



Odisha State Productivity Council

Productivity News

Theme: "Clusters as Growth Engines – Maximizing Productivity in MSMEs)"



21st March' 2026, Hotel The Prachi, Bhubaneswar

To get in touch with OSPC

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**Founder President
Late Sri Biju Pattnaik**

ODISHA STATE PRODUCTIVITY COUNCIL

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Dr. Hari Babu Kambhampati
Governor, Odisha



LOK BHAVAN
BHUBANESWAR - 751 008

No: 197/2026



Date: February 18, 2026

MESSAGE

I am delighted to know that the Odisha State Productivity Council, in association with the National Productivity Council, is celebrating Productivity Week from 12th to 18th February 2026 on the theme "Clusters as Growth Engine: Maximizing Productivity in MSME".

Productivity is the cornerstone of sustainable economic growth, competitiveness and inclusive development. The focus on cluster based development is both timely and relevant, as it strengthens collaboration, enhances innovation and empowers our MSMEs to achieve greater efficiency and global reach.

I commend the Council for its continued efforts in promoting a culture of productivity and excellence across industries in Odisha. I am confident that the deliberations and initiatives undertaken during this observance will contribute meaningfully to the State's industrial progress and economic resilience.

I extend my best wishes for the success of Productivity Week 2026.

(Hari Babu Kambhampati)

MOHAN CHARAN MAJHI
CHIEF MINISTER, ODISHA



LOKASEVA BHAVAN
BHUBANESWAR



M E S S A G E

I am glad to know that the Odisha State Productivity Council, in association with the National Productivity Council, is celebrating Productivity Week on the theme “Clusters as Growth Engine: Maximizing Productivity in MSME” and bringing out a souvenir in commemoration.

Productivity is the cornerstone of sustainable economic growth and competitiveness. In a rapidly evolving global economy, strengthening our MSME sector through cluster-based development is both timely and essential. Clusters foster collaboration, innovation, skill enhancement, and efficient resource utilization, thereby enabling enterprises to scale up and contribute significantly to employment generation and economic resilience.

I extend my warm greetings to the organizer and wish the event all success.

(Mohan Charan Majhi)

धर्मेन्द्र प्रधान
धर्मेश्वर प्रधान
Dharmendra Pradhan



शिक्षा मंत्री
भारत सरकार
Minister of Education
Government of India



MESSAGE

I am happy to know that Orissa State Productivity Council and National Productivity Council will celebrate the 'Productivity Week' from 12th to 18th February, 2026 on the theme of 'Clusters as Growth Engine: Maximising Productivity in MSME' and to mark this occasion, a Special Bulletin is being brought out.

'Productivity Week' emphasizes the continued relevance of the disciplined effort, collaboration and forward-looking mindset to secure sustainable progress. On this occasion, let us reaffirm our dedication to excellence, responsible use of resources and value creation for national development.

I wish the celebration of the productivity week all success.

(Dharmendra Pradhan)

सबको शिक्षा, अच्छी शिक्षा

डॉ. मनसुख मांडविया
DR. MANSUKH MANDAVIYA



मंत्री
श्रम एवं रोज़गार
व युवा कार्यक्रम एवं खेल
भारत सरकार
Minister
Labour & Employment
and Youth Affairs & Sports
Government of India

संदेश

मुझे यह जानकर अत्यंत हर्ष की अनुभूति हो रही है कि ओडिशा स्टेट प्रोडक्टिविटी काउंसिल तथा National Productivity Council द्वारा "Productivity Week 2026" का आयोजन किया जा रहा है।

हमारी अर्थव्यवस्था के लिए MSME सेक्टर न केवल रोजगार सृजन का प्रमुख आधार है; बल्कि विकसित भारत 2047 के लक्ष्य की आधारशिला भी है। आज के इस तकनीकी युग में क्लस्टर आधारित विकास मॉडल से नवाचार, कौशल उन्नयन, प्रौद्योगिकी अंगीकरण तथा प्रतिस्पर्धात्मक क्षमता में अभूतपूर्व वृद्धि संभव है।

माननीय प्रधानमंत्री श्री नरेंद्र मोदी जी का स्पष्ट विजन है कि भारत को आत्मनिर्भर और वैश्विक विनिर्माण केंद्र बनाने के लिए उत्पादकता, कौशल विकास और ईज ऑफ़ डूइंग बिजनेस को नई ऊँचाइयों पर ले जाना होगा। "लोकल टू ग्लोबल" और "मेक इन इंडिया" जैसे अभियानों के माध्यम से MSME क्लस्टरों को सशक्त बनाकर भारत की अर्थव्यवस्था को नई गति दी जा रही है।

मुझे विश्वास है कि यह आयोजन उद्योग, श्रमिक संगठनों और नीति-निर्माताओं के मध्य सार्थक संवाद को प्रोत्साहित करेगा तथा उत्पादकता को राष्ट्रीय आंदोलन के रूप में आगे बढ़ाएगा।

एकबार पुनः आप सभी प्रतिभागियों को सफल आयोजन हेतु हार्दिक शुभकामनाएँ।

(डॉ. मनसुख मांडविया)

SURAMA PADHY
SPEAKER
ODISHA LEGISLATIVE ASSEMBLY



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No. /Spk.

Date ... 01.03.2026



MESSAGE

It gives me immense pleasure to know that Orissa State Productivity Council is going to celebrate Productivity Week on the theme of "Clusters as Growth Engine: Maximizing Productivity in MSME".

With MSMEs contributing significantly to India's GDP and exports, cluster-based development is viewed as a critical strategy to drive industrial expansion, boost employment, and ensure the State's successful integration into the global economy. Clusters serve as vital engines of growth for Micro, Small, and Medium Enterprises (MSMEs) by fostering collaboration, shared resources, and collective efficiency. I hope, the Productivity Week will focus on innovation, enhances manufacturing competitiveness, and integrates smaller firms into global value chains, ensuring sustainable and inclusive industrial development.

I congratulate all associated with Orissa State Productivity Council and wish the celebration of Productivity Week as well as publication of souvenir all success.

Surama Padhy
(Surama Padhy)

SMT. PRAVATI PARIDA

DEPUTY CHIEF MINISTER
Women & Child Development,
Mission Shakti, Tourism.



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BHUBANESWAR

Date 19/02/2026



Message

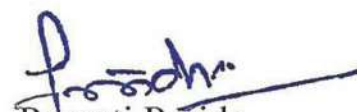
It gives me immense pleasure to learn that the Odisha State Productivity Council (OSPC), in collaboration with the National Productivity Council, is celebrating Productivity Week from 12th to 18th February 2026.

The theme chosen for this year, "Clusters as Growth Engine: Maximizing Productivity in MSME," is both timely and vital. Micro, Small, and Medium Enterprises (MSMEs) are the backbone of our economy, and by fostering a cluster-based approach, we can significantly enhance efficiency, innovation, and global competitiveness.

I commend the OSPC for its storied legacy of over 62 years of service to the nation. The Council continues to play a pivotal role as a tripartite organization bridging the gap between Government, industry, and labour.

In Odisha, our focus remains steadfast on empowering women and grassroots entrepreneurs. I am confident that the special bulletin being released on this occasion will serve as a valuable resource for government officials, industry leaders, and academic professionals alike.

I extend my heartiest congratulations to the members of the Council and wish the Productivity Week celebrations every success.


Pravati Parida

ଶ୍ରୀ ସମ୍ପଦ ଚନ୍ଦ୍ର ସ୍ବାଇଁ

ରାଷ୍ଟ୍ରମନ୍ତ୍ରୀ (ସ୍ବାଧୀନ)

ଶିକ୍ଷା, ଦକ୍ଷତା ବିକାଶ ଓ ବୈଷୟିକ ଶିକ୍ଷା

ଓଡ଼ିଶା



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ପତ୍ର ସଂଖ୍ୟା/ମନ୍ତ୍ରୀଦଳବୈଶି.

ଭୁବନେଶ୍ୱର

ତାରିଖ ୧୩.୦୭.୨୦୨୫

ବାର୍ତ୍ତା

ରାଜ୍ୟ ଉତ୍ପାଦକତା ପରିଷଦ ଏବଂ ଜାତୀୟ ଉତ୍ପାଦକତା ପରିଷଦର ମିଳିତ ଆନୁକୁଲ୍ୟରେ ଫେବୃଆରୀ ୧୨ ରୁ ୧୮ ତାରିଖ ପର୍ଯ୍ୟନ୍ତ "ଉତ୍ପାଦକତା ସପ୍ତାହ" ପାଳନ ହେଉଥିବା ଏବଂ ଏହି ଅବସରରେ ସ୍ୱତନ୍ତ୍ର ବୁଲେଟିନ୍ ପ୍ରକାଶ ପାଉଥିବା ଜାଣି ମୁଁ ଅତ୍ୟନ୍ତ ଆନନ୍ଦିତ ।

୧୯୬୦ ମସିହାରେ ସ୍ଥାପିତ ରାଜ୍ୟ ଉତ୍ପାଦକତା ପରିଷଦର ଦୀର୍ଘ ବର୍ଷ ଧରି ରାଜ୍ୟର ଶିକ୍ଷା ଓ ଉତ୍ପାଦନ କ୍ଷେତ୍ରରେ ଉଲ୍ଲେଖନୀୟ ଅବଦାନ ରହିଛି । ତଳିତ ବର୍ଷର ବିଷୟବସ୍ତୁ ରହିଛି, 'ବିକାଶର ଇଞ୍ଜିନ ଭାବେ କୂଷ୍ଠର : ଏମଏସଏମଇ କ୍ଷେତ୍ରରେ ଉତ୍ପାଦକତା ବୃଦ୍ଧି ।' ଏହା ଅତ୍ୟନ୍ତ ସମୟୋପଯୋଗୀ ଓ ପ୍ରାସଙ୍ଗିକ । ରାଜ୍ୟର ଅର୍ଥନୀତିରେ ଅଣ୍ଟା, କ୍ଷୁଦ୍ର ଓ ମଧ୍ୟମ ଶିଳ୍ପର ଭୂମିକା ଅତ୍ୟନ୍ତ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ । 'କୂଷ୍ଠର' ବା ଗୋଷ୍ଠୀଭିତ୍ତିକ ଶିଳ୍ପ ବିକାଶ ଦ୍ୱାରା ଶିଳ୍ପୋଦ୍ୟୋଗୀମାନେ ଅତ୍ୟାଧୁନିକ ଜ୍ଞାନକୌଶଳ ଓ ସମ୍ବଳର ବ୍ୟବହାର କରି ନିଜ ଉତ୍ପାଦନ କ୍ଷମତା ବଢାଇ ପାରିବେ । ଏହା କେବଳ ଶିଳ୍ପର ଅଭିବୃଦ୍ଧି କରିବ ନାହିଁ, ବରଂ ରାଜ୍ୟର ଅର୍ଥନୀତିକୁ ଏକ ନୂତନ ଗତି ପ୍ରଦାନ କରିବ । ଏହି ଅବସରରେ ପ୍ରକାଶ ପାଉଥିବା ସ୍ୱତନ୍ତ୍ର ବୁଲେଟିନ୍ ଶିଳ୍ପ ସଂଗଠନ, ସରକାରୀ ପଦାଧିକାରୀ ଏବଂ ଶିଳ୍ପଜଗତର ପ୍ରତିନିଧିଙ୍କ ପାଇଁ ପ୍ରେରଣାଦାୟୀ ହେବ ବୋଲି ମୋର ଆଶା ଓ ବିଶ୍ୱାସ ।

ରାଜ୍ୟ ଉତ୍ପାଦକତା ପରିଷଦର ସମସ୍ତ ସଦସ୍ୟ, କର୍ମକର୍ତ୍ତା ଏବଂ ଏହି କାର୍ଯ୍ୟକ୍ରମ ସହ ଜଡ଼ିତ ସମସ୍ତ ବ୍ୟକ୍ତିବିଶେଷଙ୍କୁ ମୁଁ ଶୁଭେଚ୍ଛା ଜଣାଇବା ସହ ଉତ୍ପାଦକ ସପ୍ତାହ – ୨୦୨୬ର ସର୍ବସଫଳତା କାମନା କରୁଛି ।

ସମ୍ପଦ
(ସମ୍ପଦ ଚନ୍ଦ୍ର ସ୍ବାଇଁ)

Message from Chief Guest



सीएसआईआर - खनिज एवं पदार्थ प्रौद्योगिकी संस्थान
(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)
भुवनेश्वर - 751013, ओडिशा, भारत

CSIR-INSTITUTE OF MINERALS AND MATERIALS TECHNOLOGY
(Council of Scientific & Industrial Research)
Bhubaneswar-751013, Odisha, INDIA



डॉ. रामानुज नारायण
निदेशक

Dr. Ramanuj Narayan
Director

Ref. No: CSIR-IMMT/D/Letters/38
19th March, 2026



MESSAGE

Jai Jagannath!

It gives me immense pleasure to learn that the **Odisha State Productivity Council (OSPC)**, in association with the **National Productivity Council**, is celebrating **Productivity Day on 21st March 2026**. This year's theme, "**Clusters as Growth Engines: Maximizing Productivity in MSME,**" is both timely and significant.

As a non-profit organization representing government bodies, technical institutions, academia and corporate houses, OSPC has played a commendable role in promoting productivity consciousness throughout the state. Ever since its inception in **1960**, registered under the Societies Registration Act, the Council has completed over **six decades** of dedicated service to the nation. The visionary leadership of its Founder President, the late **Shri Biju Patnaik**, continues to inspire its missions today.

The annual observance of **Productivity Week** reflects OSPC's sustained commitment to enhancing efficiency, competitiveness, and growth. The 2026 theme aptly highlights the importance of cluster-based development in strengthening MSMEs, which serve as the backbone of our economy. By fostering collaboration, innovation, and resource optimization, these clusters will undoubtedly contribute to sustainable industrial growth.

I extend my heartfelt congratulations to the organizers for their continued efforts and wish the celebrations great success. I am confident that this initiative will further strengthen productivity awareness and contribute meaningfully to our economic development

[Ramanuj Narayan]

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<http://www.immt.res.in>

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MESSAGE

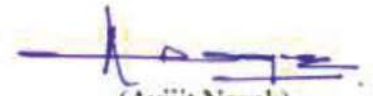
As we come together to celebrate **National Productivity Week 2026** (12–18 February), I extend my warmest greetings and best wishes for a highly successful and impactful observance.

This year's inspiring theme **"Clusters as Growth Engine: Maximizing Productivity in MSMEs"** beautifully aligns with India's vision of strengthening self-reliant, innovative, and competitive micro, small, and medium enterprises through collaborative clusters. By fostering shared infrastructure, knowledge exchange, lean practices, technology adoption, and global value chain integration, we can unlock tremendous potential for sustainable growth, efficiency, and inclusive development especially vital in mineral-rich and industrially vibrant states like Odisha.

May this week's activities seminars, workshops, awareness sessions, concept paper competitions, debates, and more ignite fresh ideas, build stronger networks, and drive real productivity gains across industries, particularly in our MSME ecosystem.

Wishing **Odisha State Productivity Council** and all stakeholders' great success, meaningful discussions, and actionable outcomes that contribute to a more productive, resilient, and Atmanirbhar Bharat.

Warm regards and best wishes,


(Avijit Nayak)
Regional Director

मु. का : उत्पादकता भवन, लोदी रोड, नई दिल्ली - 110003
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REPORT ON PRODUCTIVITY WEEK CELEBRATION 2026

The Productivity award Virtual Competition on the **“CLUSTERS AS GROWTH ENGINE: MAXIMISING PRODUCTIVITY IN MSMEs”** was organized on 26th and 27th February 2026 at the conference hall of National Productivity Council. The programme was inaugurated by Hony. Secretary Sri Debabrata Panigrahi at 10.00 am in presence of Regional Dy. Director Mr. Shyam Prasad, & Mr. Shivansh Aaditya, Asst. Director of National Productivity Council and Members consists Vice President & other Sr. Member of Odisha State Productivity Council. Total 26 Corporate houses / companies furnished their Power Point presentations of 20 minutes each have been given by large and Medium Industries. Vice President Mr. Trijib Chandra Hota, Mr. Subrata Panigrahi, COO, IQEMS, Er. Pradeep Kumar Pattnaik, Chief Manager (R), NALCO spend full day with lot of interaction with the presenters and thanks to all the Jury members and NPC officials for their full cooperation.

On the end day successfully completed the evaluation process for the productivity Award Virtual Competition 2026. Record number of participation observed for Productivity Award 2026.



14th Feb.2026. : IFFCO, PARADEEP.

The National Productivity Week was celebrated at IFFCO Paradeep unit from 12th to 18th February 2026 to popularize productivity movement and to create awareness amongst the employees about productivity. The theme of Productivity Week-2026 is **“Clusters as Growth Engine: Maximising Productivity in MSMEs”**.

Various events were conducted during National Productivity Week celebration at IFFCO Paradeep unit from 12th to 18th February 2026. As an opening note, Unit Head of IFFCO was released a message on 12th February 2026 regarding productivity week. In his message, he shared that **“Productivity is a collective**





responsibility driven by continuous improvement, innovation, safety, and cost consciousness across all functions. Sustainable growth can be achieved only through disciplined operations, optimal resource utilization, and a strong commitment to quality and efficiency. Let us strengthen our culture of teamwork and proactive problem-solving to consistently raise performance benchmarks and ensure long-term organizational excellence”

On National productivity week-2026, Odisha State Productivity Council (OSPC) and National Productivity Council (NPC) conducted a lecture meeting on the theme organized by IFFCO Paradeep Unit at production meeting hall on 14th Feb. 2026.. Mr. Subrat Panigrahi, COO, IQEMS and Sr. Member of OSPC and Mr. Alok Kumar Barik, Dy. Director, National Productivity Council was the Guest-cum-speaker on behalf of NPC and OSPC. The presentation on the National Theme **“Clusters as Growth Engine: Maximizing Productivity in MSMEs”** was very interactive and responsive. About 45 Nos. delegates from the various sections of IFFCO were attended the seminar.

14th Feb.2026. : PARADEEP PHOSPHATES LTD., PARADEEP.

The Productivity week was celebrated at Paradeep Phosphates Ltd., on 14th Feb. 2026. Mr. Subrat



Panigrahi, COO, IQEMS and Sr. Member of OSPC and Mr. Alok Kumar Barik , Dy. Director, National Productivity Council was the speaker on behalf of NPC and OSPC. The presentation on the National Theme **“Clusters as Growth Engine: Maximizing Productivity in MSMEs”** was very interactive and responsive. About 50 Nos. delegates from the different sections of PPL were attended the seminar.

14.02.2026: Seminar on “ Clusters as Growth Engine: Maximizing Productivity in MSMEs” at NOCCI, Balasore.

The North Orissa Chamber of Commerce & Industry (NOCCI) organized a seminar on the theme” Clusters as Growth Engine: Maxmizing Productivity in MSMEs” on





14th Feb. 2026 at IFC-NOCCI, Ganeswarpur. The Programme was conducted in association with Odisha State Productivity Council and National Productivity Council.

The Seminar focused on strengthening Micro, Small and Medium Enterprises (MSMEs) through cluster-led development, productivity enhancement and improved competitiveness within the MSME manufacturing ecosystem. The initiative aligns with the national vision of fostering sustainable industrial growth through collaborative and technology driven approaches.

In the welcome address, Shri C.P. Bhartia, Member, Board of Trustees highlighted the objectives of celebrating Productivity Week and emphasized the importance of improving Industrial productivity. He shared valuable insights into the evolution of Industrial operating system from traditional practices to modern AI-driven systems – and underscored how industries are achieving growth through the adoption of Artificial Intelligence and digitization.

The resource person from Odisha State Productivity Council, Mr. T.C. Hota, Vice President, Mr. Pradeep Kumar Pattnaik, Executive Member, OSPC and Mr. Roshan Kujur, Dy. Director, National Productivity Council delivered insightful sessions on productivity enhancement strategies cluster development models, and the integration of modern technologies in MSMEs.

The Seminar witnessed active participation from Entrepreneurs, managers and executives of member industries making it an engaging and informative even.

17.02.2026: The National Productivity Week 2026 was celebrated on 17th Feb. 2026 at S&P Complex and Coal Mines Division, NALCO, Angul. On behalf of Orissa State Productivity Council and National Productivity Council, the resource person Mr. Alok Kumar Barik, Dy. Director, National Productivity attended the seminar as Chief Speaker . He delivered his speech on the **theme “ Clusters as Growth Engine Maximazing Productivity in MSMEs”**. Valedictory function was held under the gracious presence of Executive Director , GGM (SPP) as chief guest. Among others, GGM (Mines), GGM (O&M)/AR and GGM (H&A) from NALCO were also present on the dias. Prize distribution session was conducted. The program was conducted by Mr. Pankaj Anand, DGM, Industrial Engineering. 150 participants. attended the Seminar.

PRODUCTIVITY WEEK CELEBRATION AT NALCO, DAMANJODI- M&R COMPLEX-12TH FEB. TO 18TH FEB. 2026.

The Productivity Week was celebrated in M&R Complex in association with Odisha State Productivity Council (OSPC) with wide participation of Mines and Refinery employees. Various competitions held such as Poster, Productivity Achievement Award, Best Contribution, Quiz etc to showcase the interests of the employees in enhancing productivity. During the week, nominated





teams from M&R participated at OSPC online contest and presented their project work.

Valedictory and Seminar Function organized on 18th February 2026 with great enthusiasm and participation from employees of M&R Complex. Shri Rabi Narayan Mishra, Unit Head & President of M/s UAIL-a subsidiary of Hindalo Industries Ltd, graced the occasion as the Chief Speaker. In his address, he emphasized the importance of productivity, teamwork, innovation, and cost optimization in achieving organizational excellence. He appreciated the collective efforts of employees and encouraged everyone to continue striving for higher standards of performance and efficiency.

Shri Amarendra Kumar Mishra, ED (M&R) graced the function as the Chief Guest and delivered an inspiring message, underlining the significance of modernization and reliability in sustaining competitiveness.

Shri Sugato Anando Basu, CGM(HR) in his delivering speech highlighted the importance of the celebration and commended the initiatives taken during Productivity Week and congratulated the participants for their active involvement.

The program was witnessed by the presence of other CGMs, GMs, executives, union and association members including trainees.

During the function, prizes were distributed to award winners in various categories in recognition of their outstanding contributions and performance. A music video presentation was also made by Shri Premesh Kumar Dwivedy, AGM(IE) during the event highlighting the sacrifice and service of workers.

In addition, an impressive Odishi Dance performance delivered by Ms.Tamana Bisoyi, 4th Std, DPS, mesmerized the audience present.

The programme concluded with a Vote of Thanks delivered by AGM (IE), who expressed sincere gratitude to the Chief Guest, Chief Speaker, award winners, organizing team, and all participants for making the event a grand success.



Maximizing productivity by Technology Upgradation in Alumina Filling System

By Chintamani Panigrahi, AGM(EL) & Jyoti Dubey, GET(EL)

In the pursuit of industrial excellence, the transition from legacy hardware to digital intelligence is no longer optional—it is a prerequisite for survival. At NALCO, a recent technological timely upgradation of the **Pot Tending Machine (PTM) Alumina Filling System** has set a new benchmark for how targeted automation can drastically enhance productivity, sustainability, and reliability.

The Legacy Challenge: The Contactor Bottleneck

For years, the alumina filling circuits in Line-1 and Line-2 PTMs relied on traditional **contactor logic-based hardwired circuitry**. While functional, this hardware-dependent system became a primary source of operational friction. The complexity was staggering: a single control circuit involved **44 auxiliary contactors** and **14 pneumatic timers**.

This “hard-wired” approach suffered from several critical vulnerabilities:

- **Timer Uncertainty:** Pneumatic mechanical timers frequently drifted due to aging, requiring constant manual adjustment.
- **Maintenance Intensity:** Fault tracing in densely wired panels was an arduous, time-consuming process.
- **Operational Inefficiency:** Malfunctioning of timers caused erratic vertical spout oscillations, informally known as “spout dancing,” which disrupted the filling cycle and sometimes pot parameters.
- **Energy Penalties:** Inconsistent alumina concentration led to increased **anode effects**, with severe cases resulting in energy losses as high as **9 MWh**.

The Innovation: Transitioning to Micro-PLC Intelligence

The solution lay in a complete architectural shift. In March 2025, NALCO successfully replaced the cumbersome hardware logic with a streamlined **Micro-PLC system** (Schneider SR3 B261FU + SR3 XT141FU) featuring 40 I/O capabilities.

By migrating logic from physical contactors to software-based ladder logic, the system achieved a level of precision previously unattainable. The **ladder logic** and

programmable timers now govern every aspect of the filling sequence—from the 15-second opening delays to the 20-second full latch cycles—with millisecond accuracy.

Impact and Sustainability: A Triple-Win Scenario

The results of this modification extend beyond simple uptime. The project delivered a “triple win” for NALCO:

1. Operational Reliability

Since implementation, control circuit-related problems have declined to nearly zero. By eliminating pneumatic timers, “timer-related issues” plunged from **40% to 5%**, and overall control breakdowns fell from **60% to 10%**.

2. Environmental Stewardship

Digital automation is inherently “greener.” By removing excess wiring and reducing the failure rate of hardware components, NALCO has significantly cut its yearly scrap generation.

- **Metal Waste:** Reduced from 7.79 kg to 2.89 kg per PTM/yr.

- **Plastic Waste:** Reduced from 1.67 kg to 0.45 kg per PTM/yr.

3. Financial Viability (ROI)

The economic argument for the upgrade is undeniable. With a modest one-time capital investment of approximately **₹ 53,000 per PTM**, the system achieves a **payback period of roughly 2 years**. This is driven by an annual saving of **₹ 27,000** previously spent on replacing defective electrical components.

Conclusion: Scaling the Future

The success of this project demonstrates that “maximizing productivity” is not about working harder but about working smarter. The proposed procurement strategy emphasizes sourcing through the Government e-Marketplace (GEM) by engaging MSME vendors from different regions across India. This approach encourages wider participation of MSMEs, promotes vendor diversification, and enhances transparency in the procurement process. It also strengthens the domestic supply chain while supporting inclusive and sustainable industrial growth. NALCO has created a low-maintenance, high-output model that is ready for wider industrial scaling.

SAIL- BOKARO STEEL PLANT

BLAST FURNACE

Article on: - In-House Fabrication of Skip for Blast Furnace-2

The Team:

1. Shri. Sachin Sharma, Sr. Manager, Blast Furnace
2. Shri. Sunil Bandooni, Sr. Manager, Blast Furnace

Details of THE PROJECT

Problem – “Non availability of skip may lead to shut down of system.”

Process Description:

A **skip** (or skip car) in a blast furnace is a large, open-topped steel container or bucket used for the vital task of **charging** raw materials into the top of the furnace.

Function and Operation

- **Material Transport:** Skips are primarily used to transport specific, weighed amounts of raw materials, including iron ore (pellets or sinter), coke (fuel), and fluxes (limestone and dolomite).
- **The System:** The skip runs on rails up an inclined “skip bridge” using a cable and winch system located in a hoist house.
- **Reciprocating Action:** Typically, two skips operate in a continuous, reciprocating cycle: one full skip travels up to dump its load into the receiving hopper at the top, while the second, empty skip simultaneously descends to be refilled at the stock house level.
- **High Durability:** These containers are designed to withstand heavy wear and tear caused by the continuous loading and unloading of abrasive materials.

The image you provided shows welders performing heavy industrial fabrication on large, cylindrical metal structures, which closely represents the environment where a new skip would be manufactured or repaired

Technical data of skip

- In blast furnace-2, Schedule replacement of skip is in every 18 months. One skip was changed in June 2023 and the other in February 2024. So the next

The basic for design of skip which is as below:		
Sl. No.	Description	Parameter
1.	Total Winded Rope Length	95m Approx.
2.	Normal Skip Burden Weight (70% Sinter + 30% Lump Ore And Additives)	22Ton
3.	Maximum Skip Burden Weight (Lump Ore Only)	30Ton
4.	Coke Charge Weight	6.68Ton
5.	Volume And Weight Of Skip Car	14.5 m ³ And 20 Ton
6.	Skip Travel Time	45 Sec.
7.	Skip Bridge Inclination	52° 7' 49"

replacements were due in August 2025 and January 2026.

- After replacing the skip in February 2024, department had only one spare skip, which was supposed to be ready in a few days. But due to a derailment, that skip was damaged beyond repair which resulted in non -availability of a skip available for the August 2025 replacement.
- To avoid this problem, team decided to fabricate a new skip in-house starting June 2024 and finish it by June 2025. This became a time-critical project because the normal procurement timeline would have taken us to June 2026.

At **Blast Furnace-2**, timing is everything. The skips are the “lifeline” of the furnace, and because they work 24/7 carrying heavy loads, they wear out quickly. To stay safe, the plant follows a strict **18-month replacement rule**. With skips changed in June 2023 and February 2024, the clock was already ticking toward the next major maintenance dates in **August 2025** and **January 2026**.

The department usually keeps a backup ready, but a sudden **derailment accident** changed everything. The only spare skip left was mangled so badly it was officially declared **unrepairable**. This left the engineering team in a “do or die” situation: they had a looming deadline in August 2025 but **no equipment** to install. Buying a new one from outside would take too much time and cost a fortune, putting the furnace at risk of a complete shutdown.

In the past, Bokaro had tried to build a skip in-house, but it didn't work out—the skip failed for “unknown reasons.” Many thought it was impossible to do it locally. However, with their backs against the wall, the Bokaro Steel Plant team took the risk. They used their own workshops, their own tools, and their own expertise to build a brand-new skip from the ground up.

It was installed and is now **running successfully**, proving that the previous failures are a thing of the past. By solving this crisis internally, the team saved the SAIL plant from a massive production loss. It is a proud moment for every worker, proving that when the pressure is on, Bokaro's engineers can match the quality of any global manufacturer.

To ensure the operational reliability of **Blast Furnace-2**, the department adheres to a strict **18-month skip replacement schedule**, with the most recent installations completed in **June 2023** and **February 2024**. Under this rotation, the next critical replacements are due in **August 2025** and **January 2026**, respectively. While the department maintained a standby skip to support this cycle, an unfortunate **derailment incident** occurred shortly after the February 2024 replacement, causing extensive structural damage to the spare unit. Following a technical assessment, the skip was declared **damaged beyond repair**, leaving the department with **zero spare inventory**. This loss has resulted in the total **non-availability** of a skip for the upcoming August 2025 deadline, creating a high risk of unplanned downtime. Consequently, it is now imperative to initiate **emergency procurement** for a new skip to bridge this gap, restore the maintenance safety net, and ensure **uninterrupted production** at Blast Furnace-2.

Solution(s) Suggested & Implemented:

To solve the crisis caused by the derailment and the lack of spares, the

Blast Furnace-2 Mechanical Department implemented a bold, three-part solution. Here is how they turned a potential shutdown into a major success:

1. The Decision for In-House Fabrication

With the August 2025 deadline approaching and no spare skip available, the team decided to bypass

external vendors. Despite the “unknown reasons” that caused a past attempt to fail, the department took full responsibility for building a **“Swadeshi” in house Skip**. This eliminated the long waiting period for procurement.

2. Overcoming Past Technical Failures

The team analyzed why the previous attempt had failed and focused on three critical engineering areas:

- **Precision Welding:** Using specialized jigs to ensure the skip frame did not warp under heat.
- **Structural Reinforcement:** Strengthening the “impact zones” where iron ore and coke hit the hardest.
- **Wheel-Bogie Alignment:** Ensuring the wheels were perfectly aligned to prevent the exact kind of **derailment** that destroyed the previous spare.

3. Rapid Response & Installation

The auxiliary shops worked on a “war footing” to complete the fabrication ahead of the August 2025 deadline. Once finished, the skip underwent rigorous load testing before being installed. This successful run has now restored the **18-month replacement cycle**, ensuring that the next replacement in January 2026 can proceed without any inventory stress.

The Result

The solution didn't just fix a temporary problem; it created a **permanent capability**. The department now has a proven “blueprint” for building skips in-house. This has saved the plant crores in procurement costs and, more importantly, removed the fear of future derailments causing a production halt.

Challenges faced

1. Executive Summary: The “Make in India” Paradigm

This project represents a radical departure from traditional procurement cycles at Bokaro Steel Plant. By internalizing the end-to-end lifecycle of **Skip Fabrication**, the team has not only secured significant fiscal savings but has engineered a localized solution that outperforms external market offerings in quality, reliability, and precision.

2. The Engineering Breakthrough: “Anti-Derailment” Innovation

Unlike standard external procurement, our in-house interventions focused on the geometrical physics of skip operation to eliminate systemic failure points:

- **Precision Geometric Alignment:** We implemented a rigorous focus on non-parallelism and non-perpendicularity, ensuring absolute structural symmetry.
- **Physics-Based Trunnion Placement:** By marking the skip trunnion strategically **below the skip’s geometrical center**, we achieved superior stability.
- **Structural Reinforcement:** The introduction of specialized **extra gusset plates** at the lower bottom serves as a dedicated anti-derailment safeguard, a feature often overlooked in standard designs.

3. Operational & Financial Impact Matrix

Our methodology transformed a maintenance requirement into a value-generating asset:

Key Performance Indicator	Strategic Impact	Documented Outcome
Direct Capital Savings	Immediate reduction in CapEx.	Rs 1.42 Crore saved for BF-2; Rs 1.3 Crore projected per subsequent unit.
Asset Longevity	Superior material and weld quality.	Guaranteed service life of 10–15 years.
Risk Mitigation	Supply chain sovereignty.	Eliminated vendor dependency and minimized supply chain risks.
Customization	Site-specific engineering.	Design optimized for actual site and real-world operating conditions.

4. Systematic Execution Framework

We did not just build; we engineered a **Quality Assurance Protocol (QAP)** from the ground up:

1. **Conceptualization:** Proposed and validated the internal skip fabrication model.
2. **Advanced Material Science:** Conducted high-level technical discussions on specific electrodes and body fabrication materials.

Implementation

Phase 1: Structural Fabrication

- **Base Plate Assembly:** The process began at the

Structural Shop, where the base plate’s curved portion was rolled, precisely aligned, and assembled with the base plate and supporting ribs through high-quality welding.

- **Logistics:** Upon completion of the primary structure, the skip body was transported to the **Machine Shop** using a specialized heavy-duty trailer.

Phase 2: Precision Machining & Trunnion Fitting

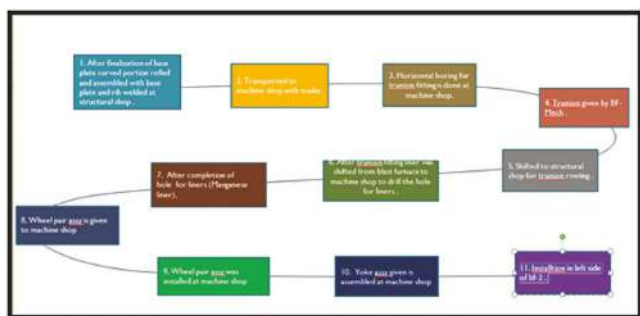
- **Horizontal Boring:** Accurate horizontal boring was executed at the Machine Shop to prepare the structure for **Trunnion fitting**.
- **Component Sourcing:** The required Trunnions were supplied by the **BF-Mechanical Department**.
- **Riveting Process:** The assembly was briefly shifted back to the Structural Shop for the critical **Trunnion riveting** process to ensure maximum load-bearing strength.

Phase 3: Liner Integration

- **Liner Preparation:** The liners were shifted from the Blast Furnace to the Machine Shop for precise drilling.
- **Manganese Liner Installation:** Following the completion of the drilling process, high-durability **Manganese liners** were successfully integrated into the skip body to resist abrasive wear.

Phase 4: Final Assembly & Commissioning

- **Wheel Pair Integration:** The **Wheel Pair Assembly** was delivered to the Machine Shop, where it was expertly installed and aligned.
- **Yoke Assembly:** The final **Yoke Assembly** was provided and fitted at the Machine Shop, completing the skip’s mechanical structure.
- **Operational Milestone:** The fully fabricated skip was successfully transported and installed on the **left side of Blast Furnace-2 (BF-2)**, where it is now running flawlessly.



Implementation sequence

RESULT

1. The Executive Breakthrough

By pivoting from external procurement to **Internal High-Precision Fabrication**, Bokaro Steel Plant has successfully de-risked its core iron-making supply chain. This initiative represents a shift from being a “consumer of technology” to a “creator of industrial solutions,” resulting in immediate fiscal savings and long-term operational resilience.

2. Strategic Value Pillars

- **Fiscal Dominance & Cost Optimization:** Achieved a verified capital saving of **Rs 1.42 crore** for the BF-2 skip fabrication, with a scalable model projected to save an additional **Rs 1.3 crore** per unit for the remaining furnace fleet.
 - **Supply Chain Sovereignty:** Eliminated critical vendor dependency, effectively neutralizing supply chain volatility and external market risks.
 - **Operational Zero-Downtime:** Secured “Timely Availability,” a critical metric that prevents catastrophic production losses associated with extended furnace downtime.
 - **Adaptive Design Engineering:** Empowered engineering teams to implement **Design Customization**, ensuring that hardware is perfectly synchronized with specific site-operating conditions—a level of precision rarely achieved via third-party vendors.
- #### 3. Operational Excellence & Asset Integrity
- **Supervised Quality Assurance:** Implementation of direct, rigorous supervision and absolute adherence to engineering blueprints, elevating the quality benchmark of critical assets.

- **Extended Life-Cycle Assets:** Engineered for long-term endurance, these in-house skips boast an estimated **service life of 10–15 years**, ensuring sustained ROI.
- **Resource Maximization:** Optimized the utilization of existing plant manpower and high-end workshop facilities, turning internal overheads into value-generating assets.

4. Impact: Beyond the Bottom Line

This project serves as a national benchmark for the **Atmanirbhar Bharat initiative**, proving that Indian heavy industry can internalize complex manufacturing. It has acted as a catalyst for:

- **Internal Skill Synthesis:** Drastically enhanced the technical capability and “tribal knowledge” of our internal engineering teams.
- **Maintenance Agility:** Strengthened both preventive and corrective maintenance response times, ensuring the heart of the steel plant never stops beating.

benefits achieved

- Reduced Procurement
- Increased Reliability
- Reduced Downtime
- Improved Inventory

Tangible Benefits - Rs. 125.85 lakhs as vetted by finance department.

**AS LONG AS
YOU'RE BEING
POSITIVE,
YOU'RE BEING
PRODUCTIVE**

GenX Diagnostics: A Journey From Convention to Cutting Edge Innovation

Context:

Clusters act as a powerful growth engine for a service industry by transitioning them from operating in isolation to a collaborative ecosystem. In India, where the diagnostics market is highly fragmented and expected to reach USD 25.6 billion by 2027, the cluster-based approach enhances productivity through shared infrastructure, technology adoption, and improved quality standards. We started with a modest centre at Sahid Nagar 9 years back and today we are operating in 10 different locations across Odisha. Our patient sample size has gone up from zero to more than 7 lakhs per annum as on today. GenX has 180 staff members, 18 consultants and 30 non-technical support team.

Objectives:

"Precision, Care, and Commitment for a Healthy Society"

Our primary objective was to raise a referral level diagnostic centre for physicians looking after patients not attending to high end corporate hospitals for various reasons. The bench mark was to keep the standard at par with corporate hospitals both in terms of hardware and manpower. It was a challenge for us to meet both the end. Our sincerity, confidence team work and subject knowledge helped us. Our scope of service has the largest test menu in Odisha.

Recently we have received strategic investment from MedGenome. It is a South Asia's largest genetic testing laboratory having more than 1300 advance genetic testing.

MedGenome has been a pioneer in delivering affordable, global-quality Genomics testing and research services in India. Deep-rooted commitment to scientific excellence is evident through their contribution to more than 1000 citations across 180 research papers. The talent pool consists of 1300 skilled employees, 200 in-house scientific experts.

While science guides all our innovations, our technological capabilities including clinically validated proprietary assays, AI/ML enabled bioinformatics

platform and in-house developed variant analysis tools enable us to transform them into real world applications.

Key Strategies followed for Maximizing Productivity in Diagnostic Cluster:

- **Common Facility Centres (CFCs):** Diagnostic set up can leverage CFCs for shared high-end, capital-intensive equipment (e.g., MRI machines, CT scanners, advanced Molecular Diagnostics/PCR machines) that individual labs cannot afford.
- **Shared Quality Assurance:** GenX maintains a robust IQC and EQAS program. Outlier monitoring, RCA & CAPA is a regular exercise. Quality assurance activities are essential for increasing trustworthiness, reducing error rates, and boosting productivity. The centre received NABL accreditation (ISO 15189:2022) in 2019 during COVID period.
- **Technology Upgradation & Digitization:** Patients' sample receiving to report delivery is done on real time mode using our dedicated cloud server. We at GenX started the concept of printing QR code in the report format. This help patients to check the authenticity and genuinity of report. We are actively participating in the state TB screening program with the help of our periphery centre. AI-powered diagnostics tools are used while reporting large population study reducing TAT significantly. We are actively considering Tele-radiology services to other centres.
- **Purpose Peripheral Centre:** Normally national level chain labs pool samples from far off places through aggregators, courier them to their main lab at Bhubaneswar. The major drawbacks are improper cold chains, degradation of sample quality, loss of man-day for the patient, delayed TAT. Treatment gets delayed. To avoid such delay and brining efficiency in reporting we initiated a chain breaking mechanism. GenX installed fully automated chemistry analysers, ISI analysers, 5-part CBC analysers and at some places hormone

analysers. Peripheral labs can process almost 90% samples on the same day and release the reports to patients.

- **Formation of legal entities (SPVs)** by cluster members enables to secure government grants and better bargaining power with suppliers for reagents and equipment.
- **Networking & Knowledge Sharing:** Collaboration among firms in close proximity allows for the exchange of information, skill development, and joint marketing, reducing operating costs.

Focus Area of Activities:

A. Alignment with National Priorities: Creating a globally competitive, innovation-driven ecosystem

We are aligned with National TB Elimination Programme which aims at National Tuberculosis Eradication Program is to eradicate tuberculosis. It's a programme towards Pradhan Mantri TB Mukh Bharat Abhiyan under National Health Mission.

Use of AI helped in building capacity which enabled reporting Lungs TB, in peripheral areas covering 20 districts and 1,80,000 patients approximately. We are also conducting research projects in collaboration with RMRC, ICMR & AIIMS. Creating global presence in collaboration with Medgenome.

B. Capacity Building and Knowledge Sharing

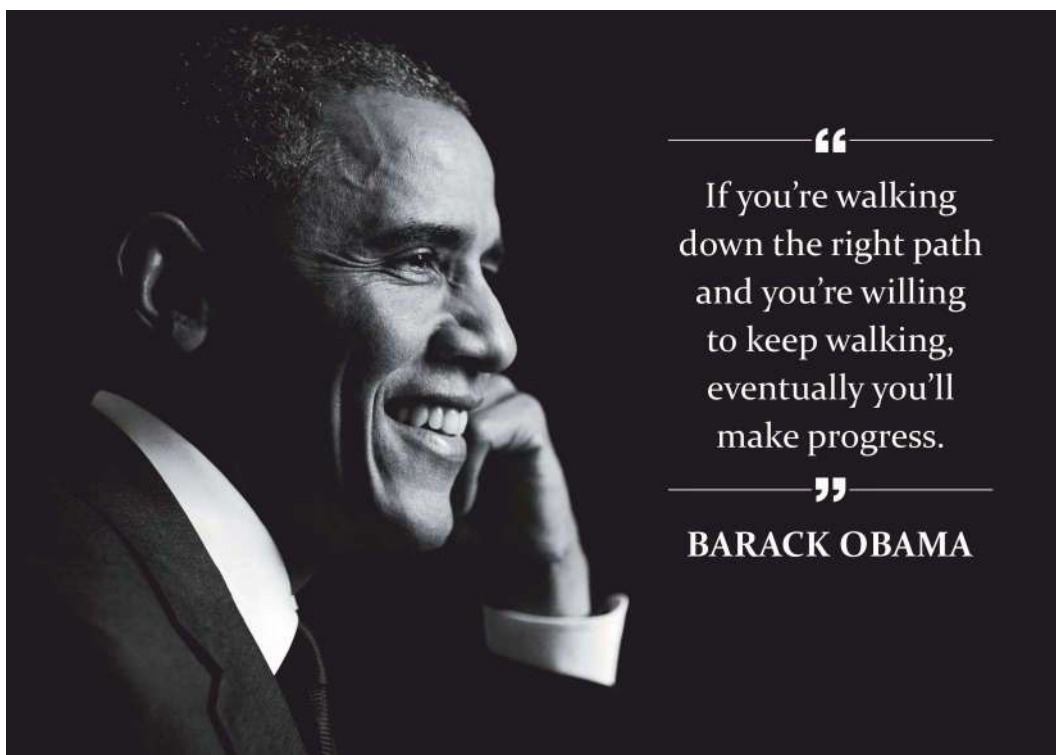
With the help of peripheral labs and availability of large skill manpower we could facilitate health checkup in smaller block level areas. We are present in 40 corporates in providing Health Check Up.

C. National Scheme: To enhance capacity, we are hiring through National Apprentice Training Scheme (NATS) and providing training to Apprentice who can professionally trim up as per organization requirement. It's an initiative towards employment generation and facilitation of graduates.

The entire process is result oriented following quality indicators which indicate different parameters for different department. Quality indicator is there to control error ratio. Triple authentication reporting is designed to control over typographical error in report despatch.

Conclusion:

Timely reporting, right diagnosis is required for a healthier and better tomorrow. Reducing TAT time and error ratio is the bigger challenge in Diagnostic industry. It has resulted in setting bigger roles and maximizing productivity in larger scale.



Optimizing the Red Mud Value Chain

A Productivity-Driven Approach to Sustainable Alumina Refining

- Author: Ms. Sangita Sadafulle
Deputy CEO – Red Mud
- Ms. Pujashree Patri Executive – Business Development & Sustainability
- Mr. Sibi Shanthan
Lead- Innovation and Utilisation

Organization: Vedanta Limited – Alumina Business, Lanjigarh

Abstract

Red mud, a by-product of the Bayer process, has long posed operational and environmental challenges for alumina refineries. At Vedanta Lanjigarh, a structured productivity-led initiative was undertaken to transform red mud management from a compliance obligation into a value-generating system. By adopting parallel execution, process optimization, and cross-functional ownership, the refinery achieved significant gains in logistics efficiency, cost reduction, and sustainable waste utilization. This article presents a practical example of productivity improvement in industrial by-product management.

Background and Challenge

Alumina refining generates red mud in large volumes, necessitating uninterrupted evacuation to maintain plant continuity. Traditionally, red mud handling was constrained by limited utilization avenues, inefficient loading cycles, high demurrage and dead-freight penalties, and safety and environmental risks during storage and transportation. These challenges not only impacted operational efficiency but also increased compliance pressure and cost exposure.

With growing emphasis on sustainability, circular economy, and cost leadership, Vedanta Lanjigarh recognized the need to re-engineer the red mud value chain through productivity principles rather than incremental fixes.

Productivity-Centric Intervention

Parallel Execution Strategy: Instead of sequential execution, the project adopted a parallel approach where regulatory approvals, infrastructure readiness, logistics stabilization, and market engagement were pursued simultaneously. This approach significantly reduced lead time and enabled faster stabilization of dispatch operations.

Process Flow Optimization: End-to-end mapping of the alumina refining and red mud handling process identified bottlenecks across filtration, handling, loading, and dispatch. SOPs were developed and standardized where gaps existed, ensuring consistent execution and clear ownership across functions.

Logistics and Dispatch Improvement: A key productivity lever was enhancing rake loading efficiency. Initiatives included standardized rake planning, mechanized loading practices, advocacy for loader-mounted weight meters to control dead freight, and focused actions to reduce wagon detention and turnaround time. These interventions enabled smoother coordination with railways and improved asset utilization.

Safety, Compliance, and Sustainability Integration

Safety was treated as a productivity enabler rather than a constraint. Structured risk assessments, CCTV surveillance, GPS-enabled vehicle tracking, and regular safety interactions were embedded into operations. Environmental safeguards such as proper lining, containment, and monitoring ensured that productivity gains were achieved without compromising compliance.

In parallel, utilization pathways were expanded beyond cement industry dispatch. Red mud was explored for mine backfilling in combination with overburden and phospho gypsum, soil conditioning trials, and landform stabilization and greening initiatives—enhancing system resilience and reducing dependency on a single outlet.

Measurable Outcomes

The initiative delivered tangible productivity benefits, including:

-
- Significant increase in monthly rake dispatch volumes
 - Reduction in demurrage and dead-freight penalties
 - Improved predictability in dispatch planning
 - Reduced inventory pressure at storage yards
 - Enhanced confidence among regulators and stakeholders

More importantly, a repeatable framework for industrial waste optimization was established.

Conclusion

The red mud value chain optimization at Vedanta Lanjigarh demonstrates how productivity thinking can convert industrial waste management into a strategic advantage. Through parallel execution, disciplined processes, strong safety integration, and cross-functional collaboration, the initiative achieved operational stability, cost reduction, and sustainable outcomes. This case offers a replicable productivity model for process industries seeking to align efficiency with environmental stewardship.



Productivity isn't about being
a workhorse. Keeping busy or
burning the midnight oil...
It's more about priorities,
planning, and fiercely
protecting your time.

GARY KELLER

SAIL- BOKARO STEEL PLANT

COLD ROLLING MILL-III

Article on: - *AI assisted Intelligent Stoichiometric Optimization in DFF Section Burners in HDGL/CRM-III*

The Team:

1. Shri. Prashant kumar Singh, Sr. Manager, Cold Rolling Mill-III
2. Shri. Kunal Ameta, Dy. Manager, Cold Rolling Mill-III

Details of THE PROJECT

Problem: Recurring White Band surface defect on galvanized sheets.

The White Band Defect emerged as a recurring surface anomaly observed on galvanized steel sheets produced in the HDGL line. Characterized by transverse, faint whitish streaks that disrupted the visual uniformity of the zinc-coated surface, these defects began triggering increasing numbers of customer complaints, especially from discerning sectors where aesthetics and finish are critical—such as automotive, appliances, and exposed construction applications. Although the bands did not always compromise the mechanical integrity of the material, they significantly affected perceived quality and market acceptability, particularly in high-end segments. Over time, these unresolved complaints began to erode customer confidence, casting doubt on the consistency and process reliability of HDGL output. Internally, the defect posed challenges for quality control, often resulting in higher diversion rates, manual inspection overhead, and reprocessing. As market perception tilted negatively, it became imperative to investigate the root cause scientifically and implement a robust, long-term corrective strategy to restore both product integrity and brand reputation associated with HDGL products.



White Band Defect observed at customer's end during downstream processing

Solution(s) Suggested & Implemented:

Based on the extensive multi-stage analysis conducted across HDGL, PLTCM, and HSM, it was ultimately concluded that the root cause of the white band defect stemmed from differential heat dissipation in hot rolled coils during ambient air cooling after coiling. Specifically, the edges of the coils, being more exposed and having higher surface-area-to-volume ratios, lose heat more rapidly than the centre, leading to non-uniform micro structural evolution across the strip width. This thermal gradient translates into variations in mechanical properties, such as lower ductility at the edges, which becomes visible during downstream processing. It was therefore hypothesized that by tailoring the heat treatment—i.e., by selectively heating the centre more and the edges less—this pre-existing defect could be visually neutralized during galvanizing. However, the original burner firing logic in the Direct Fired Furnace (DFF) presented limitations. The PLC-controlled burner sequencing was designed solely to operate burners in a binary ON/OFF fashion based on pyrometer and thermocouple feedback, without accounting for dynamic process variables like strip speed, thickness, or width. Moreover, the architecture allowed no lateral zoning control, meaning the entire width received uniform heat input regardless of specific metallurgical needs. This systemic limitation underscored the need for a new logic framework—one that could override static uniform heating and provide differentiated thermal input across the strip width in real time.

Strategic Interventions Implemented

The following modifications were undertaken:

- i. AI-Assisted Logical Burner Zoning and Dynamic Firing Control
- ii. Air-Fuel Ratio (ϕ) Optimization for Combustion Efficiency

iii. Adaptive Set point Control Using Self-Learning AI Model

iv. Lean Firing Mode for Thin Gauge Strip Processing AI-Assisted Logical Burner Zoning and Dynamic Firing Control

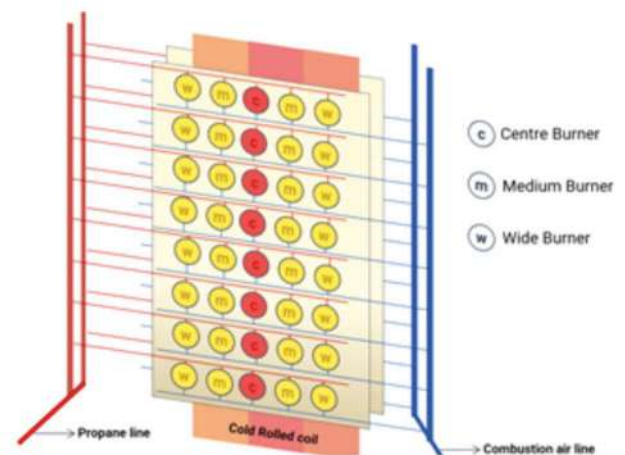
One of the most significant interventions implemented to counter the metallurgical asymmetry responsible for the white band defect was the AI-assisted logical zoning and dynamic control of DFF-4 burners. The existing DFF design was inherently limited in its control flexibility—all 80 burners in DFF-4 were either ON or OFF simultaneously, as determined by a legacy PLC program based solely on pyrometer and thermocouple feedback. This simplistic binary control logic lacked the granularity needed to account for critical dynamic parameters like strip width, thickness, and line speed, and offered no provision for lateral (width-wise) heat differentiation, a feature essential for thermally compensating edge-to-centre property variations in the incoming strip.

To overcome this, a major architectural overhaul was undertaken, wherein all 80 burners were logically and electrically segregated into three distinct lateral heating

- Centre Zone: 48 burners (up to 750 mm from the strip centerline)
- Medium Zone: 16 burners (extending coverage up to 1050 mm)
- Wide Zone: 16 burners (extending beyond 1350 mm)

This re-zoning required physical rewiring of burner control circuits, creation of dedicated firing control loops, and integration with an AI-assisted decision layer developed to interpret strip width data in real time. Based on the strip width, the AI model dynamically triggers zone-specific firing sequences. For example:

- Narrow strips ($d < 1050$ mm): Activate only the Centre Zone, minimizing fuel usage while focusing thermal input where needed.
- Medium-width strips (1051–1350 mm): Activate both Centre and Medium Zones, expanding thermal coverage.
- Wider strips (> 1350 mm): Require all three zones, ensuring uniform thermal penetration.



Width-adaptive logical segregation of DFF burners to enable transverse zonal firing

The implementation was not trivial—it required coordination across electrical, automation, and process control teams. Safety interlocks, flame supervision, and burner balancing had to be recalibrated to accommodate independent operation. Further, the AI algorithm was trained to account for transient states such as width transitions, line speed changes, and burner fault scenarios, making real-time decisions on firing patterns without introducing thermal instability or furnace cycling issues.

This intervention marked a shift from static combustion control to intelligent, data-driven zone-wise thermal modulation, aligning heat input with strip-specific requirements. It not only mitigated the visibility of white bands but also improved fuel efficiency and thermal consistency, laying the groundwork for a scalable AI-controlled furnace management system.

Air-Fuel Ratio (λ) Optimization for Combustion Efficiency

A critical intervention in enhancing both fuel efficiency and combustion quality was the optimization of the air-to-fuel ratio, quantified by the parameter λ (λ). In combustion engineering, λ represents the ratio of actual air supplied to the stoichiometric air required for complete combustion of a given fuel. For propane (C_3H_8), the theoretical stoichiometric air-to-fuel ratio is approximately 23.9:1 by volume. Prior to optimization, the DFF operated at $\lambda \approx 1.4$, corresponding to an air-fuel ratio of roughly 14:1, which implies a fuel-rich condition. In such under-oxidized environments, while

reducing atmospheres are maintained, combustion is incomplete, leading to higher volumes of unburnt hydrocarbons—primarily propane and carbon monoxide—being released through the chimney stack. This not only causes expensive fuel loss, but also increases CO₂ and pollutant emissions, conflicting with environmental and operational sustainability goals. Furthermore, fuel-rich flames exhibit lower flame temperatures, leading to sub-optimal heat transfer, especially at high line speeds or for thicker materials requiring elevated strip temperatures.

Through calculated trials and iterative tuning, the lambda value was increased from 1.4 to 2.0, bringing the air-fuel mixture closer to the ideal stoichiometric condition while still retaining a mild reducing atmosphere.

This shift significantly improved flame stability increased effective heat output per unit of fuel and minimized the release of unburnt propane. The resulting combustion was cleaner, with reduced soot generation and lower flame impingement risk, ensuring better strip surface integrity—particularly crucial before galvanizing.

Adaptive Set point Control Using Self-Learning AI Model

To address the inherent limitations of static, rule-based furnace control systems, an advanced AI assisted dynamic set point control model was developed and deployed in the HDGL furnace environment. Traditionally, set point in the Direct Fired Furnace (DFF), Radiant Tube Heating (RTH), Radiant Tube Soaking (RTS), and subsequent zones were derived from simplified logic based on pyrometer readings alone. This rigid approach ignored critical process parameters such as coil thickness, strip width, line speed, burner faults, and entry-side variations, leading to inconsistent thermal performance across diverse coils.

To bridge this gap, a self-developed middleware system was created for continuous data acquisition and real-time analytics. It collects multi-dimensional process data every 5 minutes.

A multivariate polynomial regression model was trained to predict target zone temperatures dynamically. The model learns from historical strip

behavior, operational patterns, and quality outcomes to generate zone-specific set points for DFF, RTH, RTS, RJC, and Snout. Unlike traditional control logic, this AI system is context-aware—it dynamically recalibrates thermal profiles in response to real-time variations in incoming material and line conditions.

A key strength of this model is its self-learning capability. It continuously improves as more data becomes available, adapting its regression coefficients quarterly. Over time, it becomes more adept at predicting optimal set point for a wide range of coil types and process states, thereby reducing manual intervention, minimizing quality excursions, and enhancing strip thermal stability. For instance, during a coil transition from 2.0 mm to 0.5 mm, the model anticipates the thermal behavior change not only based on thickness, but also considers line deceleration trends, power consumption from induction modules, and strip tension feedback. As a result, the furnace dynamically adjusts set points to prevent overheating or under-annealing, without requiring hard-coded logic for every material grade.

By embedding AI/ML intelligence into process control, this adaptive model transforms the furnace from a passive system into a predictive, self-optimizing thermal engine—maximizing

Lean Firing Mode for Thin Gauge Strip

Processing thin gauge strips (typically <0.6 mm thickness) in a continuous galvanizing line presents significant thermal challenges. Due to their low thermal mass, these strips are highly susceptible to Overheating during line deceleration events, such as entry-end weld transitions or coil changeovers.

While the line speed reduces rapidly during these events, the furnace's high thermal inertia prevents it from cooling at the same rate, leading to localized overheating of the thin section. This result in heat buckling, necking, and in worst-case scenarios, strip breakage or melting within the furnace.

To counter this, a Lean Firing Mode was engineered and embedded into the furnace control logic—an intelligent feature specifically designed for handling thin gauge materials. When activated, the system alternately fires burners in staggered sequences,

significantly reducing overall heat input while preserving thermal stability. This avoids the risks associated with full-scale burner shutdowns and ensures smoother temperature transitions.

This predictive adaptation is a hallmark of AI/ML interwoven with domain expertise—blending data driven modeling with deep process understanding. By factoring in both material characteristics and process dynamics, the Lean Firing Mode ensures thermal integrity, operational safety, and product quality, even in complex multi-gauge rolling schedules. It also contributes to burner longevity, reducing thermal fatigue by preventing unnecessary over-firing during slowdowns. This innovation exemplifies how smart process automation can bridge the gap between metallurgical constraints and real-world plant operation, enabling intelligent control strategies that evolve with data.

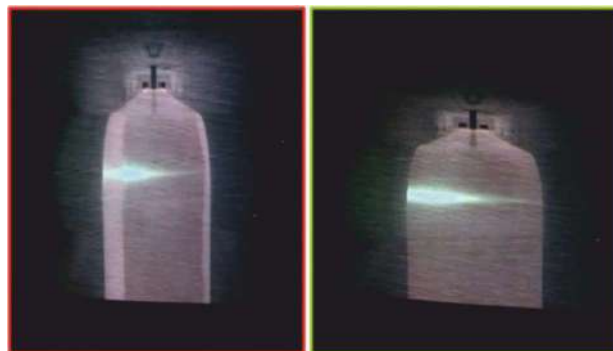
Result

- i. Suppression of White Band Defect in Final Product
- ii. Improved Propane Utilization and Fuel Efficiency
- iii. Enhanced Surface Quality and Customer Perception
- iv. Advancing Furnace Performance through Smart Automation
- v. Reduction in CO₂ Emissions and Environmental Impact

Elimination of White Band Defect from Final Product

The most prominent outcome of the interventions was the effective suppression of the white band defect, which had long plagued galvanized coil output from the HDGL line. This defect, characterized by faint transverse streaks across the strip width, was traced back to non-uniform cooling in the hot rolled coil during ambient air cooling after coiling. By the time the strip reached the HDGL furnace, this thermal legacy manifested as micro structural and surface chemistry variations that became visually evident during uniform reheating in the DFF. Through AI-assisted burner zoning, dynamic firing control, and adaptive thermal profiling, it became possible to counteract these inherited inconsistencies. Selective heating—focused more on the centre and less

on the edges—enabled controlled temperature homogenization, which helped visually neutralize the surface contrast.



Elimination of White Band Defect

The strategic implementation of zone-wise burner control enabled controlled under-heating of the edges and enhanced heating of the centre, effectively realigning the thermal exposure to match the inherited metallurgical state. By applying less thermal input to the already coarser, harder edges, the process prevented further grain coarsening and minimized oxidation instability. Simultaneously, slightly higher heat input at the centre supported complete transformation and grain refinement, ensuring consistency in mechanical properties and surface energy across the strip width.

Improved Propane Utilization and Fuel Efficiency

One of the most tangible and financially impactful outcomes of the project was the significant improvement in propane utilization efficiency across the HDGL furnace system. Prior to intervention, the average propane consumption rate for FY 2023–24 stood at 16.644 kg/ton of production, as recorded by the Energy Management Department. Following the implementation of AI-assisted burner zoning, lean firing for thin gauges, and optimized lambda (λ) control, the propane consumption rate was reduced to 13.741 kg/ton in FY 2024–25. This represents a net reduction of 2.903 kg/Ton, translating to a 17.44% improvement in fuel efficiency year-on-year.

Enhanced Surface Quality and Customer Perception

This improvement in surface uniformity directly contributed to a substantial increase in OK Coil percentage, which rose from 96.01% in FY 2023–24 to 97.50% in FY 2024–25, reflecting not only improved

metallurgical consistency but also reduced downstream rejection, better coating reliability, and higher first-pass yield. The improvement in surface finish was directly reflected in positive feedback from end customers, reduced need for coil reclassification or downgrading, and a noticeable decline in quality related diversions and manual inspection alerts. This shift in quality consistency has repositioned HDGL output as a reliable and defect-free product, restoring customer confidence and strengthening market perception of the plant's technical capability and product excellence.

Advancing Furnace Performance through Smart Automation

The cumulative effect of AI-assisted interventions significantly enhanced the operational throughput and thermal stability of the HDGL furnace. With better control over heat input—tailored to strip width, thickness, and line speed—the line experienced fewer thermal overshoots, reduced stoppages, and more consistent strip temperatures, enabling higher average line speeds and increased productivity across a wider gauge mix. The introduction of dynamic zone-wise burner control and lean firing strategies not only improved combustion efficiency but also ensured a more balanced thermal load distribution across burners. This led to lower thermal cycling stress, extended refractory and burner lifespan, and minimized unplanned downtime for burner maintenance. Importantly, the shift from static logic to a self learning AI framework marked a critical step toward autonomous furnace regulation. The system now dynamically recalculates set point in response to real-time process variables and learns from historical performance data to continually optimize heating profiles. This transformation has reduced reliance on 19 manual interventions, improved line adaptability during product transitions, and established the foundation for intelligent, predictive furnace operations aligned with Industry 4.0 principles.

benefits achieved

Benefits obtained by implementing the project may be classified as:

1. Tangible Benefits
2. Intangible Benefits.

Tangible Benefits

A) Rs. 3.23 Cr. potential cost savings per annum (vetted by F&A dept)

- Annual Production FY 24-25 = 1,73,201 Tons (A)
- Reduction in Propane Consumption due to project implementation = 2.903 Kg/Tons (B)
- Cost of Propane per Ton = Rs. 64,375.45 (C)

Financial savings for year FY 2023-2024 (Rs.)

$$A \times B \times (C/1000) = \{173201 \times 2.903 \times (64375.45/1000)\} = \text{Rs } 3,23,68,137.39$$

Financial vetting

B) Total CO, Emissions Avoided

$$\begin{aligned} \text{Total Propane Saved} &= \text{Total Propane Saved (T)} = \\ &= \text{Production (FY 24-25)} \times \text{Reduction in Propane Consumption Rate} = 173,201 \times 2.903 = 502.802 \text{ Tons} \end{aligned}$$

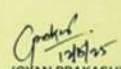
The cost saving calculation is tabulated below:

Year	HDGL Production (T)	Propane Consumed (T)	Propane Consumption Rate (kg/T)
2023-24	127490	2122	16.644
2024-25	173201	2380	13.741

Reduction in Propane Consumption due to Project implementation = 2.903 kg/T
Rate of Consumption of Propane in FY 2024-25 = Rs. 64,375.45 / T
Financial Saving for FY 2024-25 = $173201 \times 2.903 \times 64375.45 / 1000$
= Rs. 3,23,68,137.39

Also, the department was asked to enumerate whether any extra expenditure was incurred to carry out the project to which the department has replied vide mail dated 28.04.2025 stating that no extra cost has been incurred by the department and all developments have been done in-house.

Submitted please.


(GYAN PRAKASH)
Sr. Manager (F&A)

Emission Factor for Propane Combustion Standard CO,
Emission Factor = 2.984 Tons CO, / Ton propane

$$\begin{aligned} \text{Total CO, Emissions Avoided CO, Reduction} &= 502.802 \\ &\times 2.984 = 1500.36 \text{ Tons CO,} \end{aligned}$$

Intangible Benefits

- A. Improved Work Efficiency
- B. Increased in Self Confidence
- C. Increased Team Spirit
- D. Inspiration to Take New Challenging Projects
- E. Increased Cohesion Amongst Different Departments
- F. Helped in Improving the Productivity of the line

AAINAA Model Implementation – Compressor House Safety & Productivity Enhancement

This article presents a comprehensive overview of the safety and operational improvements carried out in the Compressor House of Vedanta Limited, Lanjigarh under the AAINAA (Advance Action in Industries to Abate Accidents) initiative. The project focuses on creating model safety zones, eliminating hazards, improving accessibility and housekeeping, and strengthening operational efficiency.

Team Members

- Facilitator: K. Nirmal Raj
- Team Member: M. Kombaya
- Team Member: Pritam Mihir Sri Chandan

Background

The Compressor House is a critical utility area supplying compressed air essential to refinery operations. Prior to improvement, the area faced challenges such as unsafe access to suction filters, slip and trip hazards, unorganized scrap areas, insufficient staircases, and improper housekeeping. Under the AAINAA model, systematic improvements were executed to make the area safer, compliant, and efficient.

Key Improvements Implemented

- Elimination of work-at-height risks by replacing multiple monkey ladders with a single safe staircase.
- Installation of hard barricades at cooling tower areas to prevent slips and falls.
- Provision of cool drinking water dispenser to prevent dehydration.
- Scrap segregation and removal from compressor house periphery.
- Installation of staircases for all compressors to eliminate scaffolding dependence and reduce downtime.
- Roof sheeting installed above suction filters to prevent failure and improve reliability.
- Drain covers installed to eliminate fall hazards using in-house fabricated covers.

- Development of a Safety Park with visual communication boards on safety, production, environment, and 5S.
- Display of 9 Safety Standards for awareness across teams and business partners.
- Digitalization of SOPs through QR code scanning for easy, portable access.
- Industrial epoxy floor coating applied to designate safe walkways and emergency pathways.
- Pipeline colour coding implemented for easy identification and maintenance.
- Improved fire extinguisher signage for quick accessibility during emergencies.
- Improved nomenclature and pathway marking for equipment accessibility.

Impact of the Initiative

The AAINAA Model implementation in the Compressor House significantly enhanced overall safety, operational reliability, and organizational discipline. Hazardous activities were eliminated, equipment accessibility improved, downtime reduced, and safety awareness strengthened across the workforce. The Compressor House now serves as a benchmark for other areas to replicate under the AAINAA model.

Conclusion

Through structured planning, team collaboration, and innovative safety measures, the Compressor House has transformed into a model AAINAA area. The improvements highlight Vedanta's commitment to safety excellence, operational discipline, and sustainable refinery operations.

We extend sincere gratitude to our CEO Alumina Business. Pranab Kumar Bhattacharyya Sir, for his continuous motivation, valuable suggestions, and unwavering encouragement toward employee and business partner safety across the refinery. His leadership has been instrumental in shaping initiative like AAINAA (Advance Action in Industries to Abate Accidents) across the refinery.

SAIL- BOKARO STEEL PLANT

ENERGY MANAGEMENT DEPARTMENT

Article on: - *Design, Erection & Commissioning of New Pipeline for Utilizing By-Product Coke Oven Gas (COG) to Replace Crude Tar as Fuel in RMP Kiln*

The Team:

1. Shri. Amitesh Raj, Sr. Manager, Energy Management Department
2. Shri. Harendra Pratap Singh Yadav, Manager, Energy Management Department

Details of THE PROJECT

Problem – “The legacy 800 mm Coke Oven Gas pipeline to RMP had become severely choked due to long-term tar and particulate deposition, restricting gas flow and limiting COG firing to only one kiln “

Adverse Impact on Productivity and Operations

The restriction of COG supply to only one kiln significantly reduced operational flexibility within the RMP shop. Kiln scheduling became heavily dependent on the availability of coal tar, which is inherently less efficient and more maintenance intensive. This resulted in:

- Sub-optimal kiln utilization
- Reduced firing efficiency
- Increased downtime due to frequent burner cleaning and refractory damage
- Higher dependence on manual interventions

The inability to operate multiple kilns simultaneously on COG also constrained the plant’s capacity to respond dynamically to refractory demand from downstream steelmaking units.

Escalation in Operating Costs

Coal tar, though available within the plant ecosystem, is a significantly **costlier fuel** when compared to Coke Oven Gas on an equivalent thermal basis. Prolonged dependence on coal tar led to:

- Substantial increase in fuel expenditure
- Higher handling and storage costs
- Increased maintenance expenditure due to soot

and tar residue formation in burners and ducts

- Accelerated wear of refractory linings, shortening campaign life and increasing relining frequency

The continued operation of kilns on coal tar directly translated into recurring financial losses, undermining the economic competitiveness of the RMP shop.

Environmental and Safety Concerns

Coal tar combustion generates high levels of:

- Carbon dioxide (CO,)
- Sulphur oxides (SOx)
- Nitrogen oxides (NOx)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Fine particulate matter (PM₁₀ and PM_{2.5},)

These emissions posed serious challenges in terms of environmental compliance, workplace safety, and ambient air quality. In contrast, Coke Oven Gas combustion is significantly cleaner, producing lower emissions and minimal particulate matter.

Additionally, frequent steaming of the choked pipeline resulted in:

- Excessive steam consumption
- Generation of tar-laden wastewater
- Increased load on effluent treatment systems
- Handling and disposal of hazardous sludge

Inefficient Utilization of By-Product Energy

One of the most critical impacts was the **underutilization of Coke Oven Gas**, a valuable by-product energy source generated within the plant. Despite sufficient availability of COG at the Coke Oven Battery, the plant was unable to exploit its full potential due to transportation constraints. This resulted in:

- Diversion of excess COG to buffer shops
- Flaring during low-demand periods

- Missed opportunities for fuel substitution and energy cost reduction

This scenario was fundamentally misaligned with Bokaro Steel Plant's strategic goals of **energy self-reliance, circular resource utilization, and carbon footprint reduction**.

LIMITATIONS OF CONVENTIONAL APPROACHES

Prior to the conceptualization of the new pipeline, several conventional measures were attempted to mitigate the problem. However, each approach had inherent limitations that prevented it from delivering a long-term solution.

Repeated Steaming and Partial Cleaning

Steaming was traditionally employed as the primary method for clearing tar and naphthalene deposits. However:

- The exact choking locations inside the long pipeline were unknown.
- Steaming had to be applied over extended stretches, leading to excessive steam wastage.
- The process caused temporary improvement, with re-deposition occurring rapidly.
- Production disturbances were frequent during steaming operations.

Dependency on the Ageing Infrastructure

The legacy pipeline had already exceeded its design life. Structural fatigue, corrosion, and reduced internal diameter made it unsuitable for sustained high-flow operation. Any major refurbishment or replacement would have required prolonged shutdowns, posing unacceptable risks to plant continuity.

Absence of Redundancy and Flexibility

The old system lacked redundancy. Any maintenance or failure in the single gas line immediately impacted kiln operations. This absence of flexibility was a major operational vulnerability.

Solution(s) Suggested & Implemented:

After a comprehensive assessment of the persistent limitations of the legacy Coke Oven Gas (COG) pipeline and the growing mismatch between gas availability and

utilization at the Refractory Material Plant (RMP), the Energy Management Department (EMD) concluded that incremental corrective actions such as repeated steaming or localized cleaning would not provide a sustainable resolution. The problem was systemic in nature and demanded a **structural, long-term, and productivity-oriented intervention**.

Accordingly, EMD conceptualized and implemented a **strategic augmentation of the Coke Oven Gas distribution network** by designing and erecting a **new 800 mm diameter Coke Oven Gas pipeline**, running parallel to and above the existing line. The solution was guided by the principles of **operational continuity, redundancy, scalability, safety, and environmental sustainability**.

The proposed solution aimed to:

- Restore full gas-carrying capacity to the RMP shop
- Enable simultaneous operation of multiple kilns on clean COG
- Eliminate dependency on coal tar as the primary fuel
- Reduce emissions, fuel costs, and maintenance burden
- Ensure future flexibility for maintenance and load sharing

INNOVATIVE DESIGN PHILOSOPHY

The uniqueness of the solution lies not merely in erecting a new pipeline, but in the **innovative design philosophy** adopted to overcome the constraints of space, safety, and continuous plant operation.

Step-1: Identification of Bottleneck and Capacity Constraint

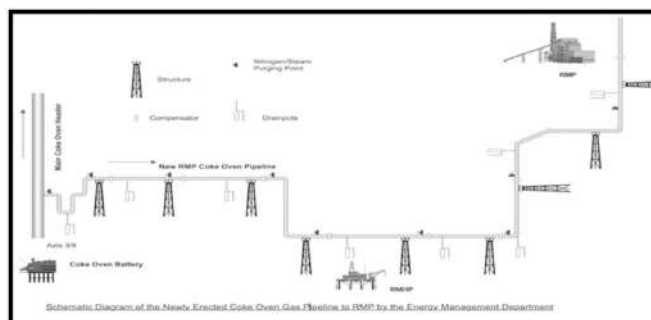
- Detailed assessment of historical gas flow data, kiln operation records, and maintenance logs was carried out.
- Severe internal choking and irreversible capacity loss of the old pipeline were identified as the primary bottleneck.
- The inability to operate more than one kiln on COG was established as a major productivity and cost concern.

Step-2: Parallel and Elevated Pipeline Concept

Instead of dismantling the old, choked pipeline—which would have necessitated prolonged shutdowns and posed significant operational risks—EMD proposed a **parallel elevated pipeline**. This ensured:

- **Zero disruption** to ongoing plant operations
- Retention of the old line as a **standby and contingency option**
- Operational flexibility during future maintenance or cleaning activities
- Enhanced reliability of gas supply to RMP kilns

Approximately **80% of the new pipeline was erected above the existing structural framework**, while the remaining **20% was laid on newly designed and in-house fabricated supports**, demonstrating optimal reuse of existing assets with minimal capital expenditure.



Schematic Diagram of Newly Erected Pipeline

Step-3: In-House Engineering and Fabrication

A key feature of the project was the **maximum utilization of in-house engineering expertise**. Critical components were designed, fabricated, and installed internally, including:

- **Seven (7) compensators** placed at calculated stress and expansion zones to absorb thermal movement
- **Eight (8) strategically located drain pots** at low points to enable effective condensate removal
- **Steam and nitrogen purging valves** provided at multiple locations for controlled cleaning, purging, and maintenance
- **U-seal isolation system** at the starting point to facilitate safe shutdown, tie-ins, and

commissioning

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This approach not only reduced project cost but also ensured better control over quality, safety, and execution timelines.

Step-4: Detailed Engineering and Layout Planning

- Route alignment was finalized from **Axis 54/39 to RMP shop**, covering approximately **2–3 km**.
- Stress analysis and support spacing were calculated to ensure structural stability at **10–15 m elevation**.
- Locations for compensators, drain pots, purging valves, and instrumentation were strategically identified.
- Integration with existing Coke Oven Gas header and RMP distribution network was planned in detail.

Step-5: Strengthening of Existing Structures and Fabrication of New Supports

- Existing support columns were assessed and structurally strengthened [*Exhibit 8*] to bear the additional load of the new pipeline.
- Where required, **new support columns and structures were designed and erected in-house**.
- This dual strategy optimized material usage while

ensuring mechanical integrity.

Step-6: Erection of Pipeline under Live Plant Conditions

- Pipeline sections were erected using cranes and lifting equipment under constrained space conditions.
- Precision alignment, elevated welding, and leak-proof joint fabrication were carried out at heights up to 15 meters.
- Stringent safety protocols were followed due to proximity to live gas lines and operating plant equipment.

Step-7: Isolation, Testing, and Commissioning

- A U-seal was constructed at the starting point to allow safe isolation of the new line.
- The entire pipeline was subjected to **pressure testing** to confirm mechanical integrity.
- **Nitrogen purging** was carried out to eliminate air pockets.
- Controlled **COG charging** was undertaken with continuous gas monitoring and trained personnel deployed at critical points.

Step-8: Integration with Kiln Operations and Performance Stabilization

- Following commissioning the new pipeline was integrated with RMP kiln burners.
- Gas flow was gradually increased and stabilized to ensure safe and uniform combustion.
- Operational parameters were monitored closely during the initial stabilization period.

Result

Post-commissioning, the new Coke Oven Gas pipeline has become the **primary gas supply line** for the RMP shop. The operational outcome has been transformational:

- **Three additional kilns** are now operating on Coke Oven Gas for the first time.
- Dual-line capability has been achieved, enhancing reliability and flexibility.

- Dependency on coal tar has been drastically reduced.
- Gas availability constraints at RMP have been eliminated.

This strategic intervention has unlocked latent production capacity, reduced fuel costs, and aligned RMP operations with Bokaro Steel Plant's long-term sustainability and productivity objectives. The commissioning of the new 800 mm diameter Coke Oven Gas (COG) pipeline to the Refractory Material Plant (RMP) has resulted in **measurable, sustained, and multi-dimensional improvements** in productivity, operational efficiency, environmental performance, and cost optimization. The outcomes validate the effectiveness of the solution and clearly demonstrate the transformation achieved through this strategic intervention.

After Implementation

Following commissioning and stabilization of the new COG pipeline:

- **Three additional kilns** were successfully brought under Coke Oven Gas firing.
- The RMP shop now operates with complete **dual-feed capability**, significantly improving reliability and flexibility.
- Stable gas pressure and flow are available at the RMP header.
- Coal tar consumption has been drastically reduced.
- Kiln operations have become smoother, more predictable, and easier to control.
- Excess COG utilization has improved, reducing diversion and wastage.

This transition represents a **structural correction of a long-standing bottleneck**, unlocking productivity that was previously constrained by infrastructure limitations.

The availability of reliable and sufficient Coke Oven Gas has directly enhanced productivity at RMP in the following ways:

- **Increased kiln availability** due to cleaner combustion and reduced fouling.

- **Improved firing uniformity**, resulting in better quality refractory products.
- **Reduced unplanned downtime**, as burners and ducts require less frequent cleaning.
- **Enhanced scheduling flexibility**, enabling better alignment with downstream demand.

By eliminating fuel-related constraints, the new pipeline has allowed RMP to operate closer to its designed capacity, thereby strengthening Bokaro Steel Plant's overall production ecosystem.

Energy Efficiency Improvement

Coke Oven Gas, being a clean and high-calorific fuel, provides superior thermal efficiency compared to coal tar. Post implementation:

- Heat transfer efficiency inside kilns has improved.
- Flame stability and temperature uniformity have increased.
- Specific fuel consumption per unit of output has reduced.
- Auxiliary energy losses associated with tar handling, heating, and pumping have been eliminated.

This improvement in energy efficiency directly contributes to productivity enhancement and cost reduction.

Environmental Performance: Measurable Impact

One of the most significant outcomes of the project is the **substantial reduction in environmental footprint**.

Carbon Dioxide (CO₂) Reduction

- Replacement of coal tar with Coke Oven Gas for three additional kilns has resulted in an **actual CO₂ reduction of approximately 35,107 tons per annum (FY 2024–25)**.
- This reduction is recurring and will further increase with full conversion of the remaining kiln.

Reduction in Other Pollutants

- Significant reduction in particulate matter (PM₁₀ and PM_{2.5},)
- Near elimination of sulphur oxides (SO_x) and

polycyclic aromatic hydrocarbons (PAHs)

- Improved ambient air quality in and around the RMP shop

The project strongly supports Bokaro Steel Plant's commitment to national and global de-carbonization initiatives.

Safety and Reliability Improvements

The new pipeline has contributed to a safer and more reliable operating environment:

- Elimination of frequent manual interventions in tar handling and burner cleaning.
- Reduced exposure of personnel to hazardous fumes and hot surfaces.
- Improved control over gas isolation through U-seal arrangement.
- Enhanced safety during maintenance due to dual-line availability.

The project was executed with **zero major safety incidents**, despite challenging conditions such as working at height, constrained spaces, and proximity to live gas lines.

Parameter	Before	After
Kilns on COG	1	4 (3 additional)
Fuel Type	Coal Tar + limited COG	Predominantly COG
Gas Reliability	Poor	Stable and reliable
CO₂ Emissions	High	Reduced by ~35,107 T/year
Steam Consumption	High (frequent steaming)	Optimized / reduced
Operational Flexibility	Limited	High
Safety Exposure	High	Significantly reduced

Major Problems Faced and Steps Taken to Overcome

Challenge Faced	Steps Taken to Overcome
Severely choked legacy COG pipeline restricting gas flow	Conceptualized and erected a new parallel 800 mm dia COG pipeline
Limited space and congested operating area	Utilized existing structures for 80% of the route and designed new supports for balance
Working in proximity to live gas lines	Adopted strict gas safety protocols, U-seal isolation, and continuous gas monitoring
Working at heights (10–15 m)	Implemented fall protection systems, controlled lifting plans, and supervised execution
Need to avoid production loss	Planned erection and tie-ins without disturbing ongoing operations
Condensate and moisture management	Installed strategically located drain pots and purging arrangements

benefits achieved

Benefits obtained by implementing the project may be classified as:

1. Tangible Benefits
2. Intangible Benefits.

Tangible Benefits

- **Fuel Cost Savings:** Rs. **46.60 Crore per annum (actual recurring)** due to replacement of coal tar with Coke Oven Gas.

- **Additional Savings Potential:**

Rs. **72.44 Crore per annum** upon conversion of the remaining kiln.

- **Carbon Emission Reduction:**
35,107 tons CO₂ per annum (FY 2024–25)[Exhibit - 11].

- **Reduced Steam Consumption:**

Significant reduction due to elimination of frequent full-line steaming.

- **Improved Asset Life:**

Cleaner combustion leading to longer burner and refractory lining life.

- **Payback Period:** Less than **one fiscal quarter**.

Financial Impact and Economic Productivity

The productivity improvements achieved through the project translate directly into substantial financial gains:

- **Actual savings of ¹ 46.60 Crore in FY 2024–25** due to replacement of coal tar with Coke Oven Gas[Exhibit -10]
- Extremely short **payback period of less than one fiscal quarter**.
- Reduced maintenance expenditure due to improved burner and refractory life.

These savings are recurring in nature and significantly enhance the cost competitiveness of RMP operations

Intangible Benefits

- Improved operational reliability and kiln availability

- Enhanced workplace safety and reduced exposure to toxic emissions
- Increased confidence and skill development of in-house teams
- Strong inter-departmental coordination and teamwork
- Alignment with Bokaro Steel Plant's decarbonization and sustainability goals
- Creation of a scalable and replicable model for other gas networks

Key highlights of the project include:

- **Strategic, long-term solution** to a decades-old Coke Oven Gas supply bottleneck at RMP
- **Entire project executed in-house**, including design, engineering, fabrication, erection, and commissioning
- **In-house strengthening of existing structures** and fabrication of compensators, drain pots, U-seal, and supports
- **Zero major safety incidents** despite execution in live gas conditions and work at height
- **No disruption to ongoing plant operations** during erection and commissioning
- **Very high financial and environmental impact**, with recurring fuel cost savings and significant CO₂ reduction
- **Highly replicable model** for other shops and Coke Oven / BF / LD gas networks within the plant



Enhancing ISC Reliability and Product Quality Through Pulley System Optimization

This article presents a comprehensive overview of the pulley system optimization project undertaken in the White Area – 3 MTPA Precipitation Unit at Vedanta Ltd., Lanjigarh. The initiative aimed to eliminate frequent belt failures, optimize slurry cooling system performance, reduce energy consumption, and enhance product quality by resolving mechanical inefficiencies in Inter-Stage Slurry Coolers (ISCs).

Team Members

- Aiswarya Pattnaik – White 1, 3 MTPA (BP)
- Mihir Das – White 1, 3 MTPA

Background

The precipitation process requires a controlled temperature gradient, supported by 11 Inter-Stage Slurry Coolers. These units rely on submersible and centrifugal pumps driven by pulley and belt systems. Frequent belt failures, high scrap generation, and elevated energy consumption negatively impacted equipment reliability and production quality.

Problem Identified

- Frequent belt failures: once every week per ISC.
- Unsafe and messy workplace due to high scrap generation.
- High energy consumption: 115 kW (horizontal) and 285 kW (vertical).
- Extra monthly resource cost of approx. Rs 10 lakhs.

Root Cause Analysis

- Inappropriate sizing of driver and driven pulleys.
- Insufficient head requirement of the pump.
- Use of out-of-spec belts.
- Pulley slippage and exposure to corrosive fumes.
- Scale ingress from tank bottom into pipelines.

Solution Development

- Pump RPM reduction by modifying pulley sizes.
- Horizontal ISC pump pulley size increased.
- Vertical ISC motor pulley size reduced.
- RPM reduced from horizontal and from vertical.

Trial Implementation & Results

Trial implementation in ISC 3001 (vertical) and ISC 3003 (horizontal) successfully demonstrated ZERO belt failures. Flow and current parameters showed significant improvement, validating the solution's effectiveness.

- Reduction in current: In Horizontal ISCs & Vertical ISCs
- Power reduction in ISC
- Improved consistency in slurry cooling and flow parameters.

Full-Scale Implementation

Following trial success, all remaining ISCs (3002–3012) were upgraded with modified pulleys. Trend analysis showed stabilized operational performance and zero belt failures across all units.

Sustainability Measures

- Regular monitoring of flow, pressure drop and equipment health.
- Scheduled CCL cleaning to prevent scaling.
- Operator and shift-in-charge training for long-term sustenance.
- Incorporation of updated BOM in SAP for future maintenance.

Benefits Realized

- COP reduction: 0.24 \$/T.
- Zero belt failures post optimization.
- Significant reduction in power consumption.
- Improved ISC availability and enhanced product quality.

Conclusion

This project demonstrates the impact of mechanical optimization on operational excellence. Pulley system redesign eliminated recurring failures, enhanced process stability, improved production quality and delivered measurable cost savings. The solution is replicable across similar industrial systems relying on belt-driven pump operations.

SAIL- BOKARO STEEL PLANT HOT STRIP MILL -(TEAM 2)

Article on: - *Optimising RHF-4 Reliability: Cost-Effective Drive Redundancy via Reclaimed Coiler Area Assets*

The Team:

1. Shri. Anjani Kumar Sinha, Sr. Manager, Hot Strip Mill
2. Shri. Tarun Agrawal, Dy. Manager, Hot Strip Mill

Details of THE PROJECT

Problem – “Operational Risks in RHF-4 Single-Point Drive Failures through Redundancy Integration.”

Process Description:

In most sections of the HSM, major drive systems are provided with built-in redundancy to ensure high reliability under continuous production conditions. However, in RHF 4, the **Pusher and Extractor AC Drives** were operating **without any redundant backup**.

This creates the **serious operational risk**:

- Any failure or technical snag in either the Pusher or Extractor drive would lead to an immediate stoppage of furnace operation.
- The mill had to wait until the faulty drive was repaired and put back in service, resulting in prolonged downtime.
- Historical SAP data for FY 2024-25 indicated a cumulative delay of **8.5 hours** attributable to such failures and associated stoppages.

These delays translated directly into significant production loss, under-utilization of HSM capacity and increased stress on operating and maintenance teams during rolling hours.

At the same time, there was a clear **cost constraint** - the objective was to enhance reliability

Without fresh CAPEX, using only available -in-house resources.

Solution(s) Suggested & Implemented:

Instead of following the conventional route of procuring new AC drives for redundancy

(each new drive costing approximately Rs 17,99,720).



Our Reference: ABB/KOL/2019/11/272
Date: 28/11/2019

ANNEXURE I

Sl. No.	Description	Unit Price in Rs.
1	ABB make ACS880-01-363A-3+P944+Q150 Drive module with cold standby and inbuilt brake chopper, external D&R, 1 No. DI/DO Extension Module, 1 No. Encoder Interface Module & 1 No. Profibus Interface Module.	1,799,720.00

Exclusion:

1. Any kind of panel.
2. Any switch gear components.
3. Any kind of cable, encoder, transformer, choke etc.
4. Anything not mentioned in scope of supply.

Budgetary Quote -ABB

The team adopted an innovative, cost-effective and sustainable approach:

1. Identification of Reclaimed Assets

Healthy ABB AC drives that had been removed from the Coiler area and were no longer in active use was identified as potential backup drives.

2. Asset Optimization

These reclaimed drives were refurbished, re-parameterized and integrated into the RHF4 control system to act as redundant drives for the Pusher and Extractor

3. Zero-Budget Concept

The entire solution was executed using internal resources - existing drives, modified panels, cable routing and control wiring-thereby avoiding any new purchase through indents.

Technical Implementation

- **Redundant Drives:** Two healthy ABB AC drives salvaged from the Coiler section was designated as backup drives for RHF4 Pusher and Extractor.

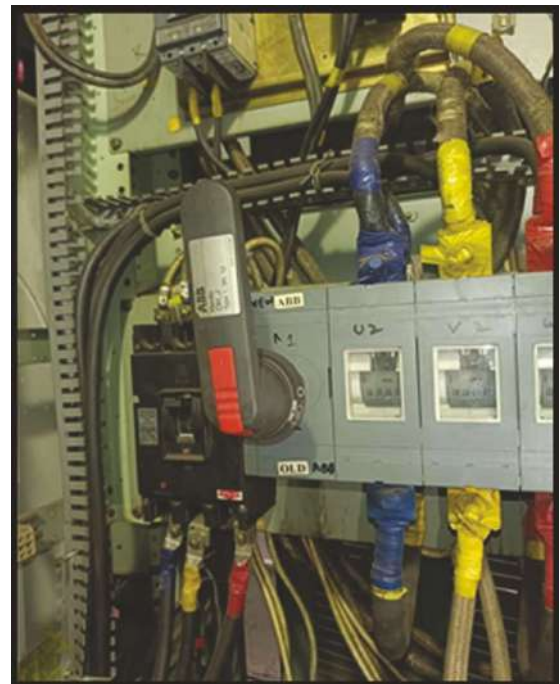


ORIGINAL DRIVE



REDUNDANT BACKUP DRIVE

Changeover Mechanism: A manual changeover scheme was engineered using **3-way Knife**



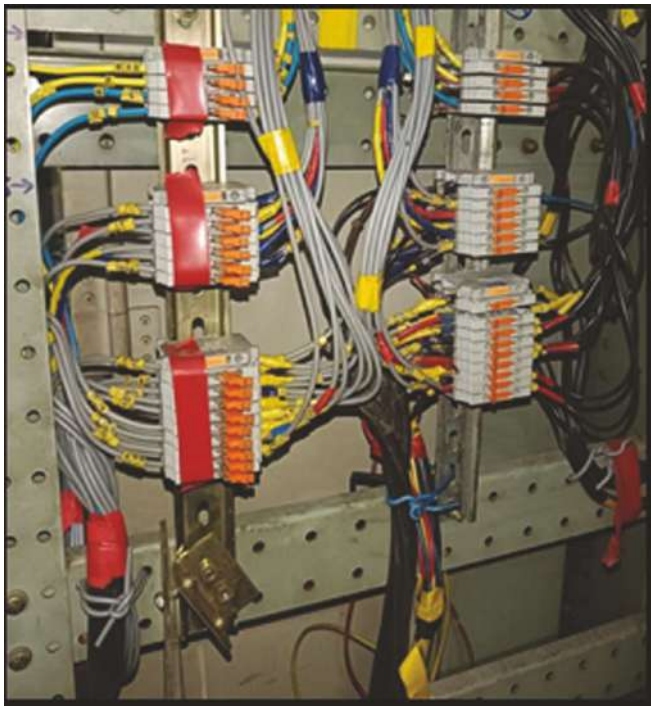
Switches and 3-way Terminal Blocks (TBs) to select between main and backup drives.



Three Way Knife Switch (Extractor) Control Wiring (Extractor)



Three Way Knife Switch (Pusher)



Control Wiring (Pusher

Key Technical Features

1. Panel Modifications

Existing RHF4 panels were reconfigured to physically accommodate 3-way knife switches and terminal blocks without requiring new enclosures.

2. Drive Parameterization

The reclaimed ABB drives were re-programmed to match the torque-speed characteristics, control philosophy and interlocks of the RHF 4 Pusher and Extractor, ensuring plug-in compatibility and stable operation.

3. Standardization & Operator Friendliness

Wiring layout, labeling and switch placement were standardized so that maintenance and operations personnel could identify and operate the changeover system quickly, even under time pressure.

4. Safety Enhancement

The 3-way switches were configured to provide positive isolation of the faulty drive during change over and repair, thereby improving electrical safety and reducing risk of inadvertent energization.

5. Green & Sustainable Design

By reusing otherwise idle ABB drives and associated hardware, the project converted potential e-waste into

productive assets, aligning with circular economy and sustainability principles within the plant.

Challenges faced

- Criticality of RHF 4 in HSM line - Change over scheme designed and implemented without disturbing rolling schedule; work planned in suitable windows.
- Complex switchover requirements - Robust manual 3-way switch and TB logic developed for quick, unambiguous selection of main or backup drive.
- Compatibility of reclaimed drives- Detailed parameter tuning and control circuit integration carried out to match RHF4 duty conditions.
- Zero-budget constraint- Entire solution realized using internal manpower, reclaimed drives and existing infrastructure.

Result

This project at RHF4 of Hot Strip Mill, Bokaro Steel Plant, successfully addresses a long-standing reliability gap at **virtually zero additional CAPEX**. By intelligently reusing reclaimed ABB drives from the Coiler area and engineering a safe, standardized and operator-friendly changeover system, the team has:

- Enhanced operational reliability of a critical furnace feeding the HSM.
- Delivered sizeable financial benefits through both cost savings and production improvement.
- Reduced electronic waste and demonstrated a scalable model of sustainable, resource-efficient engineering.

The initiative reflects a **strong blend of technical competence, practical innovation and ownership**, and is well aligned with the productivity, sustainability and reliability goals of the plant.

benefits achieved

Elimination of Direct Delays

Earlier, any Pusher/Extractor drive failure led to extended stoppages until repair.

With the new redundancy scheme, the delay per incident has effectively reduced to around **10 minutes** -

just the time needed to perform a controlled switchover.

Cost Savings-Avoided Procurement

Number of new AC drives avoided: **2**

Approximate cost per drive: **Rs 17,99,720**

Total CAPEX saved: Rs.35,99,440

Production Gain- Recurring Benefit

Average delay prevented (from SAP data comparison with previous year):**8.5 hours per year**

Rolling rate for 4-furnace operation: **683tons/hour**

Loss per ton for HSM: **Rs 7,500**

Annual recurring production benefit:

8.5hours×683tons/hour×Rs7,500/ton=**Rs 4,35,41,250**

Total First-Year Financial Impact

Procurement saving: **Rs.35,99,440**

Production gain:**Rs.4,35,41,250**

Total benefit:Rs.4,71,40,690

Sl. No.	Parameter	Calculation / Details	Amount (Rs.)
1.	One-time Cost Savings (Procurement Avoidance)		
1.1	Cost of New ABB AC Drive (Market Value)	Rs. 17,99,720 per drive	
	(ABB BQ)		
1.2	Quantity of Drives Utilized (Reclaimed)	02 Nos.	
A	Total One-time Saving	2 * 17,99,720	35,99,440
2.	Recurring Tangible Benefits (Production Gain)		
2.1	Total Delays prevented (Annualized based on SAP data)	8.5 Hours	
	(Annexure I Attachment)		
2.2	Mill Throughput Rate	683 Tons/Hour	
2.3	Contribution / Net Realization	Rs. 7,500 / Ton	
B	Total Recurring Saving	8.5 * 683 * 7500	4,35,41,250
3.	Total Financial Impact (A + B)	35,99,440 + 4,35,41,250	4,71,40,690

Savings Table

Intangible Benefits

- Marked improvement in reliability of the Reheating Furnace section feeding the Hot Strip Mill.
- Lower stress on operations and maintenance teams during rolling hours due to availability of an immediate fallback option.
- Better thermal stability of RHF4 and smoother mill operation due to reduced unscheduled stoppages.
- Demonstration of a practical model for other units to follow: leveraging reclaimed assets to close

critical reliability gaps.

Sustainability Impact

- 100% reuse** of drives that would otherwise have contributed to electronic waste.
- Extension of asset life and improved resource utilization at plant level.
- Alignment with BSP and SAIL's broader goals of environmentally responsible and energy-efficient operations.

DATA VERIFICATION

Delay data and impact calculations are based on **SAP records for FY2024-25**, capturing total downtime hours attributable to RHF4 Pusher/Extractor drive failures.

Post-implementation, these recorded delays are projected to reduce to zero, with only brief planned switchover time (~10 minutes) in rare failure events.

SAP delay data

Sl. No.	Equipment	Notification	Breakdown Details	Issue	Activity done	Date	Delay in Hours
1	HSPM-FCE4-PUSHER-AB/FAB/EL	2020010802	Fuel Pusher not working	Input contractor not picking up	Input contractor not picking up	19-05-2024	1.67
2	HSPM-FCE4-PUSHER-AB/FAB/EL	2020010825	FCE4M4 Pusher problem	pusher 4 reported trip	MADE OK	23-07-2024	0.17
3	HSPM-FCE4-PUSHER-AB/FAB/EL	2020010826	Fuel pusher tripped	tripped with fault LOCKED ROTOR	Reset DONE, running OK	23-07-2024	0.17
4	HSPM-FCE4-PUSHER-AB/FAB/EL	2020010826	Pusher 4 trip	Pusher 4	Reset done	08-08-2024	0.62
5	HSPM-FCE4-PUSHER-AB/FAB/EL	2020010901	Fuel pusher tripped	PUSHER 4 TRIPPED LOCKED ROTOR FAIL	RESET DONE, RUNNING OK	30-09-2024	0.16
6	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040242	Fuel#1 pusher tripped	hand on display in COP 1 both com. do	power cycle done, then became OK	05-12-2024	0.17
7	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040352	fuel 4 pusher reported trip	fuel 4 pusher reported trip	power recycle done, then made on	05-12-2024	0.16
8	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040329	Fuel#1 pusher tripped	Fuel#1 pusher tripped	Fuel#1 pusher tripped	09-05-2024	0.17
9	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040308	Fuel#1 pusher tripped	Fuel#1 pusher tripped	Fuel#1 pusher tripped	19-05-2024	0.17
10	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040262	Fuel#1 pusher tripped	pusher tripped on OT fuel three time	reset done, encoder setting change to 1	16-05-2024	0.42
11	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040264	Fuel#1 pusher tripped	tripped OT fuel two time	encoder selection changed from 2 to 1	20-05-2024	0.33
12	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040303	Fuel#1 pusher tripped	pusher tripped with Q fault	tripped in light of sensor, reset done	07-08-2024	0.33
13	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040402	Fuel#1 pusher tripped	tripped on OT fuel while pushing 1700	tripping current set on 274.4 & reset ok	19-08-2024	0.15
14	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040300	Fuel#1 pusher tripped	pusher 4 input contractor not getting OK	in drive panel clearing done with help of	22-08-2024	0.25
15	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040570	Pusher #4 tripped of fuel#1	Pusher #4 tripped of fuel#1	Pusher #4 tripped of fuel#1	30-03-2025	0.06
16	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040610	Fuel 4 pusher tripped	Pusher 4 Reported trip at Fuel 1 Fuel 4	reset as control was made off and then	12-05-2025	0.17
17	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040633	Fuel#1 pusher problem	Fuel#1 pusher problem	Fuel#1 pusher problem	19-05-2025	0.16
18	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040674	Fuel#1 pusher 5 VLT problem	SPM500 DRIVE WAS NOT OPENING	FAULT RESET DONE, WORKING OK	22-06-2025	0.17
19	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040701	Fuel#1 pusher tripped	found drive up on "under voltage"	fuel#1 reset then changing done	24-07-2025	0.06
20	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040700	Fuel 4 pusher tripped	hand trip with "power fault" - pusher	after fuel#1 reset drive started	02-09-2025	0.06
21	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040701	Fuel#1 pusher tripped	tripped on "under voltage" fault while	parameter no. 42 made OK. Also encoder	07-09-2025	0.25
22	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040700	Fuel#1 pusher tripped	drive and middle bus bar both broken, b	connection done and started OK	08-09-2025	0.17
23	HSPM-FCE4-PUSHER-AB/FAB/EL	2020040703	Fuel#1 pusher problem	Fuel 4 on OT	reset done become OK	19-09-2025	0.04
24	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040801	Fuel 4 extractor	Found motor phase 1770V fault	Reset & run	25-10-2024	0.27
25	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040910	Fuel#1 receiver tripped	motor tripped due to 1770V phase fault	to be checked during JOC	25-10-2024	0.06
26	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040901	Fuel#1 receiver tripped	motor phase fault as phase	reset done, motor com. checked, made OK	06-01-2025	0.17
27	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040907	FCE4M1 receiver problem	tripped with fault Motor phase	reset done, running OK	07-01-2025	0.17
28	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040907	Fuel#1 receiver discharge	Fuel#1 receiver discharge	Fuel#1 receiver discharge	16-01-2025	0.06
29	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040903	Fuel#1 receiver tripped	tripped with "overcurrent fault in COP	reset done, started OK, working OK	16-01-2025	0.1
30	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040203	Fuel#1 receiver tripped	tripped on "overcurrent fault code 2103	reset done, started, working OK	22-03-2024	0.17
31	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040204	Fuel#1 receiver tripped	tripped on "overcurrent fault code 2103	reset done, started, working OK	22-03-2024	0.17
32	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040452	Fuel#1 receiver trip	trip with 010 fault	reset done	22-03-2024	0.06
33	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040405	Fuel 4 receiver tripped	receiver tripped inside furnace	receiver arm touching VLT dist at Fuel 4	26-12-2024	0.42
34	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040602	Fuel#1 receiver problem	SPM code low battery due to low on	fuel#1 was changed but no issue, need further	10-01-2025	0.06
35	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040503	Fuel#1 extractor tripped	010 broken fuel was there	reset done & started OK	02-02-2025	0.17
36	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040542	Fuel#1 extractor tripped	tripped on "010 broken" fuel in the drive	fuel#1 reset, brake gas checked & made OK	19-02-2025	0.17
37	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040503	Fuel#1 extractor tripped	Fuel#1 extractor tripped	Fuel#1 extractor tripped	28-02-2025	0.06
38	HSPM-FCE4-RECEIVER-AB/FAB/EL	2020040527	Fuel#1 extractor tripped	Fuel#1 extractor tripped	Fuel#1 extractor tripped	16-03-2025	0.17
In FY 2024-2025						Total Delay	8.5

Savings Table

Sl. No.	Parameter	Calculation / Details	Amount (Rs.)
1.	One-time Cost Savings (Procurement Avoidance)		
1.1	Cost of New ABB AC Drive (Market Value) (ABB BQ)	Rs. 17,99,720 per drive	
1.2	Quantity of Drives Utilized (Reclaimed)	02 Nos.	
A.	Total One-time Saving	2 * 17,99,720	35,99,440
	Recurring Tangible Benefits (Production Gain)		
2.1	Total Delays prevented (Annualized based on SAP data) (Annexure I Attachment)	8.5 Hours	
2.2	Mill Throughput Rate	683 Tons/Hour	
2.3	Contribution / Net Realization	Rs. 7,500 / Ton	
B	Total Recurring Saving	8.5 * 683 * 7500	4,35,41,250
3.	Total Financial Impact (A + B)	35,99,440 + 4,35,41,250	4,71,40,690

F&A department may please vet the project.

Noting:

Note # 1 RAHUL RANJAN PANDA , (C030977), SENIOR MANAGER, HSM ELECTRICAL
Date:- 27.11.2025 16:50:08

Finance Department may please Vet the data. SAP historical delays has been attached as well as the Budgetary Quote of ABB drives has been attached which have been used for the calculation

Note # 2 MANOJ KUMAR , (C003356), GENERAL MANAGER, HSM ELECTRICAL
Date:- 27.11.2025 16:56:14

Submitted for required financial vet

Note # 3 PRADEEP KUMAR VARMA , (C003337), CHIEF GENERAL MANAGER, HSM
Date:- 28.11.2025 11:38:25

May please be examined.

Note # 4 NIRMAL KUMAR SINGH , (C003579_00), CHIEF GENERAL MANAGER, F&A
Date:- 29.11.2025 11:41:20

Please examine.

Note # 5 PRAVEEN GUPTA , (G000533_14), GENERAL MANAGER, F&A PURCHASE & STORES ACCOUNTS
Date:- 29.11.2025 15:30:04

Forwarded to F&A

Noting:

Note # 1 RAHUL RANJAN PANDA , (C030977), SENIOR MANAGER, HSM ELECTRICAL
Date:- 27.11.2025 16:50:08

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Note # 2 MANOJ KUMAR , (C003356), GENERAL MANAGER, HSM ELECTRICAL
Date:- 27.11.2025 16:56:14

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Date:- 28.11.2025 11:38:25

May please be examined.

Note # 4 NIRMAL KUMAR SINGH , (C003579_00), CHIEF GENERAL MANAGER, F&A
Date:- 29.11.2025 11:41:20

Please examine.

Note # 5 PRAVEEN GUPTA , (G000533_14), GENERAL MANAGER, F&A PURCHASE & STORES ACCOUNTS
Date:- 29.11.2025 15:30:04

Forwarded to F&A

Note # 6 GYAN PRAKASH , (D001949_16), ASSISTANT GENERAL MANAGER, F&A COST & BUDGET
Date:- 06.12.2025 11:43:54

In the above project, as claimed and certified by department, it has salvaged 2 number of ABB make drives from cooler area and refurbished the same for use in RHF. Considering, the life of refurbished drives to be 75% of new drive, it can be stated that Rs.27 lakhs benefit may have accrued as a result of this project.

Further, it would be too early to comment on the production gain claimed by the department as the project is barely 2 months old and sufficient actual data is not present to verify whether 8.5 hours annually has actually been saved as claimed.

Submitted please.

Note # 7 PRAVEEN GUPTA , (G000533_14), GENERAL MANAGER, F&A PURCHASE & STORES ACCOUNTS
Date:- 06.12.2025 15:33:39

The comments of F&A are given in note # 6 please.

Note # 8 NIRMAL KUMAR SINGH , (C003579_00), CHIEF GENERAL MANAGER, F&A
Date:- 06.12.2025 16:25:44

Forwarded.

Note # 9 PRADEEP KUMAR VARMA , (C003337), CHIEF GENERAL MANAGER, HSM
Date:- 06.12.2025 16:28:24

Forwarded.

720 m3/day FRW Reduction in 3MTPA Calciner

This article summarizes the Water and Energy Saving (ESG) project executed in the 3 MTPA Calciner at Vedanta Limited, Lanjigarh. The project successfully reduced 720 m3/day of Fresh Raw Water (FRW) consumption, contributing to sustainability and operational efficiency.

Team Members

- MD Semab
- Amarnath Pandit

Problem Statement

FRW was being used in the Calciner-3 vacuum pump, leading to high water consumption and increased operational cost. Additional FRW use in the condensate tank for hydrate washing further increased steam consumption.

Project Scope & Business Case

The project aimed to reduce FRW usage without affecting process philosophy. By integrating ACW systems into vacuum pumps and optimizing condensate usage, the project targeted cost reduction, water conservation, and improved ESG performance.

Solution Development

- ACW provision to the vacuum pump through new pipe layout.
- Replacement of FRW makeup with condensate.

- Seal water return to ACT to reduce steam consumption.

Implementation Highlights

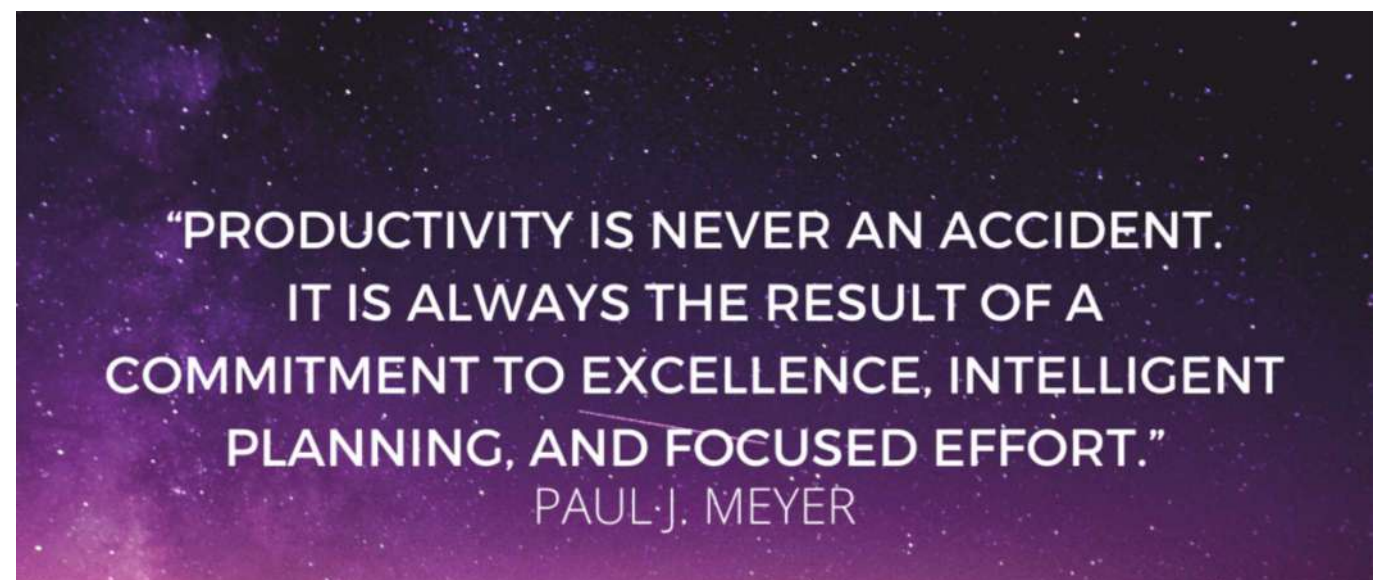
- New pipeline installation (unused 600m pipe utilized).
- Line layout finalized and approved.
- Successful shutdown execution and commissioning.

Results & Sustainability Impact

- The FRW flow reduced. This reduction significantly lowered water and steam consumption while improving operational reliability.
- Water Conservation – Major reduction in FRW usage.
- Energy Efficiency – Reduced steam demand in condensate tank.
- Cost Optimization – Total annual savings of Rs. 1,86,58,800.

Conclusion

The FRW reduction project is a successful example of innovative engineering, teamwork, and sustainability-driven improvement. The solution is replicable across similar operations and contributes strongly to Vedanta's ESG objectives.



**“PRODUCTIVITY IS NEVER AN ACCIDENT.
IT IS ALWAYS THE RESULT OF A
COMMITMENT TO EXCELLENCE, INTELLIGENT
PLANNING, AND FOCUSED EFFORT.”**
PAUL J. MEYER

SAIL- BOKARO STEEL PLANT

HOT STRIP MILL -(Team 1)

Article on: - *An Improved Interlock Logic for Feed Pump and Separator in Industrial Lubrication Systems*

The Team:

1. Shri. Vishal Solanki, Dy. Manager, Hot Strip Mill

Details of THE PROJECT

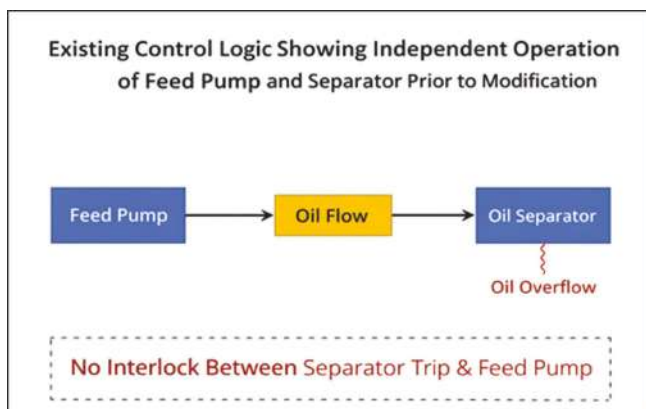
Problem – “lubrication oil overflow and wastage during separator.”

Industrial lubrication systems are critical for the safe and reliable operation of rolling mill equipment. Such systems typically comprise a feed pump responsible for circulating lubrication oil and a separator that filters and conditions the oil before reuse.

In conventional systems, the feed pump and separator are often configured to operate independently. While this allows flexibility during startup, it creates a major operational risk during fault conditions. If the separator trips due to electrical, mechanical, or process-related faults while the feed pump continues to run, uncontrolled oil flow occurs, leading to oil overflow, material loss, environmental hazards, and potential production interruptions.

Field of the Invention

The present invention relates to an automation and control logic system for industrial lubrication systems, particularly used in rolling mills, wherein a feed pump and oil separator operate in a coordinated manner to prevent oil overflow, wastage, and unsafe operating conditions.



Existing control logic

More particularly, the invention relates to an adaptive interlock logic that allows independent startup of a feed pump while ensuring dependent tripping behavior once the separator is operational

This illustrates the existing control logic wherein the feed pump operates independently without any interlock with the separator, leading to oil overflow during separator trips.

In several installations, including Finishing Mill lubrication systems repeated incidents of oil overflow have been observed due to the absence of a coordinated interlock between the feed pump and separator. Existing solutions either enforce complete dependency (which restricts startup flexibility) or rely on manual intervention, which is prone to human error.

Therefore, there exists a need for an intelligent logic system that maintains independent startup capability while introducing conditional interlocking during normal operation to prevent oil loss and unsafe conditions.

CHALLENGES FACED

The following challenges were identified during the root cause study:

- **No Logical Interconnection:**

The separator and feed pump were operating independently with no dependency logic. A separator trip did not command the feed pump to stop.

- **High Oil Loss Per Incident**

The mechanical team confirmed **~4 KL of oil overflow per event**, causing major material loss and environmental cleanup requirements.

- **Hidden Production Loss**

While only two incidents resulted in officially recorded downtime, other events were handled by lowering level switches. This introduced **Potential Mill Time**

Loss, a recognized production risk even if not logged as formal downtime.

- **Safety Hazard & Equipment Contamination**

Overflowing oil frequently spread across the lubrication bay, causing:

- ❖ Slip hazards
- ❖ Fire risk
- ❖ Oil contamination on motors, control panels, cable trenches

- **No Hardware Modification Possible**

The lubrication system cannot undergo hardware shutdown during mill operation. Any solution must be **logic-based** only.



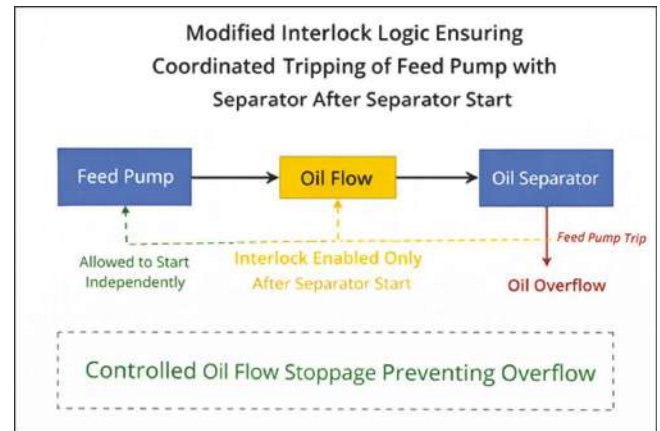
Actual Finishing Mill J-11 lubrication system comprising feed pump, oil separator and associated piping

Solution(s) Suggested & Implemented:

The main objectives of the present invention are:

- ❖ To allow independent startup of the feed pump during system initiation.
- ❖ To ensure automatic tripping of the feed pump when the separator trips, but only after the separator has been started.
- ❖ To prevent lubrication oil overflow and wastage during separator faults.
- ❖ To eliminate dependence on manual intervention during fault conditions.
- ❖ To improve safety, reliability, and efficiency of lubrication systems.
- ❖ To provide a low-cost, logic-based solution without additional hardware modification.

The logic is implemented within an existing PLC-based control system and does not require any modification to the physical equipment. The invention thus combines operational flexibility with fail-safe protection.



Improved interlock logic

Once the separator is started and a healthy run feedback is established, a conditional interlock is enabled between the separator and the feed pump.

In a preferred embodiment, the lubrication system comprises at least one feed pump and one oil separator controlled through a programmable logic controller (PLC).

At system startup, the feed pump is allowed to operate independently to facilitate oil circulation, priming, and pressure buildup. During this phase, the separator status does not influence feed pump operation.

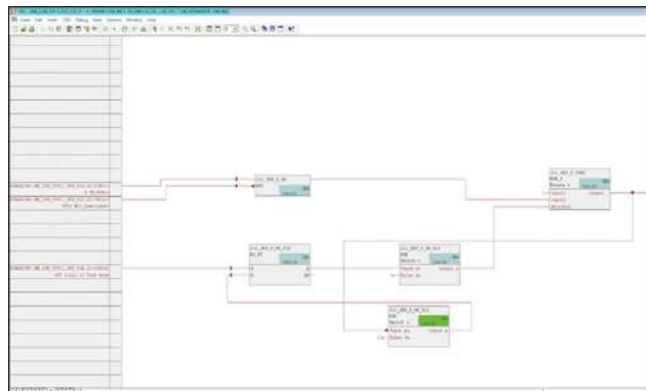
Once the separator is started and a confirmation signal indicating healthy operation is received, the control logic transitions into a dependent mode. In this mode, the feed pump operation becomes logically linked to the separator status.

If the separator trips due to any fault after entering the dependent mode, the PLC logic immediately issues a stop command to the feed pump. This prevents further oil circulation and eliminates the possibility of overflow through the lubrication system.

The logic includes internal memory bits and condition flags to ensure that the interlock is activated only after the separator have been started at least once during the operating cycle.

Reset conditions are clearly defined to allow safe system recovery.

Visual indications and alarms may be provided to alert operators of separator-related feed pump stoppage, enabling corrective action before restarting the system.



Logical flow diagram of the interlock activation and feed pump control states.

Result

The invention is useful in preventing lubrication oil wastage, improving system safety, and reducing environmental contamination. It significantly minimizes the risk of oil overflow during separator faults and eliminates repeated housekeeping and cleanup activities

benefits achieved

Operational benefits

- Post-interlock, the separator tripped **10 times**, and **no oil loss occurred**.
- System normalization time reduced from ~1 hour per event to **zero**.
- Mill reliability significantly improved.
- No operator intervention required during Separator faults.
- Overall safety and housekeeping conditions drastically improved.

Noting:

Note # 1 VISHAL SOLANKI , (C031981), DEPUTY MANAGER, HSM ELECTRICAL
Date:- 28.11.2025 10:45:44

Requesting F&A Dept. to kindly vet the details as required for the Dr. B.R. Ambedkar Award for the year 2026. Submitted for kind approval.

Note # 2 SUNIL KUMAR , (C003281), GENERAL MANAGER, HSM ELECTRICAL
Date:- 28.11.2025 12:59:53

The financial impact sheet for vetting is attached in A#1. Forwarded for kind vetting of the project.

Note # 3 PRADEEP KUMAR VARMA , (C003337), CHIEF GENERAL MANAGER, HSM
Date:- 28.11.2025 13:36:12

May please be examined.

Note # 4 NIRMAL KUMAR SINGH , (C003579_00), CHIEF GENERAL MANAGER, F&A
Date:- 01.12.2025 11:54:58

Please examine.

Note # 5 PRAVEEN GUPTA , (G000533_14), GENERAL MANAGER, F&A PURCHASE & STORES ACCOUNTS
Date:- 02.12.2025 12:41:02

As claimed by the department, oil loss has been curtailed completely post implementation of this project. The oil rolling rate of HSM is around 650 T/hr and rolling hours/day is approximately 18 hours. The differential contribution of HR coil over slabat present is approximately Rs. 1000. Hence, savings from 1 hour of production is Rs. 1000*650*18/24= 4.87 lakhs. Department has claimed savings of 4 hours. In view of above, the total savings from this project may be Rs. 25.60 + 4.87*4 = 45.50 lakhs. Submitted please.

Note # 6 GYAN PRAKASH , (D001949_16), ASSISTANT GENERAL MANAGER, F&A COST & BUDGET
Date:- 09.12.2025 17:40:24

As claimed by the department, oil loss has been curtailed completely post implementation of this project. The oil rolling rate of HSM is around 650 T/hr and rolling hours/day is approximately 18 hours. The differential contribution of HR coil over slabat present is approximately Rs. 1000. Hence, savings from 1 hour of production is Rs. 1000*650*18/24= 4.87 lakhs. Department has claimed savings of 4 hours. In view of above, the total savings from this project may be Rs. 25.60 + 4.87*4 = 45.50 lakhs. Submitted please.

Note # 7 PRAVEEN GUPTA , (G000533_14), GENERAL MANAGER, F&A PURCHASE & STORES ACCOUNTS
Date:- 10.12.2025 18:00:53

The comments of F&A are given in note # 6 please.

Note # 8 NIRMAL KUMAR SINGH , (C003579_00), CHIEF GENERAL MANAGER, F&A
Date:- 10.12.2025 18:55:16

Forwarded.

Note # 9 PRADEEP KUMAR VARMA , (C003337), CHIEF GENERAL MANAGER, HSM
Date:- 11.12.2025 10:21:03

Forwarded.

Note # 10 SUNIL KUMAR , (C003281), GENERAL MANAGER, HSM ELECTRICAL
Date:- 12.12.2025 18:56:12

Forwarded.

Financial vetting

- **Oil Loss Eliminated - Rs 25.60 lakhs**
- Direct material cost savings from complete overflow prevention
- **Production Time Saved - Rs 19.48 lakhs**

Total savings from the project as vetted by finance department-Rs.45.50 Lakhs

Intangible benefits

- ❖ **Zero-cost automation improvement**, requiring only logic changes.
- ❖ Eliminates oil overflow in all separator-related faults.
- ❖ Ensures 100% safe response under unplanned trip conditions.
- ❖ No additional maintenance requirements.
- ❖ Prevents contamination of motors, switchgear, and cable trays.
- ❖ High long-term sustainability due to simplicity and robustness.
- ❖ Fully replicable across **six similar lubrication systems** in the plant.
- ❖ Avoided mill delays and system recovery time

Improved Slurry Pump capacity Enabling of Parallel operation of Cal-3 &

This article summarizes the continuous improvement project undertaken to upgrade the slurry pump capacity for enabling simultaneous operation of Calciner-3 and Calciner-4. The initiative was led by Team The Warriors at Vedanta Limited, Lanjigarh, aiming to enhance process reliability, efficiency, and production output.

Team Members

- Project Leader: Trinetra Kumar Sahoo
- Deputy Project Leader: Prabhu Prasad Dash
- Team Member: Chinmayee Panda
- Team Member: Girish Mohanty
- Facilitator: Sanjeev Mishra

Problem Statement

The existing 110 kW slurry pump motor, operating near its full load current of 191 A, was unable to feed both Calciner-3 and Calciner-4 simultaneously. This limitation restricted operational flexibility, caused high overload risks, and reduced pumping efficiency, leading to frequent interruptions and process bottlenecks.

Root Cause Analysis

- Underrated 110 kW motor unable to meet high slurry demand.
- Frequent overload due to high density slurry and increased load spikes.

- Inadequate cable size contributed to motor heating and performance loss.

Solution Implemented

- Upgradation of motor to handle higher slurry load.
- Reinforcement and modification of motor base structure.
- Installation of 240 sqmm cable to support increased power requirement.
- Alignment, VFD relay setting, no load and load trials conducted successfully.

Project Impact and Results

The upgraded motor significantly improved process capability, enabling seamless parallel feeding of Calciner 3 and 4. The project delivered a feed increase of 50 TPH and resulted in an additional 1200 TPD of hydrate production. This enhancement contributed to an estimated financial benefit of Rs. 1.5 Crore, along with improved reliability, reduced downtime, and enhanced operational efficiency.

Conclusion

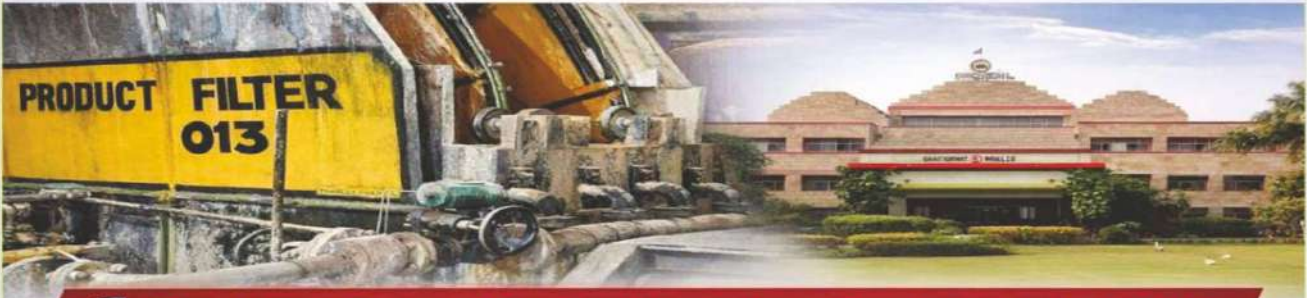
The slurry pump capacity improvement project stands as a strong example of teamwork, data-driven decision-making, and engineering excellence. With clear gains in productivity, safety, and cost savings, this initiative reflects Vedanta Lanjigarh's commitment to continuous improvement and operational excellence.





Sodic Condensate Automation at Product Filters

Enhancing operational efficiency through automated control systems



Clusters as Growth Engine: Maximizing Productivity in MSMEs

Supporting MSMEs by driving synergies for increased productivity and growth

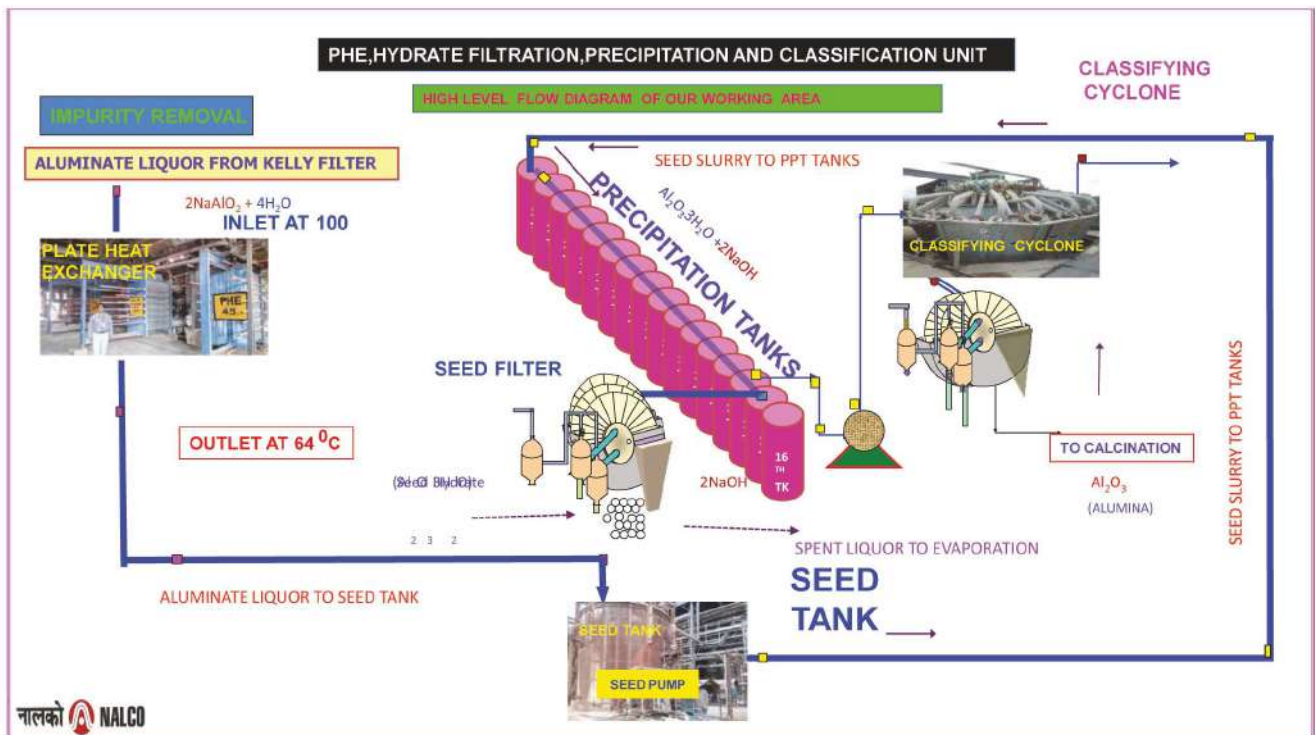
नलको  NALCO

Manas Ranjan Behera
Assistant General Manager
Control & Instrumentation



Dibyadarshi Chinmay Mishra
Senior Manager
Control & Instrumentation

Hello!



Sodic Condensate ON/OFF Valves for Product filters

Normal Sodic Condensate Line in Product filter



Normal Routine Segment Replacement



Savings in Consumption of Sodic Condensate Water

- In every Shift there is requirement of Segment cleaning minimum 20 mins
- But during manual cleaning it was 30-40 mins washing where there is extra flow of minimum 10 mins in 2-inch line with $10\text{m}^3/\text{hr}$ flow/Filter.
- Hence, there is minimum flow saving 1.5m^3 in each shift.

712 Product Filter Sodic Condensate Valve Installation

Manual Valve before the Installation



Pneumatic ON/OFF valve Installation



Savings in Consumption of Sodic Condensate Water

- In a month savings/Pr. Filter- 30 days x 3 shift x 1.5m^3 = 135m^3
- In a year sodic cond. water savings = $135\text{m}^3 \times 12\text{ months} \times 3\text{ filter}$ = 4860m^3
- To generate 1m^3 sodic condensate steam expenditure reqd. = Rs.1200 (from MIS Report)
- Savings per year in sodic condensate saving in 3 Product Filters = $\text{Rs.}1200 \times 4860\text{m}^3$ = **Rs 58,32,000/-** (In word 58.32 Lakhs)

Tangible benefits Of Installation Of Sodic condensate ON/OFF valve

Savings Segment Consumption

Product Filter-12/13

- Total no of filter bags required for segment replacements (2 discs/ filter) = 24 segments x 2 discs = 48 Nos. filter bags
- In 2 Nos filters = $48 \times 2\text{ filters}$ = 96 Bags
- Normal time period of cloth change of segments of a filter = 2months
- Due to scaling time period has previously reduced to 20-30 days
- So, there is saving of 96 bags for 1 month durability shaving of Cloths.
- Yearly saving of bags in 12/13 Filters = $(\text{Durability months saving /year}) \times 96$ = 576 bags

Intangible gain

- Before this filter washing was getting affected due to manual washing and unavailability of manpower during required time duration.
- This leads to rapidly declining product slurry generation which subsequently leads to decrease in calcination load and alumina production.
- This will improve the productivity of product filters and also enhance the life of filter cloth.
- There is an indirect gain in Production

Tangible benefits Of Installation Of Sodic condensate ON/OFF valve

Like wise in 712 filter

- Total saving = 30 segments/Disc x 2 discs x 6months = 360 bags
- 1 No. bag production costs Rs 560/-
- Total Savings calculate/year in Segment consumption in Indian Rupees = $560 \times (576 + 360)$ = **Rs. 5,24,160/-** (In words 5.24 lacs)



Innovation Portal: A New Era of Idea Management at the Refinery

Innovation has always been a cornerstone of operational excellence in our refinery. From frontline Kaizens to breakthrough digital solutions, the pursuit of continuous improvement drives our quality, productivity, and safety. Today, we take a major leap forward with the launch of the **Innovation Portal**—a unified digital platform designed to capture, evaluate, and accelerate improvement ideas from employees and business partners across the refinery.

Developed in-house by the **Business Excellence and Digitalisation Team**, the Innovation Portal transforms what once was a tedious, paper-heavy process into a seamless, transparent, and data-driven ecosystem for idea management.

A One-Stop Platform for All Improvement Initiatives

The Innovation Portal brings together all forms of structured improvement activities under a single roof:

- **Kaizens**
Enabling quick, incremental improvements with simplified digital submission and tracking.
- **Small Group Activities (SGA)**
Teams can submit problem statements, analysis, countermeasures, and results in a structured format.
- **TQM Projects**
From PDCA cycles to cross-functional projects, the portal ensures robust documentation and progress visibility.
- **Digitalisation Ideas**
Employees can propose automation, IoT, AI/ML, and Power Platform–based solutions.
- **Innovation Ideas**
Focused on product quality, process quality, productivity enhancement, and equipment efficiency improvement.

Accessible Anytime, Anywhere

The Innovation Portal is designed for maximum

accessibility and engagement:

Desktops & Laptops – For detailed submissions and evaluations

Mobile Devices – Quick submission directly from the shopfloor

Innovation Café – Dedicated access points encouraging creativity and collaboration

Employees and business partners can now participate actively in innovation without paperwork barriers.
Sensitivity: Internal (C3)

Solving the Challenges of the Past

Earlier, idea collection was done through **hard-copy formats**, which made:

- Data entry **time-consuming**
- Tracking and classification **difficult**
- Analysis and reporting **manual and error-prone**
- Quantification of benefits **inconsistent**
- Storage and retrieval **tedious**

The new portal eliminates these inefficiencies by digitising the entire workflow—right from idea capture to final approval and benefit accrual.

Built In-House: A Testament to Employee Capability

What sets this initiative apart is that it was not outsourced. It is **conceptualised, designed, and developed entirely by our Business Excellence and Digitalisation teams**.

Driving a Culture of Innovation Across the Refinery

With thousands of employees and business partners working across more than 40 processes, the refinery generates immense untapped potential for improvement. The Innovation Portal acts as a catalyst by:

- Empowering every individual to contribute ideas
- Creating transparency and recognition
- Accelerating decision-making

-
- Ensuring timely implementation
 - Institutionalising a culture of continuous improvement

It marks a significant step towards operational excellence, digital transformation, and building a future-ready refinery.

Conclusion

The Innovation Portal is more than just a digital tool—it is a cultural shift. By making idea management simple, accessible, and measurable, the refinery now has a powerful system to harness collective intelligence. This

initiative reinforces our commitment to excellence, innovation, and people-driven transformation.

As we look ahead, the portal will continue to evolve, integrating advanced analytics, AI-driven recommendation engines, and deeper collaboration features, ensuring that innovation remains at the heart of our refinery's growth journey.

We extend sincere gratitude to our CEO Pranab Kumar Bhattacharyya Sir, for his continuous motivation, valuable suggestions, and unwavering encouragement toward digitization across the refinery. His leadership has been instrumental in shaping initiatives like the Innovation Portal.

Productivity
is never an accident.
It is always the result of a
commitment
to excellence, intelligent planning,
and focused effort.

Brief Abstract of Case Study Presented in Productivity Week 2026

Organisation: - Captive Power Plant, NALCO, ANGUL, Odisha

Title of the Project:-Modification of Tramp Iron Gates of Bowl Mill from manual to pneumatic operated system.

Group Members- N C Barik, AGM (M), D P Mahapatra, AGM (M)

Function of Bowl Mills:-Bowl Mills are very important equipment in coal based thermal power Plants to dry, grind and transport coal for efficient combustion in boiler.

Pulverisation: Bowl mills grind pre-crushed raw coal (typically 25 mm size) into a pulverised coal, ensuring approximately 98 %, of the coal passes through a **50 mesh** screen for optimal combustion.

- **Drying:** Hot primary air is introduced into the mill to remove moisture from the coal & make it crushable which prevents clogging and facilitates easier grinding.
- **Classification:** The classifier separates fine coal particles inside mill & sent it to furnace of boiler while heavier particles are returned to the mill again for re-grinding.
- **Transportation:** Pressurised primary air carries the pulverized coal from the grinding zone through the classifier & coal pipes directly to the furnace of boiler.
- **Reject Handling:** The non-grindble coals, stones & foreign metals are removed from mill through tramp iron-gate & pyrite hopper by dedicated Mill Reject Handling System.
- **Operating Principle & Specifications**

The mill operates by feeding raw coal into the rotating bowl with Centrifugal force that moves the coal toward the outer perimeter, where it is crushed between GR & BRS.

Feature	Specification
Type	Medium Speed
Speed	60 RPM
Bowl Diameter	76 inches
Grinding Rolls	3 rollers (37" diameter for XRP 763)
Capacity	Approximately 33.8 Tons/Hr

Bowl Mill "XRP-763" indicates a **3-phase, 50 Hz** supply (X), the **Raymond** design (R), and **Pressurised** operation (P) using a primary air fan.

Tramp Iron Reject Gate:

The tramp iron reject gate functions as a manual discharge system that removes non-grindable material like hard coals, stones & foreign metals through pyrite hopper to reject conveyer. As per the design of the bowl mill during running of mill the upper reject gate is kept open & lower gate is kept close to collect the rejects in pyrite hopper so that the pressure inside mill will be maintained. For removing the rejects from hopper to reject conveying belt lower gate is opened the upper gate is kept close position.

Operation of reject Gate: The reject gate is part of a two-gate system (Upper and Lower) where the upper gate is kept open to collect rejects and then the lower gate opens to drop the material into the reject conveyor hourly.

Continuous Mill Operation: It maintains the mill's efficiency by preventing the accumulation of rejected material, allowing the mill to run continuously without shutdowns for manual cleaning.

When heavier coals having sp. gravity more than 1 are fed into mill they are carried over the edge of the bowl & dropped into the mill scrapper chamber which is swept by pivoted scraper to the tramp iron spout. The system typically uses manually operated isolation gates (Upper/Lower) to manage the discharge from the Pyrite Hopper to the Mill Reject Handling System

Problem in the Tramp Iron Gate:

The two nos. of reject gates (upper & lower) are operated hourly by reject operator to remove the accumulated reject & foreign metals from the reject chamber. Here to operate the reject gates the operator has direct exposure to heat, dust & risk of working at a height of 4 meters from ground level. Apart from that when opening the lower gate the upper gate is to be kept in close condition to maintain the required primary air pressure & performance of the Mill. Sometimes due to manual error the SOP of reject removal process is not followed & Mill performance gets disturbed. Delay in reject cleaning leads to accumulation of hot reject inside scrapper chamber which leads to chock of the mill PA inlet duct, bulging of insulation cover plate, side liner which leads to break down of mill.

Effect of the Problem

Frequent Reject Checking

Chances of Accidents & polluted working environment.

Mill high reject.

Bulging of liners & insulation cover plates.

Increase of Mill breakdown.

Solution: - By applying PDCA approach with DEMAC principle we had several round of brainstorming session where multiple points came up & all listed. All actionable points were again plotted in a cause & effect diagram to find out the root cause, where the actionable root cause was to modify the operation of tramp iron manual reject gate to pneumatically operated knife edge gate valves. By doing so we can eliminate manual reject gate operation & the operator can operate the valves from the valve station located at a safe distance.

Implementation

The proposed solution was implemented in Unit 2, Mill E by fitting 2 nos. pneumatically operated knife edge gate valves. A separate valve operating station is provided at a safe distance to operate the upper & lower modified knife edge gate valve & the valve station is connected to the instrument air header available at mill area. The airline is painted with properly demarcated about operation of valves.

Tangible Benefits:-

Total maint. Cost = ₹ 59530.00 (Avg. material & labour cost/mill/yr. which include the cost of liquidation of defects as per SAP)

Total modification cost = ₹ 17660.00 (Man, material & fabrication cost of modification which include 2 nos knife edge valve & 4 nos of manpower engaged for 3 days)

Total saving (a-b) = ₹ 41,870.00/mill/yr.

Total savings per year = ₹ 41,870.00x50= ₹ 20, 93,500.00 (50 Nos Mill)

INTANGIBLE BENEFITS:-

Pollution at reject area reduced & MTBF of mill reduced

Ease in operation & safe working environment.

Effective utilization of man power

Internal customer satisfaction.

-----Thank You -----

HOD (Mech.-I)

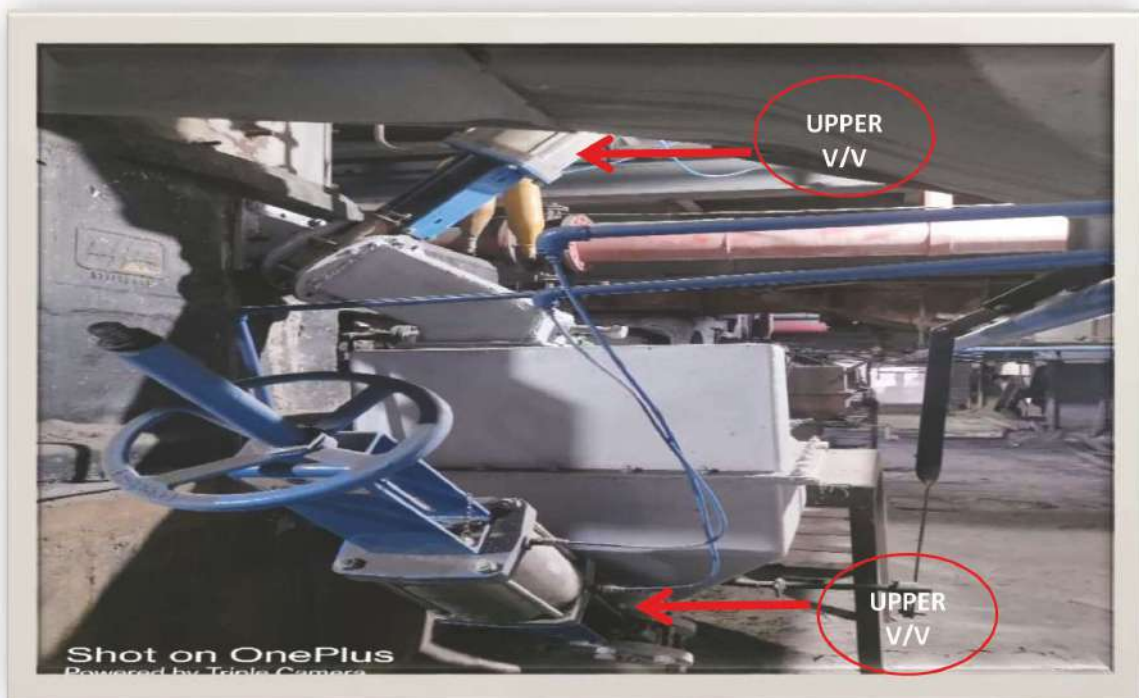
Very good modification
P. M. Pradhan
29/2/2020

पी.एम. प्रधान/P.M. PRADHAN
GM (Mech.)
सिपिपि, नालको, अनुगुल
CPP, NALCO, ANGUL

REJECT MANUAL GATE VALVE



MODIFIED REJECT GATE VALVE



Mixing Tank Agitator Reliability Enhancement

This article presents a comprehensive case study on enhancing the reliability of the Mixing Tank Agitator in the Predesilication (PDS) unit at Vedanta Limited, Lanjigarh. The frequent tripping of the agitator was causing major disturbances in Digestion, leading to production losses. The initiative aimed to eliminate agitator trips, improve slurry flow, and strengthen operational efficiency.

Project Team

- Team Leader: Mr. Abhishek Kumar Tilak
- Team Member: Mr. Sridhar Mishra

Problem Description

The Mixing Tank Agitator in the PDS unit experienced 10 overload trips in Q1, disrupting the transfer of test liquor and predesilication slurry to the Digestion unit. This resulted in complete shutdown of the digestion circuit, limiting slurry flow. The overloads also caused equipment damage, increasing downtime and maintenance cost.

Project Objective

The objective was to eliminate agitator trips and increase slurry flow to digestion. This required identifying root causes, validating them, and implementing a sustainable engineering solution.

Root Cause Analysis

- Uneven slurry distribution inside the mixing tank.
- Heavy solids settling at the bottom forming thick layers.
- Delayed response due to lack of real-time current indication in DCS.
- No recirculation mechanism to resuspend settled solids.

Solutions Implemented

- Provided real-time current indication of Agitator Motor in DCS (Quick Win).
- Installed Test Liquor Line Dropper to inject liquor closer to tank bottom.

- Extended only one test liquor line (out of two) to ensure continuous flow and prevent nozzle choking.
- Installed new FLI valve with improved flushing capability.
- Conducted tank modifications and added support structures for dropper installation.

Results & Effectiveness

The implemented solutions led to a significant improvement in mixing tank performance. Slurry settling at the bottom was completely eliminated as verified during COD inspection. Agitator overload trips reduced from 10 per quarter to zero, and slurry flow increased, exceeding the original target.

Benefits Achieved

- Zero agitator trips ensuring uninterrupted Digestion operation.
- Increased slurry flow improving plant throughput.
- Tangible cost savings of .1.1cr
- Reduction in maintenance interventions and equipment downtime.
- Extended equipment life through reduced mechanical stress.
- Enhanced operator safety and reduction in manual tank cleaning.

Conclusion

This project demonstrates the importance of structured problem solving, engineering innovation, and teamwork. The Mixing Tank Agitator now operates with higher reliability, supporting stable digestion operations and improved production. The solution of dropper inspection has been incorporated into the Turn Around (TA) schedule and can be deployed across similar systems.

"Inspiring Productivity, Honouring Excellence"

(By Rtn Basanta Kumar Sahoo.)

Today is a day of inspiration and pride,
where dedication and excellence walk side by side.

Under the noble banner of
Orissa State Productivity Council,
we gather to celebrate the spirit of progress and
achievements.

Respected dignitaries, honoured guests,
dear members and friends present here,
I extend a warm and heartfelt welcome to all of you
to this meaningful celebration at Hotel Prachi.

Productivity is the heartbeat of development,
the foundation of growth and prosperity.
It transforms ideas into achievements
and effort into excellence.

Through discipline, innovation, and teamwork,
productivity lights the path of success.

It reminds us that every moment matters
and every effort contributes to progress.

Today we celebrate the shining achievers
whose dedication and commitment
have created new milestones of excellence.

The Productivity Excellence Awardees
are true examples of hard work and innovation.

To all our respected awardees,
we offer our warmest congratulations.
Your achievements inspire others
to strive for higher standards and better performance.

On this wonderful occasion,
we also express our sincere gratitude
to the Chairman of
Orissa State Productivity Council,
the Hon'ble Secretary,
and all the respected members of the Council
for their guidance, encouragement, and tireless efforts
in making today's program a grand success.
May the spirit of productivity continue to guide us all,
towards efficiency, innovation, and excellence.

Together let us build a future
that is brighter, stronger, and more progressive.

Let productivity be our guiding light,
leading our efforts with wisdom and might.

Together we build a future bright and strong,
where excellence and progress forever belong.

Once again, heartfelt congratulations to all the
awardees
and sincere thanks to the organisers for this inspiring
celebration



Productivity Week Celebration at IFFCO Paradeep and PPL Paradeep



Productivity Week Celebration at NOCCI, Balasore



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Home Sample Collection ☎ 9692675400



इफको नैनो यूरिया एवं इफको नैनो डीएपी का वादा,
उपज अधिक और लाभ ज्यादा



पूर्णतः सहकारी स्वामित्व
Wholly owned by Cooperatives

देश का आविष्कार, देश में बना, देश के किसानों को समर्पित

इफको नैनो यूरिया तरल

FCO अधिस्वचित दुनिया का पहला नैनो उर्वरक



एक बोतल एक बोरी
यूरिया के बराबर



उत्पादन में वृद्धि



उपज की गुणवत्ता
में सुधार



सुरक्षित एवं
हानिरहित



परिवहन एवं भंडारण
खर्च में कमी



जल, वायु एवं मृदा
प्रदूषण में कमी



सभी प्रकार की फसलों
के लिए उपयुक्त



उपयोग में
आसान



इफको नैनो डीएपी तरल

FCO अधिस्वचित दुनिया का पहला नैनो उर्वरक



फसल उत्पादकता
और गुणवत्ता में वृद्धि



बीजों का
अंकुरण बढ़ाएं



भंडारण और परिवहन
में आसानी



किसान की आय बढ़ाता है



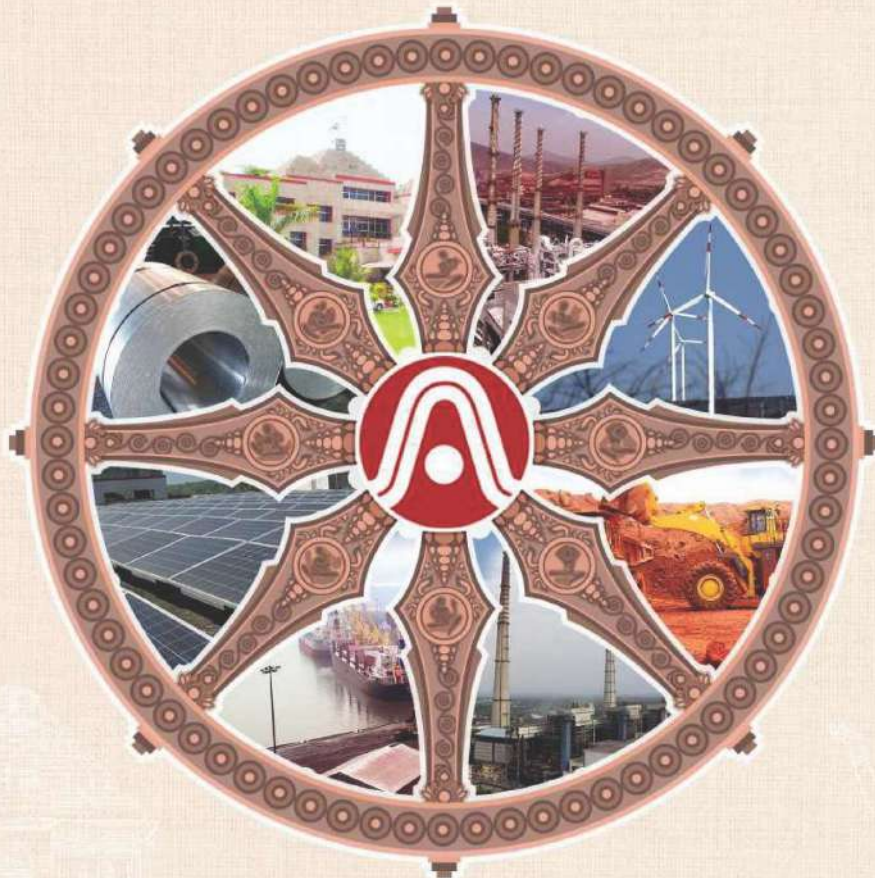
जड़ विकास में
सुधार करता है



शाखाएं और फूलों
की संख्या एवं
पौधों की अधिक वृद्धि



INDIAN FARMERS FERTILIZER COOPERATIVE LIMITED, PARADEEP UNIT



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