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ALGORITHMS FOR THE SYNTHESIS OF CONTROL SYSTEMS FOR AUTOMATING THE TECHNOLOGICAL PROCESS OF ASSEMBLING PULLEY COVERS IN THE PRODUCTION OF AN AUTOGENERATOR

А. С. Курбонов
независимый исследователь, PhD, СП ООО O'zEraeAlternator

Т. В. Ботиров
Научный руководитель, к.т.н., доцент, НГГТУ

Abstract
Control system synthesis algorithms for automating the pulley cover assembly process in the production of an autogenerator play a key role in improving the efficiency and quality of production processes. Modern automation technologies make it possible to optimize the operations associated with the assembly of components, which is especially important in the automotive industry, where the reliability and accuracy of manufactured products are critical. The technological process of assembling pulley covers in the production of an autogenerator requires an integrated approach, including the synthesis of the control system, control over compliance with assembly parameters and minimization of errors.

Introduction

Automation tasks

Assembling pulley covers is a complex and multi-step process that requires precise operations such as part positioning, mounting, and quality inspection. The main goal of automation is to create a control system that would ensure reliable and uninterrupted implementation of all stages of the process. To do this, it is necessary to develop algorithms that take into account the characteristics of the technological process and adapt to possible changes, for example, to differences in the size of components or fluctuations in operating parameters.

Modeling and synthesis of the control system

When developing algorithms for the synthesis of control systems for assembly automation, it is necessary to take into account the dynamic properties of the equipment, the characteristics of materials and the interaction processes between the individual components of the system. One of the methods of synthesis is the use of mathematical models of the technological process, which make it possible to describe it in the form of a system of differential equations or logical operators. These models help identify critical process parameters and determine which aspects of the assembly require the most careful control.

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Optimization methods are often used to synthesize a control system. The challenge is to minimize assembly time and production costs while maintaining a high level of quality. Optimization algorithms allow you to select the most efficient parameters of the control system, such as assembly speed, forces applied to components, and positioning accuracy.

Intelligent Control Systems

Modern control systems incorporate elements of artificial intelligence and machine learning that can significantly improve the performance of an automated process. The use of neural networks and other machine learning techniques allows the system to adapt to changing operating conditions, predictively control the process, and automatically adjust assembly parameters in real time. Such systems can analyze the data coming from the sensors and offer optimal solutions, reducing the likelihood of scrap and improving the overall efficiency of the process.

Quality control and feedback

A key aspect of automating the assembly process is quality control at every stage. To do this, sensors and monitoring devices are integrated into the control system to monitor parameters such as the correct installation of components, the amount of force applied to the pulley cover, and the condition of the assembly mechanisms. Feedback between the control system and the control devices allows you to quickly react to deviations from the norm and make adjustments to the process.

Data analysis algorithms based on machine vision and other sensor technologies can be used to detect defects in real time. For example, the system may automatically reject lids with visible damage or insufficient assembly accuracy. This reduces the risk of defective products and reduces the cost of subsequent inspection and repair.

The Impact of Automation on Productivity

The introduction of automated control systems into the technological process of pulley cover assembly significantly increases productivity and reduces labor costs. Automation avoids human error, reducing the risk of errors and downtime.

Due to the high speed and accuracy of operations, companies can reduce the time for the production of one unit of products, which leads to an increase in output and a decrease in the cost of production.

Conclusion

Automation of the pulley cover assembly process in the production of an autogenerator using modern algorithms for the synthesis of control systems is an important step towards increasing production efficiency. An integrated approach that includes process modeling, parameter optimization, and the implementation of intelligent systems allows for high assembly accuracy and reliability. The introduction of such technologies leads to a reduction in defects, an increase in product quality and a reduction in production costs, which is especially important in today's competitive industry.

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