Hindalco Industries Limited, Hirakud Power

VALUING OUR VALUES

- Integrity
- Commitment
- Passion
- Seamlessness
- Speed

OUR CONTINUOUS ENDEAVOUR FOR GENERATING GREEN & SAFE POWER

Presenter:

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Purpose Of Hindalco

Our Purpose ...

Why it exists, why it does what it does ?

WE MANUFACTURE MATERIALS THAT MAKE THE WORLD

GREENER **STRONGER** **SMARTER**

Hindalco Hirakud Power @ a glance

UNIT # 2, 3,4 & 5:

100MW, 10.5 KV, 0.8 PF, Air-Cooled, Brushless Excitation System, **BEM** make Generator. Single-Cylinder, 515 ^{0}C, 84.3 Bar, 379 TPH, HP-Bypass System, 1 Impulse & 31 Reaction Stage, **Siemens** Make Steam Turbine

Unit#2/3 ESPs- MIGI type , ACC Make , Unit#4/5 ESPs- Tumbling Hammer type , Elex India Make

UNIT # 2, 3,4 & 5:

Boiler-3, 4, 5, 6, 7, 8, 9, 10, 11 ,12 & 13:
3 X 155 TPH & 2 X 165 TPH , 515 ^{0}C, Cold Cyclone **M/s Thyssen Krupp India Pvt. Ltd**. make Circulating Fluidized Bed Combustion Boiler for each Unit-2,3,4 & 5 respectively i.e. total 11 nos. of CFBC boilers

1ST

First CPP in Asia to install environment friendly CFBC boiler.

First CPP in India to operate complete dry ash management system

First in State to install online ambient air monitoring system

Reducing emission and meeting the revised norms through adopting latest pollution control measure of HFTR (high frequency rectifier transformers) technology in ESP (Electrostatic Precipitator) Dust Collection System

Trigger of the Project

- Notification from Ministry Of Environment & Forests (MOEF) : Reduction of emission level of existing ESP to below 50mg/Nm3 , The project conceived through senior level management

Uniqueness of the project; is it a new concept?, is it new application-wise?

- **Less capital intensive :** HFTR removes the complexity of adding extra fields .
- **Availability :** Less maintenance compared to single phase transformer.
- **Energy Saving:** Sp. Energy Consumption is lower.
- **Ease of operation:** Remote Operation and monitoring of HFTR performance through digital communication.
- **Reliability** : Very fast spark rate response & enhancement of ESP by having conventional recti-transformer with HFTR with an addition of changeover switch

Date of commencement, Date of completion of project compared with initial planned dates;

- Project started on April'2017 and Ended on May'2019

Major milestones of project accomplishment vis-à-vis initial mapping of project

Milestones	Planned	Actual
Trial and Testing with 3 sets of HFTR in two different ESPs.	April'17- Nov'17	April'17-Nov'17
Capex approval, material & service procurement and delivery	Dec'17-March'18	Dec'17-March'18
Installation & Commissioning of HFTR in 1st field in 11 ESPs	April'18-May'19	April'18-May'19

Tangible Benefits

- Clean Environment for Plant & Society
- Productivity increased due to high availability of ESP.
- Compliance to MOEF notification
- Increased efficiency due to high collection rate of Ash inside hopper.
- *More ash collection in 1st field getting utilized in cement making.*
- Power Optimization and remote monitoring & controlling .
- Reduced downtime & reliable operation of ESP having both HFTR and conventional transformer connected through a changeover switch .

Intangible Benefits

- Employee motivation and satisfaction
- Skill Up gradation through project execution ,class room trainings etc.
- Innovation
- Sustainable cities and communities
- Decent Work and Economic Growth
- Partnership for the Goals

Replication potential and progress of project : Evidence on where and when implemented with photos before/after; What next for spreading benefits?

- This is a state of art technology first used in Power Plant of Aditya Birla Group.
- Project has been replicated in different units of Aditya Birla Group like Mahan Aluminum, Aditya Aluminum , Alumina Refinery Muri etc.
- The same can be horizontally replicated in ESP of power plants and other industries like cement, chemical, Copper etc. where there is no scope of adding fields and even involves more O&M cost.
- Presently companies like M/s Vedanta, M/s Navbharat ,M/s Bhushan Power & Steel have taken details to unlock the feasibility regarding HFTR implementation and its benefit.
- M/s Tata Power(Trombay) have already implemented the technology.

Implementation at HIL, Hirakud

- 11nos of HFTR installation and commissioning completed.

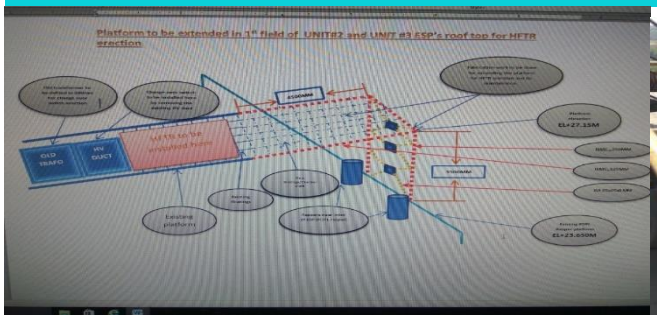
Replication Potential of Project within Sector

The project has been showcased at various platforms :

- ❖ Shared in ABG Power conference held in Mumbai in 2018 & 2019
- ❖ Shared in Hindalco's communication Portal under Sustainability column
- ❖ Shared in e-communication meet in Hindalco Sambalpur cluster.

Major Challenges Faced

- Platform extension for HFTR erection and maintenance
- Shifting of changeover switch from 4th field to 1st field
- HV duct removal and transformer shifting
- Duct modification
- Rapper modification
- Alignment of changeover switch with HFTR

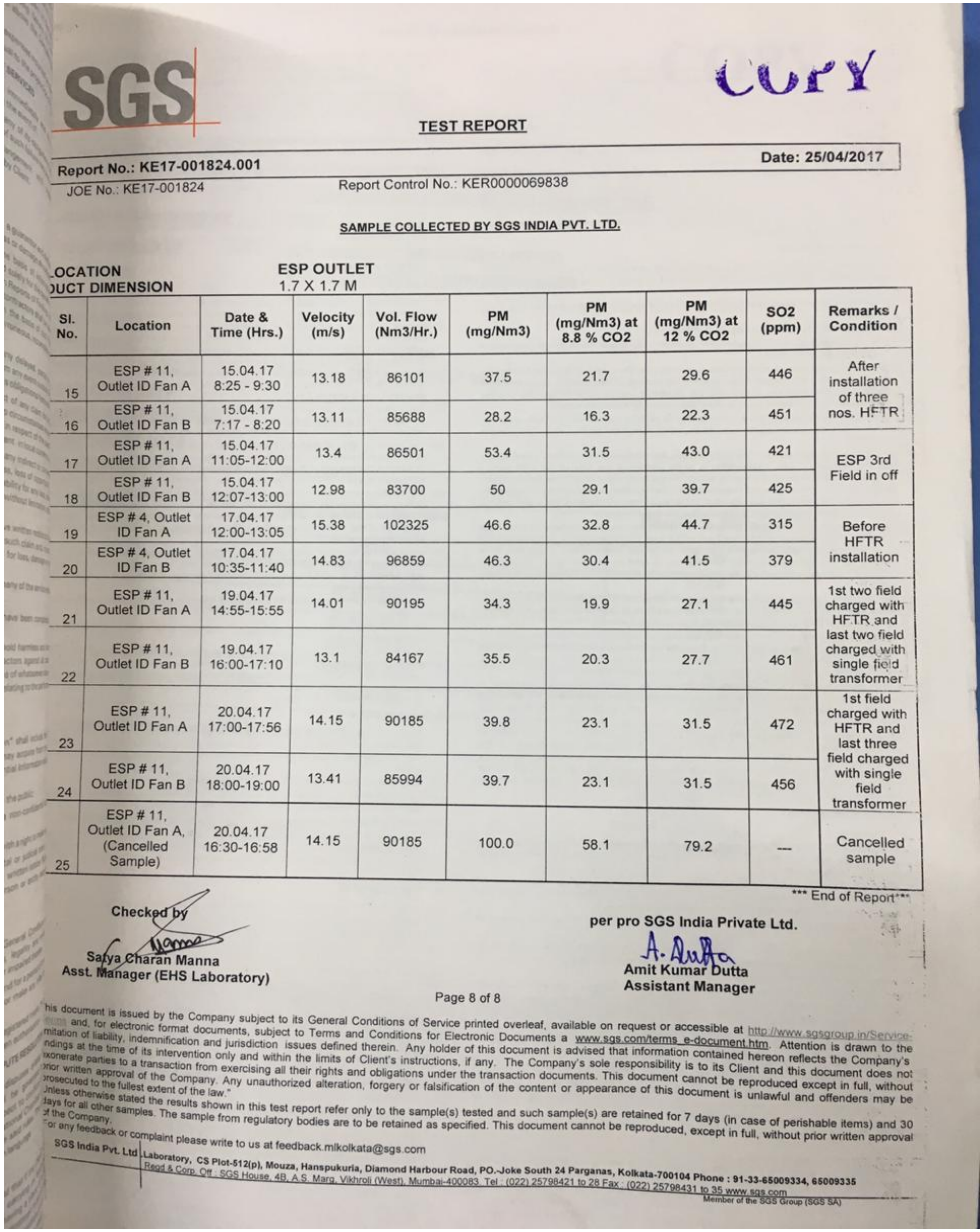


Challenges Faced & Brief on Countering

Problem statement	Root cause	Solution
Shifting of changeover switch and HFTR from ground to 1st field of ESP top	No approach for crane boom or winch machine rope to 1st filed due less space between ESPs.	Winch machine was used to lift the material from 0 mtr to ESP top and then again material has to be drag and shifted from 4th field to 1st field of ESP by using chain block in monohoist rail.
There was no space regarding erection and maintenance of HFTR.	As Field-1 conventional transformer was to be kept for reliability point of view .Both to be connected through a changeover switch .	A new Platform extended for HFTR erection and its maintenance by in house design with proper load calculation.
Duct modification	For installation of changeover switch .	All HV duct of ESPs 1s field has been modified by the internal team .
Erection of HFTR was very difficult due to rappers scattered every where on ESP top .	The height of rappers are quite high and it was fouling with HFTR .	Inhouse Rapper modification done by decreasing the height of the rappers without effecting its performance.
Alignment of changeover switch with HFTR and convectional trafo as well.	Space constraint due to duct modification where there is no margin of clearance of even 10MM.	Alignment done though a 3rd party with lot of safety precautions and expertise.
Unavailability of spare electrical feeders	As it was decided to keep both HFTR and conventional transformer .in 1st field ,we didn't have spare feeders for HFTR .	Retrofitted 11nos of new feeders during boiler shut down with the help of OEM.
Safety Compliances of workmen working at height	Project was executed at a height of approx. 32 mtr and many work at height related activities for fixing ropes and chain blocks.	Tools box talk and JSA used to be discussed with workers on daily basis. Safety precautions such as fall arrestor, guide rope, safety net etc. were used Involved to mitigate the risk factor.
Mobilization of man power and material to other boiler due to unplanned boiler shutdown.	Due to sudden boiler tube failure during operations.	Accept challenge to complete the HFTR erection during this short emergency period and to avail this unplanned opportunity for the benefit of company.

Achieving national benchmarks/Standards

- Hindalco industries limited ,Hirakud is already at par with satisfying all Pollution & Environmental standards.
- As a part of futuristic vision of M/s Hindalco Industries Limited , this project has been taken up.
- With installation of HFTR in 1st field ,we could able to get the emission to the tune of 40-50mg/Nm3,which is within the limit as per MOEF Notification, which has established an international standards for many industries.



SGS

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TEST REPORT

Report No.: KE17-001824.001 Date: 25/04/2017

JOE No.: KE17-001824 Report Control No.: KER0000069838

SAMPLE COLLECTED BY SGS INDIA PVT. LTD.

LOCATION ESP OUTLET

DUCT DIMENSION 1.7 X 1.7 M

Sl. No.	Location	Date & Time (Hrs.)	Velocity (m/s)	Vol. Flow (Nm3/Hr.)	PM (mg/Nm3)	PM (mg/Nm3) at 8.8 % CO2	PM (mg/Nm3) at 12 % CO2	SO2 (ppm)	Remarks / Condition
15	ESP # 11, Outlet ID Fan A	15.04.17 8:25 - 9:30	13.18	86101	37.5	21.7	29.6	446	After installation of three nos. HFTR
16	ESP # 11, Outlet ID Fan B	15.04.17 7:17 - 8:20	13.11	85688	28.2	16.3	22.3	451	
17	ESP # 11, Outlet ID Fan A	15.04.17 11:05-12:00	13.4	86501	53.4	31.5	43.0	421	ESP 3rd Field in off
18	ESP # 11, Outlet ID Fan B	15.04.17 12:07-13:00	12.98	83700	50	29.1	39.7	425	
19	ESP # 4, Outlet ID Fan A	17.04.17 12:00-13:05	15.38	102325	46.6	32.8	44.7	315	Before HFTR installation
20	ESP # 4, Outlet ID Fan B	17.04.17 10:35-11:40	14.83	96859	46.3	30.4	41.5	379	
21	ESP # 11, Outlet ID Fan A	19.04.17 14:55-15:55	14.01	90195	34.3	19.9	27.1	445	1st two field charged with HFTR and last two field charged with single field transformer
22	ESP # 11, Outlet ID Fan B	19.04.17 16:00-17:10	13.1	84167	35.5	20.3	27.7	461	
23	ESP # 11, Outlet ID Fan A	20.04.17 17:00-17:56	14.15	90185	39.8	23.1	31.5	472	1st field charged with HFTR and last three field charged with single field transformer
24	ESP # 11, Outlet ID Fan B	20.04.17 18:00-19:00	13.41	85994	39.7	23.1	31.5	456	
25	ESP # 11, Outlet ID Fan A, (Cancelled Sample)	20.04.17 16:30-16:58	14.15	90185	100.0	58.1	79.2	---	Cancelled sample

*** End of Report***

Checked by

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Asst. Manager (EHS Laboratory)

per pro SGS India Private Ltd.

Amit Kumar Dutta
Assistant Manager

Priority plans on fast track for +1 year and +2 years, including resource requirement

1st year plans:

- All ESPs 3rd party inspection to assess the electromechanical health of existing ESPs.
- Maintenance planning and execution to gain original health of ESPs under supervision of OEM.
- HIL is exploring new technologies like use of micro pulse transformer/High frequency pulse Transformer (HFPS) to further reduce the emission.

2nd year plans:

- Trial and testing with micro pulse transformer/High frequency pulse system (HFPS) on various ESPs with different combinations.
- Target to reduce below 30mg/Nm3,which could be again helpful for the organization to set a benchmark for all.

Top ten best practices which will form the core of approach for + 1 and +2 years

1. Hindalco Management Framework Sustainability team" – HIL core group formed with members from different areas for cross functional idea generation.

2. Problem solving by Total Quality Management.

3. Implementation of 5S.

4. Low emissions through continuous systematic improvement.

5. 100% ash utilization.

6. Ensuring zero harm by providing Standard Operating Procedures, Job safety Analysis, Do's & Don'ts and Tool box talks.

7. 360 degree guarding of moving equipment.

8. Innovation under "Opportunity Idea Change" scheme funds.

9. Learning & Sharing across ABG for horizontal replication of new technology..

10. Knowledge Integration through exploration with various OEMs and experts across the globe.

Major Learnings from Project

Thank You.