04/2015



## **VISION, MISSION & VALUES**

#### **HINDALCO** Vision

To be a Premium Metals Major, Global in size and reach, Excelling in everything we do, and creating value for its stack holders.

#### **HINDALCO** Mission

To relentlessly pursue the creation of superior shareholder value by exceeding customer expectations profitably, unleashing employee potential and being a responsible corporate citizen adhering to our values

**HINDALCO Values** 

**INTEGRITY, COMMITMENT, PASSION, SEAMLESSNESS, SPEED** 





#### "VALUES" -WE VALUE

**Integrity** : Honesty in Every Action

Commitment : Deliver On The Promise

Passion : Energized action

Seamlessness : boundary less in letter and spirit

\* Speed

: One step ahead always









## HINDALCO: OVERVIEW.....

- A Flagship Company of Aditya Birla Group
- A pioneer Non-ferrous Metals Powerhouse industry leader in both segments of Aluminium and Copper
- Renukoot Operations include:
  - ✓ Alumina Refinery
  - Co-generation Unit
  - ✓ Smelter Plant
  - Fabrication (down stream production)
  - Captive Power Plant (35 km away)





## **Capacities Overview**





- Commenced its operations in 1962 with initial capacity of 20,000 TPY metal and 40,000 TPY alumina
- Emerged as the largest integrated aluminium manufacturing company in India.
- Globally 12<sup>th</sup> largest aluminium and alumina producer
- Has been, strategically, a healthy mix of Organic and Inorganic Growth.
- Capacity Enhancement through modernization of the plants, upgrading the processes and incorporating energy efficient latest technologies.

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## SUSTAINABILITY FACTORS......

#### **Economic Growth:**

- Advance Technology Focus
- Continuous Improvement in Earnings
- Efficient Investment Management

#### **Environmentally Benign:**

- Commitment to Address Environmental Impact
- Energy Conservation
- Green Technologies

#### **Socially Responsible:**

- Improvements in Employee Health Monitoring
- Improving Safety Standards and practices
- Caring for the Communities





**Aluminium Manufacturing – Energy Intensive Process** 

- Alumina (Al<sub>2</sub>O<sub>3</sub>) production is Heat Energy intensive process
  - Heat Energy: 65%
  - Fuel Energy: 25%
  - Electrical Energy: 10%

(About 30 % of total cost is for energy)

- Aluminium production from electrolysis of Al<sub>2</sub>O<sub>3</sub> in highly energy intensive:
  - 40% of total cost of metal is for power
  - 75 % of total energy consumption relates to electrical energy





#### **Energy Management system at Hindalco, Renukoot**

- The purpose of Energy Management is "The judicious and effective use of Energ to maximize profits (minimize cost) and enhance competitive positions"
- The objective of Energy Management :
- To achieve & maintain optimum energy procurement and utilization.
- To minimize energy costs / waste without affecting production & quality.
- To minimize environmental affects.
- We have dedicated Energy Management System with Energy Manager Energy
- Auditor Certified by "Bureau of Energy Efficiency", who are responsible for -
- Mobilizing, implementing & monitoring energy saving measures.
- Suggestion Scheme with suitable rewards to ensure increased participation across the hierarchy.
- Walk-Through & detailed Energy Audits, Quality Circles, WCM Committees, Energy Conservation Month.
- Timely Monitoring of Project Status and reports to Corporate Office.





#### **Energy Management : Bottom – Up & Top – Down Approach**





- Approach to Efficient Energy Utilization and Energy Conservation:
- Reduction in Energy Consumption through effective Monitoring and Modified Systems
- Improvement in energy conservation through Waste Heat Recovery
- Plant modernization through Process Control Innovations
- Energy use reductions through Process Upgradations
  - Installation of Energy Efficient Equipment
  - Incorporating Greener and Latest Technologies

Creating extra-ordinary success with simple & explicit approach





- Reduce specific energy consumption in all operations and activities
- Adopt energy efficient technologies/equipment for all new projects
- Replace old equipment and technologies with latest energy efficient technologies/equipment continually
- Ensure control over energy consumption by periodic Management Reviews

Honest Adherence to Policy's Themes





#### Hindalco's Energy Policy Focuses on.....



Energy plays a key role in achieving the goals of sustainable development. As a way of life, we, the employees of Hindatco Industries Ltd. are committed & pledged to conserve Energy judiciously in all our activities, products and services thus transforming energy conservation into a strategic business goal. Our own policy of appreciating the importance of Energy Conservation through small improvements, technological advancements, and awareness among stakeholders for sustainable development is by way of promotion of energy efficiency.

To achieve excellence in energy conservation, we will:

- Reduce specific energy consumption in all our operations and activities.
- Produce high purity metal with high conductivity to achieve minimum transmission losses in Electrical Network.
- Conserve fossil fuels through enhanced use of renewable energy/recovered waste energy and by plugging the energy leakages.
- Create awareness among stakeholders about Energy Conservation.
- Train & educate our employees to improve skill and knowledge towards technological advancements in the field of Energy Efficiency to make themselves trend setter in the area of Energy Conservation.
- Adopt & invest in energy efficient technologies/equipment & promote use of renewable energy to conserve fossil fuel.
- Ensure control over energy consumption and sustain it by periodic management reviews, Internal & External Energy audits, bench marking our performance against best in business and motivation to employees.

As a part of our Energy Conservation Strategy & commitment to reduce Greenhouse gas emission, we are committed to reduce specific energy consumption from the present level.

Date : 31.03.2010

D K Kohly Chief Officer-Operation





HINDALCO INDUSTRIES LTD.



Greenhouse Gases Verification Statement

Awarded to

#### Hindalco Industries Ltd

For Organization Boundaries Renukoot, Dist. - Sonebhadra, UP - 231 217, INDIA. For the activities "Manufacturing Of Primary Aluminium, Aluminium Products For Fabrication, & Alumina Refining " and Renusagar Power Division, Renusagar, Dist. - Sonebhadra, UP - 231 218, INDIA. For the activities "Thermal Power Generation (Captive)"

Bureau Veritas Certification India Private Ltd has carried out the verification of the quantity of Greenhouse Gas emissions of the above organization as per ISO 14064-3:2006. The Greenhouse Gas emission quantification and reporting is found to be in accordance with the requirements of the standard detailed below below

STANDARD

#### ISO 14064 - 1: 2006

SCOPE OF CERTIFICATION

DIRECT EMISSIONS: 91,71,771 tons CO2-equivalent ENERGY INDIRECT EMISSIONS: 38,501 tons CO2-equivalent EMISSIONS DUE TO BIOMASS COMBUSTION: NIL REPORTING YEAR: 1<sup>57</sup> APRIL 2000 TO 31<sup>57</sup> MARGH 2010 LEVEL OF ASSURANCE: REASONABLE

VERIFICATION REPORT REFERENCE: INDIA-VER/11.50/2012

To check this certificate validity +61 22 6835 6300 please call:

Further clarifications regarding the scope of this verification certificate and the applicability of the ISO 14064-1:2006 requirements may be obtained by consulting the organization.

Certificate Number: INDIA/GHG/011

Date: 18 October 2012

R. K. SHARMA Director

Confficience / Managing Office Address: "Marwah Centre" 8th Flaur, Krishinelal Marwah Marg. Opp. Anna Industrial Estate, Off Saki Vibar Road, Andberi (Eart), Mandui – 400 072, India.

## ISO 14064 – 1 Certificate

Renusagar/Renukoot comprises 62%

of total Hindalco Emission

- First plant of ABG Metal to go for ISO
  - 14064 certification
- No external Consultant hired
- Base line verified & established
- Confidence built of accounting system





# Major Energy Saving Projects Undertaken at Renukoot





# Replacement of Goat conductor with AL-59 conductor





# **Project Background**

There are ten circuits of transmission lines from Renusagar for transmission of power to Renukoot. About 7 to 8 MW losses occurs in lines, which mainly depend on length and resistance of conductor.





- It was proposed to replace the GOAT conductor with AAAC to reduce the losses, but after the study of the transmission lines, it was found non-feasible due to following limitations.
- Mid span towers are necessary to reduce the span length.
- •Due to higher weight & sag, mandatory clearances may be reduced, which is not allowed.
- •Reinforcement of existing foundations is not feasible.

With several brainstorming session of team, study of tower design, survey of transmission route; following feasibility was envisaged :No change in towers are required if :

•Same catenary to be used as per existing GOAT conductor.

Same tension to be provided during stringing of new conductor.

•Similar insulator (in size and weight) to be used.





## Execution

All the details & feasibility proposal was discussed and got validated by IIT, BHU and replacement of GOAT conductor of line#1&2 with AL-59 was approved.

#### **Action Taken :**

- Final route survey of transmission line was carried out.
- Tower foundations were got inspected & tested
- Towers were reinforced/backfilled as per requirement
- Due to difficult terrain of forest & hilly area, all the safety & legal compliance were taken care of.





Results



- •Conductor-Goat
- •Diameter –25.97mm
- Resistance 0.08989 Ω/KM
- Line length 29.0 KM
- •Line loss- 1.53 MW
- •Percentage line loss 1.09%



Conductor-AL59
Diameter - 29.79mm
Resistance - 0.05687 Ω/KM
Line length - 29.0 KM
Line loss- 0.97 MW
Percentage line loss - 0.69%

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Total Energy saved per year after : 4.906 MU (0.56 MW) replacement of conductor



# **Medium Voltage Drive at DSS**





## **Project Summary**

Hindalco smelter consists of 11 Pot Line to produce 4 Lacs tons of aluminium per year. Gases generated during Aluminium electrolysis process in each pot is sucked by ID fans & sent to stack after necessary treatment at DSS (Dry Scrubbing System).

1. Three numbers of fan are installed in each DSS.

> 2. There are two ID fans running in parallel to maintain required suction pressure by manually controlling the inlet damper (60% Opening) installed on each fan.





## Details

- Total Fans: 02 (Two running)
- Type: DYTSR 2181/SBA
- Motor Rating: 620KW, 6.6KV,
   70Amp, 991 rpm, 0.85.
- Flow Control: Inlet Damper control
- Rated Flow: 66.52 m<sup>3</sup>/sec
- Discharge Head: 475 mmwc
- Fan Speed: 990 rpm

- Fan efficiency: 85.5%
- Power Factor: 0.85
- Present Running current: 47.62
   Amp.
- Inlet Damper/Vanes opening: 58% open
- Running Suction Pressure: -390

mmwc.

Actual Motor Current = 47 Amp





# Methodology

ID fans are centrifugal fans the outlet dampers affect the fan system curve by increasing the resistance to airflow. The power requirements for this type of system decrease gradually as flow is decreased as shown in the diagram.



Formula affecting the system with speed

Q2/Q1=N2/N1 P1/P2=(N2/N1)2 HP1/HP2=(N2/N1)3

Where:- N= fan Speed Q= Flow P= Pressure HP= Horsepowerchange



# Methodology

By keeping inlet damper fully open & controlling the motor rpm through Variable frequency drive, required fan inlet pressure 390 mmwc would be maintained. Energy saving will be achieved around 0.1 mu per month by running 6.6KV motors at reduced rpm.





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# **Salient Features of MV Drives**

Medium Voltage Drive is a state-of-the art multi-level cascaded Sine PWM technology.

**MV drives consist of mainly three parts – Transformer, Power Cells & Control system.** 

Lower Harmonics at Input & Output sides meets stringent International Standard of IEEE 519-1992 ( 36 Pulse rectifier system )

Nearly pure sine wave at the input & output side.

Improved power factor ( better than 0.95 over entire speed range )

Multi-level cascaded technology consists of total 18 power cell (6 power cell in series in each

phase) develop medium voltage. No output transformer requires.

High efficiency of 96% (including input transformer)

Input forced air cooled transformer with H-class insulation inbuilt in panel with multi phase shifted secondary reduces distortion and provide galvanic isolation.

Modular draw out type Power Cell design.





## Result

#### 100% gate opening

**Running Suction Pressure: -390 mmwc.** 

Variable frequency drive was installed to control the speed of the motor by keeping inlet damper fully open and maintain fan inlet pressure 390 mm WC.

Energy saved is 0.1 mu per month by running 6.6KV motors at reduced rpm.





# **Actual Energy saving**

Energ	gy Saving Calcu	lation	
	Before Installation of VFD	Proposed	Actual Achieved
Diff Pressure Across Bag House (mmWc)	-59	-59	-59
	FAN 1A		
KWH @Inlet Pressure - 380 mmWc Fan 1A	493	418	382
KWH @Inlet Pressure - 390 mmWc Fan 1A	503	428	394
Energy Saving	g Through MV V	FD ON FAN 1A	
Energy Saving (KW) Fan 1A		75	103
Energy Saving in KWH in FAN 1A per year		657000	902280
	FAN 2A		
KWH @Inlet Pressure - 380 mmWc Fan 2A	472	397	397
KWH @Inlet Pressure - 390 mmWc Fan 2A	480	405	377
Energy Saving	g Through MV V	FD ON FAN 2A	
Energy Saving (KW) Fan 2A		75.00	97.00
Energy Saving in KWH in FAN 2A per year		657000.00	849720.00
T	otal Energy Savir	ng	
Total Energy saving (KW)		150.00	200.00
Total Energy saving (KWH) per year per PotLine		1314000.00	1752000.00
Total Energy saving in mu (million unit) per year per PotLine		1.31	1.75

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# **Infrared Thermography**





# **Project Summary**

Joule heating, also known as ohmic heating and resistive heating, is the process by which the passage of an electric current through a conductor releases heat. The amount of heat released is proportional to the square of the current such that,

$$Q \propto I^2 \cdot R$$

**Infrared Imager** 



**Effect of heating on Conductor** 

The electrical conductivity of a conductor will decrease with an increase in temperature, means its resistance will increase and thereby increasing Voltage Drop. This will result to

- Disturbance in Anode Current Distribution
- Stub Out.





# **Causes of unequal/over heating**

- Uneven surface of current carrying conductor results in increase of resistance due to reduced area of cross section which leads to overheating.
- Loosening of clamp due to overheating leads to increase in voltage drop.
- Insufficient gap between current copper bar and Super J bolt leads to touching of copper bar with super J bolt and anode busbar J bolt resulting in sparking and overheating.



For ex: image on the right side shows uneven surface which leads to high resistance Exchange



# Methodology

- In the image on the right we can see that same cell in Infrared and naked eye mode.
- We can see that

   one anode bar is
   having relatively
   higher temperature
   than others in the
   row.
- This leads us to conclusion that the voltage drop across this clamp is higher than others.







# How it benefits us..

- Normal clamp voltage drop is found to be around 10 15 mv.
- We have found average abnormal clamp voltage drop around 75 mv.
- Power saving will be,

P = V \* I V = (75 - 15) \* 10-3 volts I = 3000 Amperes

P = 60 \* 10-3 \* 3000 = 180 watts

- So total energy saved will be 1576 KWH per clamp per year
- We have 55614 clamps at our plant in Renukoot. So even if we take 1% of the total clamps, it will be around 0.9 mu per year.
- The above energy saving is just due to normal clamp drop. There are several drops in a cell like bus bar voltage drop, flexible voltage drop, diamond drop, stub drop, cathode lining drop etc...

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# Eco-contact to reduce voltage drop at conductor joints





# **Project Summary**

- Energy loss at Electrical joints constitute a huge portion of losses in Electrical system.
- We came to know about Eco-contact sheets, which can be used to :
  - a) Increase conductivity of electrical connections, thereby minimizing losses by 90%, even more efficient at high temperatures.
  - b) Reduce damage of Electrical contacts and increase in life span of electrical connections.
- So this was tested at few places at Hindalco and we found that it was able to reduce loss by more than 90% at some places.





## Results

**Eco-contact provided on Aluminium to Copper joints of DC Isolators of Unit#3D** to reduce millivolt drop thereby reduction in loss



**Benefits** :> Reduction in loss by 22.8 KWH per year per DC Isolator

Reduction in temp of Isolators by about 400C

Knowledge Exchange >Excessive Rectifier room temp will be reduced after installation in remaining units



## Results



3

LOAD SIDE

	3D (	(+)ve is	olator j	oint	3D (	(-)ve iso	olator jo	int
Location	mV [	Drop	Temp	(°C)	mV E	Drop	Temp	(°C)
-	Before	After	Before	After	Before	After	Before	After
Joint 1 (A-B)	25.0	2.6	71.1	35.6	78.4	2.7	77.4	33.0
Joint 1 (A-C)	42.2	3.1	79.4	35.6	118.4	2.7	85.1	34.5
Joint 2 (A-B)	27.3	2.4	71.4	35.6	106.3	3.0	79.4	33.8
Joint 2 (A-C)	42.2	2.0	79.6	35.5	66.5	2.9	79.9	35.0
Joint 3 (D-H)	142.6	3.6	102.0	36.2	23.2	1.8	68.1	34.5
Joint 3 (D-G)	67.6	4.2	85.3	36.3	16.8	1.8	58.3	35.3
Joint 4 (D-H)	176.2	2.6	105.0	35.6	20.2	2.3	66.3	35.2
Joint 4 (D-G)	41.3	2.3	84.0	34.5	13.0	2.9	62.0	35.2
Average per CKT	141.1	2.8			110.7	2.5	1	
Average Gain	in 138.3				108	3.2		
Total Gain in mV drop		246	5.4					
Current (KA)		10	.5					
Reduction in loss (KW)		2.	6					
Total Energy saved per year		22	.8(KWH)					

#### Total Energy saved for 24 DC isolators per year will be 547.2 KWH

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## **More Results**

#### **Voltage drop on Middle Pot – Diamond connections**



Eco Contact Implemented

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Voltage Drop without	Voltage Drop with Eco-	Energy Saved per year
Eco-Contact (mv)	Contact (mv)	(KWH) per contact
168	0.8	4394.016



## **More Results**

# Voltage drop on cathodic Steel/Copper connection

Voltage Drop without	Volta <mark>ge Drop</mark> with Eco-	Energy Saved per year
Eco-Contact (mv)	Contact (mv)	(KWH) per contact
3.6	0.3	86.724







Since the beginning of Energy conservation Award sponsored by Ministry of Power, Govt. Of India, Hindalco- Renukoot is regularly bagging the prizes as per details given below.

First Prize – 1991 ➢ Second Prize − 1995 Second Prize – 1996 Second Prize – 1998 Second Prize – 2000 Second Prize – 2001 First Prize – 2002 First Prize – 2004 ➢ First Prize − 2005 ≻ First Prize – 2006 ➢ Second Prize − 2007 ➢ Second Prize − 2008 ➢ Second Prize − 2010

Second Prize – 2011



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National Energy Conservation Awards won for last 10 Years - FIRST OR SECOND ON Continuous basis.

Renusagar Power Division bagged "Energy Efficient Unit" award during 10th National Award for Excellence in Energy Management – 2009 by CII.

HIL COO, has been conferred with "Corporate Excellence" award during the International Metal Conference on Non-Ferrous Metals at Kolkata on 8th July 2011. The conference was jointly organized by Corporate Monitor and Millennium Institute of Energy & Environment Management in coordination with Indo German Chamber of Commerce.

Export Promotion Bureau, Uttar Pradesh, Department of MSME, Govt. of Uttar Pradesh awarded Hindalco, Renukoot First Prize of "Shri Janeshwar Mishra Export Award" for best performance in the field of Export under the category of Engineering & Builders Hardware for the year 2009-10





Renusagar and Renukoot bagged "10th Annual Green Tech Environment Excellent Award-2009" in Power and Metal & Mining Sector respectively- 2nd consecutive year.

Renusagar and Renukoot bagged "10th Annual Green Tech Environment Excellent Award-2009" in Power and Metal & Mining Sector respectively- 2nd consecutive year.

Hindalco Renusagar won Special Commendation Certificate in Golden Peacock Environment Management Award 2010

"Green Tech Environment Excellence Gold Award" in Metal Sector for its efforts towards Environment Management to Renukoot

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- Hindalco, Renukoot unit awarded with "Greentech Environment Platinum Award-2011".
- Hindalco, Renukoot received the "Greentech Environment Excellence Gold Award 2012"
- Hindalco Industries Limited, Renukoot unit conferred with "Greentech HR Platinum Award-2013"
- Hindalco, Renukoot unit has been received "Greentech Environment award-2013" in Platinum Category.





# **Awards and Recognition-Quality**

Hindalco, Renukoot unit won the prestigious "Golden peacock National Quality Award - 2010".

Renusagar Power Division won the prestigious "Rajiv Gandhi National Quality Award 2008" Commendation Certificate by Bureau of Indian Standard (BIS).

The prestigious Silver Certificate in Indian Manufacturing Excellence Award-2010 by Economics Times in association with Frost & Sullivan to Renukoot Hindalco has been awarded "Non Ferrous Best Performance Award-2010-11" by The Indian Institute of Metals, Non Ferrous Division on 14th November 2011 at Hyderabad.

Renusagar Power Division has been awarded with "Golden Peacock National Quality Award" for the year 2011 in Service Category.

Institute of Directors (I.O.D.) awarded Hindalco, Renukoot unit with prestigious Golden Peacock National Quality Award-2012 in Metal & Mining Sector

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# **Awards and Recognition- Safety**

Renusagar Power Division conferred with "Green Tech Gold Safety Award-2011" in Power Plant category for its exemplary efforts towards Occupetional Health & Safety by Green Tech Foundation, New Delhi.

Hindalco Renukoot unit awarded the prestigious "Greentech Gold Safety Award 2010" for Occupational Health and Safety Management in Mining and Metal Sector by Green Tech Foundation

Prestigious "Greentech Gold Safety Award 2010" for Occupational Health and Safety Management in Mining and Metal Sector by Green Tech Foundation to Renukoot.

Hindalco Industries Limited, Renukoot & Renusagar conferred with "Green Tech Gold Safety Award-2012" in Mining & Metal Sector for its exemplary efforts towards Occupetional Health & Safety by Green Tech Foundation, New Delhi.

Hindalco Industries Limited, Renukoot conferred with "Safety Innovation Award-2012" for implementing Innovative Safety Management Systems by The Institute of Engineers (India).

Renusagar Power Division won the "Greentech Safety Gold Award-2013" in Thermal Power Sector by Greentech Foundation.

Renusagar Power Division won the "Safety Innovation Award-2013" in Power Plant category by Institute of Engineers (India) for its outstanding innovative achievements in the field of Occupational Health and Safety.

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# **Awards and Recognition- CSR**

Hindalco Industries Ltd bagged " Amity Corporate Excellence Award in Corporate Social Responsibilities" by Amity International Business School.

"Golden Peacock CSR Award" for Community Development to Hindalco. The award was received by Smt. Rajashree Birla, Shri. Askaran Agarwal and Dr. Pragnya Ram from Mr Ola Ullsten the former Prime Minister of Sweden on 24th September 2010 at Lisbon in Portugal.

Hindalco, Renukoot also received the "Greentech CSR Excellence Gold Award-2012".

Renusagar Power Division won the "Greentech Gold Award-2013" for outstanding achievement in Training Excellence.

Hindalco Renukoot unit has received "Greentech CSR Award-2013" in Silver Category.

Renusagar Power Divison won the Greentech Training Excellence Gold Award 2014.

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# Power Plant





## Renusagar- Our Journey So far

TG COMMISSIONING		BOILER COM	MISIONING
TG No.	Date	Boiler No.	Date
TG # 1	04.10.1968	Boiler # 1	17.06.1967
TG # 2	09.09.1967	Boiler # 2	21.11.1967
-	-	Boiler # Spare	18.09.1981
TG # 3	02.11.1981	Boiler # 3	08.06.1982
TG # 4	09.04.1983	Boiler # 4	01.02.1983
TG # 5	31.03.1989	Boiler # 5	06.05.1991
TG # 6	23.03.1997	Boiler # 6	28.03.1997
TG # 7	27.03.1998	Boiler # 7	27.03.1998
TG # 8	31.03.1998	Boiler # 8	31.03.1998
TG # 9	02.12.2002	Boiler # 9	31.01.2003
TG # 10	26.03.2003	Boiler # 10	23.06.2003







MU Saved Total Annual Saving in Million Rs. Investment in Million Rs.





## Outcome of Encon efforts: 2013-15



Lac MT of Fuel Saved Total Annual Saving in Million Rs. Investment in Million Rs.





## Reduction trend of Electrical energy



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## **Innovative Projects**

Use of self developed fuel "CRYSTAL" additive for dozing inside the furnace to improve efficiency in all Boilers by 1.25 % each.

Problem / Concept Description	Approach	Result	Value / Financial Benefits	Status
Lower Boiler Efficiency due to higher combustibles in Fly Ash & Bottom Ash.	<ul> <li>Consulted OEM &amp; BHEL for operating parameters correction.</li> <li>Consulted Fuel Additives Manufacturers</li> <li>Consulted various books &amp; journals</li> <li>Trial taken in furnace at Chem. Lab.</li> <li>Trial taken in Boiler.</li> </ul>	-Improved the efficiency by 1.25% in boiler. -Implemented in all the eleven (11) boilers.	Rs. 22.68 Cr. /annum on recurring basis.	Implemented





## Comparative Results : Reduction trend of Combustible in Bottom Ash (%)







#### Comparative Results : Reduction trend of Combustible in Fly Ash (%)







## **Innovative Projects**

Utilization of full mill capacity in Boiler#9 &10 by maintaining throat gap between Mill body & Air port ring (XRP - 663).

Problem / Concept Description	Approach	<b>Result /</b> Implementation Status	Value / Financial Benefits	Status
Five mills were in continuous operation to maintain steam generation of 340 TPH for achieving power generation of 89 MW at lower capacity, resulting leading to higher auxiliary power consumption.	<ul> <li>After brainstorming among the team to optimize the Operation the Coal Mills, it was decided to review the throat gap between rotary vane and mill side liners.</li> <li>The existing throat gap of 12 mm as per design was further optimized to 5 – 5.5 mm.</li> </ul>	After this modification, only 04 mills are in continuous operation to achieve required steam generation of 340 TPH for 89 MW Generation, Resulting in Power saving by 200 KW for each Boiler.	Rs. 0.92 Cr. /annum on recurring basis.	Implem -ented





## Major environmental improvement Projects

#### <u>FY 12-13</u>

SI. No.	PROJECT DESCRIPTION
1	Installed Ceramic Pad Insulation for Turbine Casing to reduce Pollution & Turbine Outage Period.
2	Replaced lube oil of coal Mills on condition based instead of time based.
3	Utilized Bottom Ash in place of sand during production of FAL-G Brick/ Block.
4	Increased utilization of Fly/Bottom Ash by production of FAL-G Brick/Block approx. 5% extra from previous year.
5	Used Bottom Ash in place of sand during plastering/PCC/ grouting/ under flooring etc.
6	Utilized Coal Reject in place of aggregate in PCC/grouting/ road etc.





## Major environmental improvement Projects

#### <u>FY 13-14</u>

SI. No.	PROJECT DESCRIPTION
1	Fly ash dispatched to cement companies (15.47 lac MT).
2	Procurement of Mechanized road sweeping machine.
3	Revamping of TG No.1 for reducing Heat Rate to reduce coal consumption.
4	Construction of Rain shed in CHP #4 for reducing oil consumption during rainy season.
5	Installation of auto drain valve in drain of Conveying Air header of Ash Plant of Unit #8, 9&10 to reduce compressed air wastage and sound pollution.
6	Utilization of Bottom Ash for making clay brick by private kiln owners in nearby area.
7	To increase utilization of Fly/Bottom Ash by production of FAL-G Brick/Block approx. 5% extra from previous year (Utilization of Fly Ash/Bottom Ash-7500+5%).
8	Use of fly ash in making exterior paint to cover an external surface area.





## Major environmental improvement Projects

#### <u>FY 14-15</u>

SI. No.	PROJECT DESCRIPTION
1	Fly ash dispatched to cement companies (12.35 lac MT).
2	Use of Alternate fuel (Rice Husk / Char / Black Carbon) in place of Coal. (0.42 Lac MT).
3	Revamping of TG No.2 for reducing Heat Rate to reduce coal consumption.
4	Installation & commissioning of Waste Heat Recovery system for recovering CBD water waste energy.
5	Installation of additional Super heater coil in Boiler # 4 for improving unit heat rate.
6	Reduction in use of TG oil from 9.35 % to 9 % of sump capacity 90700 ltrs.
7	To minimize the consumption of lime from 175 gm/m3 to 150 gm/m3 of waste water.
8	To maintain the ecological balance plantation of Sapling, in Plant & Colony area.
9	Utilization of Bottom Ash for making clay brick by private kiln owners in nearby area.
10	To increase utilization of Fly/Bottom Ash by production of FAL-G Brick/Block approx. 5% extra from previous year (Utilization of Fly Ash/Bottom Ash-7500+5%).
11	Use of fly ash in making exterior paint to cover an external surface area.





#### SCHEMATIC DIAGRAM FOR ZERO DISCHARGE





## **Concern For Environment**

- 1. Best quality
- 2. Dry disposal system
- 3. Telescopic chute
- 4. Automated Queue Management System

5. provided civic amenities for drivers & Khalsis and refreshment facilities



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#### Team work & Process for Encon Implementation



Transmitting Knowledge through Best Practices



#### Heat Rate Improvement Projects:

S. No.	Projects to be Implemented
1	Installation of on-line condenser tube cleaning system in 2 units.
2	Replacement of LP Heater #1 of Unit # 3 &4.
3	Modification of APH Baskets & Sealing System of Boiler #7 .
4	Installation of additional Super heater coil in Boiler # 3 to increase main steam temperature by 10 oC for improving unit heat rate.
5	Optimisation in steam blowing frequency from 03 to 01.
6	Revamping of TG#5 for heat rate improvement
7	Construction of coal shed in CHP #4





#### Auxiliary Power Improvement Projects:

S.No.	Projects to be Implemented
1	Installation of Magna Drives in various pumps for energy conservation.
2	Modification in Boiler Feed Pump of unit #6.
3	Up gradation of Plant & Colony conventional Lights with energy efficient LED Technology Light Fitting
4	Replacement of inefficient ceiling fans in colony (400 Nos.).
5	Replacement of existing CT Fan blades with efficient ones (#2,3,4,6,9&10).
6	Replacement of Window ACs by FCUs
7	Replacement of inefficient Window/Split Air Conditioners
8	Installation of VFDs in FD Fans of unit #3,4 & spare.





#### **AWARDS & RECOGNITION**

Renusagar Power Division is not only known for its performance but committed to conservation of energy, consciousness for clean environment and safety of nearby inhabitants and employees. Result of our commitments and dedications are:

<u>2014-15:</u>

Renusagar bagged CII 15th National Award for "Excellent Energy Efficient Unit" 2014.

Renusagar bagged Green tech "Training Excellence"- GOLD Award 2014.

Renusagar bagged Green tech Gold Award for Environment - 2014.

Four Quality Circle team of Renusagar bagged Par excellence & One QC Team excellence award in the NCQC-2014, held at Pune.





# **THANK YOU**