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Ivanko Andrii, Candidate of Engineering Sciences (PhD), docent,  
Associate Professor  
(Igor Sikorsky Kyiv Polytechnic Institute)

## **PNEUMATICS IN THE TRANSFERRING SYSTEMS OF PRINTING MACHINES**

Sheet materials (*SM*) transferring in the printing, bookbinding and packaging machines is the core technological process. Sheet materials, in particular paper or cardboard is subject for significant load caused by the changes in direction and type of transferring. Depending on the processes of printing, folding, cutting or punching, character of sheet movement can be constant rectilinear motion or accelerated and decelerated ones along a curvilinear trajectory.

Reduction in the time of product manufacturing causes the creation of the hybrid printing systems including the modules of final processing. The mention above relates to the bookbinding units and modules for packaging production.

The aerodynamic gravitational effect and absence of driven actuating components appears to be the basis for pneumatic modules. The compressed air flow streaming from the nozzles of the air distributing chamber creates the force interaction for flow and sheet surface. Due to reactive and adhesive forces, vicious drag, air cushion and so called flow adhesion to the streamed side it is possible to separate, transfer and direct sheet material (*SM*) in the space without any hindrance. For the forced sheet transferring in the lower bearing surface of the air distributing chamber there are one or several rows of the cylindrical holes placed perpendicularly or with the angle to the direction of the sheet transferring. Force of dynamic air pressure in the given aerodynamic feeder will be the determining factor for calculation of the speed of *SM* moving  $V_A$ .

Speed of *SM* transferring  $V_A$  can be provided through the capturing module with discrete pneumatic drive. Compressed air with constant pressure is provided by the pneumatic chamber placed over vertical feeder table and holes-nozzels placed at right angle to the sheet surface. While module working air flows stream from the nozzles and due to adhesive force appearing in the zone of andface, sheet rise to the given level  $H$  and is pressed to friction pass.

The sheet surface should to have minimal contact with the driven actuating components. In the defined zone air cushion excludes not only any contact with mechanical parts of machines, but also is able "smoothen" its edge be the directed air flows and slow the motion in case of necessity.

Usage of the pressure-blowing devices in the form of regulated air tubes, placed on the way of *SM* transferring creates non-contact movement

in the air field in the air field. Created air system provides fast and accurate positioning of the *SM*. Vacuum slowing module diminishes partly the sheet kinetic energy. Although, due to interaction with vacuum slowing device it is possible the arising of the so called *SM* stretching. Consequently, speed movement slowing should be followed with adequate selecting of the sheet drag forces on the vacuum rollers surface as well as aerodynamic force.

Directed action of air flows causes the intensity necessary for providing the sheet material transferring and its packing into sheet stacks. Air flows can be separated and have an individual control for regulation of the *SM* kinetic energy and provide the necessary speed to the stopping elements. Pneumatic formational element increases the *SM* roughness due to creation of its round figuration. The shape of such type allows to increase the speed of *SM* transferring to the stopping elements and prevent its edge damage.

The pneumatic sections for transferring of cardboard unfolding can interact successfully with technological cutting processes. The production their profiles it is used the cutting section with rotary contraction. Taking into consideration the technological method for knife cutting that decreases the intensity of the cardboard unfolding cutting on 50%, and in the knives with doubled rectilinear chamfer on 20–25 % respectively, it is possible to use compressed air as the stopping knife element. In another words, to apply the pneumatic chamber with so called pneumatic counter-knife.

Pneumatic systems increase the working recourses of the cutting rules, deals with problems of dissymmetrical positioning of tools and devices, decrease the total technological intensity and simplify the setting of the cutting module in general. Usage of the pneumatic transferring devices of the module construction handles a problem of aggregation of the different equipment in to the single flow line.