

# IMPROVEMENT IN MANUFACTURING PROCESSES OF METAL STAMPING AND THERMOPLASTICS INJECTION COMPANIES: AN ANALYSIS UNDER QUALITY MANAGEMENT IMPLEMENTATION

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**Abstract.** *In the routine of the companies, the quality management is an essential factor to keep the competitiveness and assurance for continuity of the businesses, and the implementation of quality management system (QMS) under the standard NBR ISO 9001:2000 can be a competitive advantage. The aim of this study is to investigate and to understand the practice of implementing and operating the QMS in an organizational context, providing an analysis of the way they were implemented and operated and focusing on identifying factors which have influenced the effects of the quality management system (QMS) in forty one metallic stamping and thermoplastic injection companies.*

*This work was based in bibliographical research and the findings were obtained through questionnaires, consisted of multiple-choice questions. Relevant aspects that contributed for results of quality in one of the searched companies are analyzed and compared with a wider range of companies, which looked out for QMS implementation and registration processes. The results shown that, in the quoted company, improvements of the quality levels were realized, with reduction of non-conformities and scraps, immediately after the registration, despite the fact that in a wider range of companies, however, these improvements had not been remained throughout the time. As main conclusions, were perceived that only the registration of the QMS does not guarantee the improvement of the quality, and despite this fact, there are contributions for attainment of other benefits, that can concur for the market expansion and customers satisfaction improvements.*

**Keywords:** *QMS, improvement, manufacturing processes, customer satisfaction.*

## 1. INTRODUCTION

### 1.1 The standard ISO 9001:2000

The normative reference ISO 9001:2000 bases on a model of processes that can be applied in companies, being it of production or either an outsourcing company.

All of the requirements of this standard are written in generic terms, turning it friendlier to the operations of the companies.

The reviewed standard represents an evolution guided with the progressive thought of the quality field (Pearch and Kitka, 2006).

Camfield and Godoy (2003a) comment that different companies, in several segments are claiming for its suppliers, the attainment of the quality management system registration, as a demonstration of their qualification and warranty of better service to the contractual requirements.

According to Mello *et al.* (2002a) "the standard ISO 9001:2000 points out the importance for an organization, on identifying, implementing, managing and improving continuously the effectiveness of the processes necessary for the quality management system and on managing the interactions of those processes to reach their objectives.

This standard, according to Maranhão (2005a), demands a larger alignment from the users between its activities and the customer's expectations, besides adding value and continuously improving the performance.

When an organization adopts the standard ISO 9001:2000, according to Mello *et al.* (2002b), it should make an effort to satisfy its customers and to improve continuously its quality management system and the most of the users gets measurable benefits soon in the unfolding process requirements of the standard in its operations.

The registration stamp of the quality systems contributed so that this interconnection customer - supplier, strengthening their alliances, for a better warranty of the quality.

Thus, the standard ISO 9001:2000 has assumed a prominent position in the entrepreneur's preference as form of avoiding wastes, to increase the productivity and efficiency, getting improvement of the customer's satisfaction and greater level of internal organization of the company. (Camfield and Godoy, 2003b)

## **1.2 Quality Management System (QMS)**

According to Maranhão (2005b), "quality management system is just a group of resources and minimum rules, implemented in an appropriate form, with the objective of guiding each part of the company so that it executes in a correct way and in the right time its tasks, in harmony with the other ones, being all of them directed for the company common objective: being competitive (having quality with productivity) ", understanding as quality the customer's satisfaction, and productivity, doing more with less resources.

Moura (2003a) says that "QMS represents an organization model of the company composed of a group of supportive activities for its administration. It doesn't just worry about the organizational structure of the business that defines the people's responsibility.

It also establishes the mechanisms for the management processes, defining what to do so that the results are obtained".

The main objective of an organization, in agreement with Campos (2004), is all the people's satisfaction with which it is involved.

And then it is included the main groups in order of importance: the costumers, the employees, the shareholders and at last, their neighbors.

To reach this main objective, through the quality management system, it is necessary that it also reaches other objectives, such as costs savings, increase the product reliability and the customer's satisfaction.

## **1.3 Learning and training**

In agreement with Garvin (1993), "an organization that learns is a skilled organization in creating, acquiring and transferring knowledge and in modifying its behavior to reflect new knowledge and insights".

This definition suggests that new ideas are important and are arranged for the organizational improvement, however they are not enough, it is necessary the desire for the change.

The training in the organizations is focused mainly to complement the knowledge competence in "what to do" and in "how to do" (ISO 9001:2000).

It is important to emphasize that the learning process happens in the day by day along the time, and that there are mechanisms where the organization learns, and the people's training can influence on the final results, considers Senge (2000a).

But, Maranhão (2005c) explains that the key issue of the success seems to be the people's commitment and the solution for the problems is in the form how to develop it in the people in a way as deepened and genuine as possible and he concludes that there is no commitment when there is imposition.

## **1.4 QMS registrations and rejection index**

The QMS registration represents, according to Moura (2003b), a process of independent evaluation and its adherence to the standard or reference used for its implementation.

Moura (2003c) also says that the registration through the standard ISO 9001:2000 is the most common of them, being accomplished by several national and international organisms, representing an excellent way to guide the implementation and maintenance of the company QMS, contributing to the improvement of its administration.

However, in accordance to Cardoso *et al.* (2005a), the registrations under the standard ISO 9001:2000 does not guarantee that the organization has quality.

Still according to the same authors, "[...] the managers face the registration as one more bureaucracy of functions, because several difficulties are found in the preparations for audits".

The adoption of a quality management system according to Maranhão (2005d) "represents for most of the organizations, a source of cultural change and usually such changes provoke conflicts" and add that "if there is not a firm and clear disposition of supporting the changes, the resistances to the implementation can become unbeatable" and he guides that "a ISO 9000 implementation process should only begins if the top management of the organization is and shows satisfactorily convinced and engaged in the process."

## 2. OBJECTIVE

The aim of this study is to investigate and to understand the practice of implementing and operating the QMS in an organizational context, providing an analysis of the way they were implemented. Furthermore, identification of main difficulties and perceived benefits on implementing the quality management system (QMS), and factors which have influenced the effects of the QMS in forty one companies with metallic stamping and thermoplastic injection manufacturing processes are looked for.

The relevant aspects which contributed to the quality results obtained in one of the researched companies and the difficulties noticed and the results obtained are discussed in implementation processes and QMS registration in a wider universe of companies, as field research made.

## 3. METHODOLOGY

The means used for development of this work were the bibliographical and documental research. Bibliographical consultations of concepts and data were accomplished, in which books, scientific articles and internet are included, and the presented results were obtained through survey researches made in forty-one companies focused on metallic stamping and thermoplastics injection manufacturing processes, throughout multiple choice questionnaires, besides reports of corrective actions and extracted results of the quality indicators, registered in meeting reports of QMS critical analysis of the Alfa company.

## 4. RESULTS AND DISCUSSION

Cardoso *et al.* (2005b) consider that the registration of QMS's under the standard ISO 9001:2000 does not guarantee the quality inside the organization.

Observing the Fig. 1, it is noticed that 32 % of the companies looked for the registration due to customer's demand, in other words, the initiative had exogenous origin, what might have hindered the people's commitment in the implementation and adhesion to adopted QMS.

The second more important factor for the QMS implementation was the quality search (20%), but whose results in the registrations provoked great frustration, because only 4.9% of the companies noticed improvement in the quality, as shown in the Fig. 3, what ratifies Cardoso *et al.* (2005c) that the QMS registration does not guarantee the quality inside the organization.

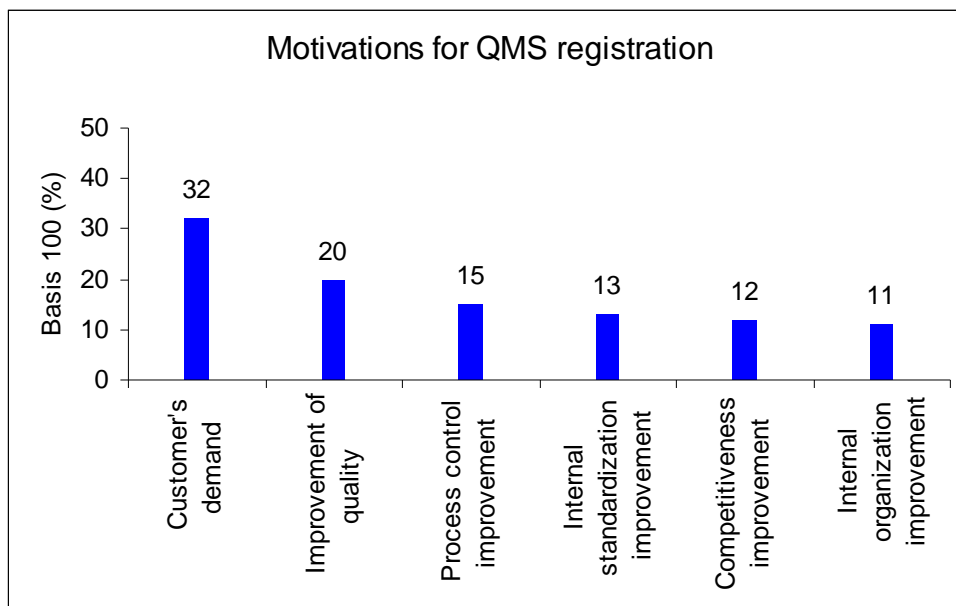


Figure 1 - Motivations for QMS's registration

As relevant factors detected by the field research, it becomes important to also emphasize the difficulties in the implementation and registration of the QMS due to culture changes (26.8%), the employee's resistance (24.4%), the employee's training (19.5%), the bureaucracy (9.8%), the interpretation of the standards (7.3%) and the own adaptation to the standards (12.2%), as shown in the Fig. 2.

These data reinforce the need of the people's commitment, obtained through effective programs of motivation and training in the QMS implementation.

In another research, conducted by Comitê Brasileiro CB-25 of ABNT–Associação Brasileira de Normas Técnicas, very similar results were obtained.

Among a representative universe of companies certified under ISO 9001:2000, some relevant information were shown in terms of difficulties on implementing the QMS, as follows: internal cultural changes, employee's resistance and the needs of employee's training to understand the required changes and the correct interpretation and application of the standard ISO 9001:2000.

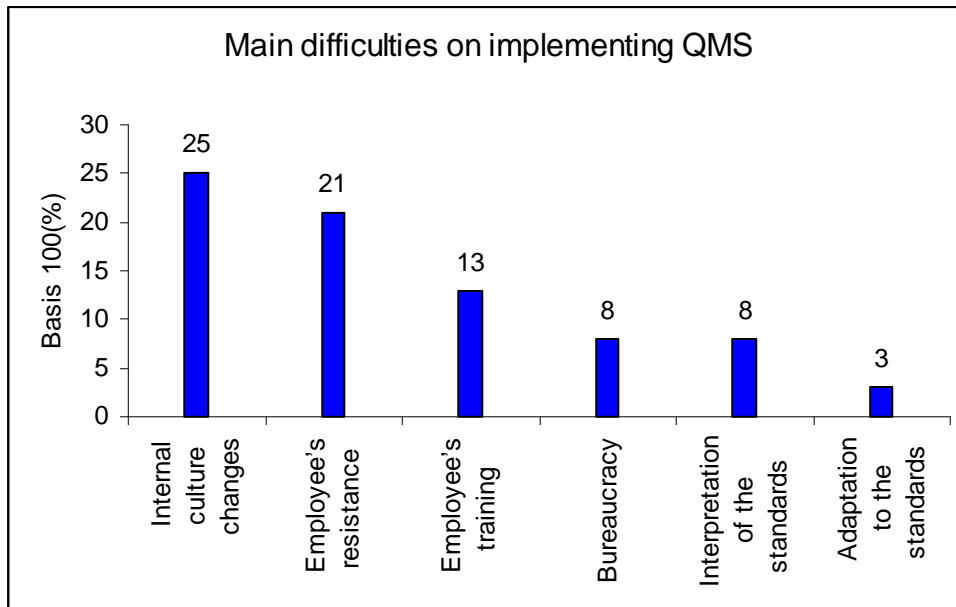


Figure 2 - Main difficulties in the QMS implementation

However, the most significant aspect to support the weak correlation between the amount of certified companies and the index of rejections can be explained through the Fig. 3, in which can be verified that only 4.9% of the researched companies noticed increase of the quality, and 24.4% noticed improvement of the internal organization, being reinforced Cardoso *et al.*(2005d).

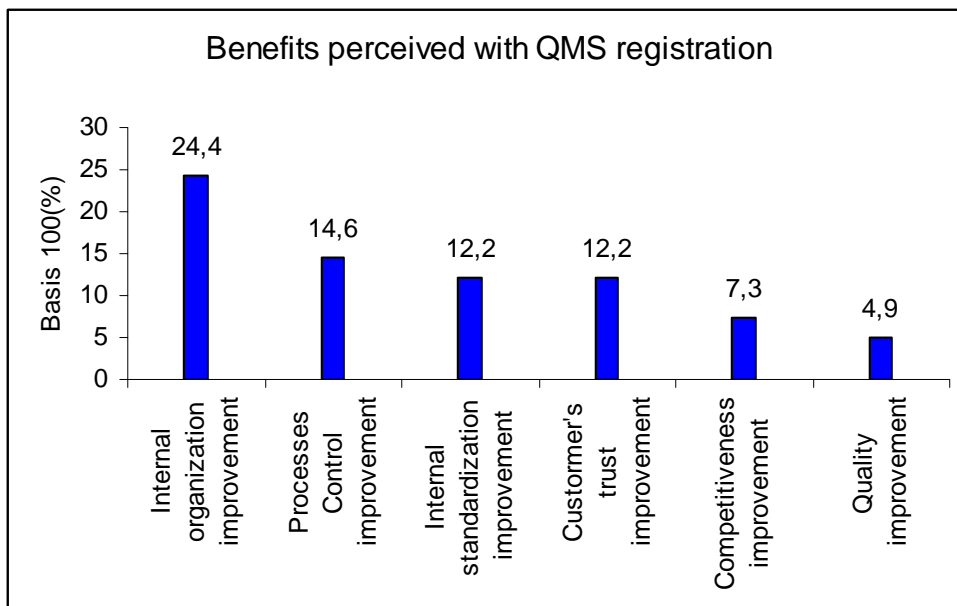


Figure 3 – Benefits perceived in the QMS registration

According to the field research taken effect in forty one companies of the segments of plastic injection and metal stamping, in terms of production quality in process, it is very significant the fact that were pointed out that 34.1% of the companies did not get reduction of the losses due to scraps, but it is quite relevant that 6.9% of the consulted companies obtained significant reductions in the indexes of scraps. (Fig. 4).

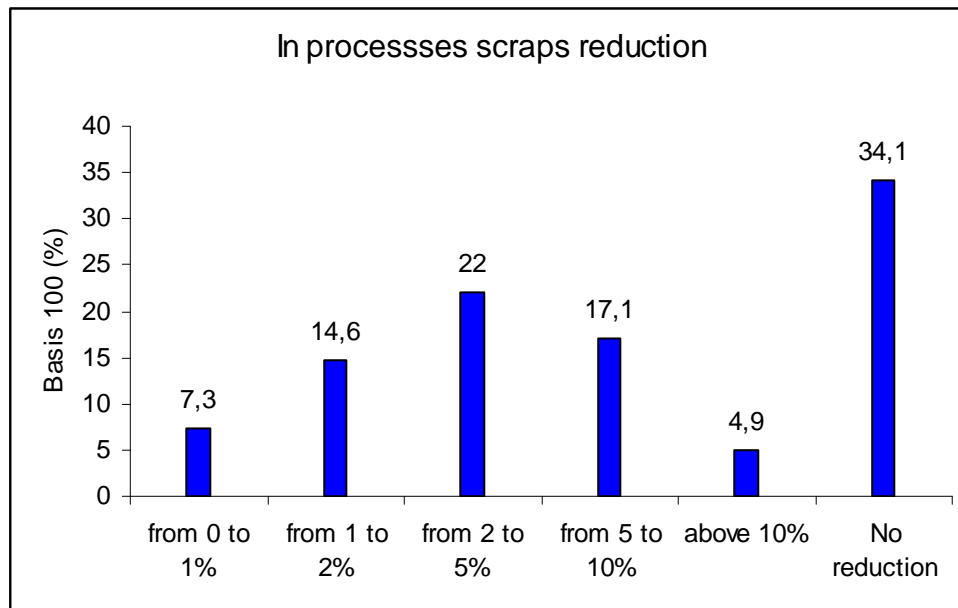


Figure 4 – In process scraps reduction

Another relevant aspect in terms of noticed improvements, and it is important to emphasize, are the production costs savings. As the Fig. 5, it is noticed that 46.3% of the companies did not obtain savings of production costs; however 53.7% of the companies obtained this improvement.

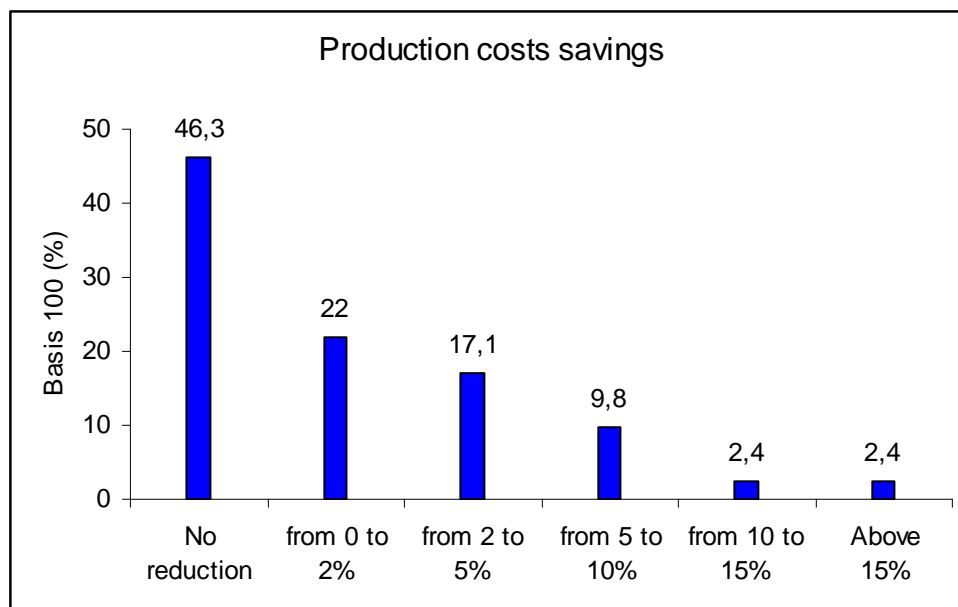


Figure 5 – Production costs savings

In the intention of looking for more detailed understanding to this study, one company, named Alfa was chosen among the 41 researched companies.

The data were obtained between September 2003 and September 2005, in other words, between the previous period of the first and the fourth internal audit of quality management system, being included in this period, the pre-audit and the registration audit and two maintenance audits, accomplished by the registration body, pointing out that there was not

the customer's request so that the company looked for the registration of its quality management system, but it was searched for the own company initiative.

For quality improvement search, the monitoring of the scraps was defined as measurement method for composition the one of the company quality indicators.

The goals were defined in regular intervals, which ones were reached, being obtained continuous improvements, and it was used Pareto's diagram in the stratification of the nonconformities and scraps, Ishikawa's diagram and the brainstorming for determination of the possible root causes of the nonconformities and PDCA for implementation of the requested improvements.

The evolution of the scraps index in process in the Plastic Injection section is represented in the Fig. 6.

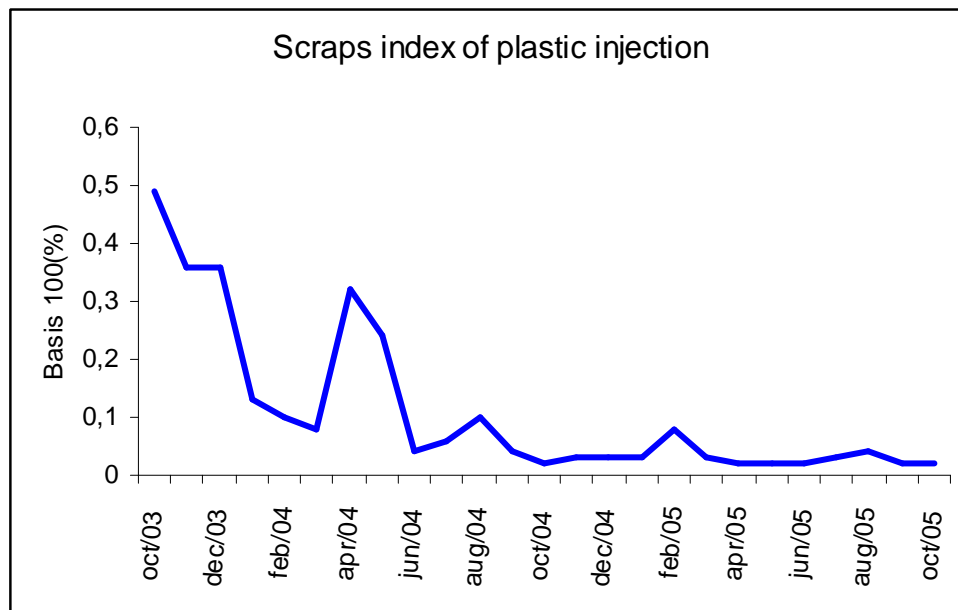


Figure 6 – Scraps index of the Injection section

From a level whose scraps index was above 0.58%, it was noticed that there was a sensitive improvement until March 2004, being reached the level of 0.08% of scraps index.

In April 2004, as it can be observed, the scraps index returned to rise, reaching the index of 0.32%.

With participation of the other areas and analyzing the characteristics of the scraps and other possible processes variables, it was concluded that there was the production restart of a component whose production had been discontinued until then, and its possible defects had not been still detected and the cavities molds of the affected pieces should be substituted.

For the "multi-cavities" characteristic of the molds, after identification of the defective cavities, the same ones were segregated, continuing the production only with the approved cavities.

Later, in more discerning dimensional analysis, it was verified that certain cavities of these molds, which ones generated defective pieces, they were with dimensions that did not comply the dimensional specifications.

The pointed results in the Figure 6 showed that the QMS implementation and its registration contributed to the scraps indicators improvement. It was verified then, a positive evolution of Alfa company quality level.

The company training program, defined periodically by the managerial body, was based on needs of competences detected in the period, supported by a program of performance evaluation.

For these needs, are added other ones which come from of process changes occurred during the period or even of lacks no detected previously.

The accomplished trainings had as established routine, the same ones' effectiveness verification, propitiating an appropriate feedback of the trained people's levels use.

Senge (2000b) explains that the learning happens in the day by day along the time and that mechanisms exist where the organization that learns can influence on the final results.

Under this aspect, it was evidenced the constancy need and effectiveness in the trainings for obtaining positive results.

The people's compromising could be verified by the effectiveness of the training actions, and it influenced the own improvement results.

Analyzing the Fig. 7 related to the *per capita* training workload, before the Fig. 6, that shows continuous fall in the scraps indexes, it was noticed that the training had influence in Alfa company quality improvement.

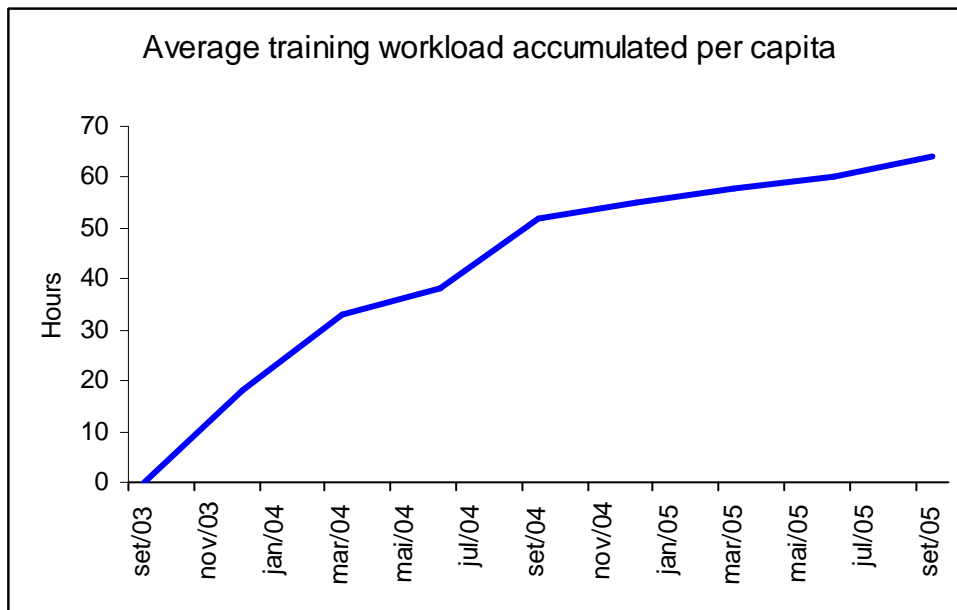


Figure 7 - Average training workload accumulated per capita

Another significant reference for evaluation of the company's quality evolution, was the perceived evolution of the customers' satisfaction, based on Maranhão's concept (2005e), as shown by Fig. 8.

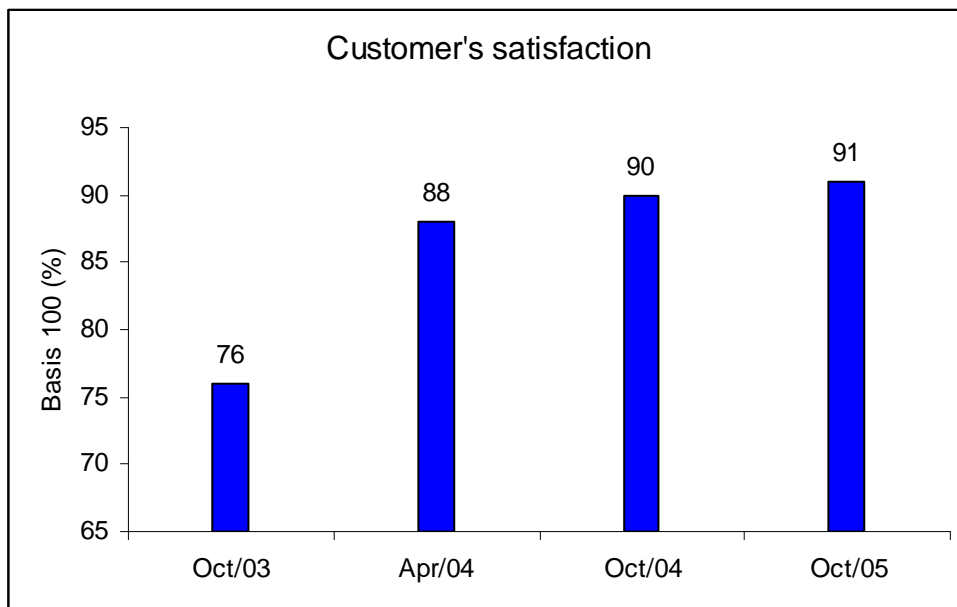


Figure 8 – Customer's satisfaction

## 5. CONCLUSIONS

According to the findings, it is ended that the customer's demand for QMS implementation can affect the people's commitment inside the organization and the QMS implementation can find difficulties due to possible culture changes and the employee's resistance.

According to the field research, the QMS registration brought as more significant benefits the increase of the customer's trust, the process control improvement, the competitiveness improvement and the internal organization improvement, but not necessarily the quality increase. However, partly the researched companies could also have verified improvements, as scraps reduction and costs production savings.

In Alfa company's case, the people's commitment could be verified by the training actions effectiveness and the training had influence in the company's quality improvement and also for manufacturing processes improvement, being also added that the QMS implementation and its registration contributed to the quality improvement, evidenced by the decrease of the scraps indexes and then for customer's satisfaction.

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