A Management Proposal of Quality Requirements to Cogeneration of Electric Energy from Sugarcane Biomass

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I - Introduction - With the advent of open markets, globalization and the prices of sugarcane main products are tied to commodity exchange and futures; the Brazilian sugarcane agribusiness needs to be competitive. The competitiveness and survival of the sugar-energy chain is subject to a management that add value to this chain through the improvement of the quality of its products and its processes for obtaining more competitive costs for the production chain. The agents of the cogeneration production chain should attend the products requirements. This could be supported by internal process (IP) elements. According to [1], a successful implementation of supply chain quality management needs add the (IP), compound by the following elements: product/service design, process management (PM) and logistics. However, this work considers the element "process management", once it is related with the management of the quality requirements of the chain.

•The main objective of this work is to investigate the main products and processes requirements on the cogeneration production chain and the (PM) practices in order to identify agreement and disagreement for proposing a framework that facilitates the attainment of these requirements on this chain. Within this context, the research aims to answer the following question: How to manage the product and process requirements of the cogeneration production chain?

•Identify IP management in the literature;

•Find the main elements of this topic.

•Find the main practices of this element in the literature;

•Investigate these practices on the cogeneration production chain in field research.

•Investigate in field research the process requirements demanded by the cogeneration production chain;

•Present a proposal based on what was identified in the previous steps.

II - Internal Process

The internal process (IP) refers to all the activities of a company. This concept includes three elements: product and service design, process management and logistics. The successful implementation of the practices of these elements can generate a significant impact on the operational performance [1]. The IP, when properly managed, facilitates the integration and rationalization of the internal operational activities of a company [2]. The authors state that internal process management has positive effects on both external and internal operating performance.

II.1 - Process Management (PM)

Summarizing, it can be identified the following main practices related to the PM element:

•Control and improve continuously the processes.

•Use of statistical techniques.

•Use of fool-proof for process design.

•Use of automatic processes.

•Use of the preventive equipment maintenance.

•Clarity of work or process instruction.

III - Methodology - The research method used in this work is the study of multiple cases, as it investigates deeply the phenomenon of the object of analysis. The research is aimed at the elaboration of a proposal through the verification of the PM element from the IP theory for different approaches and with replication of it in the agents that holds part of the production chain of ethanol as: seedling growers, sugarcane growers and millings.

Table I - Overview Planning of the Method.

Topics	Steps	Description	Results for the research
Literature Review	S1	Internal process	Definition of the theory of IP, explanation of the elements PM with its practices.
Field Research	S2	Establishment of criteria for case selection.	Identification and selection of companies for cases.
	S3	Elaboration and evaluation of the research protocol.	Better understanding of themes, validation and improvement of the questionnaire.
	S4	Conducting the interviews.	Field verification of the practices of the PM elements of the IP theory for the cases.
Analysis of Results	S5	Case report, cases 'analysis and solution proposal.	Comparative analysis of the existing practices and the missing ones investigated in the cases. Proposal solution.

IV - Results and Discussions - All of the products requirements of the ethanol production chain must be accomplished by each one of its agents (seedling grower, sugarcane grower and milling). Then, the quality of these process needs of a management that enables the attainment of these requirements identified based on the practices of the PM element of the (IP) theory in the cogeneration production chain. The investigation showed that in all of the agents of the field research, when applied, the following PM practices are used: use of statistical techniques, use of fool-proof for process design, use of automatic processes, use of the preventive equipment maintenance and clarity of work or process instruction. However, the PM practice of "control and improve continuously the processes" is not implemented on the agents investigated on this field research. It was evident a lack of a culture of continuous improvement on all the agents of the cogeneration chain investigated. To perform this gap, a Quality Management (QM) proposal is presented, which seeks to solve the lack of a continuous improvement culture in the agents that forms the cogeneration production chain. This model, once implemented, could help the main agents of this chain attain the product quality requirements, having the PM practices, as a basis for the implementation of the proposal. An illustration of the proposal to manage the product requirements in the cogeneration production chain is shown on Fig. 1.

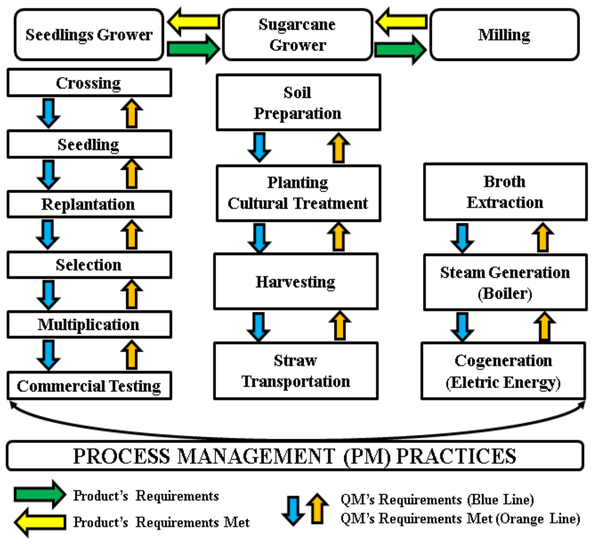

Figure 1 Illustration for managing the product requirements of the cogeneration production chain.

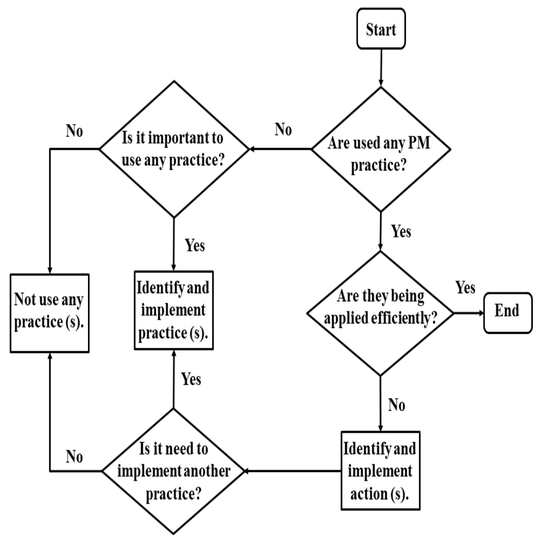

Figure 2 Flowchart of the information flow of the practices of the PM element..

The proposal is based on meeting the product requirements demanded by customers in the cogeneration production chain (yellow arrows). To meet these requirements, suppliers must meet the QM requirements (orange arrows). If at each stage of cogeneration production, the requirements of QM are met (blue arrows), consequently the product requirements of the agents will be met (green arrows). Product requirements must be defined for all agents in the production chain in order to develop and produce products that meet customer needs. These QM requirements must be defined and specified for each agent to meet the cogeneration product requirements. These requirements are those used and necessary for the definition of the management procedures with the objective of achieving the expected quality of the product, also contemplating the reduction of costs and losses in cogeneration production from biomass. In order to meet the PM element practices at the cogeneration production chain, discussed in the previous topic, it is necessary to identify, investigate and update these practices in order to improve transparency and trust among the agents of the chain through actions that compliance with QM requirements. This is to improve product quality and efficiency in the activities of the cogeneration production chain. An evaluation of the PM practices regarding their effectiveness in the timeline should be undertaken. If they are effective, they should be maintained. If they are ineffective, the cause of ineffectiveness must be identified and eliminated. In Fig. 2 is shown a flowchart that assists in the evaluation of PM element practices.

•**V - Conclusion** - The PM element from IP theory and its main practices were identified in the literature. The empirical research of multiple cases investigated the use of the practices of this element in the cogeneration production chain. The product requirements were identified on the agents of this chain as well QM requirements demanded by each (IP) of the agents. The main deficiency identified in relation to the agents was the lack of quality preservation actions to lead to continuous improvement actions. To fill this gap and to meet the requirements of the chain, a model was proposed in order to establish a flow of information to meet the QM requirements, based on the PM practices that support it. This proposal could corroborate the improvement on the quality of product requirements among agents in the cogeneration chain, which could result on the attainment of the products requirements of the agents. The main objective of this work, which is to present a proposal to manage the requirements of the cogeneration chain, was performed. However, the proposal does not address aspects related to the external activities of this chain. This is a suggestion for a future work.

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