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© **Volodymyr Pasichnyk**, graduate student, Educational and Scientific Printing and Publishing Institute Igor Sikorsky KPI, Kyiv, Ukraine, 2022 y.

Supervisor: A. I. Ivanko, PhD in Engineering Sciences, Assistant Professor, Educational and Scientific Printing and Publishing Institute Igor Sikorsky KPI

### **ANALYSIS OF EFFICIENCY OF SHEET MATERIAL FIXATION IN PNEUMATIC FINISHING MODULES**

*The article investigates the pneumatic characteristics of rotary die cutting of cardboard reamers. A comparative analysis of the air flow rate in the improved design rotary cylinders is carried out.*

**Keywords:** *cardboard sweep; rotary die-cutting; rarefied air; die-cutting ruler; pneumatic cylinder.*

*У статті досліджено пневматичні характеристики ротаційного висікального пристрою для картонних розгортки. Проведено порівняльний аналіз витрати повітря в поворотних циліндрах удосконаленої конструкції.*

**Ключові слова:** *картонна розгортка; ротаційний висікальний пристрій; розріджене повітря; лінійка для вирізання; пневматичний циліндр.*

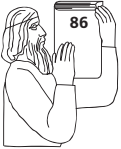


Rotary die-cutting is taking up more and more space in the printing industry. Improved die-cutting processes significantly reduce the cost of manufactured products with constant or even higher quality. In general, the improved cutting process is realized due to more economical use of consumables and better fixing and transportation of sheet materials. However, not all variants of pneumatic printing systems can provide high efficiency in the process of work, and the reason for this may be outdated or failed design of pneumatic cylinders.

With the help of CAD SolidWorks, a series of simulations on transportation and cutting of cardboard scans in a rotary two-chamber cutting module was conducted

at the Department of Printing Machines and Automated Complexes. Accordingly, based on them, it can be argued that an important problem of single-chamber pneumatic cylinders is the uneven fixation along the line of capture and processing directly and along the pneumatic cylinder in general. In the long run, insufficient value of the clamp during transportation can lead to slippage of the sheet, and as a consequence of distortion of the workpiece, or even damage to the elements of the pneumatic module. To avoid such a scenario, pneumatic systems use excess power for guaranteed locking, which significantly reduces the energy efficiency of the production module.

In the process of research, comparing the theoretical and practical significance, we obtain a very significant difference, which indicates a significant excess of work performed by the pneumatic system.



We will translate the obtained values of the working clamp into the volumetric air flow and get the following values. For practical significance:  $Q_{pr} = 0,059 \text{ m}^3/\text{s}$ . And for the meaning of the ideal:  $Q_{id} = 0,0457 \text{ m}^3/\text{s}$ .

It should also be noted a reduction in air consumption by 23 %, which indicates a possible increase in the theoretical efficiency of the pneumatic die-cutting module by improving its design.

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Науковий керівник: Т. В. Нерода, канд. техн. наук, доц., УАД

## **ПОБУДОВА СТРУКТУРНОЇ СХЕМИ ІНТЕГРОВАНОЇ СИСТЕМИ АВТОМАТИЗОВАНОГО КЕРУВАННЯ ТЕРМОПРЕСОМ**

***Структурна схема проекту інтегрованої системи автоматизованого керування термопресом складається на***