# System of Decreasing the Tear and Wear Processes in Printing Equipment

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**Analyze of a modern tear and wear problems of details in a offset printing machines is made in the present issue. The system of decreasing the tear and wear processes is offered. Different methods of increasing of operational characteristics in printing equipment are described.**

## 1. Introduction

Modern printing equipment is an important and expensive part of production technology in every printing house. Today every printer must reach a continuous work of its equipment to reach good economical results of business. But equipment's durability is not only provided by manufacturer's design department, it is also a responsibility of service companies and, of course, in the competence of printing house. The only question – what processes do we need to analyze to predict production problems?

We think that reliability and durability of printing machine's parts and mechanisms mostly depends from the quality of the surface coating and its finishing.

As a rule, the main origin of destruction of mechanism parts during their working life is laying in the surface. In a few years of usage we can find chafed places, tear and wear processes, microcracks and pulldowns on cylinders of offset printing machines.

In such situation printing houses really need the system and different methods of prevention of mentioned defects and decreasing of tear and wear processes in printing equipment.

## 2. Analyze of presented researches

Increasing of service life of parts and assemblies of printing equipment, their usability is achieved by a variety of methods, like mechanical handling and superficial plastic deformation methods, as well as trapping decoration and strengthening technologies causing corrosion resistance and other types of coverage.

In some of the works developed technological processes enhance usability detail using chromium and finishing-strengthening processing [1, 2]. Such technological features and limitations do not allow the printing houses to use the results of previous studies when restoring journals of shafts, rubber coating and painting shafts, current repair surfaces of offset cylinders etc. Other development dedicated impregnation aluminum, grey, zinc, silicon [3], but the question of development of the swhole system is not considered.

## 3. Results and Discussion

When analyzing a workload, which is common for the sheetfed and web offset presses, one of the most important factors in decreasing of detail's working condition is appears. It is the processes of tear and wear, corrosion and attenuation.

There are a lot of different factors can cause such processes, but printing house's management can't avoid all of them – because of the specific of offset printing. In the same time we can predict what factor will do more harm or less (see Figure 1).

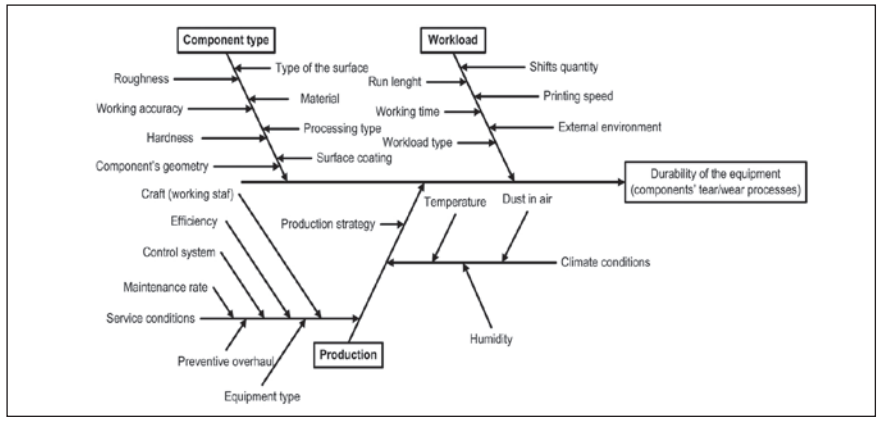


**Figure 1:** Mind map of components which take impact on durability of printing equipment



As we see, there are three main groups of factors which are influence on durability of the equipment – component type, workload and production. This means that changing of one will change all processes of tear and wear in mechanism parts. Of course, we can't decrease or move out some of them (f.e., humidity or paper dust), but we can control them and achieve the best standards. In the same time we know, that every company is working in a competitive market, the workload must be on maximum. So, printer will change or cut this group – increasing of the runs means better progress in business.

But looking only for a production factors, like service, preventive overhaul or maintenance rate, we must not forget about preventive factors – component type. To predict tear and wear printing house and manufacturer of equipment can:

- change material of the component;
- change working accuracy;
- improve surface coating;
- change type of the surface etc.

Some of these methods are not effective; some can bring additional benefits to the production process.

There are a lot of different methods for obtaining a trouble-free operational cycling. Some of them are based on the component's surface dynamical strengthening [2], other are offering the complex system of printing machinery control [4]. But one of the most universal and modern methods is strengthening with a help of vibration roll burnishing [5]. The method is based on strengthening of surface with a help of micro deformation of material's top layer (see Figure 2).

**Figure 2:** Vibration roll burnishing on a shaft

During the analysis which was made in the Ukrainian printing houses some main problems were found. The main – is dependence between workload for printing machinery and tear/wear rate, control system which is working at production, preventive overhauls and quality of printing. In the same time, paper dust, aggressive chemistry, dampening solutions and other factors are lead to progressive declining of printing equipment and its components.

To prevent such defects and problems the model of technical ensuring of printing machinery detail's rebuilding; the processes and algorithms of additional strengthening processing is offered with a help of application of fully regular surface microrelief (IV type).

## 4. Experiment

During the experiment the main object was the offset printing press Heidelberg Speedmaster SM 102-6 with Alcolor system. In this machine the printing group consists from 21 shafts (see Figure 3). The group consists from: 4 ink rollers (1, 2, 3, 4), 5 distributing ink rollers (8, 10, 13, 18), dab (20), dampening rollers (22, 23, 25, 28) etc.

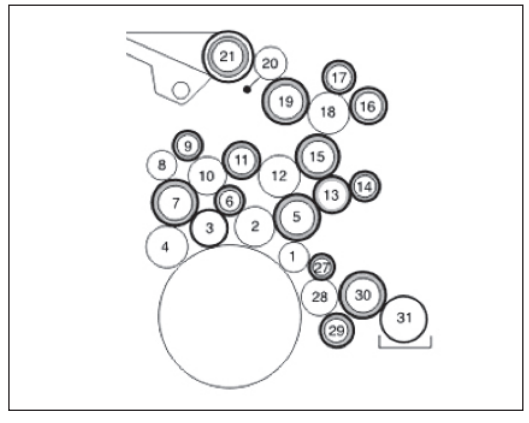


**Figure 3:** The scheme of ink and dampening rollers with mounted microrelief in a printing press Heidelberg Speedmaster SM 102 with Alcolor system

In general case a process includes: the removal of group of ink rollers (1, 2, 3, 4) from a printing press, defectation, enhanceable wear of necks, delete of old rubber coverage, rolling, on rollers (with the diameters of D1=42,0 mm, D2=52,0 mm, length L1=1087,8 mm, hardness HRC 57-60) fully regular microrelief of IV type.

As known, in a process the most critical are parameters of inflicted microrelief, and modes of operations of equipment which is used for its mounting. Going out from kinematics features the amount of turns of spindle ($n_s$), eccentricity (e), oscillation of instrument ($n_{d.t.}$), feed of detail (S) and correlation (i) which determines the mutual location of inequalities. For this case the parameters was: $n_s$=40 revo, S=2,5 mm/turn., $n_{d.t.}$=1400 min.$^{-1}$, e=1,5 mm, i=35, P=80 kg.

After the mounting of the microrelief, the rubber is mounted, and then the process of vulcanization starts. After the facing process to the width 1035 mm, the roller is placed on polishing machine, making a polish, conduct the static balancing.

During the usage of presented technology in different printing houses such advantages were reached:

- Increasing of life cycle of spare parts and mechanisms in offset printing equipment on 30-40%;
- Less time usage for maintenance and service stops;
- Decreasing of mistakes during the process of printing with conventional and UV-inks.

## 5. Conclusions

The technological process and the results of the researches allow partially argue about the high efficiency of system process based on vibration roll burnishing. Its application has allowed to increase the adhesion of rubber to the body of the shaft, upgraded the wear resistance when printing UV inks and allowed to reduce the frequency of scheduled recovery shafts in 1.6-1.9 times. Developed algorithm allows to connect options of printing equipment, the ordinary operations of the modes vibration roll burnishing. The results of this study can be used in further work to improve the usability of cylindrical parts of printing equipment.

## 6. References


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