

Contribution to the Improvement of Products Quality in Baking Industry

Aleksandar Marić¹⁾

Slavko Arsovski²⁾

Jasna Mastilović³⁾

*1) Fakultet za industrijski
menadžment, Kruševac,
Serbia*

*2) Faculty of Mechanical
Engineering, University of
Kragujevac, Serbia*

*3) Tehnološki fakultet, Novi
Sad, Serbia*

Abstract: *Food industry occupies special place in the processing industry, especially when we talk on the manufacturing of bakery products. Variable products quality on the market initiated the authors of this study to make an attempt, using comparative analysis of methods for quality control that are at most applied in bakery plants and other „convenient“ methods to indicate the shortcomings and to argue convenience of using of methods that would improve testing of the quality. That approach could create a base for designing of model of quality improvement the baking industry.*

Keywords: *product quality, baking, sensory evaluation*

1. INTRODUCTION

A Baking industry is characterized with a variety of different products that daily find their place on the market. Their quality estimate all possible generations of consumers. Stable quality of production, from the long-term point of view, is not easy to preserve. Position on the market are hardly gained, but very easily lost. In the case of so sensitive production such as the baking industry, in order of keeping of the existing positions, it is unavoidable to make all possible efforts for keeping of the achieved levels of competences. Competence is commonly expressed over three basic factors: the quality, the time and the price [1].these factors commonly represent basic – main criteria that determine consumer’s preferences for definite products. Nevertheless, consumers, which are accustomed with the conventional flavors, with already formed their own quality criteria, and being unable even to recognize distinctive sorts of bread, or to give judgments about its quality, represent the interested

customers of this industry, which are really not easy to satisfy. No educated with respect to quality, consumers very often do not know what they really seek [2]. But, the indicative fact, which is generally accepted, is that on the market one can meet distinctive oscillations of the product quality.

Goal of this work is to indicate the possible methods of estimation of products quality, whose choice could assure the demanded quality of baking industry products for the long periods of time.

2. PRODUCTS OF THE BAKING INDUSTRY

In the technological sense of word, bakery products are defined in the Legal rule- book on the quality of wheat, milling and baking products, pasta products and fast frozen doughs [7].

Bakery products, in the context of this rule-book, are bread, pastry and other kinds of bakery products.

Bread is the product obtained by mixing, fermentation, forming and baking of dough obtained from basic raw materials such as: flours obtained from cereals, grists, water or other allowed liquids, baker's yeast and other fermentation aims and table salt. With respect of the improvements of physical and sensory properties and shelf life of bread, the use of additives is allowed.

Pastries, in the context of the rule-book, are products similar to bread, but their weight per piece is not higher than 250 grams.

Other kinds of bakery products, in the context of the rulebook, are products obtained from basic and additional raw materials, as well as additives. These products have distinctive form and are processed by using of procedures differing from procedures used in production of bread and pastry.

Products that were objects of our investigations were bread and pastry. They were chosen, without tendencies of diminishing of the significance of other kinds of bakery products.

3. ANALYSIS OF BAKING INDUSTRY OF RASINA REGION FROM PRODUCT QUALITY, CADRE POTENTIALS, CUSTOMER ATTITUDES ON PRODUCT QUALITY POINTS OF VIEW

The most efficient way of generating of general attitudes about market products quality can be obtained through testing of quality in the whole chain of manufacturing, sales and consumption (market).

Each interested side has its own attitude about the quality and its own evaluation. By synergies of attitudes and evaluations of all mentioned participants it is possible in the fastest manner to recognize points of discrepancies, discover failures and recommend at the very first moment the corrective measures, and thereafter improvement and promotion measures. Such all-inclusive, integral approach to the problem can enable creation of new values owing to the quality promotion

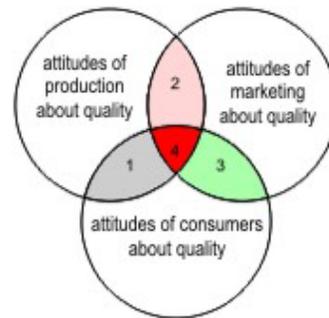


Fig. 1. Superposing of attitudes on the quality : 1 – common attitudes (interests for quality) of manufacturer and consumer; 2 – common attitudes of manufacturer and distributor (salesman); 3 – common attitudes of salesman and consumer; 4 – common attitudes of manufacturer, salesman and consumer

Superposing of attitudes about quality is shown in the Venn diagram (Figure 1). Goal of such presentation is to stress out interrelations between the interested participants (production, marketing and consumers) oriented to common general aims – the quality, which each participant has to create.

However, results of investigations in frames of our study are related to the investigations oriented to manufacturers and market (consumers).

36 bakery plants in region of Rasina were included, as well as the sample of the market (consumers) that can be considered to be representative. The show results in the case of **manufacturing** refer to: magnitude of the business system, qualification structure of the employed (Table 1, Figure 2), and innovation of knowledge of the employed (Table 2, Figure 3).

Results related to the **market (consumer)** refer to attitudes and motivations for purchasing as well as on behavior of consumers with respect to fulfilling of their needs and demands.

Analyzing the structure of organizations in the region of Rasina with respect of the human resources (magnitude of the business system), we can find out that:

- 44.44 per cent of organization employs bellow 10 employed,
- 25 per cents of organizations has 10 – 15 employed,
- 8.33 per cents of organizations has 16 – 25 and 26 – 40 employed,

- 13.90 per cents of organization employ more than 40 workers.

Hence, organizations represent predominantly small manufacturing – business systems.

Number of employed in the immediate production counts 38.36 per cents with respect

to the total number of the employed.

Number of qualified bakers and technologists with respect to total number of employed amounts to 10.48 per cents, and with respect to the number employed in production amounts to 27.18 per cents (Figure 2).

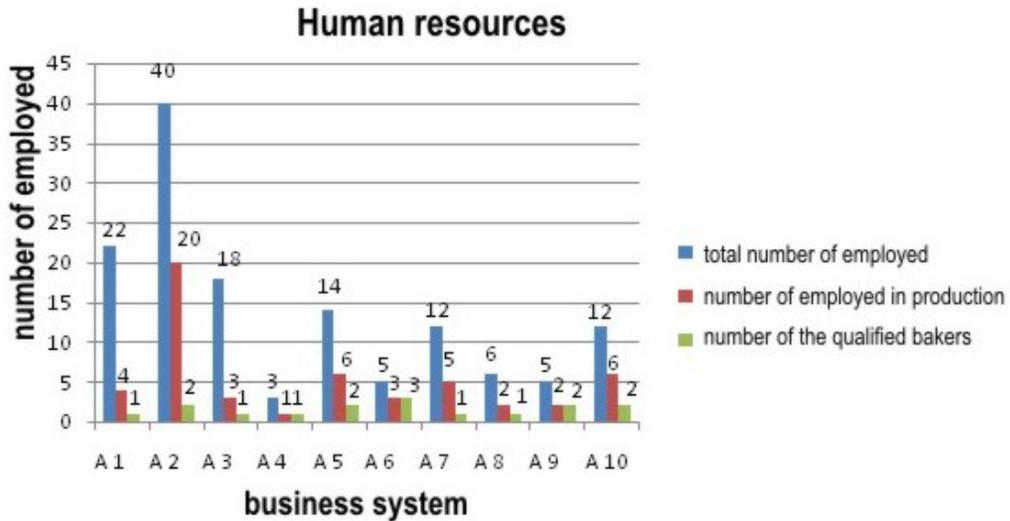


Fig. 2. Human resources structure in bakery plants in the region of Rasina

Business system/ qualification structure of cadres	Frequency	Per cent
Number of business systems that do not employ qualified workers (technologists and/or qualified bakers) in the production	12	33,33%
Number of business systems employing only qualified bakers	21	58,33%
Number of business systems employing qualified bakers and technologists	3	8,33%

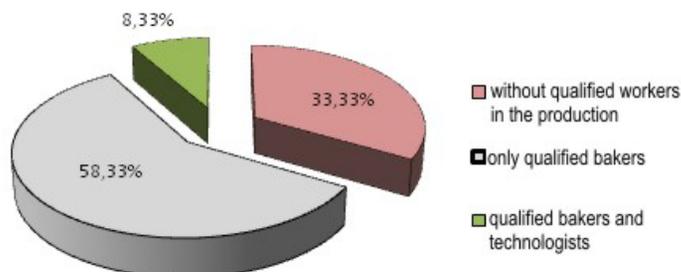


Fig. 3. Structure of cadres in bakery plants from the point of view of being qualified for performing of tasks of bakery organizations in the region of Rasina

Table 2. Structure of presence of innovation of knowledge of cadres in bakery plants in the region of Rasina

Level of acceptance of new knowledge and activities in improvement of cadres	Frequency	Per cents
Almost according all criteria and permanently	15	41.67%
Partially, only on some criteria	6	16.66%
No, or occasionally	15	41.67%

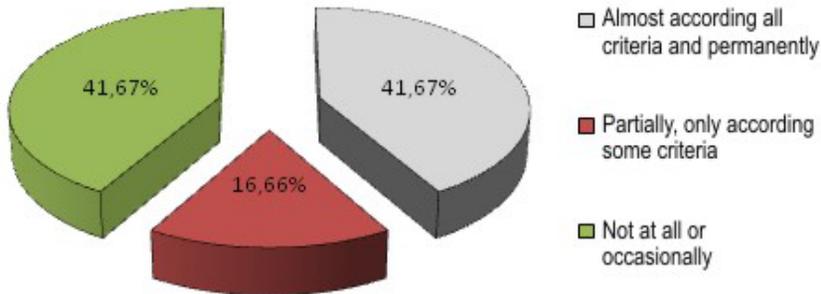


Fig. 4. Shares of education of cadres according to the Table 2 and the given criteria of bakery organizations in the region of Rasina

Criteria for innovation of knowledge that were mentioned are: participation on scientific – professional convention fairs of baking and equipment, following and acceptance of new knowledge from practice and references (professional journals, text books, internet), scholarships.

Investigations were performed in the Rasina region, with goals to find out the actual state of the baking industry. Communities of Krusevac, Aleksandrovac, Brus, Trstenik, Varvarin and Cicevac were included.

Number of the polled in the communities was chosen in such a way, as to approximately correspond to the magnitude of the community and to number of inhabitants in the Region of Rasina.

Women are carriers of purchasing in the family, and their attitudes can be projected to the choice of the family as the whole, having in mind that their choice during purchasing has to unite attitudes of all family members, so that they all have to be satisfied. Totally 273 families were polled, with totally 1145 of participants. Results presented in this work are only one part of the designed project with considerably broader frames, either from aspects of the predetermined scientific aims, or

from aspects of participants questionarried.

The importance of bread for nourishment, consumers described with the following attributes:

- Main food 10.26%,
- Important 45.06%,
- Very important 25.64%,
- Less important 13.92%, and
- Negligible 4.40%.

It is clear that 81.68% of the polled population consider bread as being very important in the nourishment, and only 18.32% of population do not consider it as food of special importance.

Ranking of factors that have effects on **decision about purchasing of the product**, consumers priorities were as follows.

1. Product quality,
2. Product freshness,
3. Regular supplying,
4. Price
5. Assortment,
6. Kindness of salesmen,
7. Personal liability,
8. Packaging,
9. Good marketing, and
10. Recommendation of a friend.

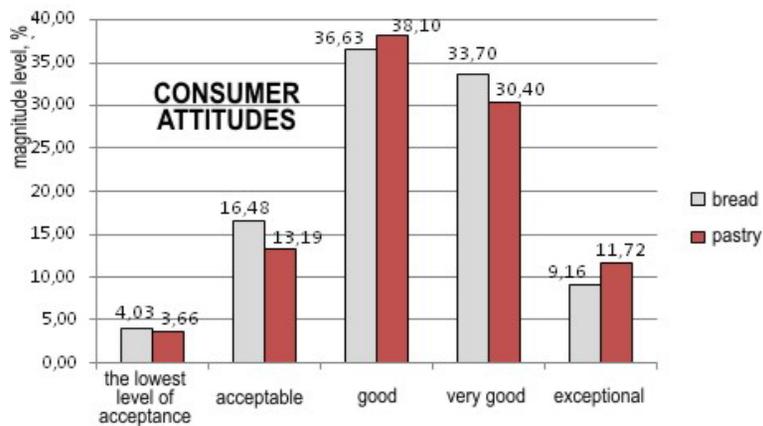


Fig. 5. Consumer attitudes about quality of baker's products (bread and pastry) on the market

Key factors for the quality (attributes influencing the quality) of bakery products, according to the attitudes of consumers, are:

1. Raw materials quality,
2. Technology,
3. Sanitation, and
4. Baker's knowledge and experiences.

Quality parameters of bakery products, according to opinions of consumers, ranked according to their significance, are:

1. Flavor (odor and taste)
2. Appearance of crust,
3. Volume,
4. Keeping manner,
5. Choice of packaging and packaging procedure,
6. Symmetry of form.

The mentioned attitudes (Figure 5), evaluation procedures and importance of bakery products for the nourishment of consumers make represent guidelines of action, not only for manufacturers, but for all interested participants in the baking industry. Using these arguments, the authors of this article wanted to point out the significance of products with respect to consumers, and to contribute to the choice of the optimal methods of estimation of the products quality.

The most often applied method of quality control in bakery organizations in region of Rasina is the evaluation by scoring.

4. EVALUATION OF PRODUCTS QUALITY BY SCORING

Scoring system is used when it is

necessary to achieve complete sensory evaluation of some product. Particular product properties are scored with numerical values, and at that time, each property, i.e. the quality element, possesses the distinctive coefficient of importance. Score multiplied with the corresponding coefficient of importance gives total number of scores for the given element of quality. For such system of evaluation exist schemes with different numbers of scores, and as optimal number a scheme with scores between 20 and 50 can be adopted [4].

For applying of this method, the most significant is the properly estimation of coefficients of importance values for distinctive quality elements, in frames of the design, so that they correspond to their significance with respect to total quality of the product being evaluated. The role of coefficient of importance in sensory evaluation scheme is the avoidance of interfering of scores.

Flour-based products are specific because, besides to odor and taste, their quality largely depends on appearance and crumb texture. To be able to evaluate some product properly, panelist has to be familiar with basic characteristics of the product, and technology of its production.

During making the choice of the method of sensory evaluation, it should be kept in mind that „the best method“ never exists. The choice of the method primarily depends on results and purposes of evaluation.

Bread is evaluated with total count of scores obtained with using of such procedur

Scores	Description	Marks
> 40	Unacceptable for marketing	1 – 2
41 – 60	Satisfactory	3 – 4
61 – 80	Good	5 – 6
81 – 90	Very good	7 - 8
91 - 100	Excellent	9 - 10

DATA ON THE EVALUATION OF BREAD (an example)

Name of the enterprise DP „Branko Perisic“, Krusevac
Date und time of evaluation Apr. 13th, 2005
Sort of the product Bread, T-850
First name and name of evaluator Bogicevic Mihajlo

Sample label		T-850									
Declared mass		700g.									
Measured mass		685 g.		712 g.		713 g.		714 g.		710 g.	
Sample number		1		2		3		4		5	
Quality elements	Coefficient of importance	B	Ax B								
Appearance	3	3	9	4	12	5	15	5	15	5	15
Volume	4	5	20	5	20	5	20	5	20	5	20
Crumb appearance	5	4	20	4	20	4	20	4	20	3	15
Crust and crumb odor	3	4	12	4	12	4	12	5	15	4	12
Crust and crumb taste	5	4	20	4	20	4	20	4	20	4	20
Total sum of scores	20	81		84		87		90		92	

Notes: A = Coefficient of importance; B = Assigned marks for the quality element; a x B = Number of scores

The following histogram shows application of control of the finished products quality in the baking enterprises in the region of Rasina (Figure 6).

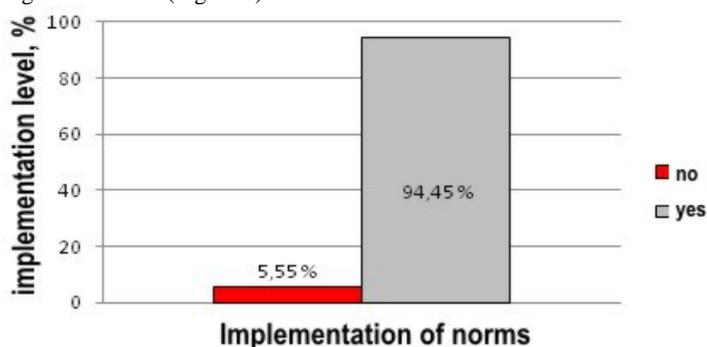


Fig. 6. Quality control in the baking industry in the region of Rasina

As it can be seen, some 5.5 per cents of organization perform almost not the control of their finished products quality, what represents

significant share. Their quality controls a limited on the free judgment of workers in the production. It is internal control form, with

estimation of the quality, without any defined parameters that could be measured (for instance, in internal laboratory of the plant). These organizations do not apply any external control, even not in the Institution for protection of human health. The remaining 96 per cent of organizations perform integrity controls of their production in the Institution for human health protection, but only 9.1 per cents of organizations has their own laboratory for the quality control.

Therefore, our investigations show that the problem of quality control in bakery plants in the region of Rasina is to be recognized as one of the most serious problems.

5. CHOICE AND ANALYSIS OF CONVENIENT METHODS FOR EVALUATION OF THE QUALITY

For obtaining of the all-inclusive and detailed data concerning sensory characteristics of bread for its evaluation purposes, whole set of different possibilities exists. The choice of the most appropriate method, which could lifer optimal results from their significance point of view, depends of the facts that determine for which purposes are such results needed.

When considering consumer attitudes, first of all hedonic methods are applied. They require a sample of consumers which is statistically large enough for elaboration of questionnaire results. Such panels have to contain 50 polled subjects, or more. Because of that, tests have to be designed so that they give clear formulation of tasks, so that the questionarried would not have any dilemmas. Tests have to be performed in short period of time, under circumstances that require not special environment condition [5]. For investigations are normally applied tests with paired samples or triangle tests, where consumers are asked to make their preference with respect to question „which of the two products is better?, or „which of three products is different with respect to the other two?.

On the other hand, for the purposes of development of bakery products, it is unavoidable to apply methods of sensory

estimations with more details describe sensory properties, and for evaluations, tested, trained, experienced panelists have to be used [6]. In such cases, different aspects of sensory evaluations are considered, using visual, olfactory, gustatory and palpatory techniques that enable detailed judgment of particular quality aspects.

Visual technique of evaluation of sensory properties lifers data on the products appearance, inclusive their correctness and acceptability, as well as product color, its hue, brightness and homogeneity. Visual technique lifers also numerous data related with cut of the bread, beginning with the crust thickness, over connection of crust and crumb, till to the bread crumb, including one more its hue and color homogeneity. The special significance for the development of the products, from the point of view of visual evaluations, have judgments referring to the crumb structure, including its homogeneity, equality, size and fineness of porosity of the crumb.

Palpatory technique lifers for bread the data that reflect its crumb properties, such as moisture, crumbliness and elasticity, and for crust, palpatory technique lifers data on its brittleness and softness.

Evaluation of bread with olfactory technique means the obtaining of data on flavor, note and intensity of odor of products. Gustatory technique lifers the data on the strength and note of taste, on chewiness and fatness of the product.

4. CONDUSION

Having in mind that the introduction of such sophisticated evaluation of bread imposes complex training of evaluators, its application in our conditions is still limited to investigations, although such an approach to bread evaluations and its interrelating with attitudes of consumers should and can bi backbone of improvements and development of bakery products of the top quality, compatible with consumer expectations, representing the basic element for realization of competitive advantages in baking industry.

REFERENCES:

- [1] Marić A., Đorđević Lj, Robajac O.: Technological process influence on product quality, Proceedings of 14th International Scientific Conference , *CO-MAT-TECH 2006*, Trnava, 19.-20. October 2006., page (817-823), Slovakia
- [2] Marić A., Đorđević Lj., Arsovski S.: Quality analysis techniques and logistics in technological systems, Proceedings of 8th International Conference “RESEARCH AND DEVELOPMENT IN MECHANICAL INDUSTRY”- RaDMI 2008, Užice - Serbia and Montenegro, 14. – 17. September 2008. (Page 499 – 504)
- [3] Kaluđerski, G., Filipović, N.: Metode ispitivanja kvaliteta žita, brašna i gotovih proizvoda, Tehnološki fakultet, Novi Sad, 1998.
- [4] Mastilović, J., Pestorić, M., Sakač, M., Pojić, M., Savković, T., Popov-Raljić, J. (2007). Savremeni pristup vrednovanja senzorskih svojstava prehrambenih proizvoda na tržištu. *Ekonomске teme*, XLV(1), 71-78.
- [5] Živković, J., Mastilović, J., Pestorić, M. (2007). Vrednovanje stavova i zadovoljstva potrošača hleba kao masovnog proizvoda. *Žito-hleb* 34, 109-113.
- [6] Pestorić, M. Pojić, M., Mastilović, J. Šimurina, O., Tasić, T., Živančev, D. Šoronja-Simović, D. (2008). Influence of sensory evaluation of traditional bread in Vojvodina. *Food processing, quality and safety* 35, 3, 99-111.
- [7] Sl. list SRJ, No. 52/95 and "Sl. list SCG", No..56/2003 - dr. pravilnik i 4/2004 - dr. pravilnik