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Bogdanova V.A.[1], undergraduate
Zhegera K.V.[1], Ph.D., associate professor
Zharylgapov S.M.[2], Ph.D., senior teacher
[1] Penza State University of Architecture and Construction, Penza, Russian Federation
[2] Zhangir Khan West Kazakhstan agrarian- technical university, Uralsk, Kazakhstan

METHODS OF STATISTICAL CONTROL OF QUALITY IN THE MANUFACTURE OF VINYL'S WALLPAPERS ON PAPER BASIS

Abstract

The article provides information about the types of control exercised in the production process. Since the largest number of marriage arises in the production process, we reviewed statistical methods that are implemented when carrying out operational control. In detail considered the construction of the control X-S-cards.

Keywords*: control, control charts, quality, wallpaper.*

Modern market economy imposes fundamentally different demands on the quality of products and services. Product quality is among the most important indicators of the organization's activities. Improving the quality largely determines the survival and success of the organization in the market, the pace of technological progress, innovation, increase production efficiency, saving all kinds of resources used in production [1].

In order to ensure high-quality products of the company establish control on all stages of the production process, from quality control of raw materials and of materials to determine conformity of the released product technical characteristics and parameters not only during his trials, but also in operation. Therefore, the quality control is aimed not so much to identify flaws or defects in the finished product as to check the quality of the product during its manufacture.

There are three types of control at production: verification, operational and acceptance [2, 3]. As the greatest number of marriage arises at production phase, special attention should be paid to operational control.

One of ways of achievement of satisfactory quality and his maintenance at a stage of operational control is application of one of a statistical control method of production - control cards. At statistical regulation of technological process at control on quantitative sign we will use double control cards on one of which average values, and on another – the characteristic of dispersion are noted that will allow to watch continuously components of the general dispersion – dispersion in instant selections and dispersion between values of average arithmetic various selections. Then it is possible to draw a conclusion on statistical of fice process, only in that case when it is confirmed by both maps.

For identification of the most significant indicators of wall-paper vinyl we will construct a tree of properties (figure 1).

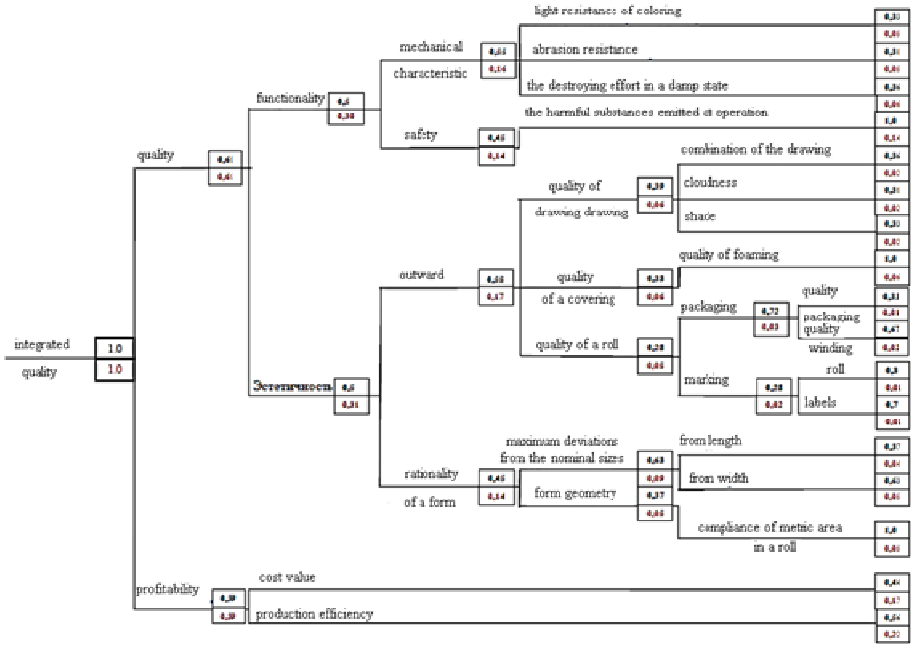


Figure 1 – Tree of properties

The analysis of the constructed tree of properties has shown that the most important indicators of quality are the destroying effort in a damp state, resistance to attrition, light resistance of coloring.

In this regard, at further assessment of quality of wall-paper vinyl on a paper basis, these indicators of quality will be used.

Statistical data, on indicators - the destroying effort (N), light resistance of coloring (points), resistance to attrition (number of attritions) taken in 1,5 months 2017 are given below:

1) The destroying effort: 8,2; 7,8; 8,6; 6,0; 6,4; 8; 3; 8,2; 7,6; 6,0; 6,1; 8,6; 7,3; 6,2; 7,9; 6,8; 9,8; 9,6; 9,3; 6,4; 7,5; 8,5; 8,6; 7,2; 10,6; 6,8; 8,6; 10,2; 10,3; 6,9; 8,4; 7,2; 9,2; 9,0; 6,8; 9,4; 9,6; 9,8; 8,4; 7,5; 9,0.

2) Light resistance of coloring: 7; 6; 7; 7; 7; 6; 6; 5; 6; 6; 6; 5; 5; 7; 7; 7; 6; 5; 7; 4; 4; 6; 7; 7; 4; 7; 5; 6; 7; 6; 7; 4; 7; 6; 5; 4; 6; 5; 4; 5.

3) Resistance to attrition: 42; 44; 42; 42; 43; 40; 41; 40; 42; 41; 41; 40; 41; 42; 44; 41; 44; 44; 44; 43; 43; 41; 43; 42; 42; 43; 42; 44; 43; 41; 44; 40; 43; 42; 44; 43; 42; 40; 43; 43.

As one of the most important indicators of the quality of the vinyl Wallpaper on a paper basis is the fastness to light, we will assess the quality of the technological process for this indicator with the use of controlling the X-S card.

Statistical data for creation of control cards are presented in tables 1-3.

Table 1 – Statistical data of an indicator the destroying effort, N

№	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	$\bar{x}$	$\bar{\bar{x}}$	s	$\bar{s}$
1	8,2	7,8	8,6	6,0	6,4	8,3	8,2	7,6	7,64	8,12	0,94	1,23
2	6,0	6,1	8,6	7,3	6,2	7,9	6,8	9,8	7,34		1,36	
3	9,6	9,3	6,4	7,5	8,5	8,6	7,2	10,6	8,46		1,38	
4	6,8	8,6	10,2	10,3	6,9	8,4	7,2	9,2	8,45		1,4	
5	9,0	6,8	9,4	9,6	9,8	8,4	7,5	9,0	8,69		1,06	

The average quadratic deviation of population is unknown.
Calculation of coordinates of borders of regulation of the s-card:
-upper bound of regulation:

$$UCL = B_4\bar{s} = 1{,}815 \cdot 1{,}23 = 2{,}23, \text{N}$$

-lower bound of regulation:

$$LCL = B_3\bar{s} = 0{,}185 \cdot 1{,}23 = 0{,}23, \text{Nl}$$

whereB_3 and B_4 – the coefficients depending on amount of values in selection.
Calculation of coordinates of borders of regulation the $\bar{x}$ card:
- upper bound of regulation:

$$UCL = \bar{\bar{x}} + \frac{3\bar{s}}{c_2\sqrt{n}} = \bar{\bar{x}} + A_1\bar{s} = 8{,}12 \cdot 1{,}099 \cdot 1{,}23 = 9{,}47\ N$$

-lower bound of regulation:

$$LCL = \bar{\bar{x}} - A_1\bar{s} = 8{,}12 - 1{,}099 \cdot 1{,}23 = 6{,}77\ N$$

In the figure 2 the X-S карта on an indicator the destroying effort is constructed:

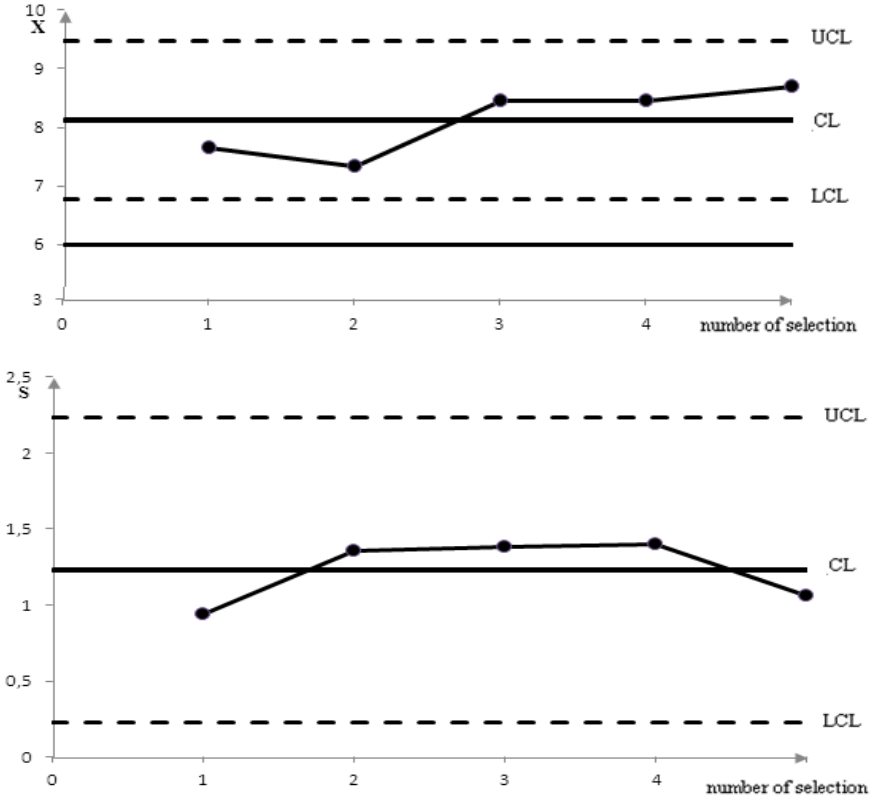


Figure 2 - the X-S карта on an indicator the destroying effort, N

Table 2 - Statistical data of an indicator light resistance of coloring, points

№	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	$\bar{x}$	$\bar{\bar{x}}$	s	$\bar{s}$
1	7	6	7	7	7	6	6	5	6,4		0,74	
2	6	6	6	5	5	7	7	7	6,1		0,83	
3	6	5	7	4	4	6	7	7	5,8	5,88	1,28	1,03
4	4	7	5	6	7	6	7	4	5,8		1,28	
5	7	6	5	4	6	5	4	5	5,3		1,04	

The average quadratic deviation of population is unknown.

Calculation of coordinates of borders of regulation of the s-card:
-upper bound of regulation:

$UCL = B_4\bar{s} = 5{,}88 + 1{,}099 * 1{,}03 = 7{,}01, ball$

-lower bound of regulation:

$LCL = B_3\bar{s} = 5{,}88\text{-}1{,}099 * 1{,}03 = 4{,}75, ball$

Where B_3 and B_4 – the coefficients depending on amount of values in selection.

Calculation of coordinates of borders of regulation the $\bar{x}$ card:
- upper bound of regulation:

$$UCL = \bar{\bar{x}} + \frac{3\bar{s}}{c_2\sqrt{n}} = \bar{\bar{x}} + A_1\bar{s} = 8{,}15 \cdot 1{,}03 = 1{,}87, ball$$

-lower bound of regulation:

$LCL = \bar{\bar{x}} - A_1\bar{s} = 0{,}185 \cdot 1{,}03 = 0{,}19, ball$

In the figure 3 the X-S карта on an indicator light resistance of coloring is constructed:

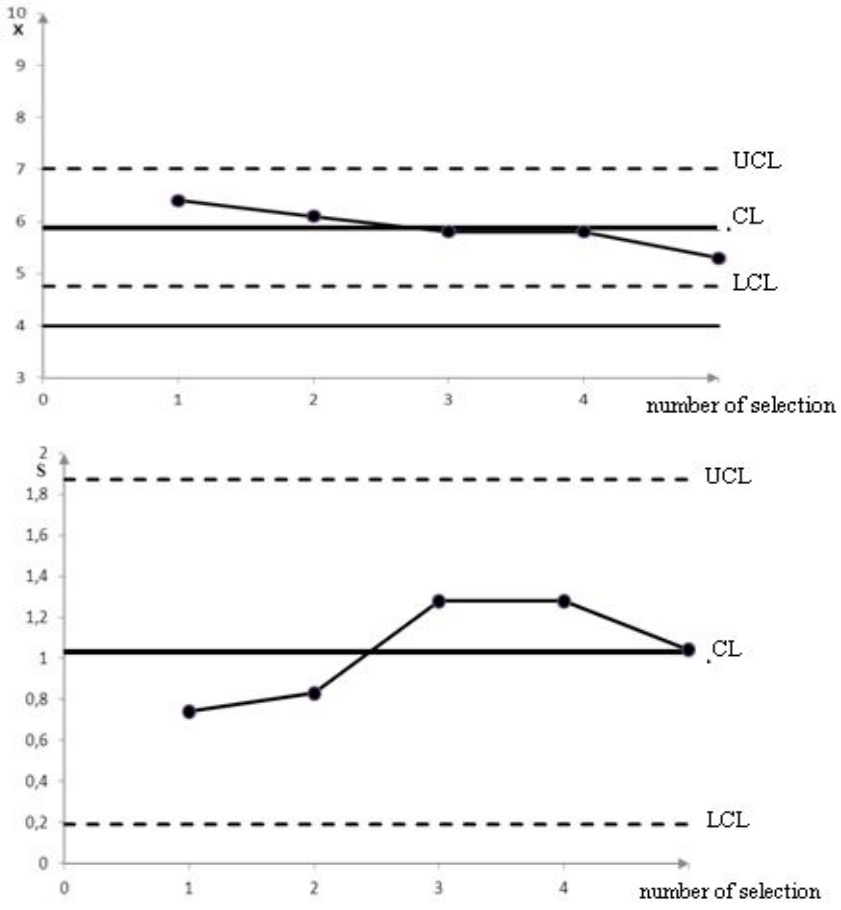


Figure 3 - the X-S карта on an indicator light resistance of coloring, points

Table 3 - Statistical data of an indicator resistance to attrition, number of attritions

№	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	$\bar{x}$	$\bar{\bar{x}}$	s	$\bar{s}$
1	42	44	42	42	43	40	41	40	41,75		1,39	
2	42	41	41	40	41	42	44	41	41,5		1,2	
3	44	44	44	43	43	41	43	42	43	42,23	1,07	1,25
4	42	43	42	44	43	41	44	40	42,4		1,41	
5	43	42	44	43	42	40	43	43	42,5		1,2	

The average quadratic deviation of population is unknown.
Calculation of coordinates of borders of regulation of the s-card:
-upper bound of regulation:

$$UCL = B_4\bar{s} = 1{,}815 + 1{,}25 = 2{,}27 \text{ number of attritions}$$

-lower bound of regulation:

$$LCL = B_3\bar{s} = 0{,}185 \cdot 1{,}25 = 0{,}23, \text{number of attritions}$$

where B_3 and B_4 – the coefficients depending on amount of values in selection.

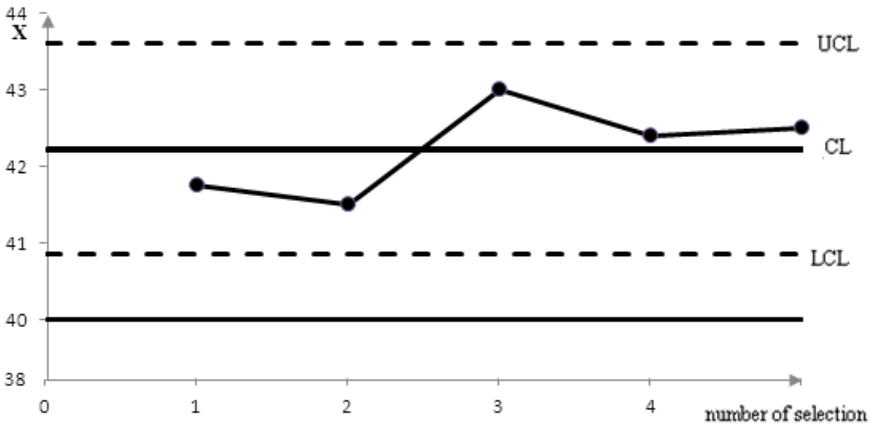
Calculation of coordinates of borders of regulation the $\bar{x}$ card:
- upper bound of regulation:

$$UCL = \bar{\bar{x}} + \frac{3\bar{s}}{c_2\sqrt{n}} = \bar{\bar{x}} + A_1\bar{s} = 42{,}23 + 1{,}099 \cdot 1{,}25 = 43{,}6, \text{ number of attritions}$$

-lower bound of regulation:

$$LCL = \bar{\bar{x}} - A_1\bar{s} = 42{,}23 - 1{,}099 \cdot 1{,}25 = 40{,}9, \text{ number of attritions}$$

In the figure 4 the X-S карта on an indicator resistance to attrition, number of attritions:



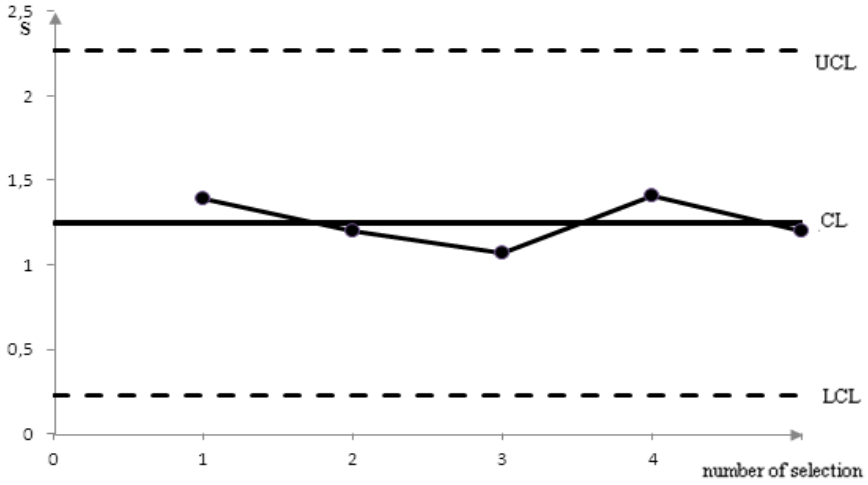


Figure 4 - the X-S карта on an indicator resistance to attrition, number of attritions

Conclusion. Having analysed the received these fig. 2-4 it is possible to draw a conclusion that the considered processes by production of vinyl wall-paper on a paper basis are stable as on all X-S cards there is no exit for regulation borders.

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ТҮЙІН

Мақала өндіріс процесінде жүзеге асырылатын бақылау түрлері туралы ақпарат береді. Өндірістік процесте некеге ең көп соққандықтан, біз операциялық бақылауды жүзеге асыру кезінде қолданылатын статистикалық әдістерді қарадық. X-S-картасының құрылысын егжей-тегжейлі қарастырды.

РЕЗЮМЕ

В статье представлена информация о типах контроля, осуществляемых в процессе производства. Поскольку наибольшее количество браков возникает в производственном процессе, мы рассмотрели статистические методы, которые реализуются при осуществлении оперативного контроля. Подробно рассмотрено строительство управляющих X-S-карт.

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Kashbayev A. A., Senior Lecturer, Master
Kukhta V.S., Ph.D., associate professor
Zhangir Khan West Kazakhstan agrarian- technical university, Uralsk, Kazakhstan

TO THE QUESTION OF ALTERNATIVE ENERGY SOURCES

Abstract

There is a scheme of a gravitational-type power plant in this paper which is provided as a potential alternative energy source. The advantage of this design is the ability of setting the desired position of working balls, which distinguishes it from previously created similar structures.