

Application of the OCRA Method in the sugar cane harvest and its repercussion on the workers' health. Preliminary study.

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Abstract: In Brazil the sugar ethanol industry has had strong growth in the last 10 years, sometimes due to the growing sugar exportation, sometimes due to the alcohol production for automobile fuel and for exportation. Despite the growing mechanization of the raw material harvest (sugar cane), the manual work still persists. The development of this article was based in the application of the OCRA Method in the sugar cane harvesting process, to evaluate the risks to the upper limbs by repetitive movements and epidemiologically prove the ratio risk x harm to the health of the workers, as well as the probability of developing improvements in the working conditions. The analysis process consists of studying the work organization, the risks to the health of the worker and the distribution of the recovery periods during the working day.

1. Introduction

The sugar ethanol sector has had a strong expansion in the last 10 years due to the sugar exportation and of the possible shortage and of environment aspects caused by the use of fossil fuels, provoking the search for alternative fuels in the world. In the following years Brazil will expand the sugar cane crops in more than 3.1 million hectares. With the current construction of more than 89 mills, 19 of them starting their operation in 2006, more than 200 thousand new vacancies will open to help in the expansion in the plantation. On the other hand, the sugar cane harvest sector presents some problems related to different factors that affect the safety and the health of the workers, such as: environmental, physiological and related to the work organization. Besides the aspects related to the health and work conditions, the process of sugar cane production has been object of studies of the social aspects caused by the migration, improper housing, and others that associate this process to important environmental impacts such as the soil degradation and air pollution during the burning of the straw. These factors in the cutting of the sugar cane has been object of discussion in the society, considering the possible impacts of this activity in the wearing out of the workers, associated to the

growing expansion of the sector. The subject is still little studied in the national and international* scientific environment, with lack of specialized literature. Due to the importance of the sugar cane culture for Brazil, considering the large number of workers involved and the lack of research in this area, the considerations of this article will bring important contributions for the detailed knowledge of the sugar cane harvest work. This article has as its objective to present a proposal of intervention through the application of a proven methodology that involves the workers as well the people responsible for the planning and managing of the production. This way it will contribute to the development of ergonomic actions in the sugar cane harvest, stimulating the development of future studies on the subject, identifying the work determinants that may affect the health of the workers and/or the productivity through the diagnosis and improvement of the conditions and work process and cooperating to the social-environmental sustainability of the sector.

2. Method:

The application of the OCRA method consists of the deep study of the work organization, starting

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from the total duration of the work day. In the studied case, the workers start their day at 7:00 a.m. and end at 3:50 p.m., with the official duration of 470 minutes, considering that the hour for the meal is already discounted from the total working day. Besides the lunch break, the worker has two 15 minute breaks, one before lunch and the other before the end of the working day. So, the worker is exposed to 430 minutes of net repetitive work in the activity of sugar cane cutting. Based on this distribution of pauses and lunch break, the punctuation in the OCRA check list is 4 points. For the OCRA Method, the study of the risk factors must be done in the representative cycle, done through a recorded video of the actual task and of the calculated cycle, obtained by the following formula: net time of repetitive work x 60 / number of cycles or pieces historically produced. In this study we requested the cutting volume more commonly obtained by the worker and we found that he cuts approximately 14.5 tons per day, which represents around 3600 cycles of cut. Applying the formula proposed by the method, we obtained a calculated cycle of 7.2 seconds, while the cycle obtained by the recording shows the time of 7.04 seconds, with a difference between them of 1.7%. As the OCRA Method presents as a maximum limit a difference of 5%, we can say that the observed cycle is representative, for it reflects the cycle the worker actually performs to obtain the daily production result.

Identifying the representative cycle, we analyze the risk factors to the upper limbs, starting from the frequency factor that identifies the number of technical actions per minute and the presence of static actions of the upper limbs, separately for the left and right upper limbs. Analyzing the left upper limb of the observed worker, we noticed that the activity is purely static because this limb is used to keep the sheaf immobilized while the upper right limb hits the base of the sheaf several times. The method punctuation for the upper left limb is 4.5, maximum punctuation for static actions. In relation to the upper right limb, the worker hits the base of the sheaf around 3 times per cycle of 7 seconds, totaling 26 technical actions per minute, which receives a punctuation of 1. As the worker keeps the knife all the time in his right hand to perform the task, this action receives 4.5 points, due to the static action.

The next risk factor analyzed is the strength, which needs the application of the Borg Scale, where the worker is interviewed and asked in which technical action he applies strength and what perception of internal strength the worker punctuates in the mentioned scale. The result presented by the

interviewed workers shows the use of strength above 5 and below 7 for more than 10 % of the time, meaning a punctuation 25 in the OCRA Method for the upper right limb and punctuation 2 for the upper left limb, for the workers mentioned moderate strength during the throwing of the sheaf (3 or 4 in the Borg Scale), during around a third of the time.

The following stage of the method requests the analysis of the postures involved in the activity and we observe the workers need to abduct the left arm while involving the sheaf and hitting with the knife, Sharp movements of the elbow, as well as ulnar deviations of the right wrist, which result in the following punctuations:

	Right	Posture	Left	Posture
SHOULDER	1		24	Abduction above 45 degrees
ELBOW	4	Sharp movements while hitting	0	
WRIST	4	Sharp movements while hitting	0	
HAND	0		0	
STEREOTYPY	3	Perform similar gestures	3	Perform similar gestures
POSTURE PUNCTUATION	7		27	

The final punctuation takes into consideration the presence of stereotypy, that is, the maintenance of laboral gestures, which are repeated in the same manner throughout time. Thus, we observe that the final punctuation for the posture is 7 for the upper right limb and 27 for the upper right limb.

Finalizing the analysis process of the risk factors, it is necessary to verify the presence or absence of complementary risks, such as: vibration, whacks, cold, inadequate gloves, mechanical compressions, precision work, as well as social-organizational risks as the imposed rhythm. In this study, the presence of whacks with the knives is observed, with the punctuation 2 for this stage.

Going through the analysis stages preconized by the OCRA Method, starting from the criterion of adding the stages recovery, frequency, strength, posture and complementary, and multiplying the value 1 as the duration factor for the exposure of 430 minutes, the following result was obtained:

	Right	Left
RECOVERY	4	4
FREQUENCY	4.5	4.5

STRENGTH	24	2
POSTURE	7	27
COMPLEMENTARY	2	0
DURATION FACTOR	1	1
FINAL PUNCTUATION	41.5	37.5

3. Results:

The results obtained in this study, and following Norma ISO 11228-3, we can say that more than 20% of the working population will present a lesion on the upper limbs in the period of 5 to 10 years. This relation is predictable due to the statistical data bank in which the OCRA Method is based, where more than 5,000 workers were studied in their working areas, and we obtained a statistical correlation with a precision of 0.00001.

Comparing this OCRA Method punctuation with the results of the investigation of the workers' health in this study, we can say that the existence of pathologies in more than 20 % of the population through clinical examinations of the upper left limb as well as the upper right limb.

The advantage of the OCRA Method in relation to other quantitative and semi-quantitative methods is the possibility of predicting the amount of illnesses in a scientific manner; evaluate the benefit of the improvements proposed in a simulated manner, even before implementing and managing the risk through the mapping of the tasks performed by the workers.

From the point of view of the introduction of improvements, it is necessary to reevaluate the distribution of the breaks and to verify the possibility of re-dividing the 30 minute break time into 4 periods of 8 minutes, totaling 32 minutes, but allowing more breaks during the working day. Keeping the knife sharp may mean a significant reduction of the strength to whack the sheaf.

References:

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