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Technical and economic studies Continuous Dense Phase feed system (Almahdi Hormozal Aluiminium smelter Case Study)

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Abstract: In This Research the technical and economic performance continuous feed system restore cell number to240 Al of 1Al-Mahdi has been integrated.at first briefly The current method feed cell and their defects is investigated. Then Air System transport is introduced and how the technical implementation is suggested . The proposed technical and The process diagram and Some general features of the target system is provided. These features is make three-dimensional modeling system Using 3D modeling software. A preliminary list of required equipment and materials Another part of The technical proposal. then, the proposed timing and estimated costs of this project are presented. The suggested time for this Project is 305 Day. And the cost of doing it if you use a air slides with square section 30 billion rials is estimated. According to economic studies Was time to return on investment for this project for two years ,After the system is started is estimated

Keywords: “feed system, aluminium smelter;”

1- Introduction

The Each pot of aluminum is divided into two general section. . The lower part of the cell where the action Electrolysis and chemical reactions, Pot is called. And the upper part of each cell is called super structure. super structure is Components that are installed on tanks alumina cell.The superstructure assembly conisists of supporting frame, ore hoppers, an exhaust collector, crust breaker and anode jaking frame. CD20 and D20 cells also have aluminium fluoride hopper. The supporting frame consists of two trusses with four legs. The legs are bolted at one end and monted on a rail at the other to allow for differential expansion.This frame is used to attach the operating equipment. Aeration system in the cell hopper provides the ability to deal with varying alumina quality and by improving the consistency of dump weights.It also prevents material briding at the discharge point and also reduces the dead alumina quantity.

The superstructure also supports the cell hooding shieldes that contain the gases given off by the process to facilitate effective emission control. And are cleaned before release to the atmossphere. In addation it also supportes various cell controlss, motors and instrumentes.

Alumina (ore) Hoppers

Two Alumina (ore) hoppers suppoted by the strutural system are furnished with a total capacity of approxinmately 5 tonnes of alumina (7tone forCD20/CD20). The alumina (ore) hopper and connected to the main air handling system. The system collects dust and effluent form each of the cells which is connected to the main emission handling system.

A dense phase alumina conveying system provides the ability to reduce the capacity of aluimia hoppers in high amperage pots due to higher consumption rate. The CD20 and D20 celles additionally have an ALF3 hopper of capacity 500 kg, and air-operated point feeders have replaced the ore-gates.

Air Exhaust Equiment:

Each cell is hooded and connected to fume removal system provided to each potline. The duct of each system extends from the cell hood to the collecting duct. The duct has a damper inside. The damper opens winder than normal during crust breaking and alumina addition. The section of the duct which penetrates the potroom building is insulated from the cell by a flexible, rubberised/non-conductive connection.

Collecting ducctes are provided along the center courtyard of each potroom.the ductes are of increasing diameter as they pick up additional branch ductes from each cell so as to maintain a near constant gas velocity of about 17.5 m/s. In D18 cells, the average exhaust volume from each cell is approximately 5000 Nm3/h, in D20 it is approximately 7000 Nm3/h.

Each set is actived by a specific from the PCU for any one of the following operations,

D18 Pots:

1-Tab end break

2-Tab end feed

3-Duct end break

4-Duck end feed

5-Anode up movement

6-Anode down movement

D20 POTS

1-Tab end break

2-Tab end feed

3-Tab center break

4-Tab center feed

5-duct centre break

6duct center feed

7-duct end break

8-duck end feed

9-ALF3 feed

10-anode up movment

11-Anode down movment

Pot control is provided by PCU2 or PCU3 or PCU3G or DCCU. PCU2 or PCU3 or PCU3G are from ALESA and DCCU is developed by DUBAL. The control is governed by six main software modules: i) Resistance and Noise Control. This consists of following programs: Resistance Control-Noise detection-Noise control-Temporary Resistance Adder Logic-New Pot Resistant Adder Logic-Anode Setting Logic-Tapping Logic ii) Break and Feed. This consists of the following programs: Scheduled Break and Feed-Demand Feed-Starve Logic. iii) Anode Effect Control. iv) Load Control. v) Aluminium Fluoride Addition Tables. vi) New Cell Control [1].

Despite the development and construction of new pot technologies at Dubai Aluminium (Dubal), development and improvement of the original D18 cell technology has been sustained, and continues to play a significant part of the growth and expansion of the company. This paper summarises the progress of the original D18 cell technology at Dubal over the past few years, and its contribution towards the goal of 1 million tonnes plant annual hot metal production Amperage has increased from an original design target of 155kAup to 196kA in 2008. To ensure adequate pot performance is maintained with this increase in production, there has been significant development of the cell alumina, bath chemistry and heat balance control. Other changes such as anode size increase, modifications to the cathode and measures to ensure bus bar integrity have allowed for further planned amperage and production increase over the next five years [3].

ALMAHDI Aluminium Corporation (AAC), once considered a modern plant, is now concerned with the issue of old reduction cell technology which is far away from currently used technologies. The plant which is located near the city of Bandar Abbas, has a total number of 240 reduction cells which utilize center break and center feed systems. The amperage of the production line is 175kA that in comparison with recently installed plant is around the half. After the Iranian targeted subsidy plan in 2010 which aimed to replace subsidies on food and energy with targeted social assistance, the price of energy has risen massively. The impact of such noticeable increase on primary aluminium industry was so intense which triggered the production section to review and assess its lavish power consumption and search for inexpensive schemes to retrofit its systems and structures. Therefore, AAC has defined a number of R&D projects Given the successful experience in dubal and hindalco same technologies in order to achieve such goals.

2- Experimental Procedure (Model)

The efficient running of potlines are highly dependent on the logistical supports of various materials and services that they require. Pot room services group ensures that these requrements are full filled. In this section various functions of this group is described.

The process of aluminium production generates effluent gases rich in flourides and particulates. If they are not recoverd, will add to the cost of operation and and adversely affect the working environment within potlines and atomosphere in the vicinity.

Function:

The Fume Treatment Plant (FTP) treates effluent gases from pot rooms, and thereby serves two important function:

1-To recover fluorides and particulate from thae gas, and recycle it back to celles.

2-To vent out clean gas into atomosphere,.

The F.T.P system

The F.TP is a closed loop dry scrubbing system comprising the following.

1-Fume collection system

2-Reaction for gas-alumina contact

3-filter to temove particulate

4-conveyors to handle fresh and teeated alumina.

Now in our country,

In iralko and hormozal company is continuous feed method to feed the cells of aluminium.

The proposed system can be continuously fed without disrupting the current system transition alumina, Designed and implemented.

Similar systems exist in such hormozal and irako, conventional alumina using air slides Are transferred to the pot room.

The process described below is based on the use of air slides tube is presented.

3- Reasons for the necessity of the project

Facilitate and improve implementation point feed system

Voltage losses due to sit alumina on bus bar and connections

Removal of waste alumina When filling the pot hopper

Reduce repair costs and Workload overhead cranes

Reducing the number of anode effects

Due to the reduction of alumina in the cell

.

Table3-Economic benefits from implementing a continuous feed system

4- Describe the process

Transition alumina

Transition of alumina using by Pipe size300DN is done. In addition to these reservoirs, transmission and alumina division into two parts, role is responsible for the storage tanks. And at the bottom of the tank wall,

Two sizes 300DNof pipe is installed

and responsible for the transfer of alumina for two sides. Alumina required for 30por Each of these tubes passes.

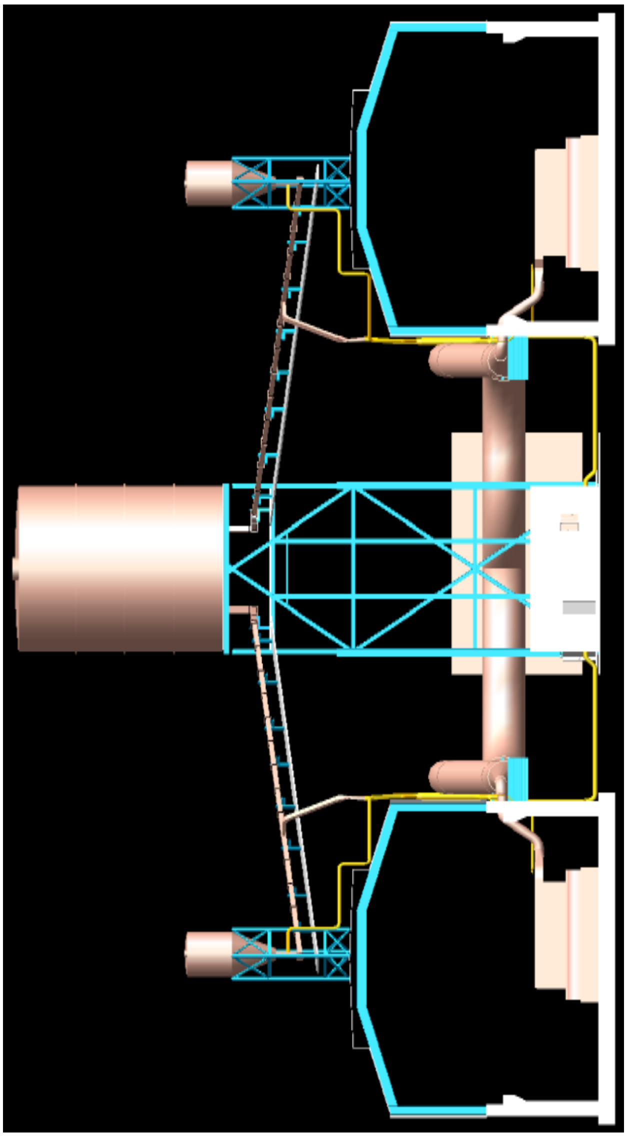

Fig-General view of the pot room and a continuous feeding system

These pipes are placed along the walls of the pot room and Using Columns of the pot room are inhibited.

And along these tubes,

Some middle tanks are installed .

The following figure View of the tubes shows.

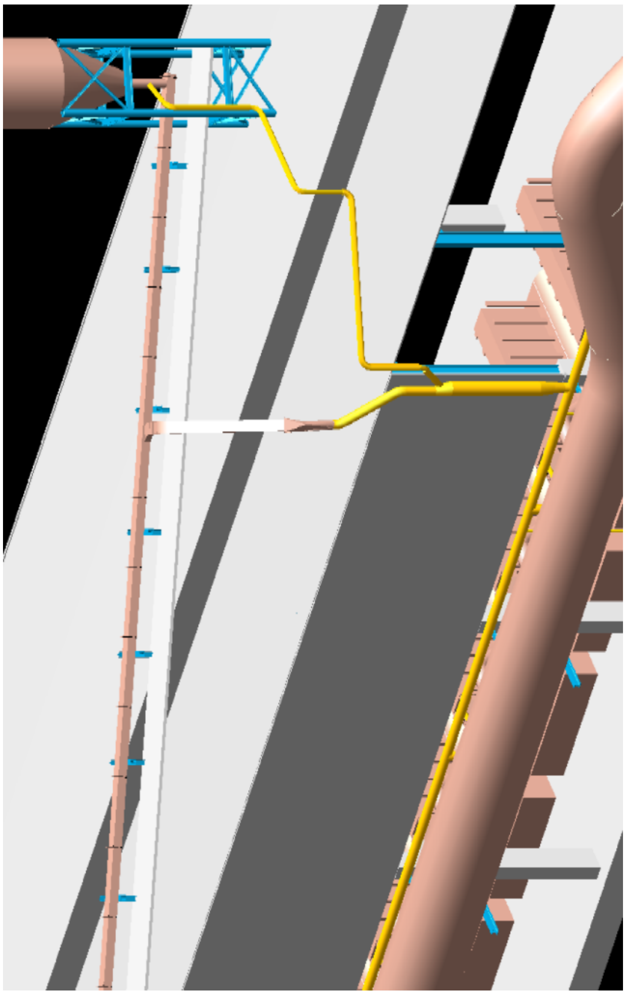

Fig- Secondary air slides

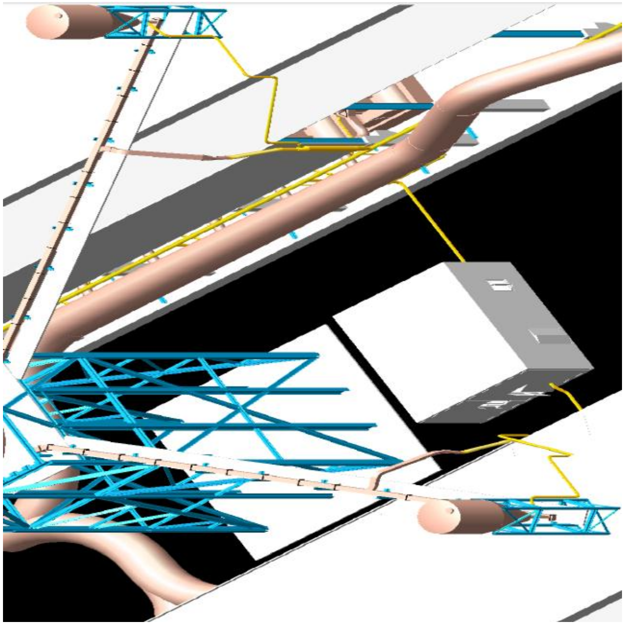

Fig- Blowers

Compressed air required at specified intervals using a small pipe sizes Is injected into the tube.

Required air through three ventilation is provided. One of them always is standby mode. addition to the three Blower mentioned above,

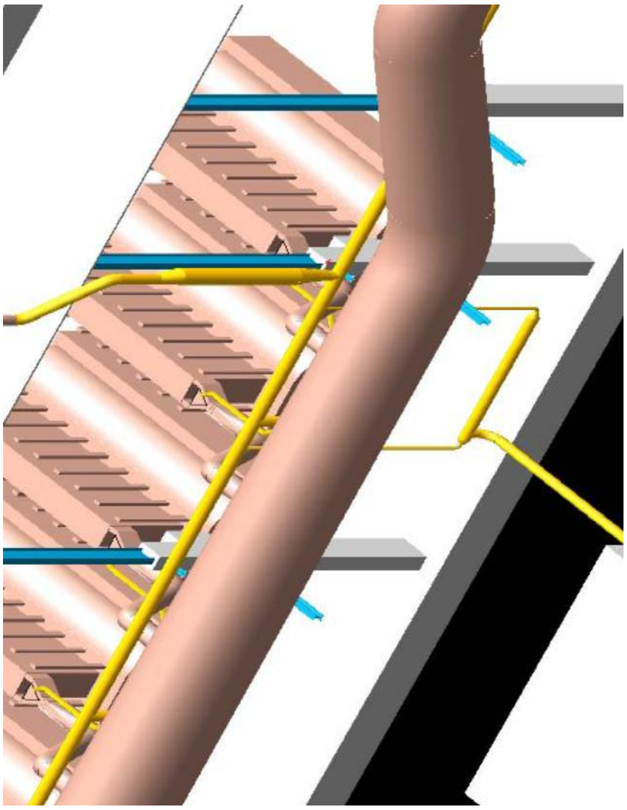

Fig- Overview of how to alumina transfer to the cells There are

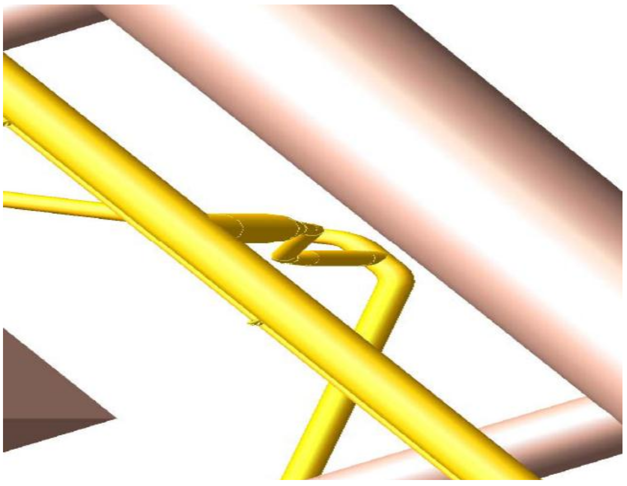

Fig-Two-cell feeder

three other fans that the task of air required for transfer of alumina in the tube.

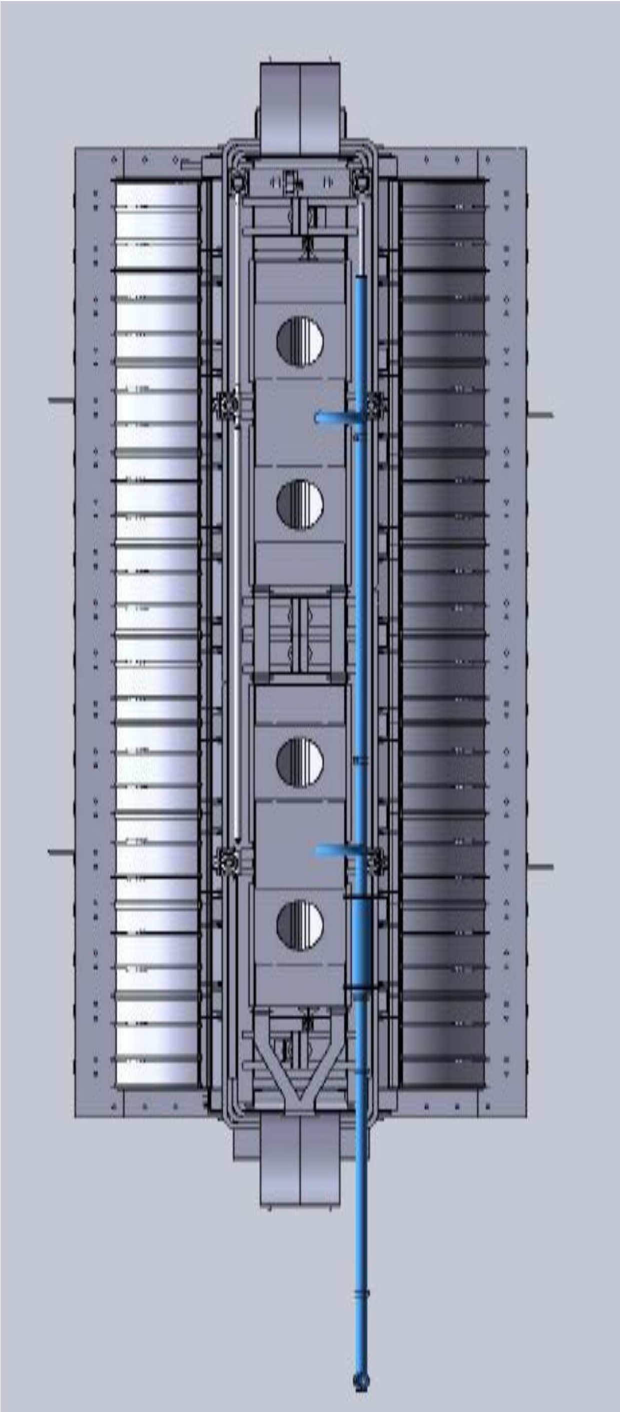

Fig- view of the continuous feed system installed on superstructure

5- Results

The net amount recovered Annual (Rails)	Annual amount of Rial	Implementation cost by Continuous feed system Alumina	Annual amount of Rial	Reduce costs by eliminating Alumina feeding system Crane
7,358,400,000	0	Voltage drop due to the loss Alumina-on connectors	7,358,400,000	Voltage drop due to the loss Alumina-on connectors
6,930,000,000	0	The cost of alumina losses	6,930,000,000	The cost of alumina losses
2,200,000,000	600,000,000	Reduce repair costs With the removal of the feeding By Crane	2,800,000,000	Reduce repair costs With the removal of the feeding By Crane
300,000,000		The annual cost of The two crane cleaning	300,000,000	The annual cost of The two crane cleaning
1,191,360,000	600,000,000	Power consumption in Feeding 120 Cell by crane	490,560,000	Power consumption in Feeding 120 Cell by crane
15,597,040,000	2,281,920,000	Total	17,878,960,000	Total

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