

QUALITY MANAGEMENT EVALUATION IN MILK PROCESSING PLANTS: A CASE STUDY*

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Abstract

This article is the result of research on a group of dairy processing industries in the department of Boyacá, the main focus is on making a diagnosis to determine the level of progress that have taken regarding the standardization of production processes, from the point of view of the development of their management processes. For this effect is designed an audit format and it is applied in eight of ten companies in this sector, located in the town of Belén analyzing the key factors of quality management from the guidelines of the NTC 6001 standard and the theoretical advances of different authors. The results show a strong need for further research on the subject because of the achievements of emerging companies since its inception have been working empirically and show little economic growth.

Key words: Quality management, Standardization of production processes, Process management.

EVALUACIÓN DE LA GESTIÓN DE LA CALIDAD EN FÁBRICAS PROCESADORAS DE LÁCTEOS: UN ESTUDIO DE CASO

Resumen

En el presente artículo se muestran los resultados de la investigación realizada a un grupo de fábricas procesadoras de lácteos en el departamento de Boyacá, el objetivo principal se centra en realizar un diagnóstico para conocer el nivel de avance que han tenido en cuanto a la estandarización de sus procesos productivos, desde el punto de vista del desarrollo de su gestión de procesos. Se diseña un formato de auditoría que es aplicado en ocho de las diez empresas de este sector ubicadas en el municipio de Belén, analizando los factores claves de una gestión de calidad a partir de los lineamientos de la norma NTC 6001 y de los avances teóricos de diferentes autores. Los resultados muestran una enorme necesidad de seguir investigando sobre el tema debido a los incipientes logros de las empresas que desde su creación han venido trabajando de forma empírica, además evidencian poco crecimiento en lo económico.

Palabras clave: Gestión de calidad, Estandarización de procesos productivos, Gestión de procesos.

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AValiação DA GESTÃO DA QUALIDADE EM FÁBRICAS PROCESSADORAS DE LÁCTEOS: UM ESTUDO DE CASO

Resumo

No presente artigo se mostram os resultados da pesquisa realizada a um grupo de fábricas processadoras de lácteos no departamento de Boyacá, Colômbia. O objetivo principal se centra em realizar um diagnóstico para conhecer o nível de avanço que tiveram quanto à estandardização de seus processos produtivos, desde o ponto de vista do desenvolvimento de sua gestão de processos. Desenha-se um formato de auditoria que é aplicado em oito das dez empresas deste setor localizadas no município de Belén, analisando os fatores principais de uma gestão de qualidade a partir dos lineamentos da norma NTC 6001 e dos avanços teóricos de diferentes autores. Os resultados mostram uma enorme necessidade de se continuar pesquisando sobre o tema devido aos incipientes sucessos das empresas que desde sua criação vieram trabalhando de forma empírica e evidenciam pouco crescimento econômico.

Palavras chave: Gestão da qualidade, Estandarização de processos produtivos, Gestão de processos.

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1. Introduction

The quality movement began in the West from the seventies, but it was not until the nineties that was conferred a more strategic sense to see it as a business opportunity. Thus, from that time to the present day have known many successful cases in your application but in contrast have also been known hundreds of cases where companies have failed in their implementation. It is a fact that there is no specific formula to generate the exact combination of the many ingredients that make up the quality, but rather represent a set designed by and for the organization strategies.

Today in the world the movement generated around quality has evolved in regard to management practices, statistical tools for quality control using software, different methodologies for continuous improvement and the design of international standards that allow companies to achieve certification in quality management, among others. However in countries like Colombia are still seeing a slow development in this

area combined with the financial situation of many organizations.

Meanwhile departments as Boyacá are no strangers to this problem which is supported by various studies such as those conducted by the department government or made by Alvarado (2006), Ruiz (2005) and Dehaquíz et al. (2012), specifically in the dairy sector who emphasize on the enormous weaknesses of these organizations and the great need for the government to focus its attention on them to achieve evolve artisanal to industrial companies not only from the technological but also from their management. Here are some concepts and some studies in Colombia and Boyacá about the treaty topic.

2. Some concepts of quality

The quality management involves a broad concept, which can be worked with tools and techniques similar to those used in other functional areas such as finance, human resources and others (Badia, 2002). Additionally, it is compatible with other management

systems such as food safety, hazard analysis and critical control points known as HACCP and GMP good manufacturing practices, as expressed by the Centro de Comercio Internacional, CCI (2008).

The total quality management is a field that has received numerous contributions not only theoretically but empirically, from the valuable progress made by Deming aimed to progress towards an integra-

ted management philosophy of our day (Perdomo & Gonzalez, 2004). The initial contributions given by Taylor and control methods for statistical quality created between 1930 and 1940 by Walter Shewhart at Bell Labs gave the starting point for many other improvements were achieved in the area of quality control in later years (Pyzdek & Berger, 1996). Table 1 shows some authors with their contributions.

Table 1. Contributions to the quality management¹.

Author (Year)	Contribution to quality management
Walter Shewhart (1930-1940)	Creation of statistical methods for quality control (SQC Statistical Quality Control)
Statistical methods for quality control (before WWII)	Quality circles, method fishtail, (Taguchi method)
Edward Deming (1950)	Deming's 14 points for management.
Joseph Juran (1954)	Careful management of the external (customers, competitors, suppliers, government, society).
Philip Crosby (1979)	"Zero defects" through a 14-step program.
Armand Feigenbaum (1983)	Participation in company-wide quality control.
Malcom Baldrige Awards (EUA, 1987)	Approach to clients and human resources through the use of 11 principles.
National Quality Award (Mexico, 1990)	National Model for total quality, promotes the adoption of comprehensive quality processes.
International Organization for Standardization (ISO) (Suiza, 1947)	Standardization of quality management systems.
European Foundation for Quality Management (EFQM) (1988)	Quality culture in European companies. Orientation to the satisfaction of the people involved.
EFQM Award (1992)	Promotion for excellence in public and private companies in Europe from eight foundations of excellence.

Thus were performed at various international research to understand the role that quality management has played in improving the level of management, for example: Antony and others (2002) provided an empirical study on the identification of critical success factors in the implementation of total quality management "TQM" industry in Hong Kong, in the same sense, Miyagawa and Yoshida (2005), explored the relationship between TQM practices and performance Japanese business ow-

ners of factories in China, in the automotive industry in Malaysia, Osman, Ali, Rashid and Jusoff Wan, (2009) studied the perception of employees regarding the implementation of TQM in micro, small and medium enterprises in the sector, and also, Jha and Kumar (2010), conducted literature review on critical success factors of TQM implementation as drivers, supported by various philosophies, allowing you, they say, companies take these results to implement TQM.

¹ Compiled from Pyzdek and Berger (1996) and Navas (2005).

3. Studies done in Colombia

In countries as Colombia in research related to quality management are among others: the identification of cultural factors that affect the implementation of the quality philosophy of Escobar (2005), who yields that can find pros and cons for application in Colombian companies, also conducted by the National Productivity Centre "CNP" (ca. 2006), who determined the impact of the implementation of quality management systems in Colombian businesses certified by various agencies during 2000-2005.

As described, the enormous importance that have been acquiring the guidelines of total quality management "GCT" did they were institutionalized through awards such as awards for quality and then elevated to the evaluation criteria management as Baldrige and European quality Awards Foundation (Guillo & Sempere, 2003; Volcurlca, Standing & Brazoal (2000), plus public policy for enterprise development and competitiveness promoted the standardization of quality management through the family ISO 9000 in order to enable organizations to create competitive advantages in the markets (Perdomo & Gonzalez, 2004). Yet in Colombia are very few studies for micro and small enterprises in the dairy chain that relate to quality management in the broad sense discussed here, is similar situation at the regional or the Colombian departments.

In a study by professors at the University of North Santander Pamplona (Cited by Albarracin & Carrascal, 2005, 15) found that companies that process milk cheeses in the cities of Toledo and the Chitagá province of Pamplona, "are mostly of artisans and micro enterprise in which the conditions of handling and processing are deficient".

Meanwhile Novoa (2010), comments that "improving the competitiveness of the dairy chain through training and modernization is the aim of the project being conducted by the Institute of Food Science and Technology (ICTA) in Manila"; additionally advanced the training in handling and processing of milk, as well as in management and quality assurance in 15 micro, small and medium enterprises of the dairy sector. The study is mainly concentrated in the municipalities of

Ubaté, Zipaquirá, Guatavita, Ubalá, Choachí, La Pradera and Subachoque, among others, where it aims to improve competitiveness in the sector, reduce costs, diversify production and capture new markets, which ultimately result in social welfare.

3.1. Studies done in Boyacá

In an investigation conducted by Ruiz (2005) are studied eight companies in the dairy sector in terms of quality and logistics, in the results is observed high degree of informality, limited training and experience of entrepreneurs in terms of quality and logistics management, little ability to interpret critical issues, technology of second and third generation, and low-skilled for workers, owners and managers.

Alvarado (2006) in his study examines the management systems in dairy operations Mipymes of the industrial corridor of Boyacá, for this, he characterizes the industries studied in the department of Boyacá in factors that determine the efficiency of the management system in the production area. Dairies analyzed was found the following: in general there is poor quality, lack of infrastructure which results in lack of hygiene and poor quality products, backward technology, low training in modern techniques of processing milk and little knowledge international market experience.

As relates to the department of Boyacá, according to the National Economic and Social Policy, CONPES (2010), the region of Cundinamarca and Boyacá owns a 31% of milk production, ranking as the second producing region in the country with higher productivity in the production of 7-15 lt. / cow / day.

Studies by Lopez et al. (2010) found in cheese Dairy Paipa IBEL Belen Township, Boyacá that:

"The population of molds and yeasts in the milk was not significant with respect to those found in cheese why one might think that the presence of the majority of microorganisms is due to environmental conditions, or by improper manufacturing practices during processing after curdle milk for cheese making".

The reasons given above, for determining the need for small dairies, micro and craft Belen Township, continue as systematic and sequential strategy of quality management (ISO 9001), sectoral standards (GMP, HACCP) and standards of food safety, since they are compatible and that such standards have been achieved more easily under this strategy by Colombian businessmen (Atehortúa et al. 2009; Castillo & Martinez, 2010; CCI, 2008).

In the department of Boyacá an estimated 80,000 families living in the dairy chain, starting with the one with less than 10 cows on his farm, through which the transports, which sells door a door or that collects to sell to medium and large companies, even those who use it to produce its derivatives to small and medium scale. Of the 15 million liters of milk produced daily in Colombia, one million 600 thousand liters are milked in 117 of the 123 municipalities in Boyacá that have dual purpose cattle (milk, meat) (Forero, 2011). More specifically, the town of Belen, Boyacá, which has established itself as the best city in the Municipal Integrated Performance department in accordance with the assessment made by the National Planning Department during the year 2009. Although this line is of great importance to national and district levels factories still employ the technology for several years, without investing in new alternatives with a view to improving the products, to increase production and decrease the environmental impact of this.

In the study by Deháquiz et al. (2012), is proposed a model of environmental management system that can be applied to small businesses in the milk industry in the Industrial Corridor Boyacá. The diagnosis is made through the case study applied to ten small and legally constituted companies, located in different locations (rural and urban). As a result is proposed an environmental management system for this type of organizations.

4. Methodology

Because of the scope of the objectives, the study was developed primarily exploratory and descriptive in order to identify and describe elements and characteristics of the management processes of eight of the ten companies selected Belen Township as study

units. The work was supported by strategies such as observation, documentary research and application of an instrument for data collection. The multi-axis methodology as methodical, developed by Mingers & Brocklesby (1997), directed the study through the following phases: Phase 1 problem identification, phase 2 assessment, phase 3 testing, phase 4 evaluation and phase 5 action, in this last phase was performed including the standardization of a stage of the production process of the company IBEL Belen township.

The following explains each of the steps:

PHASE I. PROBLEM IDENTIFICATION: from reviewing the state of art at international, national, regional and municipal level, is described in general way what is said of the total quality management, because it is a problem in Boyacá and in processing cheese companies in town of Belen, for it is used the document review. Besides were determined ten cheese companies, carrying out interviews with their representatives and observing behaviors and attitudes, to define eight of them showing interest in to participate in the study. Additionally, it clarifies why it is important to solve the problem of the level of quality management that help the better manage of their processes. Different solution models also arise from the literature review, Malcolm Baldrige, EFQM, Juran, Deming, ISO 9001, NTC 6001, all within the philosophy of quality management.

PHASE II. APPRECIATION: the description what is happening in each of the eight companies in the study, is determined by examining the audit interviews type, in order to get to know what is going on, told by its own actors and participant observation about how to carry out the management direction, operational processes and support processes in the particular context of each company. Whereas social type relationships with interviewees, the physical aspects of the processes and the personal experience of who conducts the audit, a re-description in terms of the concepts and theories of quality management is done by comparing current management against key factors already identified, in order to establish the level of understanding we have of the business processes that give an unsatisfactory result.

PHASE III. ANALYSIS: after determining possible explanations for what is happening in quality management in enterprises of Belen, by characterizing in three of their business processes, based on the results in the interviews and audit are set by the theoretical review and owners experience the possible generating mechanisms of the problem, especially in the various activities of production processes.

PHASE IV. EVALUATION: the different models are evaluated by classifying alternative explanations, taking into consideration the type of small business that make the units of study, what became known through direct interview, the mechanisms by empirically that affect the management of enterprise-scale, situation triangulated with the results of the other units of study and the literature to determine the knowledge and activities in the receipt of raw materials, affecting the results of quality management.

PHASE V. ACTION: is established based on the elimination of alternative explanations and diagrams (MBNA, EFQM, ISO 9001 and NTC 6001), the need to standardize the production process, the receipt of raw material IBEL industry, along with the plan action to carry it out. The technical specifications, the instructions and procedures are subject to description, explanation and transformation by the actors of the company to shape the regulatory change.

The study was conducted based on the information provided by eight of the ten dairy processing companies in the town of Belen that showed interest in the realization of the study. In order to characterize each of the companies, it was realized a visit for all of these organizations to identify the name of the company, representative who attended the interview-audit, number of employees, products they produce and number of liters of milk are processed at day.

Then it is designed a questionnaire taking into account the determination of the critical factors reported in the theory of quality management by standards as NTC ICONTEC 6001 (2008), ICONTEC GIN 39 (2010) and supported by the theoretical framework,

finally are determined dimensions and categories which are become to a Likert scale.

Table 2. Aspects contained in the questionnaire².

DIMENSIONS	CATEGORIES
Direction processes	Planning and Routing
	Management Evaluation
Operating processes	Business management
	Planning and product realization processes
	Design and product development
	Purchasing Management.
Support processes	Production of goods or service
	Human Resources
	Information management
	Financial accounting
	Management of physical resources

5. Results and discussion

For collecting the information were visited each of the dairy processing factories and was applied audit format that was developed from the 6001 NTC. During the data collection was very noticeable lack of business organizations.

Regarding the direction processes, the 90% of the factories don't have clear the organization chart, the same person who processing the product is the manager and the production manager, the responsible for sales and business. They don't have defined production strategies, sales, advertising or marketing activities. The process is realized according to collect milk to be achieved in the marketplace.

5.1. Total compliance regarding 6001 NTC 2008

The level of overall compliance with quality management companies in the study, two of them reached for values of 40.36% and 30.24%, the other showed lower values when compared to the standards of the 6001 NTC 2008. The overall results obtained suggest that

² The authors.

the quality management in these companies do not have significant impact on their performance, the lack of standardization (documentation, indicators, targets, improvement, implementation, etc.), its processes.

This contrasts with the results achieved by the National Productivity Centre CNP (2006), where small businesses have quality certification, a 92.2% felt that quality management has had an impact on their good performance business.

The highest percentage is in the support processes, management processes are the lowest, because most plants do not have defined these processes and also the same owner-administrator, operator, makes payments to suppliers, distributes and sells products.

The compliance management processes presents values:

- 0% in the company identified with the number 4, because the plant is relatively new (2 years) and the owner despite being processed, is more concerned that the council has not complied with light connections appropriate gas and therefore has not been able to plan and organize the company, says that does not even know if you can continue working there, you cannot plan production because it depends on a neighboring house that supplies the light.
- 8.1% in the plant identified by the number 2, who despite not having its plant in excellent condition if they have any information as vision, mission and follow some formats.

A similar situation occurs in the operational processes, where values were found:

- 3% on the 8th floor where it shows devoted solely to process cheese without control or monitoring, no defined roles so that the operator is on the path to collect the milk is the same process without using clothing adequate or minimum requirements of BPM.
- 16%, on level 4 who do their best to keep up and give some weight to the records, are flow-charts of processes, and are regularly reviewing the market.

As for the support processes, varied more widely, with values:

- 5% in the company 8, for the reasons described above.
- 26% in one company which has already established competencies, training needs, recruitment processes and recruitment is done in accordance with the requirements of the law, which does not happen in all companies evaluated, has control of documents and records, kept up to date financial information and keeps track control and physical resources such as equipment and facilities (maintenance program).

Comparing these results, we note that differ from the best practices found by Quality Corporation in two large companies (Sofasa and Freeze Dried Coffee Factory), where process management has become a fundamental element and its contribution and performance, must be viewed holistically, to consolidate its results, therefore, carry out this good practice in companies of Belen, has to give satisfactory results because “the company size does not influence the process improvement as a result of certification” (CNP, 2006,40).

5.2. Direction processes

The standard defines two aspects that are addressing and planning and management evaluation.

In terms of planning and routing, no processing plants exceeded 50% compliance. The planning and analysis addressing yielded the following results:

- The address of the company is not kept informed and updated its organizational strategy aimed at customer satisfaction and continuous improvement
- The address does not identify, implement and maintain procedures to assess the ability to meet legal requirements.
- Management does not define its processes and plans.

- The objectives, requirements and responsibilities of each process are not defined and documented.
- The business processes are not consistent with strategy.

As for management evaluation, the values were very low compared to those in planning and routing, the highest value was obtained by the company in February to 21.43% because some records are market returns and production monitoring but do analysis or interpretation of data, the others barely reached 7.1%.

It is emphasized that the company that had the highest rating in planning and routing, scored 0% in assessment, which indicates that this process is only in documents, is static and is not subject to continuous improvement through systematic evaluation processes as said above.

The planning and routing, along with the management evaluation for continuous improvement, are some of the responsibilities of management, according ICONTEC (2008) NTC 9001; additionally, Juran (1993), Crosby (1991, cited by George & Alvarez, 2005), Sousa & Voss (2002) and Feigenbaum (1986), presented as key in their strategies to achieve the quality of management company for this reason not to develop these aspects, hardly adequate performance achieved in their management.

5.3. Operational processes

We considered five factors: business management, baking and their product realization processes, product design and development, procurement, production of goods or provision of service.

With regard to the commercial, it was determined that the companies in the study, do market research or seek new customers, have long set its wholesale customers who are respected by their competitors. Hence the low compliance rates obtained, where only the company 4 has considerable value of 44%, because it is new in the market and makes business management to sell their products.

We found no documentation in most processing plants and also they show no interest in making this type of monitoring because they see it as a waste of time. The formats requested by INVIMA performed by the obligation but not analyzed for them because not diligence during data therefore are not real, and are not valued as a tool for continuous process improvement.

The results in terms of business processes, differ from the findings of CNP (2006), certified for Colombian companies, it was found that in terms of customer satisfaction, 79% of employers have focused on ensuring quality work before, during and after the production of goods and services, so as to achieve compliance with the specifications.

According to Harrington (1995), standardization of work processes is important to verify that all current and new employees, using the best ways to carry out activities related to product development. Standardization is one of the first steps to improve any process and this is achieved through the use of successful procedures. However, in the units of study found the opposite.

5.4. Support processes

It took into account the following factors: human resources, information management, financial management and management of physical resources.

Regarding human resources, the plants do not clearly define the responsibilities because they have workers who do all that work is in the collection of the raw material receiving, processing, packaging and selling opportunities on some products do not have the skills documented in education and training of staff, and training needs, do not evaluate the performance, the owner is on the ground and is telling everyone to do.

Only one of the processing plants responded that he had a 79% compliance in human resources, high value compared to that obtained by the other, that is consistent, because it is the unit of study where they have achieved the best results in all processes, due to better documentation, training, recruitment and motivation of its employees, resulting in the interest of management in these areas.

It is emphasized that the CNP (2006), found that 68.4% of respondents Colombian entrepreneurs, with certification, gives a good or excellent response regarding staff participation in quality management, noticing that there are opportunities for improvement regarding retention of human talent, generation by empowering commitment to achieving organizational mission and vision. These opportunities for improvement are similar to those detected for companies studied Belen.

The management of physical resources was a good level of compliance for two of the companies analyzed, by having teams even if rudimentary, for process control product, which qualifies as an artisan, but when asked about maintenance planning, calibration and records, found the absence of this documentation.

6. Conclusions

Concerning the general characteristics of the companies in the study were found to have some planning on paper, but not implemented, nor systematically evaluated, missing the opportunity for continuous improvement, through improvement projects and corrective and preventive actions, on the other hand they don't have market research and business management generally is emerging, because they have a captive regional market and have an unspoken pact between them to respect their customers. Nor holding your product planning and product development is almost nil. Additionally, the control of product quality, purchasing and process in their specifications is handmade and rudimentary.

In other areas such as human resources don't have established competencies and their development, there is total lack of empowerment for decision-making by the employee in operating processes, because the owner intervenes in most cases the performance product and experience-based control only have information on legal requirements with the Chamber of Commerce and the INVIMA, otherwise it shows total lack of documentation (procedures, records, specifications, control charts and operation, etc.). In the financial area, this potential risks on assets don't have been considered, the costs of goods and servi-

ces as well as levels of production losses and break even are not defined. Finally, the physical resources for quality assurance are in disrepair, inadequate and don't have them in use and therefore planning the maintenance and calibration of equipment with no records exist. Facilities also considered impaired, indicating lack of maintenance and preservation.

The findings in this study regarding the characteristics of the dairy sector in the industrial corridor in the department of Boyaca, agree with those found by Alvarado (2006), Ruiz (2005) and Dehaquíz et al. (2012), who claim these dairies have strong weaknesses in many aspects such as administrative, the low qualification of human talent, the high degree of informality, low technology production processes, lack of defined document structure that generally difficult the implementation of group strategies that will improve the conditions of the whole industry, which has made far individual efforts without reaching the expected results.

The above results show the high need for the dairy sector department of Boyaca for received strong support from academia and the government in regard to the design and implementation of management practices at all levels, for example the implementation of good manufacturing practices partly reduce the number of defects in the manufactured goods or the implementation of quality management systems help to improve these units at all levels. It is therefore expected to draw the attention of researchers to continue turning their attention to these factories, which for years have worked with few references and expect management design strategies that help them achieve sustainability in the market.

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