

QUALITY STRATEGIES IN THE CERAMIC INDUSTRY IN DEVELOPING COUNTRIES

ACCOUNT OF A PRACTICAL EXPERIENCE

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PRESENTATION

This account relates the experience of the Corona Organisation (Colombia, South America) over the last six years, after the Organisation adopted a Total Quality strategy to allow confronting international competition.

Firstly, a brief historical outline and description of the socioeconomic environment is given, in which this took place. The policy involved is then defined, setting out the philosophical approach to the process of change, and how this approach has generally been implemented.

This account subsequently details some specific aspects of the process adopted in two of the Organisation's companies, setting out the results obtained to date. Finally, some remarks follow and some conclusions are drawn from the lessons learnt.

1. HISTORICAL OVERVIEW OF THE CORONA ORGANISATION

The history of the Corona Organisation begins in 1881 with the establishment of the Sociedad Cerámica Antioqueña S.A.

In the 54 years that elapsed between 1881 and 1935, changes were seen both in the ownership and nature of the company's business. In 1931 its registered name was changed to Locería Colombiana, S.A., today one of the group's companies that specialises in tableware. It was taken over by the present day owners in 1935, upon which consolidation of its business started.

Between 1945 and 1963, the Organisation went through a period of rapid expansion. Numerous factories were opened: in 1948 a mosaic tile facility, in 1952 the first sanitary ware factory, in 1957 a second tile factory, in 1962 a factory of ceramic insulators, in 1962 the second sanitary ware facility, and in 1963 a factory of bathroom fittings.

The 18 years between 1963 and 1981 saw the strengthening of the Organisation and the continued expansion of existing facilities. The manufacture of basic consumables began in 1967: raw materials, frits and replacement parts. In 1975 a sales system was set up. In 1981 a new glazed floor tile factory was built.

Between 1981 and 1989 technology was upgraded with the adoption of fast firing, and the trends in the surrounding socioeconomic fabric were identified. This led to the following stage (1989 to the present day), in which the striving centred round the implementation of a Total Quality process.

The Corona organisation currently has the following turnover:

- Annual sales of:
 - * 24 million square metre tile, with 5 factories
 - * 3 million articles of sanitary ware, with 2 factories.
 - * 21,000 ton tableware, with one factory.
 - * 4,000 ton electric insulators, in one factory
- Over 7,000 workers are employed.

2. DESCRIPTION OF THE SOCIOECONOMIC ENVIRONMENT

The Organisation's growth and size have resulted from capitalizing on the opportunities that Colombia has offered from 1950 to the present day.

During this period, Colombia's economy has been characterised by steady, though unspectacular, economic growth, in terms of increased GDP. At the same time, the country enjoyed relative political stability (at least more stable than that of many Latin American countries).

The country had adopted the prevailing economic development policy of the time, backed by Cepal in South America, which involved industrialisation by replacing imports, i.e. protecting national production from foreign competition by putting in place high tariffs.

This led to a period of relatively rapid industrialisation in the country, facilitated by the availability of a skilled and disciplined workforce. The Corona Organisation used these opportunities profitably.

By 1990 it had become clear that the Cepal policy was no longer viable, and it became time for the Colombian Authorities to consider whether the country should follow the direction already taken by other Latin American countries such as Chile, Mexico and Venezuela, which had opened up their markets to international competition, with some success. (The recent disasters in Mexico and Venezuela could not be foreseen at the time).

This trend was observed by the Organisation's Management, who foresaw the need to adopt strategies that could cope with the expected situation.

Subsequently, in February 1989 the Board of Directors held a three-day meeting to survey and analyze the situation. They then decided to adopt a strategy of Total Quality called «ALBORADA (DAWN) 2000, The Process of Development through Quality».

3. HOW THE CHANGE WAS TACKLED

Alborada 2000 was designed as a process that would change and breathe new life into the cultural make-up of the Corona Organisation, raising efficiency and achievement levels, to assure that the success attained in a closed economy would continue in an open marketplace.

Alborada 2000 was envisaged as a process that would intervene systematically in the Organisation's cultural outlook and way of working, in order to ease its transition to the new socioeconomic context. The long-term efficiency of an organisation depends on how well it manages to adapt to the characteristics of its socioeconomic environment.

Alborada 2000 is a process of change, which involves transforming company culture, accommodating a new organisational model, set within the underlying model's basic framework of change, which provides a new way of looking at the world, man and the organisation.

As a guide in the search for that organisational profile, a Main Aim and some Fundamental Principles were defined, so as to have guidelines for change.

This Main Aim and these Principles are the foundations of an ideal corporate design, within a new entrepreneurial model.

MAIN AIM

The Main Aim lies in developing and maintaining an Organisation which is customer sensitive, focusing on service and inspired by the philosophy of Total Quality, as well as also being socially active, aware of its responsibilities to the country, coworkers and shareholders. The Organisation must centre on its people and have participative management.

FUNDAMENTAL PRINCIPLES

HUMANISTIC ADMINISTRATION. Work must be seen as the foundation of human dignity and the greatest source of self esteem, achievement and satisfaction. Each individual should be looked upon as an player needing meaningful work, a sense of direction, and possessing the ability to contribute.

EXCELLENCE IN QUALITY. The quality of the work will be real, to the extent that customers' differentiated needs and expectations are satisfied.

MAXIMUM IMPORTANCE OF THE CUSTOMER. Customers must be the company's reason to be, and it is through the constant, systematic strengthening of this relationship that the business of the future will be guaranteed.

FOCUS ON PARTICIPATION. Each coworker participates to the extent that his whole being partakes of his work: his emotions, training, thoughts and creativity. The aim is to work together, making room for everyone to provide their contribution. Communication among workers will involve encouraging and ensuring combined effort and teamwork.

SOCIAL COMMITMENT. The Organisation has an impact on society, and it should be understood that this impact must always be positive. As the transformation is carried forward within the Organisation, a contribution must also be made to transforming society.

In brief, through Alborada 2000 it is sought to build an Organisation:

- which learns ceaselessly from its experience and continuously raises its efficiency.
- is simple, fluid and customer orientated,
- in which a systematic, process-based way of thinking prevails,
- which is made up of responsible, creative, self-motivated, efficient individuals,
- which is socially responsible, environment friendly and integrated within the community.

With the aim of achieving such an Organisation and carrying out the Main aim and Fundamental Principles, a culture of ongoing training must be fostered through action at three levels, involving: individuals, working groups and the Organisation as a whole.

At each level, four basic transformations are targeted:

1) IN THINKING: Instead of focusing on results, thinking should be centred on processes which include the result.

2) IN MANAGING TIME: Instead of time management based on action, the focus should be on time management that promotes preparation, action and analysis.

3) IN THE FOCUS OF ATTENTION: Instead of directing attention exclusively to internal company issues, which produces hierarchical, fragmented and isolated organisations, the vision should include the customer, thus giving rise to horizontally-oriented, differentiating organisations that include customer and environment within their scope.

4) IN MANAGEMENT: Instead of an authoritarian, bossy company, managing should be through sense and criteria.

These changes materialize in the workplace. How everybody improves his work in his daily tasks will bring about the transformations.

4. PROCESS STAGES

The strategy involved in implementing the process was designed by ourselves, based on the investigation-action methodology, enabling a process to be created with input from everybody, by harmonising each person's own experience.

Long stages were set for the orientation of the process, in accordance with the natural cycles of change planned for the change in corporate culture. A change in the way of thinking was taken as the prime focus of quality. The term «stages» was used to indicate cycles of change, rather than steps or actions to be taken.

First of all, a certain period of time was allotted to each consecutive stage, so that every company in the Organisation could apply the process in the same uniform way, in the set order. Experience showed however that these stages were not consecutive but intermingled and overlapped. It was also shown that not all companies could advance at the same speed.

The 4 main stages were:

- Understanding and commitment
- Fertilisation
- Instrumentalisation
- Consolidation

The understanding stage was designed to make the Organisation aware of the intention to implement change. Facilitators were trained to direct workshops on the new philosophy, at all levels, in each company. These workshops were aimed at making everyone involved familiar with the Main Aim and Fundamental Principles, as well as comparing each company's actual situation with the targeted, prospective situation that would arise on their implementation.

More than 70,000 man-hours were invested in this process throughout the Organisation, over 1989 and 1990, reaching more than 6,000 people.

The fertilisation stage sought to create a climate of change, in a striving to make individuals and teams aware that quality was the key issue, encouraging workers to reflect and participate.

A series of workshops were held in 1990 and 1991, which dealt with this stage, with a view to fostering leadership among heads of groups and facilitate setting up working teams. Subjects dealt with in these workshops were, among others: How to manage ongoing improvement, strategic service planning, quality assurance in industrial processes, and the development of leadership skills. The teachings reached 1,100 people in 80 leadership workshops, and 150 people in 40 workshops on the remaining subjects. The total investment was 50,000 man-hours devoted to training.

The instrumentalisation stage involved enhancement and innovation in operating systems, with the close cooperation of the *natural working groups* and interfunctional teams.

A *natural working groups* is made up of a head with his immediate coworkers, who perform the same process. In 1990, as a result of the workshops that had been held, each company set up an action plan which allowed forming the first *natural working groups*, earmarking areas for improvement, and setting up the first improvement projects.

At this point, each company used an approach of its own, in accordance with its own specific needs and characteristics, though always within the general lines that had been laid down for the process.

Furthermore, in the instrumentalisation stage, it was realised that structures needed changing, in order to adapt to new market and process demands. Thus, starting in 1991, changes were implemented in the structure of certain companies, and in 1992 a thorough restructuring took place of the whole Organisation, a process that has lasted until today.

The consolidation stage was envisaged as a stage, in which the whole Organisation would be engaged in implementing the process, and the change would have been institutionalised. We believe that we are at present approaching this stage.'

5. PROCESS APPLICATION AND RESULTS

The following sets out the main elements of the specific process followed in two companies: a ceramic floor tile manufacturer, and a company that produces electric insulators, with their respective results.

CERAMIC FLOOR TILE MANUFACTURER

PROCESS

The basic training course which involved informing all coworkers of the process was completed in August 1990.

Between 1989 and 1990, company management attended a series of training workshops on new quality methodologies. Based on what was learnt, *natural working groups* were established as the setting in which improvements were to be made. Work then began on the customer-supplier relationship between process steps.

Towards the end of 1990, a statistician was hired to teach workers in natural groups how to adopt a statistical approach to the processes they were involved in. This activity subsequently evolved, becoming an accompaniment for superintendents and supervisors in identifying problems and improving processes.

Following this first step, the superintendents and facilitators disseminated the quality methods among the workers and laid the basis for assuring processes in the natural groups. Methods such as Pareto analysis, X-R control graphs, and fishbone diagrams^à, were used.

Around the beginning of 1991 the production area was reorganized into improvement teams. An improvement team is a working team that includes all the necessary processes for obtaining a finished product, from pressing to packaging. Its workers are not responsible for individual technological processes, but their role relates to the output of a line, with more direct customer contact. With this new structure, the customer-supplier concept was simplified, interfunctional conflicts were eliminated and process improvements were encouraged.

In 1990 and 1991, all the group heads of the company trained in the workshops of Chief Leader 1 and 2, which were designed to familiarise them with the new style of Alborada leadership. Following this training, improvement teams were formed and consolidated.

In production, the role and name of the supervisors were changed to facilitators, with one facilitator being allotted to every two improvement teams in each shift. Their initial role as controllers became one of cooperating with the operator in solving his work problems. The superintendent managed and looked after two improvement teams, the emphasis lying on their education and training.

In 1991 work began on a different way of training production operators, so that they would achieve total process control through multifunctional development. Training was thus undertaken in all the processes, as well as that of equipment maintenance. With this approach, these operators became known as *process controllers*. From this moment onwards, implementation began of the concept of Total Production Maintenance (TPM).

In 1992, the concept of improvement teams was extended to the entire production area, and teams were formed in the consumable supplies areas of body materials and glaze preparation.

The administrative strategy of the teams remained operative until July 1993, when their management was assigned to one facilitator per team for three shifts. It was hoped that this approach would help them solve the problem of divided responsibility. From then on, the improvement team with its *facilitator* became responsible for maintaining the process.

This change of role enabled the supervisor to take charge of managing and carrying out the factory's improvement projects.

The ceramic knowledge, once in the hands of the technical area, was passed on to the line technician and he relayed it to all the members of the improvement teams. The technical area could then concentrate on innovating and developing products.

In 1993, the maintenance area was restructured in such a way that the *process controllers*, after following a basic training course, were put in charge of more basic maintenance; and the service area likewise of specialised maintenance.

Since the outset of this year, the improvement team has become involved in the preventative maintenance of their production line, working together actively with mechanical personnel in carrying out programmed maintenance. This way of working increasingly became a process of information transfer to the process controller.

In 1994, the glaze preparation facility was restructured, with the aim of facilitating differentiated attention to the different improvement teams, and a data gathering and monitoring system was also put in place to provide real time data which would facilitate decision-making for the improvement teams.

In 1995, emphasis was placed on implementing the improvements of the production teams in the company's administrative areas, and the same year saw the continued process of installing and improving systems in production.

Work has also begun on setting up a system of indicators designed to help orient all the areas to the satisfaction of the customers.

RESULTS

The results of the Alborada 2000 process can be divided in two categories;

1. Results with regard to the social organisation of work;
2. Contribution to the general results of the company

As far as the social organisation of work is concerned, the following results have been achieved:

- Broadening of the vision of those involved in the production process, moving from a narrow, point view to an overall view of the process, thus enhancing the meaningfulness of the person's work and promoting greater self-motivation.

- There was a greater involvement in decision-making for coworkers, complementing their professional experience with statistical tools, making them more aware of how their processes performed.

- Greater share of responsibility for each person in his team's results.

- Lowering of communication barriers.

- Better relationships among team members.

- Change from a centralised administration focused on overall control and management, to a decentralised form of administration specifically aimed at managing each improvement team.

Summing up, all these results show that progress has been achieved in the integral development of those working in the improvement teams. With respect to general company results, the following was found:

The period examined showed an increase in the complexity of production as a result of extending product variety and raising quality requirements, going from 30 basic models to 150 with high quality decoration. Furthermore, the porosity of the ceramic body dropped from 10 to 5%.

This makes the following results even more noteworthy:

- Time required for developing models dropped from 18 to 3 months.

- The variation of product sizes was decreased. Instead of 4 sizes in 90% of production, which was basically 20x20, to a size with a product mix of 20x20, 30x30, 33x33, and 41x41.

- Decrease in the variation of colours. This went from 10 to a maximum of 3 colours per model.

- Improvement of the internal quality indices:

- Top quality production went from 75.0 to 87.2%
- Fired scrap dropped from 7.0 to 3.1%

- Plant exploitation efficiency rose from 79.0 to 89.1%
- Increased body materials production capacity. This went from 8.5 to 10.5 ton/hour.

These improvements led to a drop in total production costs of 3.2% in the period between 1989 and 1994.

ELECTRICAL INSULATOR COMPANY

PROCESS

When the Alborada 2000 process started, the groundwork for change had already been laid. Since 1987, a significant number of staff had already undergone systematic leadership training, which could thus be rapidly applied to developing Alborada 2000.

Between 1989 and 1990, information and education at the level of the heads was completed, with regard to the Alborada 2000 process. At the end of 1990, a group of engineers was formed, who started studying world class manufacturing techniques, and a link was set up between this approach and Alborada 2000. Based on study and a diagnosis of «habits to be rooted out», the training process to be followed in the company was defined.

Towards the end of 1989, work started on predictive process control. In 1993, the manufacturing facility was extended in order to achieve total production process quality assurance, based on slip stability, independently of the variations arising in raw materials. The implementation of this process ended in 1994, and was consolidated in 1995.

Since 1990, work has been carried out on protecting the physical environment, both inside and outside the facility, with regard to eliminating particulate matter and dust emissions, as well as treating and reusing industrial wastewater.

At the end of 1991, the cycle of basic education for the operators was rounded off, and the first *natural groups* were formed among the employees.

That same year saw the first quality audit, a demand of the country's electricity industry, and work started on process standardization. Towards the end of 1992, the first standardization manual was issued, which was approved by one of their main clients, the Mexico Federal Electricity Committee.

In 1992, all personnel received instruction on the subject of waste, and a start was made in identifying and suppressing waste, beginning with the most critical areas. Leadership training was also carried out at supervisor level.

That year, all payment incentives were scrapped, and the former quality and productivity bonuses were included in operators' basic salaries.

Starting in 1993, the first manufacture cell was formed in the finished products section, and this experience led to the formation of cells in the other sections. In 1994, six such groups had been formed and it is hoped that this concept can be transferred to all the production processes that will allow it.

Towards the middle of 1993, a re-introduction and retraining programme was started at operator level, in an attempt to enhance the work dimension, by providing an overall understanding of the company. The programme has also sought to improve the understanding of the customer-supplier concept, both internally as well as externally, and the basic tenets of standardization are also dealt with. All company personnel go through this programme periodically.

That same year saw the restructuring of the production facility, switching over from a functional concept of sections to that of product lines. Using this criterion, natural groups were formed at operator level, and supervision was organised. A department was also created of consumables engineering, and work was started on bringing customers and suppliers closer together, as well as improving suppliers' products.

In 1994, work started on systems for achieving swift model changes (SMED) in developing bushings and strain type insulators, focusing on implementing fixing without bolts. Work also commenced on total production maintenance (TPM) in each cell, beginning with the lubrication of equipment by the operators.

During that year, workers involved in preparing bodies and glazes also underwent training in handling measuring instruments and interpreting the resulting data, so that they themselves could carry out process controls and adjustments.

Similarly in 1994, workers were also trained in the use of the 5s methodology that facilitates improving order and cleanliness in the work environment. The name 5s comes from the 5 Japanese words that mean: proper appearance (seiri), methodic order (seiso), cleanliness assurance (seiketsu), and discipline (shitsuke). A working committee was set up on order and cleanliness, which included operators, supervisors and engineers. The objective of the committee was to get every cell to include order and cleanliness routines in their normal working procedures.

As a result of special work with the supervisors, on carrying out individualised analysis of their capacities and general training, their role and name were changed, and they became known as process facilitators.

At the end of 1994, the company's objective was defined as that of obtaining certification according to standard ISO 9002. In 1995, work was done on bringing the quality systems into harmony with this goal. A second audit was held in September 1995 of the quality system with standard ISO 9004-1, and ISO certification is expected around the middle of 1996.

In 1995, it has been attempted to get the natural groups from the cells involved in production planning, so that every operator will know exactly which order, and which customer he is working for. This has raised workers' commitment to quality and performance, making work itself more meaningful.

RESULTS

With regard to the social organization of work, the following results were achieved:

- More became known about the customers, the contact is closer, and there is a greater engagement on their behalf.
- Leadership skills of the heads, and teamwork have improved, with each worker's input being valued.
- Auto-control of quality by the workers has improved at every level.
- Thinking has changed, there being a greater understanding of what happens within the processes.

With regard to the effect on output generally, the following results have been attained:

More difficult products of greater complexity are being manufactured: the turnover in large ware went from 15% of total production in 1989 to 40% in 1995: the production of grey-coloured insulators also rose.

In spite of this rise in complexity, from the point of view of the contribution to general company results, some of the most significant outcomes have been as follows:

- Drop in waste. In 1990, 20 ton/month body materials was lost owing to slip that did not meet specifications. In the last two years, losses for this reason have been 0.2 ton/month.
- Reuse of 20 ton/month from dust collectors
- Decrease in stocks, namely:
 - * body materials by 92%
 - * process products by 42%
 - * finished product by 83%
- Rise in productivity per man by 18%
- Drop in scrap losses by 53%
- Drop in the manufacturing schedule by 30%
- Drop in fuel consumption by 18%

As a result of these improvements, total manufacturing costs dropped by 31% per ton.

6.- CONCLUSIONS AND REMARKS

1.- The Quality strategy designed by the Corona Organisation is serving to help the Organisation successfully confront the new economic situation. Improvements have been achieved that have impacted company results in a positive way. We are sure that Corona would be more vulnerable if implementing the quality process had not been undertaken.

2.- The Quality strategy has contributed to the overall development of the Organisation. Its development has led to changes that have yielded some positive short-term results, but we feel that the Organisation has prepared itself in such a way as to make these results improve steadily and systematically as time goes by.

3.- In general terms, it has been possible to promote advances in the personal development of all the people involved. Their level of independence and auto-control of quality, as well as their degree of participation and understanding of their work have risen.

4.- Owing to the way it was tackled, namely as an investigation-action process, the Alborada 2000 process has served as a training school for everybody that belonged to the Organisation.

5.- The essence of corporate cultural transformation has been understood as a personal transformation. People create systems and it is a person's reasoning and thinking that determine his level of development and the quality of his works.

6.- When the approach used in a Quality process involves a transformation of company culture, its development becomes more à, complicated, and the most important results become visible in the long term.

7.- The companies that have advanced most within this process have been the ones in which the philosophical approach was swiftly combined with concrete realizations that made the change materialize.

8.- Care should be taken to ensure that operational and structural changes back up the basic philosophical approach. All the working tools, systems and methodologies must be coherent in respect of the sought objective, so that the values set may be put into operation and upheld across time.