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Real Process Characteristic Capacity Weight in the Product 500 Grams in a Rice Mill

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Abstract

In the present study we performed the measurement of the actual process capacity of the characteristic weight in the product 500 grams in a rice mill. The data were obtained by applying a sampling plan according to the production of the four packing machines.

The ability of this process to meet specifications was determined by analyzing the actual capacity (AP), upper process capability (UPC), lower process capability (LPC), actual process capability and percentage (%) of nonconforming product (NCP). The study shows in economic terms the impact generated by the current scenario and finally shows statistical information of each machine to evidence trends that may be generating noise and variations in the packaging process.

Keywords: machines, mills, rice, packaging.

INTRODUCTION

The content of the packaged products must comply with minimum requirements required by Colombian legal regulations. Failure to comply entails major economic sanctions that may threaten the stability of any business.

Weight is one of the most important quality features in a mass consumer product. Packing quantities below or above the face value has major drawbacks, in addition to the above, can also affect the brand image and sometimes create scenarios where operations are cost inefficient [1], [2].

For this reason, it is important to know the real situation of the content of a product; For this purpose, this variable should be measured and evaluated technically.

Statistical methods exist that allow to fulfill this purpose, they are tools that were born in the middle of century XIX, in essence identify the changes that occur in a process, due to its nature, that is to say by the use of raw materials of different suppliers, the skills of operators, the operating conditions of the equipment and other factors involved [3], [4].

For variations to be acceptable, they must be within a range set by a specification. This is defined by a technical standard, by decision of the client or by necessity of the process itself.

In order to know the degree of compliance of a quality characteristic with respect to its specification, its potential processing capacity (PPC) index must be calculated, this indicator compares the width of the specifications or the variation tolerated for the process with the amplitude of the actual variation of this, represented by its standard deviation; lower process capability (LPC), Upper Process Capability (UPC), Actual Process Capability (APC). These last indices take into account the concept of process centering, as a complement to these indices the probable percentage of product that does not comply with the specifications must be determined. (% PNC) [5], [6], [7]

The present study aims to measure the capacity of the packaging process of a rice mill, to meet the specifications established for the characteristic weight of the product of 500 grams, applying the statistical concept of process capacity and nonconforming product with them is intended to provide technical information for the company to scale the current situation and undertake improvement activities [8], [9], [10].

In order to comply with the objective of the present study, data collection was planned using sampling techniques and ensuring randomization of the data.

Subsequently, the indices of potential processing capacity (PPC), Upper processing capacity (UPC), lower processing capacity (LPC), actual process capacity (APC) and nonconforming product percent (NCP) were calculated [11], [12], [13].

It was defined the degree to which the actual production of the rice mill packaging process is able to meet the quality feature. We also determined the probable percentage of product that presented weights outside the established parameters. Finally, the economic impact of the current situation was quantified in economic terms in terms of non-compliance with the characteristic weight of the product analyzed [14], [15].

The calculations and analysis were developed in the Minitab 16 statistical software.

METHODOLOGY

The project began with the characterization of the packaging process, a sample of 586 pounds of rice was selected [17, [18]. The measurements were carried out on an electronic scale, OHAUS, Model CT600L, Series CK 05857, Identification FC.CA-1003 Measuring intervals 2g to 600g, scale division 0.1g, calibration date 2014-09-17. Certificate Number 14279 ZC.

The sampling plan was based on the assumption of homogeneity of the data. There are four (4) Tecnopack brand packaging machines that work under similar conditions. The type of sampling is the simple random. "a sampling design is said to be random simple if all possible samples of size n are equally likely to be selected" [19], [20].

To find the sample size, the daily production of the machines was considered. Its nomenclature starts from number five (5) to number eight (8), the production capacity of each machine is 60 units per minute. They work two shifts, each of 8 hours; the daily production estimated by the four machines is 230400 units.

The standard deviation was calculated by a pilot sample of 200 units randomly extracted from production under normal conditions for one day. (See Annex A) A maximum error of 0.2 grams with a reliability of 95% was estimated.

N = 230400 units

σ = 2.47 grams

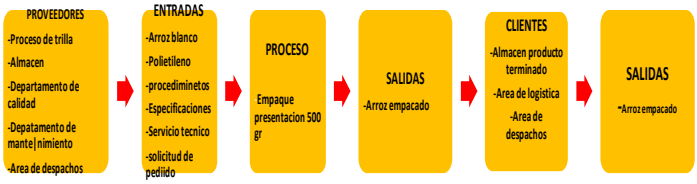
B = 0.2 grams

K = 1.96

n = 584 units

Equation 1. Sample size

$$n = \frac{Ns^2}{(N-1)\left(\frac{B^2}{k^2}\right) + s^2}$$



Source: Gutiérrez Pulido & De la Vara Salazar, 2009.

The units were collected in one working day. Each hour was randomly selected 36 pounds, nine units per machine, starting at 06:00 am and ending at 10:00 pm. In the last collection eight samples were taken, two for each machine to complete the 584 units. (See Annex B).

Once this information was obtained we proceeded to calculate the indices of capacity and nonconforming product applying the properties of the normal distribution. The study was stratified by the analysis of each machine, to determine individual behavior.

The degree to which the actual production of the process is able to meet the quality characteristic under study was established.

Finally, the current situation of the product with respect to weight and its impact on the organization in economic terms was analyzed. To fulfill this purpose it was necessary to project a production condition in which the probability of finding product below 500 grams was close to zero, this would ensure compliance with the minimum weight recorded in the nominal content. To achieve this new scenario the average of the current process was theoretically increased, maintaining the same dispersion, this is achieved in practice, mechanically modifying the dosing system of the machines; the values that the variable could take were calculated by increasing the weight of the pounds and the costs that would incur the company considering the amount of rice that would be packed above the established.

The above point estimate was made by applying the properties of the normal distribution and based on daily yields and rice prices to January 2017.

The company in which the research work was developed, is licensed by Minitab 16, for that reason and for its kindness in quality control issues, calculations and statistical analysis were done in this software.

The Minitab 16 statistical program does not have the Shapiro-Willk test for the normality test, but has a similar one, the Ryan-Joiner test; to counter this condition, Anderson-Darling, and kolmogorov-smirnov will also be tested.

RESULTS

Packaging Process

The rice mill referenced in the present study, packs its products in different presentations, 250 grams, 1000 grams, 3000 grams, 5000 grams and 10000 grams. The most representative is the one of 500 grams, constitutes 90% of the production. To obtain the presentation of 500 grams multiple operations must be performed.

It starts by filling the hoppers with white rice, from the threshing process. Subsequently the rice passes directly to the dosing system of the machine by gravity through a duct, this system is composed of 8 molds (glasses) arranged on a rotating disk. The rice is dropped into the molds as the disk rotates and at the same time moves the load to the hole in the forming tube of the machine. This is covered by a sheet of polyethylene that is displaced while the rice falls. The vertical and horizontal jaws seal the bags with the contents. The bags with rice fall to a small conveyor belt to be taken quickly where an operative

who places 25 units in a repackaging bag. The package is placed on another conveyor belt, the packages are moved to a machine to be sealed. An operator receives the bag and transports it in a wheelbarrow to the finished product area [20], [21].

The packaging process has four machines (machines 5, 6, 7 and 8) each capable of packing 3600 units per hour.

Figure 1: Tecnopack machine

Source: MOLINO DE ARROZ, 2017. Packing Machine

The production plant regularly works throughout the year in two shifts of 8 hours each for 6 days a week. (Monday to Saturday) [22], [23].

The quality of the rice is based on several characteristics, one of them is the weight, represents the actual content of the product.

For the presentation of 500 grams, the company has defined a specification of 502 grams ± 2 grams, which means that each packaged unit must have a weight within this range, otherwise it is considered nonconforming product.

In order to contextualize the present study and to identify the potential sources of noise, which could affect a possible non-compliance with the variable weight, the packaging process was characterized, clearly identifying its main components.

Source: MOLINO DE ARROZ, 2017. Packing process

Figure 2: Characterization

As Figure 2 shows, many factors are involved in the packaging process that can generate variation and permanently threaten the quality of the product.

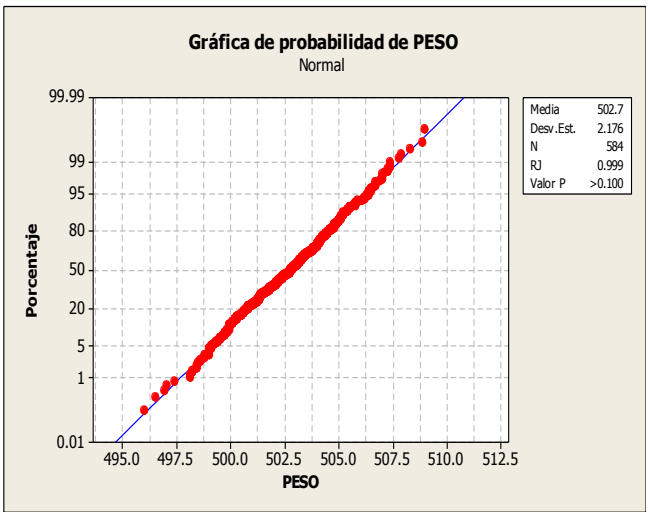
Suppliers are identified, who supply products and services to be transformed. The main input element is the rice that comes from the threshing process. This must meet specific characteristics to ensure a good performance in terms of the variable weight. There are also activities that generate value and convert the entries into finished product. There is very important technical support, a relevant factor in the proper functioning of machines, equipment and the reduction of variation caused by the dosing system. Finally, the customers are the ones who receive the production of the packaging process.

NORMALITY TEST

The characteristic weight in the pounds of rice, is a continuous random variable, follows a normal type distribution. To accept this assumption, three normal tests were performed on the sample data. The Minitab 16 statistical program has the Ryan-Joiner, Anderson-Darling, and Kolmogorov-Smirnov tests.

The results of this evaluation are shown in graphs 1, 2 and 3.

Graph 1. Ryan-Joiner Normal Test

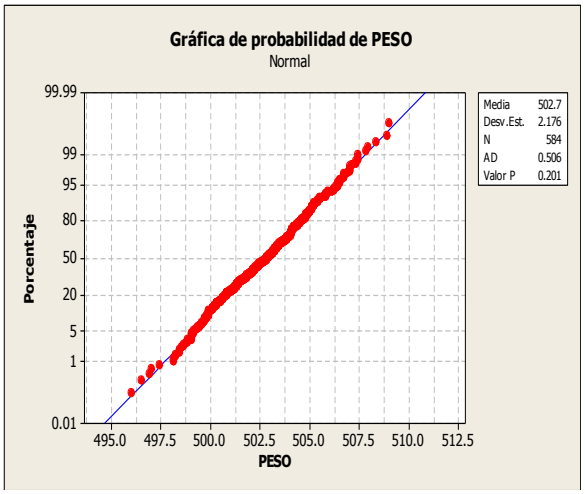


Source: MOLINO DE ARROZ, 2017. Weights of 584 pounds

With a confidence interval of 95%, the Ryan-Joiner test shows that with a p value equal to 0.100, the null hypothesis is accepted. The weights of the pounds in the packaging process are normally distributed.

This statement is validated with the graph, it shows the behavior of each data with respect to the blue line, which represents the normal distribution.

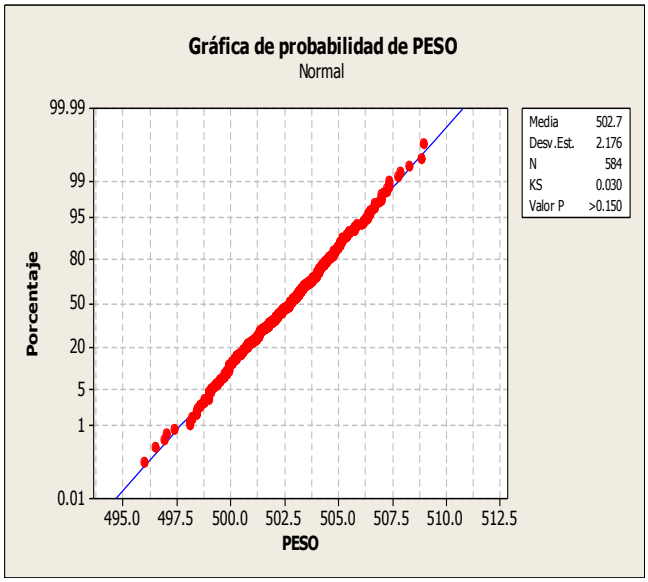
Graph 2. Anderson- Darling normality test



Source: MOLINO DE ARROZ, 2017. Weights of 584 pounds

Like the previous test, that of Anderson-Darling confirms that the data analyzed are distributed in a normal way, the graph of normality shows this clearly. With a confidence interval of 95%, the p value is equal to 0.201, which leads to accept the null hypothesis.

Graph 3. Normal test Kolmogorov – Smirnov



Source: MOLINO DE ARROZ, 2017. Weights of 584 pounds.

With the third test of normality, that of Kolmogorov - Smirnov, it can be seen that, in fact, the 584 pesos fit into a normal distribution, the graph and p value validate this assumption (p value = 0.150), with a confidence interval of 95%.

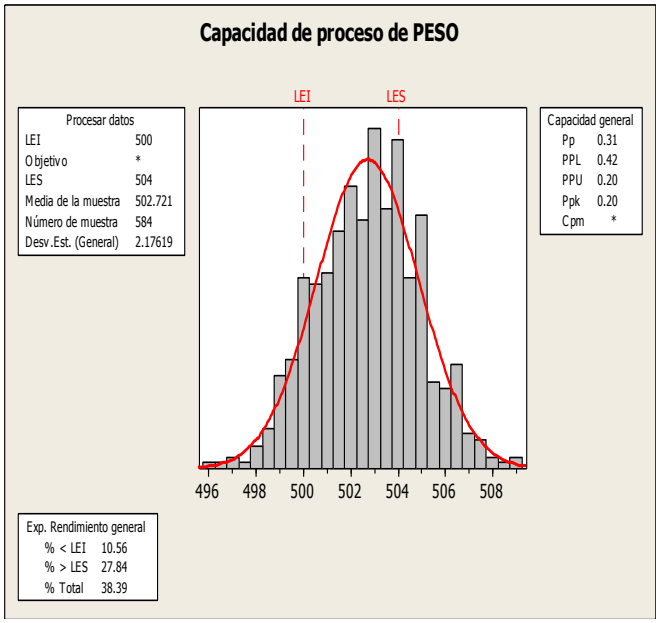
However, for process capability studies it is not a condition that the data follow a normal distribution. "6σ (six times the standard deviation) is the actual variation, due to the properties of the normal distribution, where it is stated that between μ ± 3σ is 99.7% of the values of a variable with normal distribution, even if there is no normality, a large percentage of the distribution is found in μ ± 3σ because of Chebyshev's inequality and the empirical rule" [23], [24], [25].

The rice mill defines the specifications for the variables that represent the characteristics of the product and the process, based on technical standards, the nature of the process and the customer's requirements.

For the case of weight, it was established that the specification for the presentation of pound out of 502 ± 2 grams.

The calculation of the indices of the process capacity and the nonconforming product were done with the help of the statistical software Minitab 16, the results are shown in figure 4.

Graph 4. Process capacity analysis



Source: MOLINO DE ARROZ, 2017. Weights of 584 pounds.

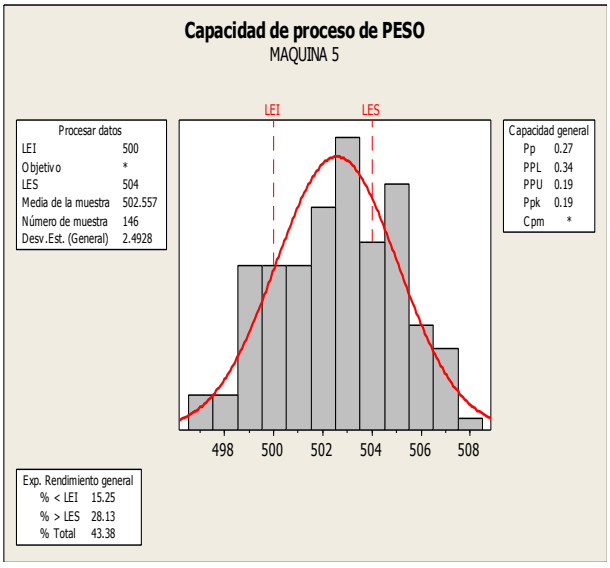
The units analyzed were 584 corresponding to the total of the established sample. The result shows that the amplitude of the process is greater with respect to the amplitude of the specifications, the red lines indicate the theoretical dispersion allowed by the process, the filling system of the rice mill presents little ability to comply with the established parameters. Its potential capacity (0.310) reflects the degree of dispersion of its data, it is far from the 1.33 that is suggested for this type of indicator. The average of the sample (502.72 grams) indicates that the process is off-center to the right side, since the theoretical average of the process is 502 grams. This fact is

confirmed by the value of higher and real capacity (0.20). The likely percentage of nonconforming product is out of specification is 38.39%, 10.56% of the pounds would have weight below 500 grams and 27.84% would have content above 504 grams. Only 61.61% of production meets the desired weight.

The results evidence large problems in compliance with the characteristic weight, generating a large quantity of product with higher and lower content of rice to the stipulated. The company must immediately carry out improvement projects if it wishes to achieve the objectives set. For this it is necessary to know in more detail the possible sources of variation. The stratification of information facilitates the interpretation of facts, gives clear guidance on the real causes, and provides tools for making sound decisions.

The individual behavior of the machines is analyzed, with this it is tried to identify the degree of incidence of each of them in the lack of capacity to fulfill specifications of the packing process with respect to the characteristic weight. The results are shown in graphs 5, 6, 7 and 8.

Graph 5: Processing capacity of machine 5

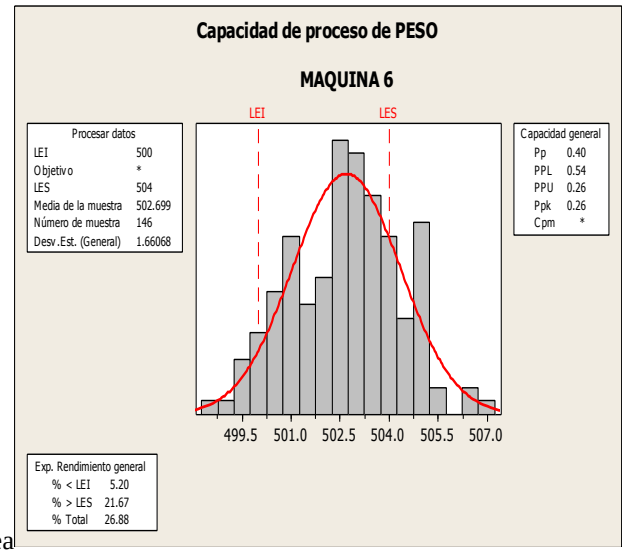


Source: MOLINO DE ARROZ, 2017. Weights of 584 pounds.

In figure 5 it is observed that the amplitude of the process of the machine 5 is much superior to the amplitude of the specifications. The red lines that represent the specifications dimension the situation. The production of this machine has little processing capacity. Its potential capacity index (0.27) is much lower than expected, it is also lower than that of the overall process. The mean of the sample (502,557 grams) indicates that the weight of the pounds that packs this machine have a bias towards the right side of the distribution, this fact ratifies the index of superior capacity with a 0.19 and also the quantity of product does not as it exceeds the weight of 504 grams (28.38%).

Machine 5 is generating more nonconforming product than the overall process.

Graph 6 Processing capacity of machine 6



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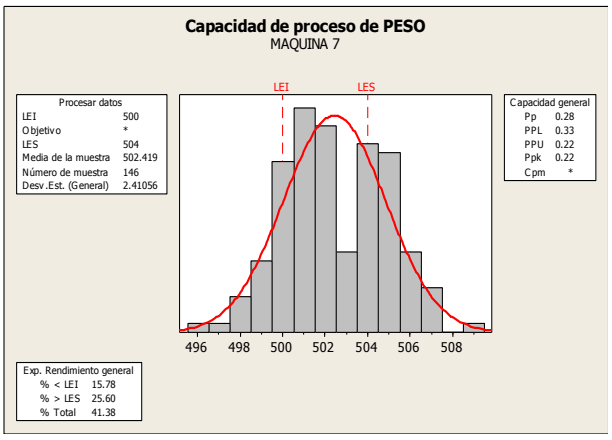
Source: MOLINO DE ARROZ, 2017. Weights of 584 pounds.

In graph 6 shows the non-compliance of the machine specification 6, the process amplitude is higher than the tolerance. This causes the potential capacity index to be 0.40. The capacity study of this machine also shows that the largest quantity of nonconforming product is on the upper side of the specifications, the probability of producing product weighing above 504 grams is 21.67%.

Despite non-compliance with specifications, it is noted that the production of nonconforming product of this machine (26.88%) is lower than that of the process (38.39%).

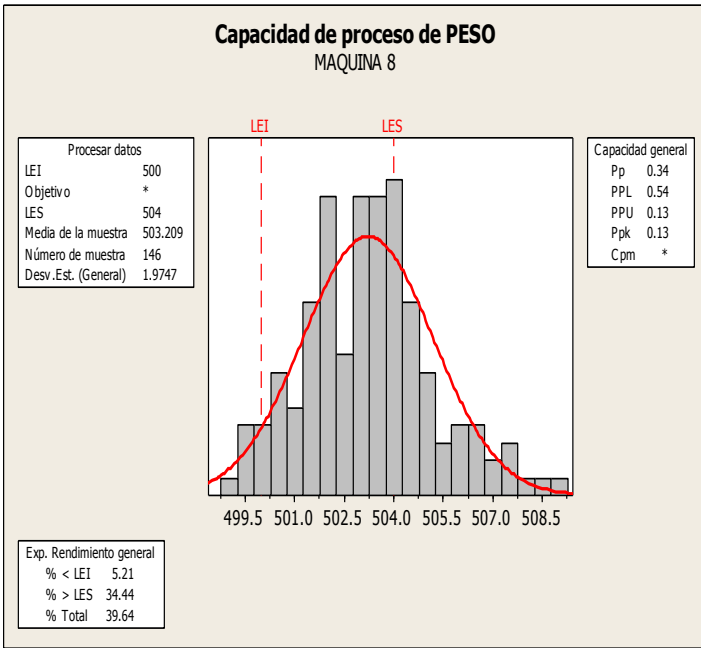
Graph 7 Process capacity machine 7



Source: MOLINO DE ARROZ, 2017. Weights of 584 pounds.

1Figure 7 clearly shows that the machine 7 is also unable to meet the set weight. Their capacity and nonconforming product indices are lower than the overall process. It presents major problems towards the upper side of the specification.

Graph 8 Processing capacity of machine 8



Source: MOLINO DE ARROZ, 2017. Weights of 584 pounds.

It can be seen from Figure 8 that the production of the machine 8 presents a large bias towards the upper side of the specification. Similarly, a significant deviation of the central value from the theoretical average is observed, 34.44% of the pounds packed in this machine have weights above 504 grams. The reflection of this situation is its superior capacity index, which is the lowest value among the four machines studied.

Machine 8 is the one with the largest amount of nonconforming product producing above 504 grams, with 34.44% compared to 28.13%, 21.67% and 25.60% of machines 5, 6 and 7 respectively.

Another aspect that can be seen in these graphs is that machines 5 and 7 are the one with the largest product weighing less than 500 grams with 15.25% and 15.78% compared to 5.20% and 5.21% of machines 6 and 8.

The study determined that there are pounds with weight outside the specifications, generating negative impacts for the company in terms of over cost and customer perception.

Immediate correction would mean that at least the weight recorded at the nominal content (500 g) must be met. In this case, if this correction were made and taking into account the current centering and dispersion tendencies of the process (average 502.72g and standard deviation 2.17), it would have to be overweight since the dosing system should be adjusted, increasing approximately the total average to 507 grams and thus guarantee a minimum of product below 500g (close to 0%).

In this new scenario, the lower limit would be fulfilled, but production would be at levels of overweight as shown in Table 1.

Table 1: Economic impact

	PROBABILIDAD	PROD/MENSUAL	GRAMOS DE MAS	$ GRAMOS DE MAS
MENORES A 500g	0.06%	3000		
500g-504g	8.33%	416500		
504 g-505g	9.50%	475000	475000	$ 1,330,000.00
505g-506g	14.39%	719500	1439000	$ 4,029,200.00
506g-507g	17.70%	885000	2655000	$ 7,434,000.00
507g-508g	17.71%	885500	3542000	$ 9,917,600.00
508g-509g	14.39%	719500	3597500	$ 10,073,000.00
509g-510g	9.50%	475000	2850000	$ 7,980,000.00
510g-511g	5.10%	255000	1785000	$ 4,998,000.00
511g-512g	2.22%	111000	888000	$ 2,486,400.00
512g-513g	0.79%	39500	355500	$ 995,400.00
513g-514g	0.23%	11500	115000	$ 322,000.00
514g-515g	0.05%	2500	27500	$ 77,000.00
515g-516g	0.01%	500	6000	$ 16,800.00
			TOTAL	$ 49,659,400.00

Source: Own

Only 8.33% of the production would comply with the desired, the rest of the pounds would have an excess of content, this would force the company to incur a surcharge of $ 2.8 per additional gram packed, which according to projected production (5000.000.000 pounds / month) would be approximately $ 49,000,000 / month.

The above point estimate was made by applying the properties of the normal distribution and based on daily yields and rice prices to January 2017.

DISCUTION

Para la aplicación de estos métodos de clasificación se deben tener en cuenta los parámetros que rige la manipulación de alimentos en Colombia, para así mismo hacer cumplir las leyes a la hora de realizar los diferentes empaques de arroz, evidenciamos falencias en varias maquina alguna de sobre peso y otras por falta de peso lo cual puede ser sancionado por estas entidades que rigen la manipulación y empacado de alimentos.

CONCLUSION

The present work evaluated the capacity of the packaging process in a rice mill to produce units with contents that are in the range of 500 grams and 504 grams.

Through the characterization of the process, it was possible to clearly visualize the input, output and main activities factors,

highlighting elements such as the quality of the rice that comes from the threshing process and the technical support to the dosing system of the machines. This identified the potential generators of variation, a key concept to determine the quality of a product.

Simple random sampling was designed; it defined a sample size equal to 584 units and a collection methodology, ensuring that the selected units represent the total production under normal conditions in a day of work.

It was determined that the packing process of the rice mill does not have the capacity to meet the specifications of the characteristic weight in the reference of 500 grams. The result of the analysis yielded a potential capacity index equal to 0.31, a value that is far from the desired one (1.33). Consequently, the amplitude of the process is much higher than that of the specifications, and the actual capacity (0.2) shows a bias of the pounds towards the upper limit. Machine number five (5) was identified as the largest generator of nonconforming product and number six (6) as the lowest percentage. It was also established that machine number eight (8) is the one with the largest amount of nonconforming product producing above 504 grams and the number seven (7) being greater than 500 grams.

The non-processing capacity implies that the rice mill, out of its total production, 38.4% of the pounds are outside the parameters established by the company (500gr-504gr), the excess content being the of greater problem with 27.8%.

Producing less than 500 grams (10.56% probability) can generate distrust in those customers who detect this situation, and also creates a distorted perception of the product and the company. To correct this problem is visualized an immediate action, increase the average of the pounds produced by 4.5 grams, modifying the dosing system, this would involve packing more content than the one referenced in the label (91.6% of the production), incurring an envelope cost approximately 49 million pesos per month.

RECOMMENDATIONS

It is suggested to the company to advance improvement processes taking advantage of the valuable frame of reference that leaves this study, since in addition to describing technically the current situation of the characteristic weight, also shows trends of each of the machines.

It is recommended to implement a training program in statistical methods and quality control in the company, especially the technical and operational personnel, so that through the correct measurement, timely detection of deviations that may occur in daily operations, also this competition will allow to visualize more easily the options of improvement.

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ANNEXES

The author authorizes the use of information contained in the annexes, for academic purposes

ANNEX A Pilot sample

Muestra	Peso	Muestra	Peso	Muestra	Peso	Muestra	Peso	Muestra	Peso
1	500.0	41	504.7	81	502.9	121	501.0	161	501.2
2	500	42	502.3	82	503.5	122	503.4	162	502.6
3	500.7	43	503.7	83	494.7	123	504.8	163	504.4
4	505.7	44	502.8	84	506.2	124	501.2	164	500.3
5	500.4	45	501.0	85	499.3	125	500.3	165	501.7
6	501.2	46	500.4	86	501.2	126	501.6	166	495.0
7	502.2	47	503.5	87	502.4	127	501.6	167	495.0
8	500.9	48	500.2	88	498.6	128	499.2	168	501.2
9	501.6	49	501.7	89	501.4	129	502.4	169	499.3
10	502.2	50	500.3	90	502.9	130	498.6	170	497.3
11	502.3	51	502.4	91	501.3	131	499.1	171	495.9
12	501.6	52	500.3	92	503.6	132	499.2	172	498.2
13	494	53	501.4	93	499.4	133	498.8	173	497.8
14	499	54	502.0	94	501.9	134	499.1	174	499.9
15	501.7	55	500.3	95	501.1	135	500.0	175	494.6
16	501.3	56	499.3	96	502.8	136	501.3	176	502.2
17	503.4	57	503.3	97	502.6	137	505.9	177	503.4
18	502.3	58	501.3	98	500.8	138	504.9	178	496.9
19	502.4	59	499.8	99	500.8	139	500.8	179	504.5
20	503.7	60	500.5	100	502.8	140	502.4	180	502.0
21	501.2	61	502.8	101	502.1	141	501.3	181	500.4
22	504.8	62	502.5	102	502.3	142	501.3	182	502.3
23	493.7	63	504	103	503.1	143	503.3	183	501.4
24	505.2	64	506.2	104	502.3	144	506.1	184	502.0
25	501.4	65	498.1	105	500.6	145	502.6	185	501.1
26	500.2	66	500.8	106	500.5	146	499.5	186	497.4
27	501.5	67	502.3	107	505.2	147	502.3	187	497.4
28	501.7	68	499.7	108	499.7	148	501.8	188	502.7
29	503.3	69	501.7	109	500.4	149	501.5	189	501.2
30	500.8	70	501.6	110	499.2	150	501.3	190	495.7
31	501.4	71	502.1	111	499.2	151	500.0	191	498.2
32	505.8	72	502.7	112	498.7	152	500.6	192	498.9
33	497	73	503.6	113	499.1	153	504.0	193	498.0
34	502.2	74	503.9	114	501	154	498.1	194	501
35	503	75	499.5	115	494.5	155	498.5	195	495.2
36	501.1	76	501.6	116	501.5	156	499.2	196	502.3
37	504.4	77	500.7	117	505.7	157	506.4	197	501.7
38	502.4	78	502.0	118	503.6	158	495.8	198	494.4
39	499.8	79	499.8	119	501.1	159	501.3	199	502.3
40	500.3	80	501.2	120	502.2	160	501.3	200	502.4

Source: Own

ANNEX B Simple random sampling

HORA	MAQUINA	PESO	HORA	MAQUINA	PESO	HORA	MAQUINA	PESO	HORA	MAQUINA	PESO
06:00	5	499.1	07:00	5	505.4	08:00	5	503.5	09:00	5	504.7
06:00	5	503.8	07:00	5	499.8	08:00	5	503.9	09:00	5	506.3
06:00	5	504.8	07:00	5	503.1	08:00	5	500.1	09:00	5	504.3
06:00	5	500.6	07:00	5	500.6	08:00	5	499.4	09:00	5	503.8
06:00	5	502.4	07:00	5	499.8	08:00	5	502.8	09:00	5	503.2
06:00	5	500.5	07:00	5	502.0	08:00	5	499.1	09:00	5	502.0
06:00	5	502.2	07:00	5	505.2	08:00	5	499.1	09:00	5	499.0
06:00	5	507.0	07:00	5	505.5	08:00	5	499.0	09:00	5	503.1
06:00	5	506.5	07:00	5	507.9	08:00	5	504.8	09:00	5	499.1
06:00	6	503.8	07:00	6	501.2	08:00	6	507.0	09:00	6	504.9
06:00	6	502.1	07:00	6	501.1	08:00	6	505.1	09:00	6	504.0
06:00	6	504.1	07:00	6	501.5	08:00	6	503.6	09:00	6	505.2
06:00	6	503.0	07:00	6	501.2	08:00	6	501.2	09:00	6	502.6
06:00	6	503.6	07:00	6	502.2	08:00	6	503.6	09:00	6	502.3
06:00	6	505.2	07:00	6	498.6	08:00	6	505.2	09:00	6	505.7
06:00	6	500.5	07:00	6	499.9	08:00	6	503.6	09:00	6	504.4
06:00	6	500.6	07:00	6	500.1	08:00	6	504.0	09:00	6	505.0
06:00	6	499.7	07:00	6	501.4	08:00	6	504.2	09:00	6	504.6
06:00	7	500.9	07:00	7	501.1	08:00	7	499.5	09:00	7	501.5
06:00	7	503.8	07:00	7	500.8	08:00	7	499.4	09:00	7	499.0
06:00	7	504.7	07:00	7	501.4	08:00	7	499.3	09:00	7	501.8
06:00	7	496.0	07:00	7	498.2	08:00	7	498.8	09:00	7	499.4
06:00	7	500.8	07:00	7	498.2	08:00	7	500.3	09:00	7	502.0
06:00	7	502.3	07:00	7	498.6	08:00	7	500.3	09:00	7	499.0
06:00	7	499.8	07:00	7	500.5	08:00	7	500.1	09:00	7	500.6
06:00	7	504.2	07:00	7	500.1	08:00	7	500.1	09:00	7	500.6
06:00	7	505.8	07:00	7	499.9	08:00	7	499.7	09:00	7	499.9
06:00	8	505.1	07:00	8	507.8	08:00	8	504.6	09:00	8	506.4
06:00	8	504.4	07:00	8	504.5	08:00	8	504.1	09:00	8	505.8
06:00	8	503.7	07:00	8	504.5	08:00	8	506.2	09:00	8	507.4
06:00	8	503.0	07:00	8	508.3	08:00	8	504.9	09:00	8	505.4
06:00	8	503.8	07:00	8	504.9	08:00	8	506.7	09:00	8	504.4
06:00	8	504.9	07:00	8	505.5	08:00	8	507.4	09:00	8	507.1
06:00	8	503.7	07:00	8	506.4	08:00	8	505.9	09:00	8	504.6
06:00	8	503.7	07:00	8	507.4	08:00	8	505.8	09:00	8	507.0
06:00	8	503.2	07:00	8	509.0	08:00	8	506.6	09:00	8	504.4

HORA	MAQUINA	PESO	HORA	MAQUINA	PESO	HORA	MAQUINA	PESO	HORA	MAQUINA	PESO
10:00	5	498.8	11:00	5	504.8	12:00	5	501.9	13:00	5	506.3
10:00	5	504.0	11:00	5	507.0	12:00	5	503.1	13:00	5	501.8
10:00	5	500.0	11:00	5	499.5	12:00	5	501.0	13:00	5	499.9
10:00	5	501.8	11:00	5	501.8	12:00	5	500.0	13:00	5	500.3
10:00	5	503.0	11:00	5	501.3	12:00	5	499.8	13:00	5	499.9
10:00	5	496.5	11:00	5	504.1	12:00	5	503.2	13:00	5	506.9
10:00	5	499.7	11:00	5	502.5	12:00	5	498.4	13:00	5	502.6
10:00	5	501.7	11:00	5	502.9	12:00	5	503.2	13:00	5	505.0
10:00	5	505.0	11:00	5	503.1	12:00	5	497.4	13:00	5	505.3
10:00	6	501.1	11:00	6	503.0	12:00	6	504.0	13:00	6	504.8
10:00	6	503.7	11:00	6	502.5	12:00	6	503.9	13:00	6	503.0
10:00	6	502.4	11:00	6	501.6	12:00	6	504.8	13:00	6	504.3
10:00	6	502.9	11:00	6	502.1	12:00	6	503.2	13:00	6	504.8
10:00	6	500.7	11:00	6	503.2	12:00	6	504.2	13:00	6	501.3
10:00	6	502.7	11:00	6	503.4	12:00	6	502.8	13:00	6	503.5
10:00	6	502.3	11:00	6	503.0	12:00	6	503.3	13:00	6	502.7
10:00	6	505.1	11:00	6	504.4	12:00	6	506.7	13:00	6	505.0
10:00	6	502.8	11:00	6	504.1	12:00	6	502.8	13:00	6	506.4
10:00	7	504.8	11:00	7	501.1	12:00	7	501.5	13:00	7	503.7
10:00	7	498.1	11:00	7	503.2	12:00	7	499.9	13:00	7	504.0
10:00	7	501.5	11:00	7	506.4	12:00	7	504.1	13:00	7	502.8
10:00	7	506.7	11:00	7	502.1	12:00	7	505.4	13:00	7	505.1
10:00	7	501.3	11:00	7	499.8	12:00	7	504.1	13:00	7	504.5
10:00	7	507.3	11:00	7	506.7	12:00	7	504.1	13:00	7	506.2
10:00	7	499.9	11:00	7	503.6	12:00	7	505.1	13:00	7	502.9
10:00	7	508.9	11:00	7	506.7	12:00	7	501.0	13:00	7	504.8
10:00	7	505.8	11:00	7	505.9	12:00	7	504.2	13:00	7	504.7
10:00	8	500.5	11:00	8	503.4	12:00	8	505.1	13:00	8	502.3
10:00	8	502.9	11:00	8	502.9	12:00	8	502.7	13:00	8	504.1
10:00	8	501.8	11:00	8	501.4	12:00	8	504.1	13:00	8	505.7
10:00	8	503.5	11:00	8	503.4	12:00	8	503.3	13:00	8	504.1
10:00	8	504.6	11:00	8	501.9	12:00	8	501.2	13:00	8	502.2
10:00	8	503.4	11:00	8	504.0	12:00	8	503.9	13:00	8	503.5
10:00	8	502.2	11:00	8	503.8	12:00	8	504.5	13:00	8	504.2
10:00	8	501.4	11:00	8	503.3	12:00	8	502.5	13:00	8	499.5
10:00	8	501.7	11:00	8	504.5	12:00	8	503.0	13:00	8	500.3

HORA	MAQUINA	PESO	HORA	MAQUINA	PESO	HORA	MAQUINA	PESO	HORA	MAQUINA	PESO
14:00	5	503.0	15:00	5	505.8	16:00	5	498.5	17:00	5	499.2
14:00	5	505.1	15:00	5	499.0	16:00	5	501.3	17:00	5	503.3
14:00	5	497.0	15:00	5	505.4	16:00	5	502.2	17:00	5	500.8
14:00	5	502.8	15:00	5	500.1	16:00	5	503.9	17:00	5	503.5
14:00	5	501.6	15:00	5	501.7	16:00	5	498.1	17:00	5	498.4
14:00	5	505.0	15:00	5	502.3	16:00	5	501.0	17:00	5	505.1
14:00	5	502.4	15:00	5	501.5	16:00	5	499.0	17:00	5	503.2
14:00	5	501.4	15:00	5	504.6	16:00	5	500.7	17:00	5	505.9
14:00	5	504.4	15:00	5	505.8	16:00	5	501.1	17:00	5	499.3
14:00	6	501.0	15:00	6	501.3	16:00	6	500.7	17:00	6	503.3
14:00	6	503.1	15:00	6	500.7	16:00	6	502.4	17:00	6	500.3
14:00	6	504.3	15:00	6	500.9	16:00	6	502.7	17:00	6	501.9
14:00	6	499.6	15:00	6	500.2	16:00	6	502.5	17:00	6	501.8
14:00	6	503.2	15:00	6	500.9	16:00	6	505.0	17:00	6	502.3
14:00	6	502.8	15:00	6	502.4	16:00	6	500.3	17:00	6	500.3
14:00	6	502.6	15:00	6	503.1	16:00	6	502.7	17:00	6	502.7
14:00	6	503.3	15:00	6	500.1	16:00	6	500.2	17:00	6	502.5
14:00	6	502.7	15:00	6	502.1	16:00	6	501.2	17:00	6	502.8
14:00	7	504.1	15:00	7	504.9	16:00	7	502.1	17:00	7	501.3
14:00	7	506.2	15:00	7	500.5	16:00	7	505.4	17:00	7	503.8
14:00	7	503.9	15:00	7	505.4	16:00	7	504.5	17:00	7	504.5
14:00	7	504.8	15:00	7	504.1	16:00	7	501.7	17:00	7	501.2
14:00	7	501.6	15:00	7	504.5	16:00	7	504.7	17:00	7	505.5
14:00	7	502.4	15:00	7	500.2	16:00	7	500.8	17:00	7	500.7
14:00	7	503.2	15:00	7	499.9	16:00	7	504.6	17:00	7	501.8
14:00	7	506.2	15:00	7	503.8	16:00	7	500.4	17:00	7	496.9
14:00	7	506.3	15:00	7	504.1	16:00	7	504.2	17:00	7	503.2
14:00	8	501.6	15:00	8	501.4	16:00	8	501.8	17:00	8	501.3
14:00	8	500.6	15:00	8	501.3	16:00	8	504.0	17:00	8	500.3
14:00	8	501.7	15:00	8	502.0	16:00	8	502.5	17:00	8	500.5
14:00	8	503.3	15:00	8	503.1	16:00	8	502.0	17:00	8	500.4
14:00	8	502.2	15:00	8	504.0	16:00	8	503.0	17:00	8	502.1
14:00	8	502.9	15:00	8	502.2	16:00	8	499.6	17:00	8	502.3
14:00	8	500.2	15:00	8	502.3	16:00	8	498.8	17:00	8	502.8
14:00	8	504.5	15:00	8	503.4	16:00	8	500.8	17:00	8	500.7
14:00	8	503.2	15:00	8	501.3	16:00	8	503.3	17:00	8	502.5

HORA	MAQUINA	PESO	HORA	MAQUINA	PESO	HORA	MAQUINA	PESO
18:00	5	503.4	19:00	5	506.1	20:00	5	504.2
18:00	5	505.5	19:00	5	499.9	20:00	5	507.3
18:00	5	502.6	19:00	5	504.8	20:00	5	503.9
18:00	5	504.2	19:00	5	502.7	20:00	5	505.2
18:00	5	503.6	19:00	5	505.1	20:00	5	506.4
18:00	5	504.4	19:00	5	503.2	20:00	5	505.1
18:00	5	500.6	19:00	5	500.8	20:00	5	501.3
18:00	5	504.9	19:00	5	502.2	20:00	5	505.3
18:00	5	502.8	19:00	5	499.5	20:00	5	504.8
18:00	6	500.8	19:00	6	504.3	20:00	6	502.9
18:00	6	499.2	19:00	6	503.3	20:00	6	503.4
18:00	6	500.3	19:00	6	503.5	20:00	6	505.2
18:00	6	501.6	19:00	6	501.2	20:00	6	501.7
18:00	6	501.9	19:00	6	501.8	20:00	6	504.0
18:00	6	500.8	19:00	6	501.4	20:00	6	503.4
18:00	6	499.7	19:00	6	503.8	20:00	6	503.2
18:00	6	502.7	19:00	6	502.4	20:00	6	504.0
18:00	6	499.6	19:00	6	502.1	20:00	6	503.0
18:00	7	502.0	19:00	7	500.8	20:00	7	499.0
18:00	7	500.8	19:00	7	501.4	20:00	7	504.6
18:00	7	503.9	19:00	7	503.1	20:00	7	502.4
18:00	7	500.6	19:00	7	499.7	20:00	7	499.9
18:00	7	501.3	19:00	7	505.0	20:00	7	501.3
18:00	7	502.1	19:00	7	504.4	20:00	7	502.4
18:00	7	502.6	19:00	7	506.5	20:00	7	501.1
18:00	7	501.4	19:00	7	501.8	20:00	7	502.0
18:00	7	502.2	19:00	7	498.4	20:00	7	504.0
18:00	8	505.0	19:00	8	504.2	20:00	8	502.3
18:00	8	504.1	19:00	8	499.3	20:00	8	501.3
18:00	8	502.8	19:00	8	503.4	20:00	8	501.8
18:00	8	500.8	19:00	8	503.9	20:00	8	503.1
18:00	8	499.7	19:00	8	505.2	20:00	8	504.1
18:00	8	499.9	19:00	8	503.1	20:00	8	501.2
18:00	8	499.9	19:00	8	502.1	20:00	8	504.0
18:00	8	502.2	19:00	8	502.8	20:00	8	503.4
18:00	8	501.4	19:00	8	501.0	20:00	8	501.8

Source: Own