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Additional components of risk assessment and their impact on the probability parameter

Piotr Saja[1], Artur Woźny [2], Andrzej Pacana[2], Magdalena Dobosz[1]

[1] Podkarpackie Center of Educational Services (Rzeszów), e-mail: psaja@pcud.edu.pl
[2] Rzeszów University of Technology, Faculty of Management

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Abstract
The article raises the issue of risk assessment and its impact on the quality and safety of work. During the assessment of the turning lathe position additional components associated with the jobs personalization were taken into account. Paragraph 2 item 7 of the Regulation of the Minister of Laborr and Social Policy of 26 September 1997 on general safety regulations defines occupational risk as the likelihood of an adverse event. The authors drew attention to the reality of the accident, which sometimes depends on the predisposition of the employee. It turns out that a correct estimation of the probability of occurrence of the accident to be able to react in a timely way seems extremely important.. This parameter will be assessed more accurately if we take into account a number of additional components resulting from the characteristics of the employee. The results of the personalized assessment of risk may allow appropriate planning of corrective and preventive actions.

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1. Introduction

The provisions of the Labor Code in the art. 226 indicate a series of tasks and responsibilities of the employer related to risk at work occurring at the workplace, which is the basis of preventive health protection of workers. A duty to assess, document, inform employees of the occupational risks and the rules of protection against threats, and above all the need for the necessary preventive measures to reduce the risk are worth specifying. However, to be able to introduce appropriate corrective or preventive measures, it is necessary to estimate this risk as precisely as possible.

Due to the lack of specific guidelines on the assessment of occupational risk, it is conducted in various ways, depending on the knowledge and experience of evaluators. The choice of the appropriate method is not successful in the assessment. It is crucial to estimate accurately various parameters of the method used which, in consequence, leads to the real result of the final risk assessment. As a result, there is a possibility of preventing or minimizing the effects of adverse events.

2. Estimation of professional risk

The risk assessment includes collection of information, hazard identification, risk assessment and determination of risk acceptability. Estimation of occupational risk is, therefore, the third step in the whole procedure of the assessment. The selection of an appropriate method that will be adequate to the analyzed position is important at this stage, and then one needs to determine the size of the individual parameters, while taking into account all information gathered so far. The position evaluated.

Parameter P is very important in the risk assessment parameter is P defined as the probability. It is found in most of the available methods, e.g. PN-N-18002, PHA, Risc Score, or IEC 300-3-9 (GREENWOOD R. 2006, ROUGHTON J., CRUTCHFIELD N. 2008)

3. Additional components and their impact on the probability parameter

Probability means assigning numbers to the random events, usually from the unit range indicating the chances of occurrence (ZAŁUSKI W. 2008, CONSTANTIN S. 2012).

In practice, the bases for assigning the appropriate quantity to the probability parameter during the occupational risk assessment are the data on accidents, occupational diseases, or information gained from observation on the posts and an interview with the employee. However, in the literature (ORDYSIŃSKI S. 2014, WOŹNY A., PACANA A. 2013,

ZAWIESKA M. 2007) one can find additional components that can add credibility and accuracy. They include:

- employee's length of work in the workplace,
- experience on the post,
- age,
- health, and diseases recorded.

The authors improved risk assessment of the professional risk of a lathe operator position, which for a long time has not been updated, and the result of the assessment over the years have been acceptable. Changing the employee's age, seniority or experience, over the years, these results have changed significantly. During the comparative analysis in the article PACANA A., ET. AL., *Additional determinants of occupational risk assessment on the example of the HGV driver* - Technika, Eksploatacja, Systemy Transportowe No. 6, 2016 the authors showed the differences after an introduction to assess the characteristics of individual employees.

The authors' experience shows that the inclusion of additional components as shown in Table 1. changes result of the risk assessment and makes it more appropriate.

The components of risk assessment listed in Table 1 have been analyzed on the example of a lathe operator.

3. Position characteristics

Comparative risk assessment of the position was conducted on the position shown in Fig. The lathe, which is the equipment for this position, is located in a small factory. The employer employs six workers on this position. Each of them has different seniority and age,and different health problems or lack of them.

Fig. 1. View over the position of lathe turning in the analyzed workplace.

The tasks of the employee - a lathe operator include mainly activities such as:

- preparation of the work (becoming familiar with the technical documentation preparation tools),
- parameter setting and overseeing the work of lathes,
- clamping of workpieces,
- commissioning, implementation of treatment and stop of the lathe turning,

Table 1. Additional components

Seniority, experience	
Big:	Routine
Small:	Lower knowledge about the position, low level of skills for troubleshooting of typical situations that require to prevent accidents or injuries resulting from the lack of experience and knowledge of how to behave in a given situation
Age	
Young person:	Tendency to risk and bravado
Older person:	Weaker physical condition, faster fatigue, less quickness, reduced span attention, cardiovascular problems, dysfunctions of the musculoskeletal system.
Health status, co-morbidities:	
Periodic sleep apnea, insomnia, lack of rest before starting work, skin or inhalant allergies (pollen season), headache, difficulty in concentration, drowsiness, chronic fatigue syndrome, diabetes: general weakness, blurred or double vision, a history of stroke , ailments of the gastrointestinal tract (reflux), hypertension, dizziness	

- detection of irregularities in the work of the lathe and informing relevant departments of restoration and repair,
- handling of instruments and measuring tools to check refinishing quality,
- maintaining the workplace with regard to the principles of rational organization of labor, health and safety, fire protection and environmental protection.

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The key information for personalized risk assessment included:

- work experience, 12 years in this company,
- 15 years of experience
- age: 52 years old
- health: diabetes, hypertension.

Owing to this information it is possible to make a more detailed risk assessment.

4. Estimation of occupational risk for the lathe operator with an application of Risk-Score method

The team of inspectors after identifying all hazards and a deeper analysis showed the selected physical hazards. The Risc-Score method was chosen for occupational risk assessment and the methodology can be found e.g. in the literature (WOŹNY A., PACANA A. 2013).

Table 2. Estimation of professional personalized risk on a lathe operator position

Selected physical hazards		
1. Tripping, slipping, resulting from slippery and uneven surfaces around the machine (e.g.: a result of splash or spill of fluids (oils, coolants, etc.).		
P	**6**	Quite probable
E	**6**	Frequent (daily)
S	**3**	Loss: Average/ Employee absenteeism
Result	**198**	**Risk: Acceptable** (Recommended control – prophylactic actions are not necessary)
2. Sharp, projections and rough machine parts, e.g.: components of machines, tools, chips, on workpieces, etc.		
P	**10**	Very probable
E	**6**	Frequent (daily)
S	**7**	Loss: Big Severe body injury
Result	**420**	**Risk: Unacceptable.** One should immediately about the work process
3. Risk of eye injury with foreign particles, e.g. dust or chips.		
P	**10**	Very probable
E	**6**	Frequent (daily)
S	**7**	Loss: Big Severe body injury
Result	**420**	**Risk: Unacceptable.** One should immediately stop work
4. Moving parts of machines supported, in particu-lar: • rotating cutter heads or turret lathe chucks, spindles, screws, shafts, etc., • space converging rotating machine elements, for example. Gears, friction wheels, pulleys, sprockets, etc., • tool moving linearly, e.g.: frame saws and belt conveyors.		
P	**10**	Very probable
E	**6**	Frequent (daily)
S	**7**	Loss: Big Severe body injury
Result	**420**	**Risk: Unacceptable.** One should immediately stop work
5. Falling machine parts, e.g.: heavy workpieces, handles, clamps, tailstock, etc.		
P	**10**	Very probable
E	**6**	Frequent (daily)
S	**7**	Loss: Big Severe body injury
Result	**420**	**Risk: Unacceptable.** One should immediately stop work
6. Surfaces hot or cold (hot surfaces, machine parts and workpieces, hot water, coolant, oil, and steam).		
P	**6**	Quite possible
E	**6**	Frequent (daily)
S	**7**	Loss: Big Severe body injury
Result	**252**	**Risk: Tolerable** Necessary to verify the recommended preventive measures
7. Ejection of workpieces or tools during the process of cutting metals, e.g.: spatter, workpieces, damaged tools (grinding, turning tools, milling cutters, etc.).		
P	**6**	Quite ossible
E	**6**	Frequent (daily)
S	**7**	Loss: Big Severe body injury
Result	**252**	**Risk: Tolerable** Necessary to verify the recommended preventive measures
8. Noise threat, damage, or loss of hearing.		
P	**6**	Quite possible
E	**6**	Frequent (daily)
S	**7**	Loss: Big Severe body injury
Result	**252**	**Risk: Tolerable** Necessary to verify the recommended preventive measures

When determining the number of the probability parameter of accident occurrence (P) as 10 or very likely one took into account the human factor, which has a significant impact. Component: employee's age, seniority or experience influenced the choice of the size of a reference numeral.

The example analyzed showed the influence of tie and changing individual characteristics of the employee on the outcome of a risk assessment.

5. Conclusions

Risk assessment is currently the subject of theoretical considerations among scientists, inspection bodies, inspectors of Chief Labor Inspectorate and acting on their behalf inspectors of OSH services. A properly performed risk assessment on the example of the operator of the lathe with additional components turns out to be the key to a wrecked or collision-free work process. If it is assume that, while risk assessment, that parameter "P" is at level 6 - then the overall risk is acceptable, given the parameter "P" at 10 (very likely) the overall risk appears to be "unacceptable" – which forces the employer to cease the work process immediately.

The analysis showed the need to pay attention to additional components resulting from human factor thus creating a personalized risk.

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風險評估的其他組成部分及其對概率參數的影響

關鍵詞
塑性變形，奧氏體，
不銹鋼，
磁性能

摘要
本文提出了風險評估及其對工作質量和安全性的影響的問題。
在車削車床位置的評估期間，考慮了與作業個性化相關的附加部件。
1997年9月26日“勞工和社會政策部長關於一般安全條例的條例”第2款第7項將職業危險定義為不良事件的可能性。 作者提請注意事故的現實，有時取決於僱員的傾向。
事實證明，對事故發生概率的正確估計能夠及時作出反應似乎極為重要。如果我們考慮到一些附加組件導致的這個參數將被更準確地評估， 員工的特點。
風險的個性化評估的結果可允許對糾正和預防措施的適當規劃。