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QUALITY MANAGEMENT OF THE ESPRESSO-TYPE PRODUCTS

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ABSTRACT: *Knowledge on the manufacturing process variability requires the proper functioning of the quality technical control department, which must carry out tests and analyses to characterize the process condition and to operatively make the corrections required to restore it within the allowed development limits (within the tolerance range) to ensure the prescribed accuracy and quality. Due to the technical progress and increasing requirements of the beneficiaries, it was generally adopted the practice to increase the warranty period granted by suppliers for products, enhancing in this way the quality control tasks in tracing the product behaviour in operation. Thus, the technical quality control actively influence the entire production process by applying corrective measures in all the company's departments that contribute to achieving the quality.*
KEYWORDS: *quality, control, management, espresso product*

INTRODUCTION

The definition of an espresso is a much debated subject, as people's ideas of espresso vary according to their own taste perceptions. Almost every aspect of espresso making is up for discussion: from espresso blend to tamping technique to volume of the espresso. The espresso coffee is a mixture of the coffee quality, machine quality and the skill of those who prepare it.

Nevertheless, there has been much scientific research into making the perfect espresso, or "God Shot", and a set of parameters have been defined as to what an espresso should be:

- *an espresso is made with between 6-8 grams of ground coffee;*
- *the temperature of the water when first in contact with the espresso is between 90-95°C;*
- *the pressure of the water on entry is between 7-9 bars;*
- *the volume of an espresso is between 28-36ml;*
- *the time it takes to brew the espresso is between 25-30 seconds.*

The espresso coffee machine quality control on the manufacturing flow and by final inspection is an essential factor in any scientific system of organization and management of production.

Today more than yesterday, and tomorrow more than today, we can also talk about the quality of quality control, because, in the modern concept, the quality control is not confined to the passive role of detection, finding and recording of the quality defects, but has the active role to influence the production, in order to prevent the defects.

METHODS AND TECHNIQUES FOR ORGANISING THE QUALITY CONTROL OF PRODUCTS

The evolution of the methods for organising the control made spectacular leaps under the influence of the complexity and increased technological processes precision. In order to make good decisions about the development of the manufacturing processes, it is required a quality control based on scientific criteria.

Because most quality characteristics are random variables, and the production processes development complies with the laws governing the random phenomena and processes, the quality control methods applied to the products and manufacturing processes are based on the probability theory and mathematical statistics.

On this basis, the manufacturing processes variability may not only be known, but "controlled" as well, i.e. to be consciously influenced.

Knowledge on the manufacturing process variability requires the proper functioning of the quality technical control department, which must carry out tests and analyses to characterize the process condition and to operatively make the corrections required to restore it within the allowed development limits (within the tolerance range) to ensure the prescribed accuracy and quality.

The quality control should not interfere only in the manufacturing flow and in the final stage, of finished product, but must be present in all the prior stages of the actual manufacturing process, i.e. in the stages of conceptual technological design and preparation of the manufacturing process, which decide the quality. Also, the control does not end after the acceptance and delivery of the final product, but further extends to the beneficiaries, through the service provided. In complex installations, the control continues during making the assembly operations and technological tests.

Due to the technical progress and increasing requirements of the beneficiaries, it was generally adopted the practice to increase the warranty period granted by suppliers for products, enhancing in this way the quality control tasks in tracing the product behaviour in operation.

The feedback provided by the quality control indicates the deviations from the prescribed quality that may occur, and establishes the corrections to be made. By finding the "errors" (deviations) in due time, the adjustment command is introduced in the manufacturing process to quickly correct and prevent the deviations.

Thus, the technical quality control actively influence the entire production process by applying corrective measures in all the company's departments that contribute to achieving the quality.

The existence of a well-organized quality control system, provided with highly qualified staff and modern equipment, does not exempt the design and execution factors from the liability to ensure high quality products. The control creates the required conditions for gathering all the forces to accomplish the tasks. The quality control plays a major role in preventing the rejections and complaints which, besides prejudicing the prestige of the factory – the "trademark" – and reducing the portfolio of orders (thus jeopardizing the production expansion and factory development), lead to increased production costs (caused by the rejections, corrective measures, bonuses, etc.). The quality of the quality control is determined by:

- *accurate knowledge of the control technology, i.e. who, what, how, how much and with what device to be measured;*
- *endowment of the manufacturing flow and final inspection with measurement and control devices with the precision indicated in the technical documentations of the products;*
- *use of modern control methods;*
- *training of the quality controllers, their intransigence and objectivity;*
- *system of material incentives and liabilities;*
- *authority delegated by the company's managements to the quality control department.*

After monitoring the observance of the manufacturing process, we reached the following conclusions:

a) *the technological process is adequate, the production goes well and the prescribed quality is achieved;*
b) *the technological process shows a variability, but by applying certain corrections, it can be restored to the normal operation;*
c) *the technological process shows a pronounced variability that by corrections it cannot be restored to the normal operation. It is necessary to interrupt the manufacturing process for making structural interventions, to avoid discarding products;*

The final check is performed to compare the characteristics and performance of the finished product with the referential which led to its realization and making the decision on its acceptance.

The final check may encounter three different situations:

- *the product is accepted and will be directed to the depot / warehouse of finished products;*
- *the product is not accepted, but can be remedied, situation where some phases of the technological process are repeated to eliminate the arisen nonconformities;*
- *the product is rejected and will be directed to the storage of rejects, taking care to avoid the possibility of its accidental or deliberate reintroduction in the manufacturing flow.*

Obviously, the flow control is more important than the final control, because it allows the timely detection of the manufacturing disorders and, as a consequence, the exceeding of the tolerance limits. However, the interphase control allows the removal of the rejects or further remedial operations and, therefore, it has a first-order economic importance.

The logical process to develop the control technology starting from the input data is shown in figure 1, and has the following components:

Fig 1: The logical process to develop the control technology

a) *The input data, consisting of all the information contained in the specifications, execution drawings and processing technology, presented as plan operations, technological route or any other document showing how to make the product;*
b) *The control performance algorithm – the logical sequence of input data processing, which is reflected through the response to some inquiries (questions) which are in the same time the basic principles (conditions) that the control technology must finally fulfil.*
c) *The output data are specified in the control technology, the graphical presentation being determined according to the product and practice adopted by the manufacturer.*

THE COFFEE ESPRESSO PRODUCT – ITS QUALITY MANAGEMENT

The coffee espresso machine is characterized by the following parameters, presented in Table 1.

Table 1. The following parameters of the coffee espresso machine

Characteristics	The unit of measurement	Nominal value
Electric supply	V	220 V, 50 Hz
The class of the contained uses	-	II
The absorbed power	W	1500
The power absorbed by pump	W	25
Warming-up time	s	70

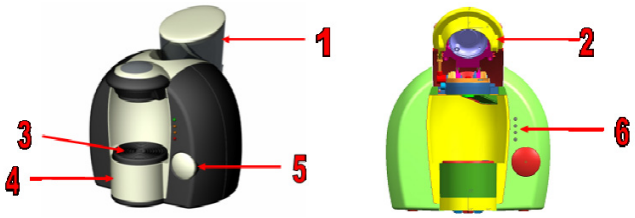

Figure 2. The coffee espresso type. 1 - water tank 1,7 l; 2 - brew mechanism; 3 - adjustable cup holder; 4 - removable drip-tray; 5 - start-stop button; 6 - led indicator removable drip-tray; 5 - start-stop button; 6 - led indicator

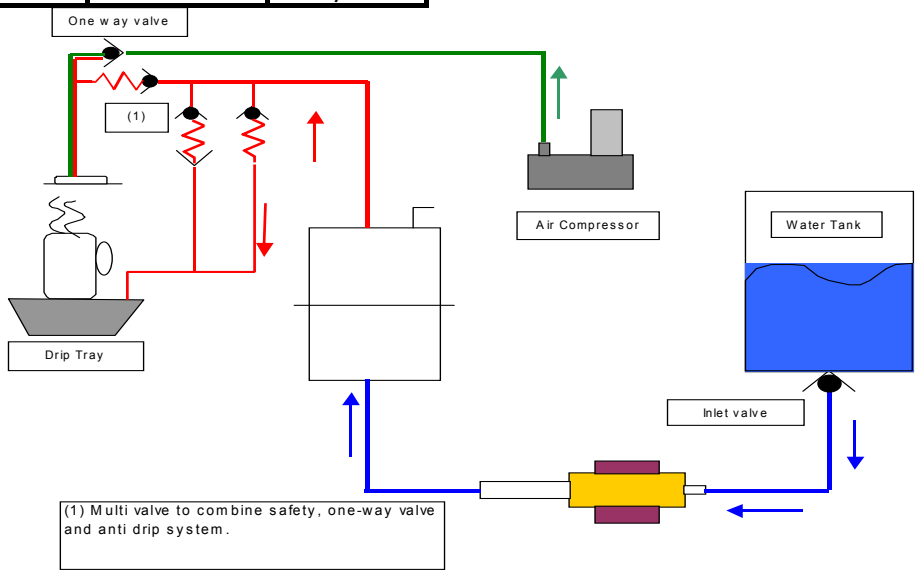

Figure 3. The hydraulic circuit of coffee espresso

Defects of the coffee espresso machine:

a) Clogged turbine

Table 2. Defect, clogged turbine

Cause	Miscellaneous residues from the water tank reach and clog the turbine.
Repair	Dismantle the machine and replace the turbine. This operation lasts 10-15 minutes.
Remediation	Fit a filter in the water tank to retain the residues existing in water.

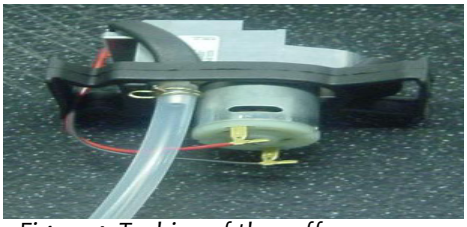

Figure 4. Turbine of the coffee espresso

Table 3. The monthly rate of defects

Defect: clogged turbine	Month	Jan. 2011	Feb. 2011	Mar. 2011	Apr. 2011	May 2011	Jun. 2011	Jul. 2011	Aug. 2011	Sept. 2011	Oct. 2011	Nov. 2011	Dec. 2011	Total
	Quantity produced	6372	16745	21074	7003	15847	15626	11400	7074	13985	14474	15729	7972	153301
	Quantity controlled	128	277	484	159	408	300	217	222	517	547	474	329	4062
	% controlled	2.01	1.65	2.30	2.27	2.57	1.92	1.90	3.14	3.70	3.78	3.01	4.13	2.65
	Nr. of defects found	2	0	13	7	5	15	7	9	12	22	27	10	129
	% defects = CPPM	1.56	0.00	2.69	4.40	1.23	5.00	3.23	4.05	2.32	4.02	5.70	3.04	3.18

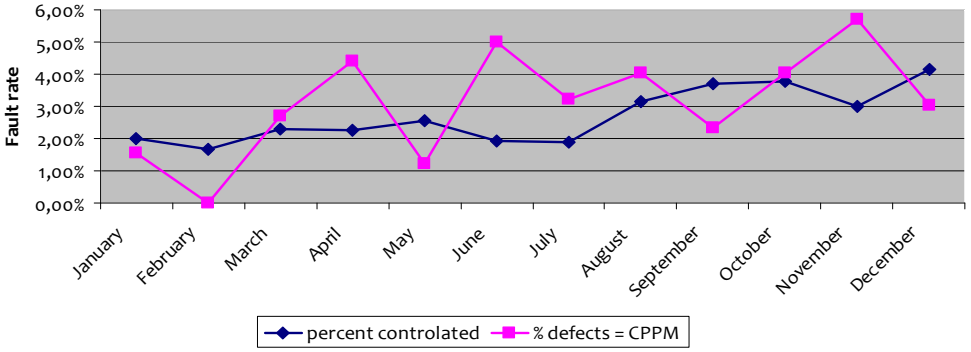

Figure 5. The monthly rate of defect, clogged turbine

b) Boiler steam leaks between the bodies

Table 4. Defect, boiler steam leaks between the bodies

Cause	Improper gasket. The gaskets are supplied in bags of 10,000-20,000 pieces and become deformed.
Repair	Dismantle the boiler and replace the gasket. This operation lasts about 10-15 minutes.
Remediation	Before fitting the gaskets, place them under a heat source of about 40-50°C, which makes the rubber seal to return to its original form.

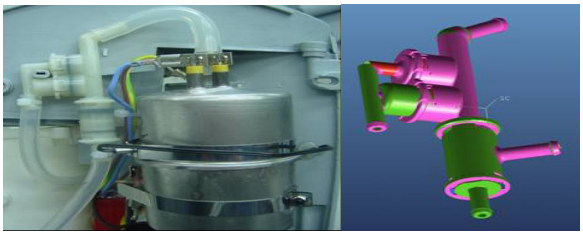

Figure 6. Boiler steam

Table 5. The monthly rate of defects

Defect: Boiler steam leaks between-en the bodies	Month	Jan. 2011	Feb. 2011	Mar. 2011	Apr. 2011	May 2011	Jun. 2011	Jul. 2011	Aug. 2011	Sept. 2011	Oct. 2011	Nov. 2011	Dec. 2011	Total
	Quantity produced	6372	16745	21074	7003	15847	15626	11400	7074	13985	14474	15729	7972	153301
	Quantity controlled	128	277	484	159	408	300	217	222	517	547	474	329	4062
	% controlled	2.01	1.65	2.30	2.27	2.57	1.92	1.90	3.14	3.70	3.78	3.01	4.13	2.65
	Nr. of defects found	5	3	12	6	5	17	7	8	12	20	21	9	125
	% defects = CPPM	3.91	1.08	2.48	3.77	1.23	5.67	3.23	3.60	2.32	3.66	4.43	2.74	3.08

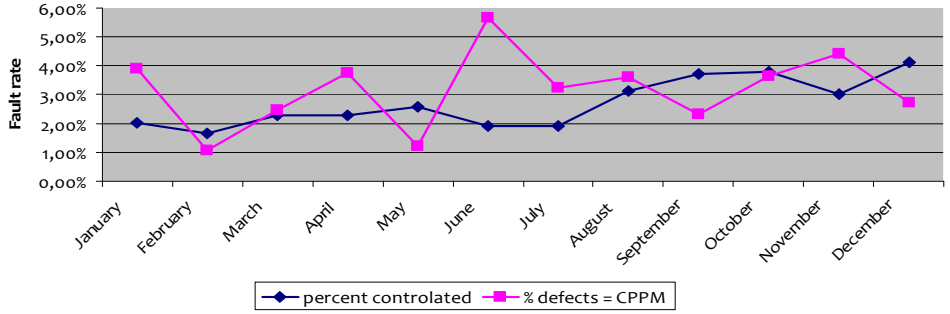

Figure 7. The monthly rate of defect, boiler steam leaks between the bodies

c) Water heater thermostat burned

Table 6. Defect, water heater thermostat burned

Cause	Too little paste on the temperature probe located on the boiler steam.
Repair	Replace the burned thermostats, unscrew the probe temperature, place thermal paste on the probe and put the latter in place. This operation lasts about 10 minutes.
Remediation	Install on the boiler production line a thermal paste dosing equipment.

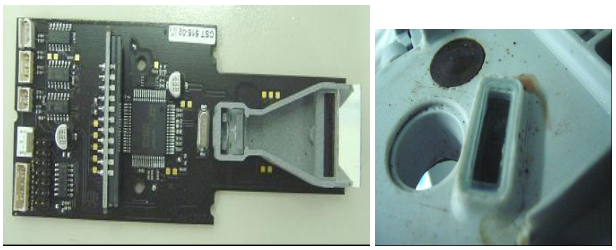

Figure 8. Defect: water heater thermostat burned

Table 7. The monthly rate of defects

Defect: water heater thermos- tat burned	Month	Jan. 2011	Feb. 2011	Mar. 2011	Apr. 2011	May 2011	Jun. 2011	Jul. 2011	Aug. 2011	Sept. 2011	Oct. 2011	Nov. 2011	Dec. 2011	Total
	Quantity produced	6372	16745	21074	7003	15847	15626	11400	7074	13985	14474	15729	7972	153301
	Quantity controlled	128	277	484	159	408	300	217	222	517	547	474	329	4062
	% controlled	2.01	1.65	2.30	2.27	2.57	1.92	1.90	3.14	3.70	3.78	3.01	4.13	2.65
	Nr. of defects found	1	5	7	4	5	10	7	5	10	15	17	9	95
	% defects = CPPM	0.78	1.81	1.45	2.52	1.23	3.33	3.23	2.25	1.93	2.74	3.59	2.74	2.34

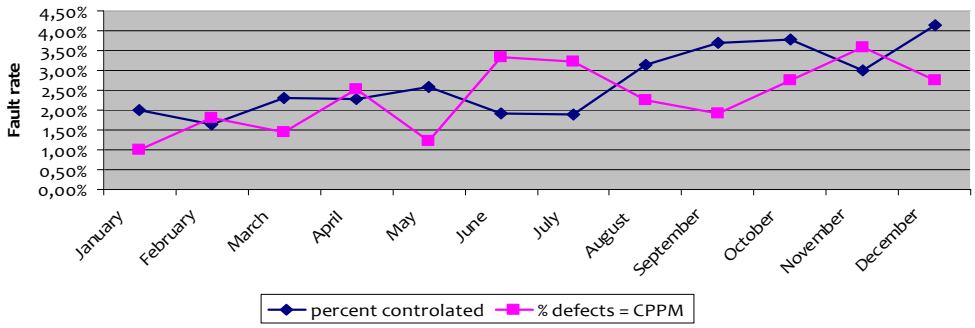

Figure 9. The monthly rate of defect, water heater thermostat burned

CONCLUSIONS

In conclusion, we can say that the quality control system aims to achieve the following objectives:

- *determining the compliance of the quality system elements with the requirements of the quality standards;*
- *determining the quality system effectiveness to achieve the established objectives;*
- *improving the quality system of the company.*

The quality system audit can be conducted for internal and external purposes.

So, a company may decide to carry out audits to assess their own quality system, compared to a certain standard, or to check if the system is implemented and meets continuously the prescribed requirements.

On the other hand, the beneficiaries may decide to carry out the Supplier Quality System Assessment, either before contractual relations or after contract conclusion.

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