APPLICATION OF THE METHOD OF QUALITY FUNCTIONAL DEPLOYMENT WHEN DEVELOPING A NEW EXTRUDED PRODUCT

PhD assistant professor M.R. Mardar
Odessa National Academy of Foods Technologies

During the new product creation the researcher quite often bases on the subjective judgment and it sometimes leads to appearance of the product on the market which doesn't meet the requirements of the customers. One of the perspective directions in the field of creation of a new food product is application and adaptation of the modern instruments and methods of quality management, such as methodology of QFD (Quality Function Deployment) [1, 2]. The above - mentioned method was developed at the end of 1960-s in Japan. Its aim is to provide customers′ demands when planning and designing the products and when designing the technology of making and producing of the production as well. The first ideas, stated concerning the questions of quality, connecting the parameters of a product quality and the process of its creating with the customers expectations, were practically realized in Bridge stone Tire and Matsushita Electric at the end of 1966 and got the name "*Quality Assurance Plan*". The first table of quality in the form of a matrix diagram was developed in 1972 in Mitsubishi Heavy Industries. We should take into account that the greatest contribution into the new methodology development was made by Iy. Akao, S. Mizuno who published the book with the title "*Quality Function Deployment: the approach to the General quality control*" [3, 4]. Since this moment the development of QFD methodology development according to distribution of the general Quality management, has begun.

Application of QFD method for constructing the new food product is based on receiving the consumers' demands for the new product, revealing the most important and perspective from them and transferring of the given demands into the quantitative technical characteristics of the product. The peculiarity and advantage of this method application is contained in getting not only stated during the public- opinion poll demands for the product but also unacknowledged demands, fulfillment of which will allow the enterprise to offer the customer the goods with the unique characteristic and to win the struggle witch competitors [5].

The main instrument, when using the given method, is building of a correlation matrix, with the help of which the QFD team, consisting of the specialists of different profiles, makes estimations at different stages of the research. All the results of the similar estimations can be brought together into one and the same table. The visual proof of the method made it popular under the title "*Quality House*", in which every element of the "*House*" represents the results of one of the conducted stages of the new product development [1, 2]. The given method includes application of a number of other quality instruments, such as an affinity diagram, a tree - like diagram, benchmarking methods and others. The customers demands for the product quality are developed by stages, beginning witch determining of the product necessity on the market and ending with the ways of quality control. The final estimation of the project concerning the product development belongs to the customer, that's why it′s particularly important that during all the work at the project the consumers should directly or indirectly take part in the work.

Application of the structuring method of Quality function at all the stages of production creating allows to realize such most important principles of quality management, as catering for the consumer and making decisions, based on the facts obtained. Structuring of Quality function also provides realization of quality conception, which proclaims Total Quality Management (TQM) - one should not correct a drawback (a fault) but prevent it.

The new product development when using QFD method includes the following stages[1]:

- ✓ collecting of the information:
- ✓ the information processing:
- ✓ generalization and structuring of the consumers' demands
- ✓ prioritization of the customers' demands
- ✓ building of "Quality house"
- ✓ development of the new product conception
- ✓ development of the technical task for the product.

Application of the given method for creating the new food product, and particularly in our case,

the extruded product, should end in development of the technical task and approval of the recipes. At the first stage of QFD – the analysis during selective investigation, "*the consumers' voice*" was determined. The consumers' estimation is a necessary stage of the new product development. It allows to reveal the most preferable sample and to determine if it corresponds to the conception and if it needs some changes [1, 2]. For collecting the information, the written questionnaires of the respondents were used. The answers to the open question "*Please, make up a list of your wishes concerning the extruded product quality*", allowed to determine the list of the consumers' demands for the expected production. At this stage of the information processing the methods of composing "*The consumers' voice*" table, were used. In this table the consumers' demands were specified, simplified and concretized. Generalization and structuring of the consumers' demands were carried out with the help of two quality instruments: an affinity diagram and a tree - like diagram. When using the affinity diagram the demands were distributed by relative groups and then were generalized. As a result of carrying out of this procedure the amount of demands essentially decreased, because the identical demands were deleted and the similar ones were generalized. The given demands then were divided with the help of the tree-like diagram into the implied stated and unrealized demands. Application of the tree-like diagram gives an opportunity to reveal the secret, unrealized consumer′s wishes. Fulfillment of such demands helps the researcher to leave the competitors behind and to increase the audience having a special purpose. The demands for safety and normative documents for the product, which must be followed by all means, should be concerned to the implied demands for the food product. Eventually the consumer's′ demands for the extruded product have been determined: a pleasant taste, crunching structure, high nutritional value, being natural, presence of the biologically active substances (BAS), a low calorie content, being healthy, a reasonable price.

At the stage of prioritization of the consumers' demands, the repeated address to the consumers′ demands are always contradictory and it′s impossible to create the production, which would meet all the consumers' demands. As a result it is necessary to have a clear idea about the demands which must be satisfied by all means and the demands which can be neglected to a certain degree. To answer these questions it′s necessary to regulate the list of the consumers′ demands by the degree of importance. So further questioning was directed to determination of the importance factors of consumers′ preferences indices by a five-mark scale, namely: 5 - very valuable, 4 - valuable, 3- less valuable but it would be nice to have it, 2 - not very valuable, 1 - isn′t valuable. By the consumers' demands rating it has been stated that the most important things for the consumers' of the extruded product are its pleasant taste and crunching structure, being healthy, being natural, high nutritional value, presence of BAS and, of course, reasonable price. The results of the consumers' demands, their priorities are included in the special columns of "*Quality House*" (fig. 1).

After finishing of the stage, connected with visualization and estimation of importance of the consumers' expectations, it was necessary to solve guaranteeing of the given expectations fulfillment in practice. With this purpose, on the basis of studying of the normative and technical documents, we have determined the technical characteristics of the extruded product, which are connected with wishes and expectations of the consumers' and are included into the "top" of Quality house, namely: mass protein portion, mass starch portion, mass cellulose portion, BAS content, applying additives, energy value, mass moisture portion, coefficient of outburst, mass by volume, the expiration date, safety indices, preventive properties, price.

In the central "*room*" of Quality House, the conventional signs of the quantities of the correlation coefficient between the consumers' demands and technical characteristics of the product are included. For every characteristic the criterion, taking into account meanings of the correlation coefficients of the particular characteristic and the demands priority, put forward by the consumers', was calculated. As it turned out, transformation of the consumers' demands into the technical characteristics has shown, that formation of gustatory characteristics of the product depends on the chemical composition of the extruded product, namely on BAS content (in this case on presence of aroma forming compounds), on the amount of the additives introduced, the product′s being healthy depends, first, on the chemical composition of the product, on the amount of the included additives and presence of the preventive properties of the finished product. Also the expiration date, energy value of the finished products directly influences the products being healthy.

During the correlation matrix building, so called "*the roof of the house*", the relations of quantitatively measured quality indices between one another, have been filled in; and the directions of

their change for providing the necessary meanings of the consumers′ demands, have been determined.

The results of the benchmarking have been put down into the "*veranda*" of Quality House. The purpose of conducting of the benchmarking is determining of the degree of the competitors′ demands, revealing of strong and weak points of the competitive organizations and discovery of the real possibilities for "*break - through*" improvement of the own product [5].

As a result the understanding has been achieved concerning the fact: to what degree the product, developed by us, is perfect in comparison to the best analogues of the competitive companies.

In this case the expert method has also been used and a five - mark scale from "*a bed mark*" to "*an excellent mark*", has also been used, namely 5 - excellent; 4 - good; 3 satisfactory (mainly corresponds); 2 - barely satisfactory (corresponds partly); 1 - badly (doesn't correspond to expectations). The results of such comparison are presented in the "*veranda*" of Quality House. The extruded product of the famous trade company "*Corn figured items with bacon taste*", has been chosen as a competitive product.

When filling the "*basement*" of Quality House the priority of the developed product was calculated (estimated). Generalizing the data concerning strength of the connection between the technical characteristics of grain bread and the consumers′ demands, taking into the account the importance of the latter ones, the priority of optimization of the recipe composition of the extruded product, has been determined. As it has been shown, it′s first necessary to provide the preventive direction of the new developed product at the expense of introduction of the natural additives into its composition as well as to provide the increased BAS content and it′s necessary to pay special attention to the product safety indices.

So, application of the methods of quality function deployment allowed to reveal the most important characteristics of the extruded product for the consumer, to determine the correlation between the priorities of the consumers and the technical characteristics of the product, and further on it will be taken into account when developing the technical task and recipe composition of the new product with the aim of providing its competitive advantages.

Bibliography

1. Ponomaryov S.V. *Upravlenie kachestvom produkczii. Instrumenty I metody menedzhmenta kachestva/S.V. Ponomaryov, S.V. Mishhenko, B.Ya.Belobragin, V.A. Samorodov I dr. M.:RIA "Standarty I kachestvo". 2005. 248 s.*

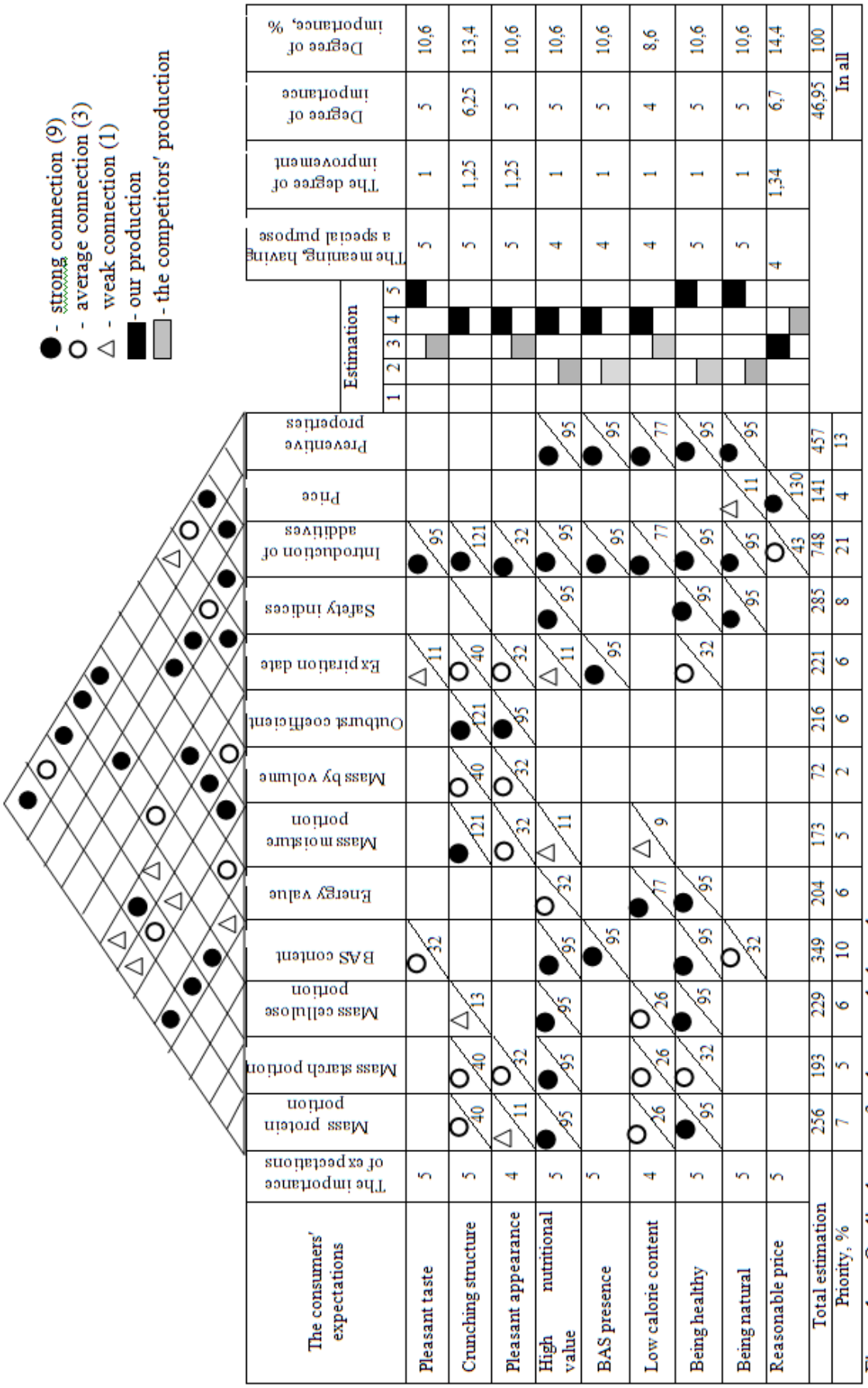
2. Suvorova L.A. *Primenenie metodologii QFD I statisticheskih metodov d upravlenii kachestvom produkczii na promyshlennom predpriyatii/ L.A. Suvorova, R.P. Czvirov //Kachestvo, innovaczii, obrazovanie. 2005. №2. S.72-78.*

3. Akao Y. *Quality Function Deployment (QFD). Integrating customer requirements into product design. – Portland, OR: Productivity Press, 1990. – 369 p.*

4. Misuno, S. *QFD. The customer-driven approach to quality planning and deployment/S. Misuno, Y. Akao.- Tokyo, Japan: Asian Productivity Organization, 1994. – 365p.*

5. Matison V.A. *Primenenie metoda razvyortyvaniya funczii kachestva dlea konstruirovaniya produlta v pishhevoj promyshlennosti //V.A. Matison, N.A. Demidova. //Pishhevaya promyshlennost'. 2012. №4. S.44–45.*

Recommended for publication: 22.03.2013.



The consumers' expectations	The importance of expectations	Mass protein portion	Mass starch portion	Mass cellulose portion	BAS content	Energy value	Mass moisture portion	Mass by volume	Outburst coefficient	Expiration date	Safety indices	Introduction of additives	Price	Preventive properties	Estimation 1	2	3	4	5	The meaning, having a special purpose	The degree of improvement	Degree of importance	Degree of importance, %
Pleasant taste	5				○ 32					△ 11		● 95								5	1	5	10,6
Crunching structure	5	○ 40	○ 40	△ 13			● 121	○ 40	● 121	○ 40		● 121						■		5	1,25	6,25	13,4
Pleasant appearance	4	△ 11	○ 32				○ 32	○ 32	● 95	○ 32		● 32						■		5	1,25	5	10,6
High nutritional value	5	● 95	● 95	● 95	● 95	○ 32	△ 11			△ 11	● 95	● 95		● 95				■		4	1	5	10,6
BAS presence	5				● 95					● 95		● 95		● 95				■		4	1	5	10,6
Low calorie content	4	○ 26	○ 26	○ 26		● 77	△ 9					● 77		● 77				■		4	1	4	8,6
Being healthy	5	● 95	○ 32	● 95	● 95	● 95				○ 32	● 95	● 95		● 95					■	5	1	5	10,6
Being natural	5				○ 32						● 95	● 95	△ 11	● 95					■	5	1	5	10,6
Reasonable price	5											○ 43	● 130						■	4	1,34	6,7	14,4
Total estimation		256	193	229	349	204	173	72	216	221	285	748	141	457								46,95	100
Priority, %		7	5	6	10	6	5	2	6	6	8	21	4	13								In all	

Figure 1 - «Quality house» for the extruded product

Figure 1. «*Quality house*» for the extruded product.