REDUCTION OF REPROCESSING LEVELS IN THE PRODUCTION OF SiC MACRO GRAINS

Besto O Joy, Dijo Varghese V, Dipin Chandran, Donald Paul, Joswin Vincent, Shillin K S
Department of Mechanical Engineering, IES College of Engineering. Kerala, India

***Abstract*— The study aims at reducing the reprocessing levels of SiC macro grains. As per the current circumstances the production of SiC contains lot of reprocessing levels, mainly at fine grit size. The demand for fine grit is really high, due to its superior characteristics. We intend to reduce the level of reprocessing and thereby increase the performance of the company to meet the market demand. We plan to analyze the production technique followed in a leading abrasive production plant and going to provide a suitable solution which can make the company to meet the demand. The research deals with the evaluation of various crushing machine in the grit production process. The quality of the product can be achieved by selection of most appropriate machine sequence.**

***Index Terms*—FEPA standard, Fine grit, Reprocessing, SiC, Macro grain.**

I. INTRODUCTION

In the present scenario the demand for fine grits (size range from 80 to 220 microns) are very high. There is high demand coming from markets to produce high levels of silicon carbides. But with current facilities in the plant they are unable to produce the required amount of products to meet the market demand. *Since the company only provides standard products under FEPA standards and due to the high level of reprocessing the company rarely meets demand*. In the situation the company must be able to reduce its reprocessing levels and be able to meet the demand.

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II. ANALYTICAL THEORY

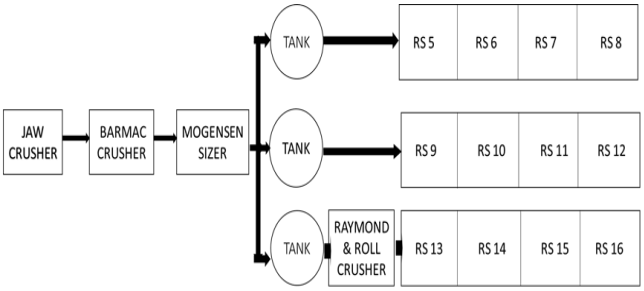
The Silicon carbide produced is crushed which contain particles of different grit size. The customers want abrasive products of several fineness, so these products have to be graded. The crushed products are sorted into products of different grit size using various screening machines and are collected in different bins. For the collection of SiC, processing and reprocessing is to be done. For the efficient working and demand meeting, the reprocessing process is to be reduced. Equations for the production of fine grits is expressed as,

1. Percentage of fineness = (total fine products/ material crushed)*100
2. Percentage of product = amount of material retained in mesh/total amount of product
3. Amount of material retained in the sieve =percentage of product *X*Y*Z/100

Where
X=amount of feed to the crusher in MT/hr (Metric tonne)
Y=Number of working hours per day
Z=Number of working days per month

III. THE SYSTEM

The crushing and the following grading process plays the major role. So the research area selected is crushing and grading lines.



IV. OBSERVATION

In order to understand the quality of the product produced by each crushing unit, a number of testing methods are employed. We are mainly using the sieve shaker analysis to identify the maximum amount of fine grits that can be produced by each unit. The input & output samples of different crushing machines in the plant were analyzed for three consecutive days and carefully analyzed.

GRIT	BARMAC (MT)	ROLL CRUSHER (MT)	RAYMOND MILL (MT)	TOTAL PRODUCTION (MT)	DEMAND (MT)	DIFFERENCE (MT)
80-100	804.7	268.95	53.7	1127.35	1500	372.65
120	190.7	194.52	41.25	426.47	700	-273.53
150-180	99.7	29.15	15.35	144.2	190	-45.8
220	101.7	27.5	16.35	145.55	183	-37.45
220/F	24.3	7.7	5.1	37.1	50	-12.9

The observations indicate that, the production is less than demand. The sequence of the processing is to be replaced considering the demand.

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V. METHODOLOGY

The production process is to altered by creating a sequence which keeps the production up to the demand.

1. Collect the samples of each product from each machine-

The samples were collected from the rotex for about 100 grams for each product. There are about 20 products available, a sample bag is used to collect the sample and is taken for testing.

2. Analyze the result

About 100 gram of the sample was collected from the bag using an electronic weighing machine. The sieve pans were arranged in the defined FEPA standards of the product. The arrangement is transferred to the rotap sieve shaker for about five minutes. The result is analyzed and recorded.

3. Calculate the amount of fine grit generation by each machine at the maximum capacity (theoretical)

The output results of each fine grit by each machine at the maximum capacity were calculated. We analyzed the amount of fine grit available in the output for the machines like barmac,roll crusher & raymond mill.

4. Calculate the difference in the production (theoretical) and demand

The recorded results were referred to the current demand faced by company. The present sequence of recrushing is used for identification of current situation.

5. creating various sequence using different machine:

Theoretically we identified various sequences that can be applied for the recrushing.

CASE-1 BARMAC+RAYMOND MILL+ RAYMOND MILL+ROLL CRUSHER

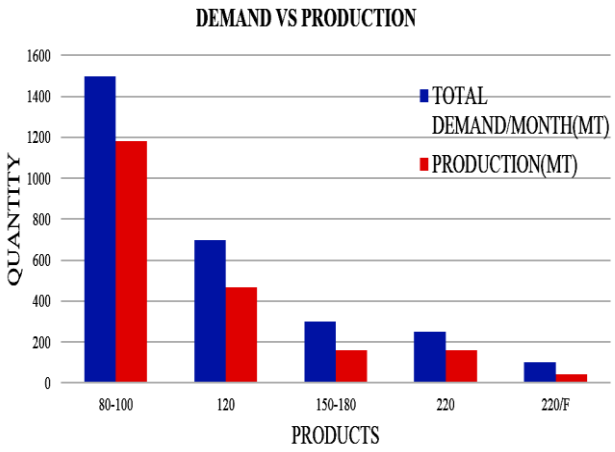
CASE-2 BARMAC+RAYMOND MILL + RAYMOND MILL + RAYMOND MILL

CASE-3 BARMAC + RAYMOND MILL + ROLL CRUSHER + ROLL CRUSHER

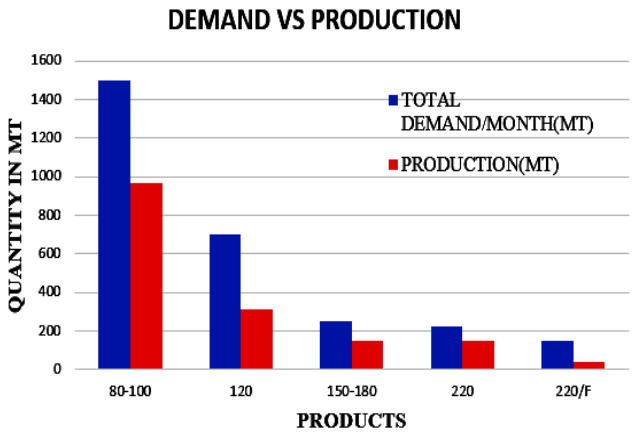
CASE-4BARMAC+ROLL CRUSHER+ ROLL CRUSHER+ ROLL CRUSHER

6. Calculate the fine grit generation in each case:

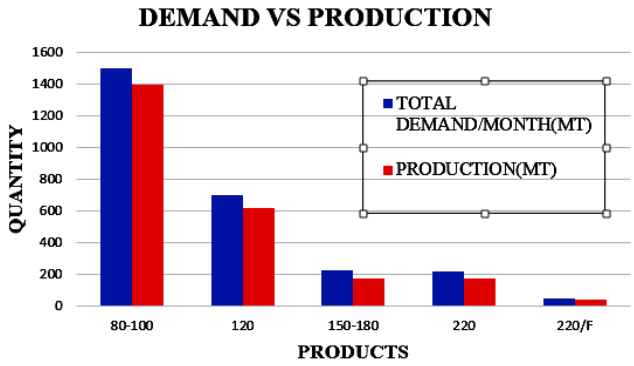
The outputs were derived theoretically with the help of journals.



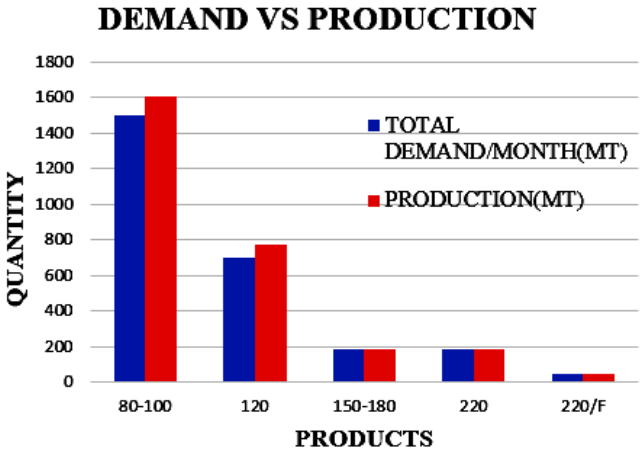
Case – 1



Case – 2



Case - 3



Case – 4

7. Analyze the results obtained and determine the optimum sequence:

In the first, second and third cases, the production is not making up to the demand. in the fourth case, the production exceeds demand. For the range of 80-100,120,220 the production seems to exceed the current demand which is helpful when considering rise of demand in future. For the range 150-180& 220/f the production rate is less than demand, but can be tolerated due to its current level. Hence we can see that case 4 is the best and optimum sequence that can be deduced

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VI. RESULT

From the analysis, it is clear that case 4 produces more amount of fine products i.e. barmac with three Roll crusher is the best combination because it is meeting all the types of products demand than that of three other cases. But for the range of 80-100,120,220 the production seems to exceed the current demand which is helpful when considering rise of demand in future. For the range 150-180& 220/f the production rate is less than demand, but can be tolerated due to its current level. Hence we can see that case 4 is the best and optimum sequence that can be deduced.

VII. CONCLUSION

In a manufacturing industry the major relevance lies in the quality of the final product obtained. Here the quality of the product is determined by the FEPA standards. From the experimental results and calculations done in the company, an interesting fact found was, the total production of the company is greater than that of the demand. The company currently produces Silicon carbide of different grit size. From the analysis it can be realized that, the production of SiC products of only certain grit size is not meeting the demand. Using the results from the experiments, various cases were created which can produce more fine grits. The order of the machine, the input material given to them and the number of machines used, were different in each case. From the analysis of various cases, it is understood that, the combination of three Roll crusher produce more fine grits and requires less reprocessing levels. This combination can also increase the profitability of the company with minimum reprocessing levels.

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NOMENCLATURE

SiC –silicon carbide
RS –rotex screener
MT – metric tonne
FEPA - federation of European products of abrasives

AUTHORS

First Author –Besto O Joy, doing graduate in Mechanical Engineering from Calicut University, Student in IESCE, Chittilappilly, Thrissur, Kerala, India.

Second Author –Dijo Varghese V, doing graduate in Mechanical Engineering from Calicut University, Student in IESCE, Chittilappilly, Thrissur, Kerala, India.

Third Author –Dipin Chandran, doing graduate in Mechanical Engineering from Calicut University, Student in IESCE, Chittilappilly, Thrissur, Kerala, India.

Fourth Author –Donald Paul, doing graduate in Mechanical Engineering from Calicut University, Student in IESCE, Chittilappilly, Thrissur, Kerala, India.

Fifth Author –Joswin Vincent, doing graduate in Mechanical Engineering from Calicut University, Student in IESCE, Chittilappilly, Thrissur, Kerala, India.

Sixth Author –Shillin K S, Assistant Professor, Department of Mechanical Engineering, IESCE, Chittilappilly, Thrissur, Kerala, India.

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