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# Presentation for CII National Award for Best Environmental Practices - 2021

**Presenter**
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**Smelter, Nalco**



1

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## Title of the Project

**Integrated Pneumatic conveying of coke fines in Carbon plant, Nalco Smelter**



2

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## About Nalco:

- National Aluminium Company Ltd (Nalco) is a Navaratna CPSE under Ministry of Mines.
- It is an integrated Alumina and Aluminium complex established in 1981 with registered Corporate office at Bhubaneswar.
- The manufacturing operations are in the state of Orissa starting from Bauxite Mines & Refinery in Damanjodi to Smelter & Captive power plant in Angul.
- Final products – Ingots, Wire rods, Billets & Alloy strips.
- Present production capacity of Smelter - 4,60,000 T per annum.
- Net sales turn over - Rs 8869 Cr in the financial year 2020-21.

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3

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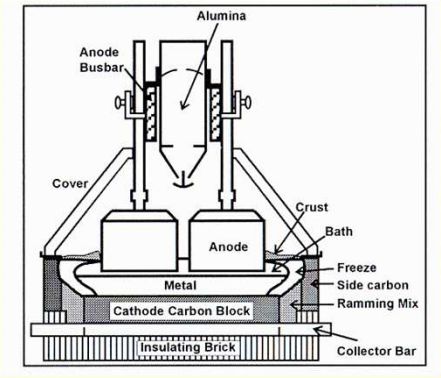
## About process:

- Aluminium metal is produced from Bauxite ore by Electrolysis process.
- Anode is one of the inputs for production of Aluminium by Electrolysis process.
- Anode being a consumable, Nalco has its own set up for production of anodes, known as Carbon plant.
- Anode is made up from calcined petroleum coke and coal tar pitch in 4 stages.




**Electrolytic pot cell**

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4

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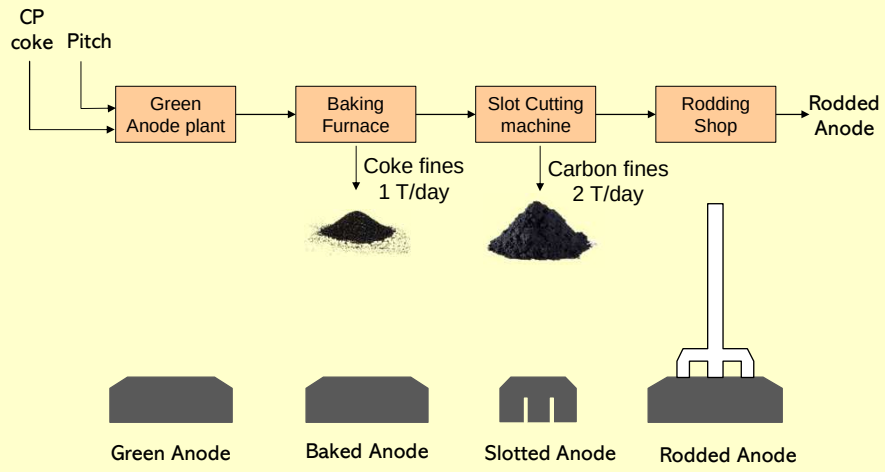
## Scetions of Carbon Plant:

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5

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## The need for recycling:

- In the baking process, the spent coke fines are generated and these were discharged into the open concrete pit and then bagged manually for disposal. After, it is declared as hazardous waste by OSPCB in 2012 due to presence of Fluoride the, selling was stopped and these were used for land filling as per authorization granted to the industry. It become very difficult to handle this huge quantum of coke fines to the tune of 600 T per annum and to dispose off.
- whereas, the carbon dusts generated during slot cutting of Anodes are collected in a bin and transported to storage yard. As the quantum of carbon dust is huge approx. 2500 T per annum, the space in the storage godown was going to be exhausted in near future.
- Coke or carbon fines had not only created a threat to the health of the workmen during handling but also increased the ambient dust level in the work zone.

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6

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## Trigger major thrust/reason behind initiating the project:

1. The disposal of the coke and carbon dust created a big problem in terms of storage and disposal in near future.
2. Company was going to lose Rs 5.0 Cr per annum if not recycled and selling is not permitted.
3. The ambient dust level indirectly impacted the work atmosphere and the health of the workmen.
4. The issue of coke/carbon fines racked up by Statutory & Regulatory authority and stakeholders.
5. It became difficult to comply the stringent requirements of EMS like ISO 14001.

The management strongly felt:

1. To adopt of eco-friendly technology to collect the coke fines in a mechanized way and then transport to GAP for recycling thereby achieving a potential savings of **Rs 5.0 Cr** per annum.
2. To have a clean work zone and healthy working atmosphere.
3. To conserve resources to have sustainable development.



7

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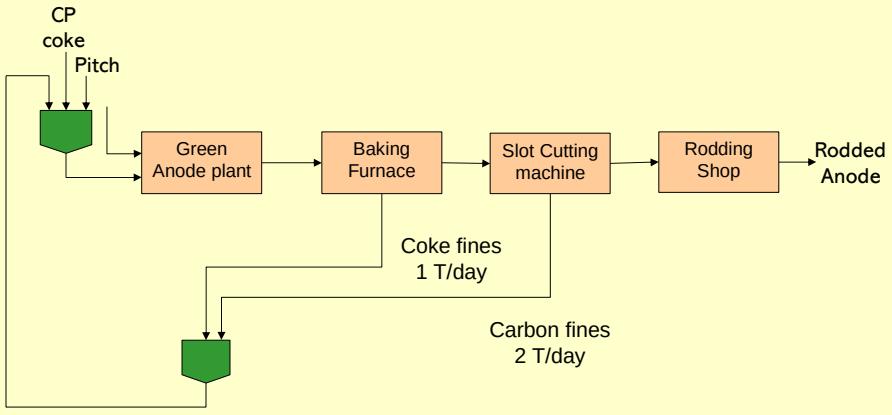
## Conceptualization of a closed loop system:






8

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## Project details:

Name of the project: Integrated Pneumatic conveying of coke & Carbon fines on LSTK basis.

Name of the contractor: M/s Macawber Engineering Systems India Pvt. Ltd., Mumbai

Work order No.: SMLT/MMP/3000002948/403/4500036311 dtd. 29.08.2016

Contract period: One year (29.08.2016 - 28.08.2017)

Project completion date: 29.06.2019

Project cost : Rs 210 Lakh



9

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## Uniqueness of the project:

Technology: Dense phase pneumatic conveying

Conveying pipe length: 500 meter

System: Semi-automatic system

Environmental angle: Totally dust free system

**Design basis: Equipments confirming to Indian Standards (IS).**



10

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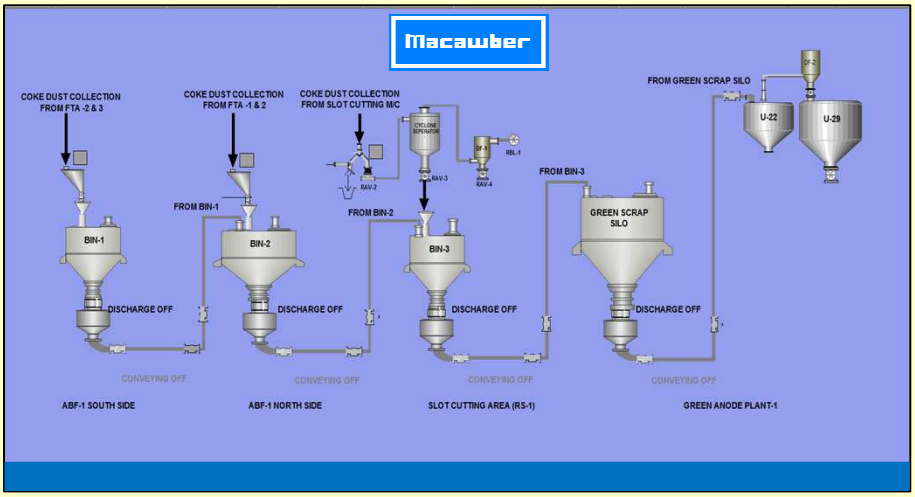
## Overview of the implemented system:

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11

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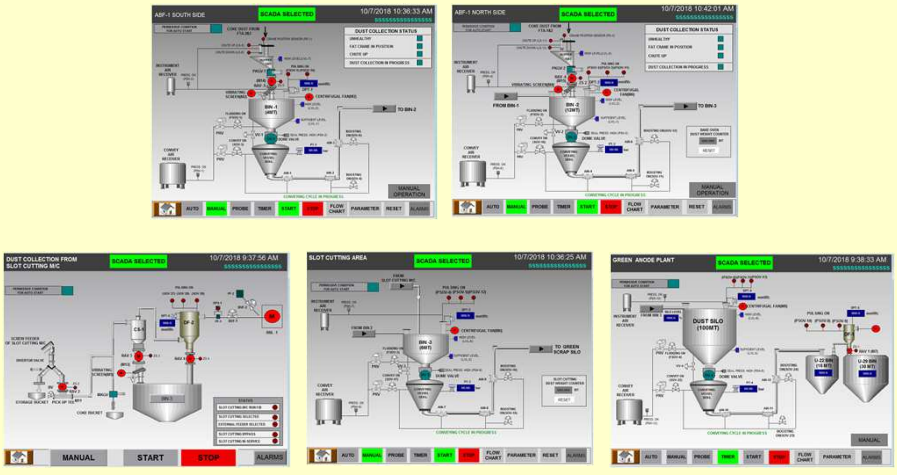
## Process & Instrumentation Diagram:



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12

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## Challenges faced during Implementation:

1. Frequent Choking of the conveying pipes at the bends.
2. Choking of Filter bags of vent Filters.
3. Overflow of collection bins at Bake oven end.
4. To erect the equipments in the vicinity of a running plant.

## Action taken to the above technical problems:

1. Air booster line provided throughout the conveying pipe line and pneumatic valves are provided at 6 places which operates automatically with high pressure drop.
2. The fabric of the filter bag changed and standardized for coke/carbon fines.
3. Additional fluidization values provided at the exit points of the collection bins.
4. Planned shut down taken in co-ordination with O&M group of plant.



13

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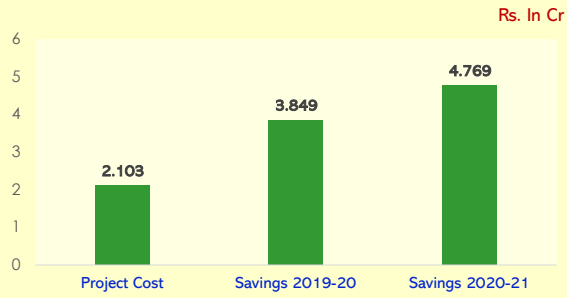
## Tangiable benefits:




**Total savings :**

2019-20 : Fines conveyed 1132.35 MT@ Rs 34,000/MT = Rs. 3,84,99,900
2020-21 : Fines conveyed 1402.70 MT@ Rs 34,000/MT = Rs. 4,76,91,800

**Cumulative savings in two years: Rs 8,61,91,700**



14

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## Intangiable benefits:

- Dust level in the work zone maintained between 1.4 – 4.6 mg/Nm3 against the norm of < 10 mg/Nm3
- Disposal of coke fines in the land fill eliminated completely.
- Manpower (labour) deployed for bagging is no more needed.
- Eco-friendly system in line with Nalco policy.


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15

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## Replication potential in Indian Industry:

- It is recommended to implement such pneumatic conveying system for similar processes.

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16

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## Snaps of the system:




17

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# Thank You



18