

ОЦЕНКА ВЛИЯНИЯ КОНСТРУКТИВНО-ТЕХНОЛОГИЧЕСКИХ ФАКТОРОВ НА КАЧЕСТВО ЦЕПНЫХ МУФТ И ИХ ПОДСИСТЕМ

*Сергеев С.А., Толмачева В.М., Боев С.Г., Есипов Д.А.,
Амелин В.Ю., Данильченко В.И., Амелина Н.В.*

Ключевые слова: цепная муфта, качество, допуски, закон распределения.

Аннотация. В работе рассматриваем вопросы, касающиеся выявления влияния входных параметров на выходные показатели цепных муфт и их подсистем (ПС), т.е. устанавливаем связь между ними. Одновременно показываем как можно оценить влияние технологических факторов на выходные параметры и каковы пути снижения технологического разброса этих показателей.

ASSESSMENT OF THE IMPACT OF THE CONSTRUCTIVE AND TECHNOLOGY PARAMETERS ON THE QUALITY OF THE CHAIN COUPLINGS AND THE SUBSYSTEMS

*Sergeyev S.A., Tolmacheva V.M., Boev S.G., Yesipov D.A.,
Amelin V.Yu., Danilchenko V.I., Amelina N.V.*

Keywords: chain coupling, quality, limits, distribution law.

Abstract: The problems concerning correlation of the input parameters and out parameters of the chain couplings and the subsystems are under discussion. More over the estimation of the influence of the technology facilitations on the output parameters and the methods of decreasing the technology dispersion of such parameters are analyzed in the work.

Actual values of the input parameters of chain couplings and their subsystems differ from the estimated data which are determined as nominal. The reasons for technology dispersion (spreading) are the imperfections of the equipment and tools, instability of the material properties from party to party, imperfection of the processes of assembling and control.

Dispersion of the values of the input parameters of the articles has accidental character. Their distribution law for production runs of chain couplings and the subsystems with the fixed engineering procedure, proper equipment can be accepted serviceable. The law is characterized by means of the studied value $\bar{x}$ as the center of grouping of random number) and the measure of dispersion which is the creation of standard (mean effective) deviation S_x or dispersion S_x^2 :

$$\bar{x} = \sum_{i=1}^n x_i P_i ; S_x = \sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 P_i} ,$$

where x_i is the middle of an interval of a statistical row; $P_i = n_i / N$ is the size degree (n_i – bit quantity, N – the volume of tests).

When calculating admissions the maximum deviations limit with the value $\delta_x = \pm 3S_x$. At such value δ_x the tolerance limits contain 99.73% of all deviations.

Technology dispersion of the input parameters stipulates the dispersion of output data, and the correlation between the relative values of the input and output

parameters of chain couplings and their subsystems are presented in the following form:

$$\Delta \bar{y} = D \Delta \bar{x}, \quad (1)$$

where $\Delta \bar{y}$ and $\Delta \bar{x}$ are vectors of relative values of the output and input parameters; D is the matrix of influence coefficients.

We define the matrix D as the product of the transitional matrixes

$$D = ABC, \quad (2)$$

where A, B, C are matrixes of the influence coefficients according to varied input parameters on the output characteristics of the details, parameters of the details on the output parameters of the links and the parameters of the links on the output product data.

The dispersion of the output data is calculated with error equation

$$\bar{\delta}_y^2 = |D_{ij}^2| (\bar{\delta}_x^2), i = l, j = m, \quad (3)$$

where $\bar{\delta}_y^2, (\bar{\delta}_x^2)$ are vectors of the squares of the limits according to output and input values in relative units.

The equations (3) allow to reveal share influence of each parameter on dispersion of output characteristics of chain couplings and their subsystems.

Therefore, the introduced dependences allow solving problems of the analysis and synthesis of subsystems and the system itself. The first problem is to delimitate the limits of dispersion of the output data of the products according to the input parameters. The second problem is to establish the admissible limits of dispersion of input parameters based on the normalized output characteristics. Besides, there appears an opportunity to develop such method of control tests of the output data which could indicate any malfunction in engineering process during production of the products under consideration.

The values $\bar{x}$ and S_x constitute the precision characteristic of the production of the chains and sprockets. Thus the results of the conducted metrological research of the domestic and foreign manufactured chains demonstrate that the first ones possess quite an insignificant half of the scattered field $\delta_x = 3S_x$.

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Сергеев Сергей Александрович – к.т.н., доцент, директор ООО "Наука и образование", г. Старый Оскол, РФ, ssa-cib@yandex.ru	Sergeev Sergey Aleksandrovich – candidate of technical science, associate professor, director of LLC "Science and Education", Stary Oskol, Russia, ssa-cib@yandex.ru
Толмачева Валерия Михайловна – к.б.н., доцент, Курский институт развития образования, г. Курск, РФ	Tolmacheva Valeria Michailovna – candidate of biology science, associate professor, Kursk University of education development, Kursk, Russia
Боев Сергей Григорьевич – к.э.н., доцент, Юго-Западный государственный университет, г. Курск, РФ	Boev Sergey Grigorevich – candidate of economic science, associate professor, Kursk state south-west university, Kursk, Russia

Есипов Дмитрий Александрович – преподаватель, Курский монтажный техникум, г. Курск, РФ	Esipov Dmitry Aleksandrovich – teacher, Kursk mounting technical school, Kursk, Russia
Амелин Василий Юрьевич – аспирант, Юго-Западный государственный университет, г. Курск, РФ	Amelin Vasiliy Yurevich – Ph.D student, Kursk state south-west university, Kursk, Russia
Данильченко Вадим Игоревич – аспирант, Московский государственный строительный университет, г. Москва, РФ	Danilchenko Vadim Igorevich – Ph.D student, Moscow state construction engineering university, Moscow, Russia
Амелина Надежда Викторовна – к.э.н., преподаватель, Курский государственный политехнический колледж, г. Курск, РФ	Amelina Nadezhda Victorovna –candidate of economic science, teacher, Kursk polytechnic school , Kursk, Russia

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