

SAFETY AUDIT OF BAND SAW IN MANUFACTURING ORGANIZATION

Martin Kotus¹, Erika Jankajová¹, Katarína Lestyánszka Škúrková²,
Darina Matisková³, Martin Zach⁴

¹ Department of Quality and Engineering Technologies, Faculty of Engineering, Slovak University of Agriculture in Nitra, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic

² Institute of Safety, Environment and Quality, Faculty of Materials Science and Technology in Trnava, Slovak University of Technology in Bratislava, Botanická 49, 917 24 Trnava, Slovak Republic

³ Department of Manufacturing Management, Faculty of Manufacturing Technologies with a seat in Prešov, Technical University of Košice, Bayerova 1, 080 01 Prešov, Slovak Republic

⁴ Expert Engineering Department, Institute of Lifelong Learning, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

Abstract

KOTUS MARTIN, JANKAJOVÁ ERIKA, LESTYÁNSZKA ŠKŮRKOVÁ KATARÍNA, MATISKOVÁ DARINA, ZACH MARTIN. 2016. Safety Audit of Band Saw in Manufacturing Organization. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 64(2): 467–471.

This paper deals with the verifying of safety status for a selected device in the manufacturing organization. The safety audit of band saw was realized in the manufacturing process. Safety requirements of the machinery for cutting material are given in the standard STN 200723. This standard from the point of view of the work safety defines selected requirements for sawing, cutting compounds and the using of prevention to work with cutting compounds. Among the basic requirements belong material clamping and security services for cut, band saws and jaws wear, as well as the required protective cover. The efficiency of audit in percentage was evaluated by the level of fulfilment as follows: fulfilled (A) mostly fulfilled (AB), conditionally fulfilled (B) or unfulfilled (C). Through safety audit, were defined the weaknesses that increase the degree of employee health hazard. There were proposed corrective actions to eliminate weaknesses and retraining employees. It is still needed to perform the safety audit due to reduction of the probability of occupational injury.

Keywords: occupational safety, risk, health hazard, danger

INTRODUCTION

Verifying the status of an organization, a firm or a company in the area of business economics is understood as a safety audit. The results of verification are recorded in various forms. An effective enforcement of determined processes has to be verified by internal audits at regular time intervals. Audit includes the experience gained by executives and experts in the area of occupational safety and health during inspection in organization, inspection and control of workplaces and technical devices as well as during seminars and trainings (Burda *et al.*, 2010; Mura, 2012).

In the area of management systems, audit is established as a valuable tool for the assessment of functionality and suitability of systems. The safety

audit can be included in the priority in reducing the risk of employee health hazards.

The employer is obliged to permanently check and require legislative compliance and other regulations to ensure occupational safety and health, principles of safe work, safe behaviour at the workplace and safe working practices. If deviations are observed in the compared state of the process 'should be – is', it is necessary either to carry out the training of staff or the instructions for the procedure must be adapted to the actual course of the process (Kredatusová *et al.*, 2010; Bujna *et al.*, 2010).

This paper evaluates the safety of the band saw in the manufacturing process of metallic materials separation. Manual handling with material and its shape with sharp edges represents a potential health hazards for employees. During the cutting

operation, there is a risk of staff injury. However, the cutting tool crucially influences the quality of the machined surface (Votava, 2013a; Votava, 2013b). The risk of occupational injury can be reduced by an appropriate work process, by using of personal protective work equipment and by staff training.

MATERIAL AND METHODS

The concept of audit can be understood as one form of control. It allows us to know the strong and weak points of occupational safety; it gives an answer not only to what is in this area inadequate but also why this is so and how to obtain redress.

The safety audit is performed in the manufacturing organization METALTRADE, s.r.o. located in Nitra. The company deals with machining of metal parts for the automotive industry, particularly with components for exhaust and catalyst systems, such as various flanges made of carbon and creep resistant steels. The manufacturing organization is well equipped with modern control devices that are certified and reliable in assurance of quality products.

The safety audit is performed on the band saw with unit designation BOMAR ergonomic 290.250 GAC. The gravitational band saw for cutting steel is equipped with a flip rotary arm made of cast iron.

The band saw has an exact solid carbide band guiding, adjustable 500mm linear ending with a release device on the return stroke with the speed of the band 40–80 m/min. The machine has a control panel, cooling function and the voltage detection in the saw band.

The standard STN 200723 – Metal working machines: Safety regulations for metal cutting saws, applies in full range to occupational safety on band saws.

The internal audit was divided into the following parts:

1. Initial meeting – approval of the audit plan, an overview of the activities during the audit, approval of communication channels, questions for audited manufacturing organization;
2. Control of fulfilling the requirements – using methods of gathering information such as interviews, observation of work activities and review of documents;
3. Final evaluation and discussion about audit results;
4. Preparation of the audit report.

After the evaluation of individual questions, the overall result of efficiency in percentage is determined by calculating and the appropriate coefficient of fulfilment is allocated, see Tab. I.

RESULTS AND DISCUSSION

The safety audit leads to the definition of identified safety deficiencies and consequently to the proposal of corrective actions and to determination of responsibility for their application.

The audit plan is as follows:

- audit no.: 12/15;
- type of audit: planned safety audit of device; STN 200723, directives and regulations on occupational safety and health;
- supporting documents regarding audit: instructions for use of band saw (safety principles and warnings of danger);
- purpose of audit: to verify compliance with the principles of occupational safety and hazards for the machine;
- audited entity: company management, production manager, machine operator;



1: BOMAR ergonomic 290.250 GAC

I: Audit classification

Total level of fulfilment (%)	Evaluation of processes	Evaluation
90–100	fulfilled	A
80–90	mostly fulfilled	AB
60–80	conditionally fulfilled	B
less than 60	unfulfilled	C

Source: own

- working group of audit: Tomas Pauliček, Martin Kotus;
- date of audit: June 2015.

The safety audit questionnaire consists of 17 questions; their evaluation and comments to questions are shown in Tab. II.

In Tab. III, there is presented the audit report with a description of identified deficiencies and proposal for corrective action.

Work safety must always be met when using some machine in production. However, every machine is subject to degradation processes, which is a reason to make regular inspections of rotating machine parts, weld joints and anticorrosion protection (Votava, 2013c). In mechanical engineering plants, there are many negative factors that affect the workers and present strain on the organism of workers during their active jobs (Hnilica *et al.* 2010).

In the manufacturing company the plant lubrication and maintenance of the machine is provided by external staff in specified intervals. However, in the manufacturing process could occur the hazards, for example the damage to the machine, which increases the risks of accidents and endanger the health of employees. The security audits implied that the highest classification of the risk was found for unreported risk situations and for the unkeeping the workplace in operational condition and desired purity. For that reason were suggested the corrective measures when the operator is obliged to immediately report the damage of the machine or possible danger when working with cutting compounds.

Machinery safety is one of the basic factors effecting on the assurance of occupational safety. Legislation in the area of machinery safety is rapidly

II: Safety audit questionnaire

No.	Question	Evaluation (1–10)		Comments
1	How well was the operator informed about the work with the machine?	10	100%	The operator was trained in work and occupational safety on machining centres
2	What kind of shoes does the operator use?	0	0%	The operator does not use work shoes with reinforced steel toe
3	What kind of clothes does the operator use?	10	100%	The operator has work clothing
4	When does the operator check the accuracy of the workpiece?	10	100%	The operator measures the accuracy of the workpiece only after removing the workpiece from the workspace
5	How was the operator informed about the principles of first aid?	10	100%	The operator completed the training about first aid
6	Where the manuals of machine are?	0	0%	The operator did not know where the manuals were
7	What way was the operator informed about the instruction manual of machine?	10	100%	The operator was informed about the instruction manual of machine by training
8	What eyes protective equipment does the operator use?	5	50%	The operator does not use eyes protective equipment in its entirety
9	Does the operator turn on the machine from other sources than specified by the manufacturer?	10	100%	Only from sources specified by the manufacturer
10	How does the lubrication and maintenance of the machine work?	10	100%	External staff ensures machine maintenance at specified intervals
11	To whom and when does the operator report risk situations?	8	80%	The operator reported failure dimension during machining to the head of failure department but not immediately when an error has occurred
12	How the cleanliness is maintained at the workplace?	8	80%	The operator cleans the workplace every time in the exchange of shift, it means every 8 hours
13	Does the operator use protective gloves?	10	100%	The operator wears gloves
14	Does the operator use a protective helmet?	0	0%	The operator does not wear a protective helmet
15	Does the operator use ear protection?	0	0%	The operator does not use ear protection
16	Is the machine sometimes in operation without supervision?	5	50%	In the exchange of shift, the machine is in operation without supervision, but it is not machining
17	How does the complete stopping of machine running happen?	10	100%	Entirely without any operator intervention

68%

Source: own

III: Safety audit report

No.	Description of identified deficiencies	Risk classification (1–10)	Corrective action	Responsible
1	The operator does not use work shoes with reinforced steel toe	5	The operator is obliged to use work shoes with fixed steel toe	Hp
2	The operator did not know where the manuals were	6	The management is obligated to provide manuals of operating machine at the workplace	Hp
3	The operator does not use eyes protective equipment in its entirety	8	The operator is obliged to use protective glasses also with side shields	Hp
4	The operator reported failure dimension during machining to the head of failure department but not immediately when an error has occurred	8	The operator is obliged to immediately report a risk (emergency) situation	Hp
5	The employee does not maintain the workplace in required purity (when working with lubricants, sliding surfaces arise on the floor)	8	Employee should maintain his workplace in purity, without sliding surfaces on the floor	Hp
6	The operator does not wear a protective helmet	3	The operator is obligated to wear a protective helmet	Hp
7	The operator does not use ear protection	3	The operator is obligated to use ear protection	Hp
8	In the exchange of shift, the machine is in operation without supervision, but it is not machining	4	In the exchange of shift, the machine should be turned off	Hp

No. – sequence number, Hp – Head of Production
Source: own

developing, which is influenced by increased demands and claims for occupational safety and health of employees, which are currently based on the 'holistic approach' (Girmanová *et al.*, 2009).

The employer is responsible for the occupational safety and health of all employees according to relevant laws and directives. His duty is to organize corresponding measures and supervise their implementation. The basic principles of safe work should also be included in the corporate policy of occupational safety and health (Šolc *et al.*, 2013; Píla *et al.*, 2014).

In the given period, there were identified weaknesses with the average value of requirement accomplishment 68% during verifying the compliance of the principles of safety and alerts to danger in the selected organization. Based on the audit classification, the process was evaluated as a conditionally fulfilled with the designation B – conditionally fulfilled.

Based on identified weaknesses at the workplace, follow-up corrective actions shown in the safety audit report (Tab. III) were drawn. The operator was informed and simultaneously he was instructed in correcting the identified weaknesses. All disagreements and corrective actions were recorded in order to make a follow-up audit for the fulfilment of tasks. A Production Manager was charged to remove deficiencies within one month, and a Quality Manager will verify the performance of tasks.

The prevention of damage to the health of employees at work is the basic system of planning and implementation of all activities of the manufacturing organization. The planning and implementation of the safe work policy is carried out by using safe work equipment, improvement of working conditions and working environment factors, but also through social actions. The safety audit is a tool for verification of regulatory compliance for the health protection of employees.

CONCLUSION

The success of manufacturing organization may come with the implementation and maintenance of the quality management system, which is designed for the purpose of continuous improvement of organizational performance, and with dealing with the needs of all stakeholders at the same time. Through the application of the quality management system, organizations are stimulated to analyse customer requirements, to define processes that contribute to creating a product that is acceptable for customer, and to keep these processes under control (Mura, 2011; Andrásyová *et al.*, 2013).

Regular audits of the management system of occupational safety and health provide a comprehensive assessment of work organization conformity with the procedures and practice of safe work and they also enable continuously evaluating the effectiveness of safety management system (Konstanciak, 2012; Selejdak *et al.*, 2012).

Regardless of the reason of execution of audit, audits are a costly affair, whether in terms of time or people, and they are financially demanding. Therefore, audit must be planned, performed seriously, and it should give reliable reports. In order to be justified, it must provide objective results, increase the confidence in the system, and form the basis for improving the system.

This paper was focused to the safety audit of the band saw in the production process. According to the audit report were proposed specific security solutions designed to reduce the threat rate of employee health. The completely prepared audit was given report to the quality manager in the manufacturing organization who is responsible for removing of deviations identified during the audit. In keeping with the proposed guidelines, it is possible to ensure a sound working environment and prevent the possibility of occupational injury.

REFERENCES

- ANDRÁSSYOVÁ, Z., HRUBEC, J., BAS CERDA, M. C. 2013. Improvement of manufacturing process quality according to final inspection results. *Acta Technologica Agriculturae*, 2: 47–50.
- BUJNA, M., KREDATUSOVÁ, M., BURDA, M. 2010. Identifikácia a analýza ohrozenia pre výrobný proces ložiska. In: *Kvalita a spoľahlivosť technických systémov*. Nitra: SPU.
- BURDA, M., ČIČO, P., BUJNA, M. 2010. Posúdenie rizika pracovného miesta komplexnou metódou. In: *Kvalita a spoľahlivosť technických systémov 2010*. Nitra: SPU.
- GIRMANOVÁ, L., MIKLOŠ, V., PALFY, P., PETRÍK, J., SÜTŐOVÁ, A., ŠOLC, M. 2009. *Nástroje a metódy manažérstva kvality*. Košice: TU Elfa.
- HNILICA, R., JANKOVSKÝ, M., DADO, M., MESSINGEROVÁ, V. 2013. Experimental evaluation of combined effects of risk factors in work environment. In: *Engineering for Rural Development 2013*. Jelgava: Latvia University of Agriculture.
- KONSTANCIÁK, M. 2012. Analysis of technological strategies on the example of the production of the tramway wheels. *Archives of Materials Science and Engineering*, 57(2): 69–74.
- KREDATUSOVÁ, M., BUJNA, M. 2010. Identifikácia a analýza ohrozenia vo vybranom procese. In: *Najnovšie trendy v poľnohospodárstve, v strojárstve a odpadovom hospodárstve*. Nitra: SPU.
- MURA, L. 2011. *Všeobecná ekonomická teória*. Bratislava: CRR.SK.
- MURA, L. 2012. *Úvod do podnikania*. Komárno: Univerzita J. Selyeho.
- PÍLA, J., ADAMČÍK, F., KORBA, P., ANTOŠKO, M. 2014. Safety Hazard and Risk in Slovak Aviation Regulations. *Our Sea, International Journal of Maritime Science and Technology*, 61(1–2): 27–30.
- SELEJDAK, J., KONSTANCIÁK, M. 2012. Practical use of quality instruments in rails production process. *Hutnik – Wiadomości Hutnicze*, 79(12): 952–955.
- ÚNMS SR. 1988. *Obrábacie stroje na kovy. Bezpečnostné požiadavky na stroje na delenie materiálu*. STN 20 0723. Bratislava: ÚNMS SR.
- ÚNMS SR. 2011. *Bezpečnosť strojov. Všeobecné zásady konštruovania strojov. Posudzovanie a znižovanie rizika*. STN EN ISO 12100. Bratislava: ÚNMS SR.
- ŠOLC, M., MARKULIK, Š., GRAMBALOVÁ, E. 2013. Quality of refractory materials in the technological process. *Advanced Materials Research*, 524(527): 2026–2030.
- VOTAVA, J. 2013a. Influence of edge radius of sintered-carbide tip on roughness of machined surface. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 61(5): 1497–1504.
- VOTAVA, J. 2013b. Influence of roughness of machined surface on adhesion of anticorrosion system. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 61(6): 1889–1896.
- VOTAVA, J. 2013c. Protection of welded joints against corrosion degradation. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 61(6): 1897–1904.

Contact information

Martin Kotus: martin.kotus@uniag.sk

Erika Jankajová: jankajova@informslovakia.sk

Katarína Lestyánszka Škúrková: katarina.skurkova@gmail.com, katarina.skurkova@stuba.sk

Darina Matisková: darina.matiskova@gmail.com, darina.matiskova@tuke.sk

Martin Zach: martin.zach@mendelu.cz