UDC 637.1(470.12)

Quality system implementation of the basis of the stable functioning of processing enterprises

The article proves the necessity to use quality system in the conditions of Russia's accession to the World Trade Organization. It characterizes the main principles of this work in industrial dairy enterprises. The authors present a set of measures to implement the HACCP system (Hazard Analysis and Critical Control Points) at CJSC Totma Butter-Making Plant (the Vologda Oblast) in order to improve the competitiveness of its products.

Quality system, efficiency, competitiveness, dairy products quality, World Trade Organization (WTO), Hazard Analysis and Critical Control Points (HACCP), the critical control points (CCPs).

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Global progress trends in nutrition are associated with the products which are enriched with functional ingredients that contribute to the promotion and strengthening of public health. The improvement of product quality is an essential condition of this process. It is the most important and determining factor of producer's success among the customers [3].

The factors of final dairy output quality include the characteristics of feedstock, components and materials, the individual stages of production that determine the overall

quality level of technological processes, as well as clear control system operation at all the stages of production.

The development of single standards and requirements for product safety is necessary for the members of the Customs Union – Russia, Belarus and Kazakhstan – in order to protect their markets from low-quality imports and reduce of trade barriers for their products and services within the scope of the Common Economic Space that has been formed since January 1, 2012.

The harmonization of technical regulations and standards of the Customs Union and the Single Economic Space will be conducted within the European legislation. It is one of the most important questions for Russia's accession to the World Trade Organization (WTO). Moreover, the problem of WTO should be seen as the problem of protecting domestic markets and the contest for the expansion into foreign markets. This applies primarily to the agricultural and food industries. According to the unanimous opinion of most experts, politicians and state figures, these branches will be the most vulnerable sectors in the first years of Russia's membership in WTO.

Meanwhile, the analysis shows that a lot of Russian enterprises haven't come to the point of this organization's requirements, so they are poorly prepared for Russia's entry into WTO. In this connection it should be noted that Russian companies have already entered the zone of risk; the current state of affairs urge them to think about competitiveness. The growing competition of foreign companies on the Russian domestic market and the low competitiveness of domestic products on the foreign market cause significant economic and social problems. The accession to WTO may increase these problems greatly if we don't reconstruct quality management and don't use the best international and national experience to improve the organization of production. As for the export ambitions of some enterprises, they will have to be left behind [4].

Upon the accession to WTO, many companies and the whole industries couldn't meet competition because of the influx of overseas goods and services which are often cheaper and of better quality. Western foodstuffs, which are well-subsidized and more competitive, will displace Russian products due to their amount and affordability, as it takes place in Ukraine. This will lead to the lack of domestic foodstuff competitiveness and consumer debalance in favor of imported chicken legs, stale meat, dairy products, etc.

According to expert estimates, only 25% of domestic enterprises can be able to compete with foreign producers on the domestic market, especially after the significant reduction of some customs duties.

Today, quality management system is one of the main methods to produce competitive products. Of course, this system should be effective. World experience in quality control management shows that the stable quality of a product can not be achieved without the stabile quality of raw materials. Therefore, there is a trend to closer cooperation between the manufacturers and suppliers of raw materials and component parts. This is true both for developed and developing countries, though these trends are different there. It is no coincidence that the international standard offers the procedure of choosing a supplier as an element of quality assurance system [6].

The cost of quality has a direct impact on the cost price for goods – a key competitive factor. The systematic analysis of these costs in order to optimize them is an integral part of enterprise's quality programs. The role of top management is undeniable in creating such a climate in the team, when the principle of "first and foremost quality" isn't just a slogan.

For over three decades the tasks of creating high-quality products have been solved in the world through the quality control system. Nowadays, the principles of quality management, which are influenced by the development

of economic, cultural and political systems of the country, are quite diverse. As for the quality assurance methods, the long-standing international practice shows that they are similar and some main trends can be pointed out in this connection [2].

Japanese scientist H. Taguchi expressed the essence of modern quality assurance methods in the following statements:

1. It is necessary to assess the damage that poor-quality products can inflict on the society. In this case we take into account the damage caused by finished products (refusals, injuries, accidents, impossibility of own functions performance, failure to meet customer requirements) and the damage in the production of defective products (waste of time, overhead energy, strength and toxicity of some manufacturing processes). It is necessary to take into account the amount of such damages in calculating the preventive costs of quality.

2. A company should continually improve production quality and reduce costs in order to produce competitive goods. It is necessary to take into account the fact that customer requirements increase constantly. This fact should be considered when developing a firm's strategy.

3. The main purpose of the program on improving products' quality must be the permanent reduction in the differences between the product quality indicators and characteristics specified by a customer. This task is associated with the regular improvement of metrological service.

4. The damage, which is suffered by a customer because of failure to comply with his requirements, is proportional to the square of deviation value of quality indicators. This must be taken into account when setting the requirements for the quality of production processes.

5. The quality and cost prices of finished product are mainly determined by the quality of design and technology. Therefore, it is necessary to focus on the requirements for the quality of finished products in designing and planning production process and control methods.

6. The deviation of product performances from the specified characteristics of product quality should be reduced during the development period and prototype tests.

7. It is necessary to identify the dependence of operational characteristics on other parameters of a product and technological process and plan an experiment based on statistical calculations using this dependence [5].

The HACCP system (Hazard Analysis and Critical Control Points) is the main model of quality management and food safety in the developed countries. The HACCP concept was developed in the early 80-ies of the XX century in the United States. The implementation of HACCP began in the European Union with the adoption of the Directive 93/43/EEC on the Hygiene of Foodstuffs. Then these countries developed national documents regulating the requirements of the HACCP system and the procedures for its development. The HACCP system had become the mandatory requirement in the U.S., Canada and most European Union countries by 2000. In 2004 the European Parliament and the Council of the European Union adopted the Regulation on the Hygiene of Foodstuffs instead of the Directive 93/43/EEC. According to Article 6, the executive agencies of the European countries should recognize as necessary the certification of the HACCP system that is carried out by competent authorities, i.e. by authorized governments of the countries in which they are located. In Russia the All-Russian Research Institute of Standards developed the State Standard R 51705.1-2001 "Quality systems. HACCP principles for food products quality management. General requirements" that was enacted on July 1, 2001. In the same year the State Standard developed and implemented the System of Voluntary Certification HACCP. Eleven certification agencies are operating today within the scope of this system.

As for food industry enterprises, HACCP is a system which allows the companies to direct their resources and efforts to the critical zones of production and, at the same time, it reduces the risk of manufacturing and selling a dangerous product. However, this system is a strong evidence of the fact that the producer provides all the conditions which guarantee the stable production of quality and safe products.

The modern HACCP system is based on seven principles, the consequent implementation of which allows the producers to develop, implement and successfully manage this system at the enterprise:

- Principle 1: Conduct a hazard analysis.
- Principle 2: Identify critical control points (CCPs).
- Principle 3: Establish critical limits for each critical control point.
- Principle 4: Establish critical control point monitoring requirements.
- Principle 5: Establish corrective actions.
- Principle 6: Establish record keeping procedures.
- Principle 7: Establish procedures for ensuring the HACCP system is working as intended.

The rapid expansion, general acceptance and extensive use of the HACCP system in the industrial experience can be explained by a number of advantages for the organizations which use it.

There are the following internal benefits of HACCP implementation:

✓ the basis of HACCP is a system approach to the parameters of food safety at all stages of life cycle – from processing raw materials to final consumer use of the product;

✓ the use of preventive measures rather than belated attempts to rework and withdraw products;

✓ the unambiguous determination of the responsibility for ensuring food safety;

✓ the exact identification of critical processes and focusing the main resources and efforts of the company on them;

✓ significant saving due to the reduction of the share of manufacturing defects in the total production volume;

✓ documentary evidence proving reliance upon the safety of foodstuffs that is particularly important when analyzing complaints and litigations.

There are the following external benefits of HACCP implementation:

➢ consumer confidence in products;

➢ the possibility of entering new markets, including the international ones, and expanding the present outlets;

➢ additional benefits for the participation in major tenders;

➢ improved competitiveness of a company's production;

➢ increased investment attractiveness of an enterprise;

➢ reducing the number of reclamations by providing stable quality of products;

➢ building up the reputation for producing quality and safe foodstuffs [7].

We have developed a working program of measures aimed at the implementation of the HACCP system at CJSC Totma Butter-Making Plant. It is located in the Totma District of the Vologda Oblast. The main activities of the company involve milk purchasing and processing. The plant is specialized in producing whole-milk foodstuffs. The main performance indicators of the plant in 2009 – 2010 are presented in *tables 1 and 2.*

The production volume decreased by 17.23% in 2010 as compared with 2009. The decline in whole-milk production is associated with the insufficient supply of feedstock.

There is the largest share of milk, curd and kefir in the output of products because they are the most popular foodstuffs. The company is going to expand the output of dairy products in future.

Table 1. Output volume and product mix in CJSC Totma Butter-Making Plant

Product	2009		2010		Deviation	
	Volume, t	%	Volume, t	%	(+;-)	%
Milk	1152.00	58.92	977.49	60.40	-174.51	84.85
Kefir	175.70	8.98	207.85	12.84	32.15	118.30
Sour cream	108.10	5.53	90.70	5.60	-17.40	83.90
Butter	116.80	5.97	71.52	4.42	-45.28	61.23
Curd	392.20	20.06	259.69	16.05	-132.51	66.21
Cheese	10.50	0.54	11.19	0.69	0.69	106.57
Total	1955.30	100.00	1618.44	100.00	-336.86	82.77

Table 2. Economic indicators of CJSC Totma Butter-Making Plant in 2009 – 2010

Indicator	2009	2010	Deviation, (+;-)
Cost price, thsd. rub.	131704.40	81702.00	-50002.40
Sales proceeds, thsd. rub.	120604.00	73531.00	-47073.00
Profit (loss), thsd. rub.	(12762.00)	(695.00)	+12067.00
Profitability of production, %	-9.7	-0.9	8.8
Profitability of sale, %	-10.05	-0.9	9.15

Unfortunately, a product range is quite narrow now, there is a lack of secondary raw milk products (they use little buttermilk and whey for normalization but the main amount of secondary milk is flown away through sewers. Nowadays, new products with various fillers and high biological and nutritional value are in great demand [1].

These figures show that the production was unprofitable both in 2009 and 2010. CJSC Totma Butter-Making Plant is inefficient. It is necessary to arrange special activities aimed at preventing and reducing damage and losses and increasing investment profit.

The main sources of profit are increased sales, reduced production costs, improving the quality of commodity output. The most important strategic goal of the company CJSC Totma Butter-Making Plant is an increase in the competitiveness of production sold in the markets.

The implementation program of the HACCP system can be considered in the case of the plant's curd production.

CJSC Totma Butter-Making Plant produced curd using traditional vats until 2005. The equipment was both physically outdated and obsolescent. The mechanization of curd making process was excluded. In addition, the produced curd did not always satisfy the requirements: there were the significant deliveries of raw milk of poor quality, so it was necessary to reduce the risk of secondary contamination and extraneous microflora growth in the finished products.

The curd production line by "Alpma" was run at the plant in 2005. The main difference between the curd production line and the traditional patterns of production is fully mechanized process that ensures high hygienic indicators and, consequently, increased shelf life of this product.

Dynamics of curd production by CJSC Totma Butter-Making Plant in 2006 – 2010 is presented in *table 3*.

The average level of dynamics range in that period:

$$y = \frac{\sum y_i}{n} = \frac{142423.00}{5} = 28484.60 \text{ thsd. rub.}$$

Absolute average annual increase:

$$\Delta y = \frac{\sum \Delta y_i}{n-1} = \frac{20890.00}{4} = 5222.50 \text{ thsd. rub.}$$

Table 3. Dynamics of curd production in 2006 – 2010

Year	Commodity output at current prices, thsd. rub.	Absolute increase		Growth rate, %		Rate of increase, %	
		Basic	Chain	Basic	Chain	Basic	Chain
2006	11231.00	-	-	-	-	-	-
2007	21205.00	9974.00	9974.00	188.8	188.8	88.8	88.8
2008	31520.00	20289.00	10315.00	280.7	148.6	180.7	48.6
2009	46346.00	35115.00	14826.00	412.7	147.0	312.7	47.0
2010	32121.00	20890.00	-14225.00	286.0	69.3	186.0	-30.7
Total	142423.00	-	20890.00	-	-	-	-

Growth coefficient:

$$C_g = \sqrt[n-1]{\prod_{i=1}^{n} PC_i} = \sqrt[4]{1.888 \cdot 1.486 \cdot 1.470 \cdot 0.693} \approx 1.300.$$

The curd production volume increased by 186% in 2010 as compared with 2006. But the company has significant reserves to improve the efficiency of curd production which are provided for in the HACCP system implementation at the plant during the period from 2012 to 2014.

Before developing the HACCP plan, the company's management has informed the entire engineering staff about their intentions. The personnel should fully share the idea of implementing the HACCP plan.

Production control at CJSC Totma Butter-Making Plant is effected by technical and microbiological control services, as their goal is ensuring production in strict accordance with the standards, improving taste and nutritional quality, increasing storage quality on the base of adherence to all technological modes of production.

In order to control quality we conducted researches and identified critical control points. The purpose of this phase was to determine the points, steps or procedures that can be applied to control, making it possible to prevent the hazards, eliminate or reduce them down to acceptable levels. There are the following examples of critical control points: thermal processing, cooling, chemical residues test for the ingredients, control over the structure of products, metal contamination test for products.

Critical control points have been set at the plant in accordance with the recommendations of the State Standard R 51705.1-2001 by the "decision tree" method.

Critical control points for incoming inspection of feedstock are shown in *table 4*.

In order to determine critical control points of the production process it was necessary to answer each question sequentially for every stage, where significant hazards had been identified, and for each hazard. Critical control points of the production process are shown in *table 5*.

The production process hazards were divided into the groups *(tab. 6)*.

Thus, five critical control points were identified:

– 1 CCP – spoilage microorganisms;

– 2 CCP – pathogenic and conditionally pathogenic microorganisms;

– 3 CCP – chemical toxicants in the environment;

– 4 CCP – radioactive elements;

– 5 CCP – extraneous impurities.

Monitoring system was developed for each critical control point in order to carry out planned observations and measurements which were necessary for the early detection of critical limits violations and the implementation of appropriate preventive or corrective effects (process setting-up).

Table 4. Critical control points of incoming feedstock (incoming inspection)

Name of feedstock	Hazard	B1	B2	CCP
Raw milk	Toxic elements	Yes	No	CCP (№1)
	Pesticides	Yes	No	CCP (№2)
	Antibiotics	Yes	No	CCP (№3)
	Radionuclides	Yes	No	CCP (№4)
	Coliform bacteria	Yes	No	CCP (№5)
	Quantity of mesophilic aerobes and facultative anaerobes	Yes	No	CCP (№6)
	Pathogens, including salmonella	Yes	No	CCP (№7)
	L.monocytogenes	Yes	No	CCP (№8)
Auxiliary feedstock	Toxic elements	Yes	No	CCP (№9)
	Pesticides	Yes	No	CCP (№10)
	Radionuclides	Yes	No	CCP (№11)
	Mycotoxins	Yes	No	CCP (№12)
	Nitrates	Yes	No	CCP (№13)
	Quantity of mesophilic aerobes and facultative anaerobes	Yes	No	CCP (№14)
	Coliform bacteria	Yes	No	CCP (№15)
	Staphylococcus aureus	Yes	No	CCP (№16)
	Pathogens, including salmonella	Yes	No	CCP (№17)
	Mold	Yes	No	CCP (№18)
	Yeast	Yes	No	CCP (№19)
	Minor impurities	Yes	Yes	Absent

The absence of unacceptable risk ensures frequency of monitoring procedures.

All registered data and documents related to the monitoring of critical control points must be signed by performers and registered in HACCP worksheets.

Corrective actions aimed at the violations of critical limits should be established and documented for each critical control point.

We have studied two competing products by 5 parameters (external qualities, taste, package security, market outlet, enterprise's prestige) of the elements of HACCP quality management system in points on a 5-point scale *(tab. 7)*.

The coefficient of competitiveness can be calculated by the formula:

$$C = (5\times35 + 5\times20 + 4\times15 + 4\times20 + 3\times10)/$$
$$/(5\times35 + 5\times20 + 4\times15 + 5\times20 + 4\times10) =$$
$$= 445/475 = 0.94;$$

$C < 1$ – low competitive products.

The introduction of the HACCP system will improve package security, expand market outlet and increase enterprise's prestige *(tab. 8)*.

There is the following calculation of the competitiveness coefficient:

$$C = (5\times35 + 5\times20 + 5\times15 + 5\times20 + 5\times10)/$$
$$/(5\times35 + 5\times20 + 4\times15 + 5\times20 + 4\times10) =$$
$$= 500/475 = 1.05.$$

$C > 1$ – high competitive products.

So, the implementation of the elements of the HACCP system is efficient and positive for an enterprise's activity.

The elements of production quality system have been implemented at CJSC Totma Butter-Making Plant since 2012. In order to analyze the cost of quality we have defined four groups of costs for the next three years *(tab. 9)*.

Table 9 shows that the structure of cost is changing. The shares of cost of controlling, internal and external costs of defective products are decreasing, while the cost of preventive measures is rising. The most important object of control is the percentage of quality assurance cost *(figure)*.

Indeed, if the quality management system functions, it reduces the amount of defective

Table 5. Critical control points of the production process

Stage of technological process	Hazard	Availability				CCP
		Close to zero	Insigni-ficant	Signi-ficant	Critical	
Cleaning and cooling	Coliform bacteria	No	-	-	-	Absent
	Quantity of mesophilic aerobes and facultative anaerobes	No	-	-	-	Absent
	Pathogens, including salmonella	No	-	-	-	Absent
	L.monocytogenes	No	-	-	-	Absent
Pasteurization and normalization	Quantity of mesophilic aerobes and facultative anaerobes	No	-	-	-	Absent
	Pathogens, including salmonella	No	-	-	-	Absent
	Coliform bacteria	No	-	-	-	Absent
	L.monocytogenes	No	-	-	-	Absent
	Glass	No	-	-	-	Absent
	Metal filings	Yes	No	Yes	No	CCP (№20)
Inoculation and ripening	Quantity of mesophilic aerobes and facultative anaerobes	No	-	-	-	Absent
	Pathogens, including salmonella	No	-	-	-	Absent
	Coliform bacteria	No	-	-	-	Absent
	L.monocytogenes	No	-	-	-	Absent
	S.aureus	No	-	-	-	Absent
	Yeast and mold	Yes	No	Yes	No	CCP (№21)
	Glass	Yes	No	Yes	No	CCP (№22)
	Metal filings	Yes	No	Yes	No	CCP (№23)
Bunch processing	Quantity of mesophilic aerobes and facultative anaerobes	No	-	-	-	Absent
	Pathogens, including salmonella	No	-	-	-	Absent
	Coliform bacteria	No	-	-	-	Absent
	L.monocytogenes	No	-	-	-	Absent
	S.aureus	No	-	-	-	Absent
	Yeast and mold	Yes	No	Yes	No	CCP (№24)
	Glass	No	-	-	-	Absent
	Metal filings	Yes	No	Yes	No	CCP (№25)
Reheating, whey removal	Quantity of mesophilic aerobes and facultative anaerobes	No	-	-	-	Absent
	Pathogens, including salmonella	No	-	-	-	Absent
	Coliform bacteria	No	-	-	-	Absent
	L.monocytogenes	No	-	-	-	Absent
	S.aureus	No	-	-	-	Absent
	Mold	No	-	-	-	Absent
	Glass	No	-	-	-	Absent
Quality control	Coliform bacteria	Yes	No	Yes	No	CCP (№26)
Marking and packaging	Quantity of mesophilic aerobes and facultative anaerobes	Yes	No	Yes	No	CCP (№27)
	Pathogens, including salmonella	Yes	No	Yes	No	CCP (№28)
	Mold	Yes	No	Yes	No	CCP (№29)
	L.monocytogenes	Yes	No	Yes	No	CCP (№30)
	Toxic elements	Yes	No	Yes	No	CCP (№31)
	Antibiotics	Yes	No	Yes	No	CCP (№32)
	Pesticides	Yes	No	Yes	No	CCP (№33)
	Radionuclides	Yes	No	Yes	No	CCP (№34)
	Coliform bacteria	Yes	No	No	-	Absent
Transportation	Quantity of mesophilic aerobes and facultative anaerobes	Yes	No	No	-	Absent
	Pathogens, including salmonella	Yes	No	No	-	Absent
	Mold	Yes	No	Yes	No	CCP (№35)
	L.monocytogenes	Yes	No	No	-	Absent
	Coliform bacteria	Yes	No	No	-	Absent
	Quantity of mesophilic aerobes and facultative anaerobes	Yes	No	No	-	Absent
	Pathogens, including salmonella	Yes	No	No	-	Absent
	Mold	Yes	No	No		Absent
	L.monocytogenes	Yes	No	No	-	Absent

Table 6. Groups of hazards

Relevant hazard	The group of relevant hazards
Yeast and mold	1. Spoilage microorganisms
Coliform bacteria	2. Pathogenic and conditionally pathogenic microorganisms
Listeria monocytogenes	
Salmonella	
Staphylococcus aureus	
Toxic metals	3. Chemical toxicants in the environment
Pesticides	
Antibiotics	
Nitrates	
Radionuclides	4. Radioactive elements
Glass, metal filings	5. Extraneous impurities

Table 7. The competitiveness indicators before the introduction of a quality management system based on the principles of HACCP (in points on a 5-point scale)

Indicators	Curd «Slavic»	Curd «Classic»	Indicator's share, %
External qualities	5	5	35
Taste	5	5	20
Package security	4	4	15
Market outlet	4	5	20
Enterprise's Prestige	3	4	10

Table 8. The competitiveness indicators after the introduction of a quality management system based on the principles of HACCP (in points on a 5-point scale)

Indicators	Curd "Slavic"	Curd "Classic"	Indicator's share, %
External qualities	5	5	35
Taste	5	5	20
Package security	5	4	15
Market outlet	5	5	20
Enterprise's Prestige	5	4	10

Table 9. Plant's costs of the quality system implementation in 2012 – 2014

Group of cost	2012		2013		2014	
	Amount, thsd. rub.	Structure, %	Amount, thsd. rub.	Structure, %	Amount, thsd. rub.	Structure, %
1. Cost of controlling	**176.30**	**25.5**	**138.53**	**21.2**	**129.53**	**20.2**
Remuneration of the personnel engaged in monitoring and testing	160.28		125.94		117.75	
The cost of materials	16.02		12.59		11.78	
2. Internal cost of defective products	**254.43**	**36.9**	**206.75**	**31.8**	**208.25**	**32.5**
The cost of spoiled goods	254.43		206.75		208.25	
3. External cost of defective products	**147.00**	**21.3**	**120.76**	**18.5**	**88.30**	**13.8**
Remuneration of the personnel engaged in reimbursement	17.80		14.69		10.77	
Transportation cost	4.5		2.70		1.80	
Cost price for spoiled goods	124.70		103.37		75.73	
4. Cost of preventive measures	**112.50**	**16.3**	**185.00**	**28.4**	**215.00**	**33.5**
Training, consulting, etc.	112.50		185.00		215.00	
Total costs	**690.20**	**100**	**651.04**	**100**	**641.08**	**100**

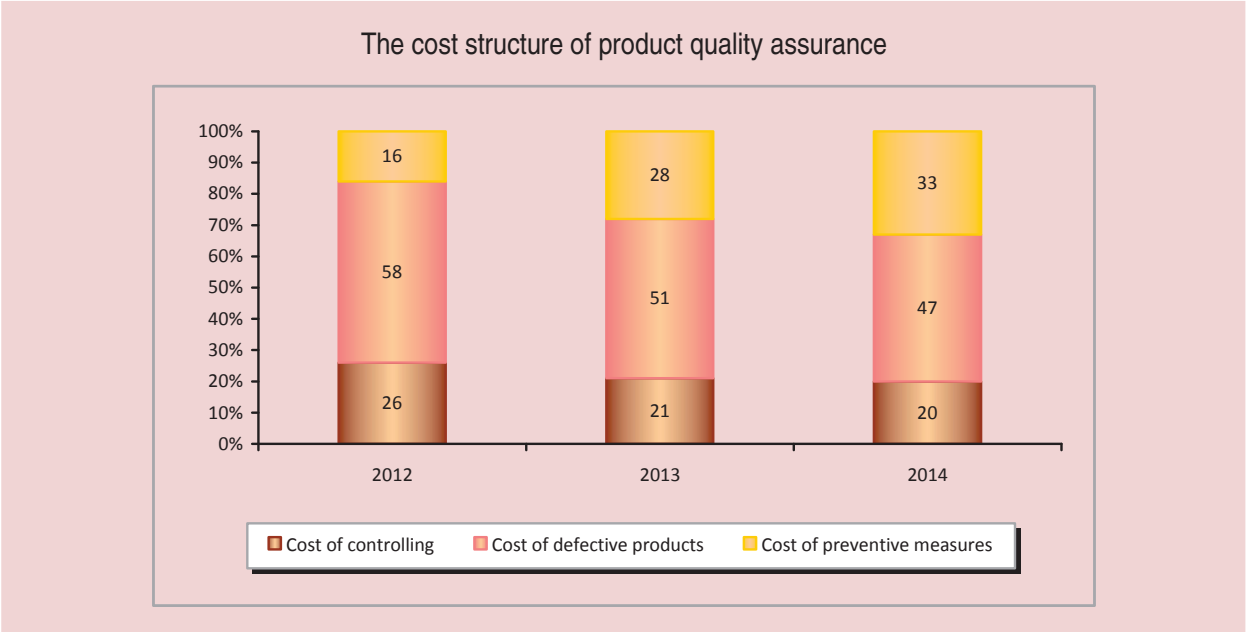

Table 10. Performance indices of CJSC Totma Butter-Making Plan after the introduction of a quality management system

Index	2012	2013	2014
The volume of production, t	250	260	270
Unit cost, rub.	124	127	130
Sell price for production unit, rub.	139	142	146
Cost of commercial output, thsd. rub.	31000	33020	35100
Sale proceeds, thsd. rub.	34750	36920	39420
Gross profit, thsd. rub.	3750	3900	4320
Implementation costs, thsd. rub.	690	651	641
Financial effect, thsd. rub.	+3060	+3249	+3679

products and the cost of controlling, and the main objective of the plant is to guide and coordinate the processes of production.

CJSC Totma Butter-Making Plant will be able to increase the volume of curd production in 2013 and 2014 because this product is competitive and it is in demand *(tab. 10)*.

According to these data, the cost price for curd is rising because the volume of production is increasing. Sale proceeds of these products will increase by 2170 thousand rubles in 2013 as compared with 2012 and by 2500 thousand rubles in 2014 in comparison with 2013.

The growth rate of profit will amount to 104% in 2013 as compared with 2012 and 110.77% in 2014 as compared with 2013.

The effectiveness of quality management is evaluated on the base of profit and profit margins (static values) and the dynamic rate of profit (dynamic values).

Since these values are positive, then the quality management of CJSC Totma Butter-Making Plant can be recognized as effective.

It is obvious that under increasing pressure of regulatory requirements on the food industry, the system similar to HACCP makes business more attractive, increasing its safety and quality standards.

These measures will expand product market of CJSC Totma Butter-Making Plant and, consequently, increase profit that remains at the disposal of the company after the sale of products.

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