

Measuring the effectiveness of circuit grinding coke of Anode plant at Almahdi-hormozal Aluminium complex

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Abstract: Anode reacted as a positive pole in recover cells with aluminium and since of tow main roles of transforming electric flow and cooperation in the electrochemical process of changing alumina to aluminium is so important. Since the quality of the produced aluminium is related with quality of anode directly so in this study deal to measuring the quality of aluminium industry , in this study we discuss on producing micro seeds of coke that is as one of the most important producing parameters of anode with suitable quality. So the process of studies of producing fine in one stage of feeding involved coke mix and green with the considered sizes and before feeding set the size of classifier size and changed the speed of any circulation, and deal for sampling the product. In some of the speeds of classifier sizes, the quality of the product was suitable and good for producing anode, and in some speeds of the sizes it was unsuitable and without quality.

Keywords: “;aluminium, anode, fine, classifier, coke, Blaine”

Introduction

. The last stage of producing aluminium , is the process of electrolyze in recover of cell with the aim of higher purity than 99/75 %. In the above section the recover cell is positive pole (anode) and in the below section located negative pole(cathode). One of the first materials of the anode is coke, such that about 40% of its content made by coke in sizes little than 140 micron. The especial level of the micro seeds of coke and its particles , play key role in anode quality such that measuring the anode quality deal performed with investigation of especial level of fine and sizes of coke particles.

Almahdi Aluminium complex is the biggest aluminium plant in the country that located in Hormozgan and in 17km of west of Bandar Aabass . the circuit grinding coke is such that the materials with 0-5 mm after separation by Sarand transformed by tape of Naghale and then through anticorrosion pipes toward grinding. The materials in the grinding after smashing in the effect of filter back fan went toward classifier and under centrifugal power, the angle of classifier sizes and speed of circulation of the classifier separated and the soft materials of micro seeds with sizes of -140 micron created from center section of classifier toward classifier through back filter and returned to the grinding section.

For evaluation of the quality of fine in the producing process of anode used of blainee figure . this figure is a critique for amount of micro seeds of the used products

and defined as especial level of fine unit and on the base of square centimeter. In the process of producing anode the suitable operation for this parameter is about 3400 to 3800. if this figure was higher than its normal amount since of increasing the especial level, using of tar in producing the required paste for making anode increased, that in addition of increasing producing anode cost, also lead to reducing its quality. Producing fine with blainee lower than its normal amount lead to reduction of tar using in producing anode, that this case is of important factors of dryness of paste and making cracks in the raw anode. This issue led to reducing mechanic resistance and quality of anode electrode.

In general, anode has two important key roles in the process of producing aluminium involved: transforming electric flow to the cell and cooperation in the electrochemical process of changing alumina to aluminium. So maybe say that quality of anode is effective on produce operation such that in the case of reducing anode quality increased its oxidation rate and increased from 450 to 650 kg for per tone producing of aluminium. This issue led to increasing the cost of producing to 16 million dollars annually.

Moler et al (2005) studied coke grinding process and separation through classifier in lab sizes. They showed that 60 to 90% of operation of the factory performed in shorter time than optimized time. This issue led to the hardness of especial level of fine not be guaranteed. In addition the blainee figure in the particles with 1 to 1000 micron in the process of 2000 to 5000blainee achieved,

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this minimum and maximum distance of the blaine figure indicated the operation process depended to grinding coke features, control algorithms and coke quality in the producing process.

Chamlar et al (2005) by using of determining product coke after grinding coke performed it in the lab sizes. They put the oil coke with sizes 0-2 in grinding circuit and sampled in two stages of sampling. In the first stage the feeding of the grinding was 28 kg with return amount 31%, and in the second stage with 25 kg and 10% of the return material grinded. In addition, the speed of the suction in the especial level or the blaine figure was 3090 and in the high suction, it was 2100.

This issue indicated that the size of the particles of the product was depended to the control of the process completely and setting suction of the air in the process of producing fine.

On the base of the coke role in the anode efficiency in the process of producing aluminium, in this study the speed of circulation of the classifier size for determining amount of producing, blaine figure and distribution of the particle sizes fine investigated.

Materials and method

For ensuring of the circuit condition , before sampling and making kinds of changes, the first sample gathered and analysed. After investigation the test results, as compare of them created changes.

Since one of the main parameters in efficiency of the grinding circuit of anode plant of Almahdi aluminium plant is the speed of circulation, in this study investigated the speed of circulation of classifier on efficiency of circuit in the industrial circuit. On the base of the first design and operational experiences that the speed of suitable circulation for classifier about 100 t/m. therefore in this study in any stages, the speed of circulation with a regular circulation is lower and more than speed of operational circulation

Representing findings and analysis results

Table 1 showed the operational conditions during various sampling of this study

| Rotational speed of callsseifire bland | | | | title |
|--|-------|-------|-------|--|
| 90 | 85 | 80 | 75 | |
| 20 | 20 | 20 | 20 | Feed tonnage to Asia (tph) |
| 90 | 85 | 80 | 75 | Speed of classifier bland(rpm) |
| 81 | 85 | 89 | 90 | Volume file storage in blade speed adjustment (present) |
| 84 | 95 | 94 | 89 | Save the file volume in the sampling time (percentage) |
| 44 | 44 | 44 | 44 | Fine tank volume (cubic meters) |
| 40000 | 40000 | 40000 | 40000 | Beck's volume filter intake fan (fan classifier) (cubic meter) |
| 6/850 | 6/850 | 6/850 | 6/850 | The production line output (tons per hour) |
| 437 | 437 | 437 | 437 | Asia Power (kW) |
| 6 | 6 | 6 | 6 | Lining life (months) |
| 8/2 | 8/2 | 8/2 | 8/2 | Classifier blade angle (degrees) |

Table 1-Rotational speed of callsseifire bland

Smash circuit feeding

What is considered in design of factory for grinding feeding is pour coke with sizes -5000 micron. But in this study used of coke and green mixes with sizes bigger than 5000micron for grinding feeding. Table 2 showed the Sarand analysis of feeding grinding that about 25% of it is the amount between 15800to 5000micron.

| Screen size | Weight / g | Weight / percent |
|--------------|------------|------------------|
| 15800 | 0 | 0 |
| 7900 - 15800 | 38/1 | 11/90 |
| 4750 - 7900 | 48/7 | 15/20 |
| 2360 - 4750 | 78 | 24/34 |
| 1400 - 2360 | 37/7 | 11/77 |
| 355 - 1400 | 62/5 | 19/51 |
| 255 - 355 | 20/3 | 6/33 |
| -255 | 35/1 | 10/95 |
| جمع | 320/4 | 100 |

Table 2- Analysis crushing circuit feed

Changes of speed of circulation of classifier blades

In this study the speed of circulation of classifier blades in four stages set on 80,75, 85 and 90 t/m. information of smash circuit system recorded and after 4h in any circulation speed deal for sampling. Table 1 show the information of it in four stages

The effect of circulation speed of the classifier blades on blaine figure

This figure is as the first and most important fine parameter that indicated required tar amount for preparing paste, and also evaluated in produced anode quality significantly

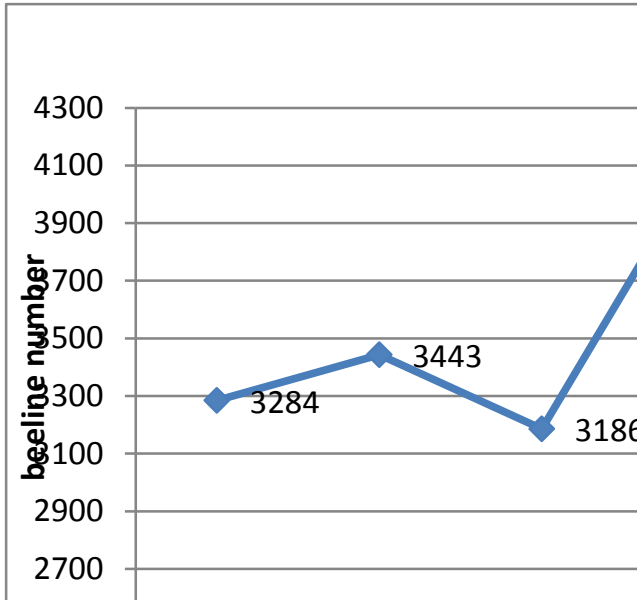


fig2-The impact classifie blade in velocity of the Blaine number

Investigation of the sent samples in the lab showed that blaine figure results of the first and third stages of changes speeds of circulation of classifier blades set on 75 and 85t/m and achieved amount were 3284 and 3186 that is close to reference figure of blaine that is 3400 to 3800, and is used in line produce. But in the second stage the changes of speed of classifier blade that set on 80t/m is 3434 for blaine figure. This figure is for using in suitable produce line. And as compare with blaine figure of first and third is most important.

Investigation figure 2 showed that achieved blaine figure that performed in 90t/m it will be higher than considered amount. And it is far from standard figure. The studies, experience and process of work of anode showed that if blaine figure will be higher than 3800. since of having higher especial level we required increasing amount of tar in produce. This issue created three main problems.

- 1- the final cost of anode increased.
- 2- Using coke in anode block reduced
- 3- The amount of added tar that is since of increasing blaine figure in block anode.

In the stage of coke, since of high heat of 1180, it is released, and this is result in reduction of weight of coke anode as compare as raw anode. So the produced fine with parameters higher than blaine figure that is the most important fine parameter not used for suitable anode.

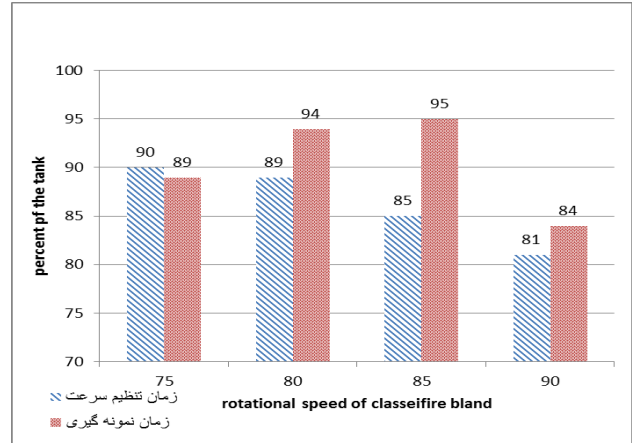


Fig3-The change of speed of circulation of classifier blade on product sizes

For producing anode, the various sizes of anode with large, middle and very large used, for this reason for filling cracks. They used of fine with 0-140microne. So the best sizes of them are from 140-45 micron.

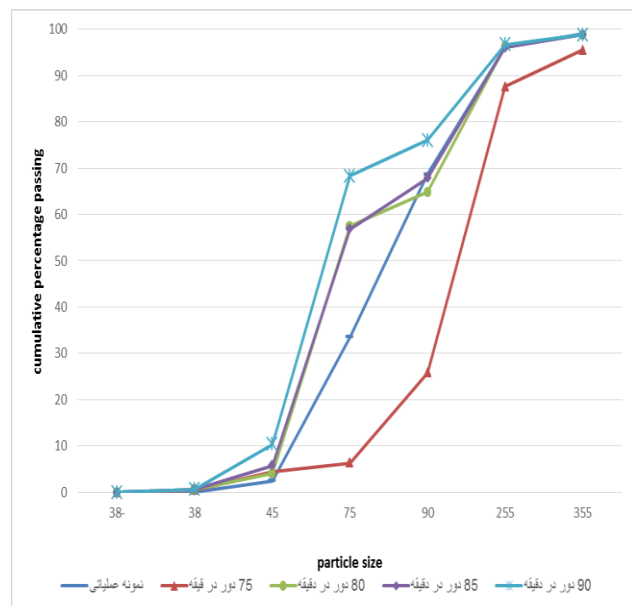


Figure 4- Sarandí analysis of samples (anode with large, middle and very large)

The results from analysis showed that in circulation speed of 75t/m of soft quantity amount, and about 12 percent of big seed exist. But in this state on the base of it that in producing anode, used of other coke sizes, so we can use of it in various sizes. The amount among 38 to 45 micron is more than other seeds so we can found that their quality is lower than other sizes.

The effect of speed of circulation of classifier blade on fine produce

Be suitability of amount of output fine amount from its save tank for anode produce line, with its produce amount, are from parameters that should be considered. Since in the case of unsuitability of these two case , especially if produce and separation of the considered fine sizes be lower than produce line , surely stopped form the produce anode line.

Evaluation of tank level of fine save showed that the amount of producing fine in circulation speed is 75t/m as compare as required anode reduced. If the grinding works with this capacity, we cannot provide suitable produce and harmonic with it.

Conclusion

Analysis and measuring of the results of the tests in four stages it is concluded that in the case of sizes of particles of feeding of circuit instead of 0 to 5mm that predicted in the design is about 25% among 0 to 15800 micron. And the angle of classifier blade set on 8/2degree , the speed of circulation of classifier blade in 90t/m is not suitable for produce and separation of fine since blaine figure is as the first and most important quality parameter and it is close to 75 t/m that is close to distribution of particles . therefore produce and separation of fine in this state not proposed. In speed 85t/m in the case of distribution of size of particle, amount of produce and blaine figure relatively is suitable for produce line. However, produce and separation of fine in circulation speed 802t/m investigated is so good, and produced anode is the view of fine quality is as the main parameter of quality.

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