INTRODUCTION OF NEW TECHNOLOGIES FOR NOISE REDUCTION IN PAPER PRODUCTION

Andrii Kovtun
Candidate of technical Sciences, senior lecturer, IEE
National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

Olena Zemlyanska
Senior lecturer, IEE
National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

Maksym Kovtun
Candidate of higher education of IEE
National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

Noise is one of the most harmful factors inherent in our civilization. Production noise is a chaotic set different in force and the frequency of sounds, arising in the air environment and directly affect working capacity. Introduction in production of new technological processes, increase in capacities and rapidities of processing equipment, mechanization of productions was brought to that, workers during change to a greater or lesser extent are exposed negative impact of noise. [1]

Noise adversely influences the person. In workers who deal with the roaring machines and mechanisms, there is steady hearing disorder that quite often brings to occupational diseases (partial and total deafness). The largest loss of hearing is observed within the first ten years of work, and eventually, this danger grows.

However long noise influences not only aurally. It makes the person nervous, her health influences yours, reduces working capacity and speed of the movement, slows down the thought process. All this can lead us to an accident on production. The most productive means of fight against noise – decrease it in a creative source.

The industry in general and the paper industry, in particular, are most often faced with the fact that if the standard noise level is exceeded, the operation of the equipment is impossible at all or only within limited limits. The introduction of innovative technical solutions, such as a seal tape for suction shafts, fully meets the requirements of today’s noise level.

The usual level of sound pressure in the vicinity of a working paper machine poses the challenges for designers to implement noise protection measures. In particular, legislation on worker health and environmental protection requires the introduction of noise reduction measures.

The introduction of the technology of reducing the level of noise, which is issued by paper-processing machines, in particular: The noise level of suction shafts should be reduced by 5 dB, which corresponds to the reduction of sound energy by 68 %. Reducing the level of noise at the level of the working area will significantly improve the working conditions near the paper production machines. Because the main sources of noise in the paper processing machine are the bales of the forming and press parts.

The development of the latest technologies is carried out in research fields such as «seals with optimal wear», [2] reduction of energy consumption and reduction of vacuum losses.
Comprehensive research and testing results in new seal materials and new seal geometry. The SeaLencer system (Fig. 1) was described as a result of systematic research studies on a stand for acoustic tests in search of low noise design.

![Fig. 1. Main shaft of SeaLencer system](image)

Besides other parts, suction shaft consists of shaft housing with holes and vacuum suction box. Sealing belts are used to isolate the vacuum in the wrapper of the suction shaft and are pressed against the inner side of the suction shaft body. When conventional sealing belts are used on the outside, the vacuum is broken. After leaving the suction zone, due to the sudden flow of air back into the holes of the suction shaft, pulses of high-frequency sounds occur, which cause an irritating effect of noise of the suction shaft. [3]

The purpose of the SeaLencer system is determined by its specific geometry to optimize the pressure gradient in the interference over the sealing tape. The gradual, non-sudden flow of air into suction holes on the surface with beveled edges leads to a controlled and uniform reduction of the pressure in the holes, which is easily determined by hearing: the sound is «softer» with a reduced level of sound pressure.

The starting acoustic tests at a speed of 1000 to 2000 m/min show the acoustic effect (Fig. 2) produced by the SeaLencer system by means of acoustic images: The horizontal axis is related to the frequency and the vertical axis is related to the speed. [3]

![Fig. 2. Acoustic effect of SeaLencer systems](image)

Each color represents the sound pressure level in the corresponding frequency band (yellow – very high level, red – high level, blue – medium and low level). A comparative analysis of the conventional sealing tape and the Sealner tape shows a marked decrease in the level of sound pressure produced and a significant decrease in the proportion of irritable high frequencies (yellow lines and red zones).

Additional advantages of the Sealner system are reduced friction energy and reduced wear of the material from which the sealing belt is made (longer life). As the sealing surface decreases, not only the friction between the sealing belt and the shaft body is significantly reduced, but also the thermal stress of the sealing belt material.

After the system was installed, the Sealner on the paper processing machine decreased the level of sound pressure produced by 5 dB. Those skilled in the art
describe the noise produced by the sucking Gauche shafts after modernization as «softer», «quieter» and «more pleasant».

Conclusions. The development of technologies to reduce noise levels, which is one of the key topics of scientific works, has been analyzed. The main directions and questions of research activity are described to reduce the noise levels at workplaces and improve safety in terms of noise impacts, because noises are the theme of the future for many sectors of industry.

References:

DOI 10.36074/15.05.2020.v5.32

PSYCHOLOGY OF LABOR SAFETY

ORCID ID: 0000-0003-0821-2166 Natalya Prakhovnik
Candidate of technical Sciences, associate Professor, IEE
National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

ORCID ID: 0000-0002-9608-3677 Olena Zemlyanska
Senior lecturer, IEE
National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

Vladyslav Kolomiichuk
Candidate of higher education faculty of Electrical Engineering and Automation
National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute»

UKRAINE

Industrial traumatism is called the «disease of the 20th century». According to the World Health Organization (WHO), deaths from accidents in our time take the third place after cardiovascular and oncological diseases. Statistics show that there were 410 deaths and about 4394 accidents in Ukraine in 2019. [1] It is impossible to reconcile with the suffering and death that a people’s productive injury brings.

This is to some extent the generation of human hands, the costs of technological progress. In order to cure society from this terrible «disease», obviously, it is necessary to follow the same path, which is followed by medicine, which has learned to fight against many diseases considered incurable. To cure a particular person means to return to his health. To cure from disease society means to create such conditions in which the disease is practically impossible.

Such disposal of diseases is called prevention. This is the most important principle of medicine. Prevention of industrial injuries is the only effective method of combating it.

The psychology of labor safety is a branch of psychological science, which studies the psychological causes of accidents arising in the process of work and other activities, and develops psychological methods for improving safety. The object of