THE CORRELATION BETWEEN STRUCTURE OF EMPLOYMENT AND ACCIDENTS AT WORK IN METALLURGICAL ENTERPRISES

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Abstract

The question of workplace accidents occuring in metallurgical industry companies plays a significant role due to the generated social and economical costs. The article presents the analysis of workplace accidents in companies of metallurgical industry and the relationship observed between the employment rate, work experience and the age of employees. The collected data covers the period from 2009 to 2015. The choice of the period for the analysis is justified by the changes taking place in law regulations after Poland joined the EU, and also by the changing employment structure.

Keywords: Accident at work, metallurgical enterprises, safety at work

1. INTRODUCTION

The question of workplace accidents occuring in metallurgical industry companies plays a significant role due to the generated social and economical costs. Thus, the principal task of the top management should be the creation of the proper safety culture which depends first of all on its engagement. The promotion of coherent policy in the field of safe work organisation, cooperation of employers with employees, may contribute to the increase of work comfort and also to the limitation of workplace accidents or occupational deseases numbers.

The article presents the results of analyses concerning the workplace accidents occuring in metallurgical industry companies in years 2009-2015. The accidents were divided from the point of view of the seriousness of their consequences (fatal accidents, serious accidents and others - minor injuries). The group they relate to was indicated - from the point of view of years of service and age. The number of days when workers were inable to work due to the accidents was also taken into account.

The aim of the article is to present, how the number of accidents at work in years 2009-2015 has changed in relation of the type of the accident (other - minor injuries, serious and fatal accidents) and age of the injured persons. The analysis also included the inclusion of the number of days and seniority of injured persons.

2. ACCIDENT AT WORK, TERMINOLOGY, LEGAL REQUIREMENTS

The workplace accident is understood as a sudden, impossible to predict incident which results in injuries, deaths, damages [1, 2]. The place of occurrence and the type of activity allow the following classification: professional - related to the performed work and non-professional, not related to the perfomed work, which includes among others traffic accidents, plane crashes, construction disasters and others. The article consists of an analysis of the workplace accidents occurring in metallurgical industry companies which are related to the performed work (professional).

In the Polish legislation the accident at work is described as a sudden event, caused by the external factor, resulting in injury or death of a worker and related to the performed work [3]. This definition, however, is not identical in all countries. It is generally recognised that the workplace accident should be characterised by the urgency and be a result of the external factor. The differencies are observed in the second part of the definition, which states about the damage, harm and loss.

The differencies come down to three variants, in which [2]:

- the accident is equated with the injury;
- the accident is equated with the injury and the situation prior to the accident;
- the injury is one of the possible consequences of the accident.

Also, the essential differencies are observed within the assessment of the accident results, which may include: physical injuries of the worker, material damages, production disruptions, the damages to the reputation of the company [2].

The workplace accidents in the metallurgical industry affect negatively the course and quality of the professional life of workers. Therefore it is important to create a coherent national policy in the field of protection against the workplace accidents. Poland, like many other countries, is a member of the International Labour Organization. ILO is deeply involved in actions targeted at workplace safety improvement, which includes the determination of the policies of the member countries in the field of workplace safety improvement. The key legal act turned out to be the Convention no. 31/1929 concerning the protection against the workplace accidents, generally regulating the obligations of the countries and employers in case a workplace accident occurs. The convention imposes on member countries the obligation of establishing the national law in the field of life and health of the workers protection [4]. In the Polish legislation the obligation of professional risks limitation, determination of the circumstances and the causes of the accidents lies on the employers [5]. The compensation system for the injured workers was also created [3]. The legislator not only in the legislation relates to the incidents described as workplace accidents but also presents his social attitude to the issue taking into account the accidents which are furtherly related to work, and derivative - the accidents which are aligned with the workplace accidents and occured during the period of the accident insurance.

3. ANALYSIS OF ACCIDENT AT WORK IN METALLURGICAL ENTERPRISES

The analysis deals with the number of the workplace accidents occurring in the metallurgical industry companies. According to the Polish Classification of Activities, the data collected by the Central Statistical Office relates to metal production branch, which includes:

- the producers of pig iron, ferroalloys, steel and metallurgical products;
- the producers of pipes, cables, closed steel profiles;
- the producers of other pre-treated steel products - cold drawn bars, cold rolled products, wires, cold-formed products;
- the producers of precious metals and other non-ferrous metals (silver, gold, platinium, copper, lead, zinc, tin, aluminium);
- cast iron founding, cast steel founding, other light and non ferrous metals founding not elsewhere classified.

The number of incidents classified as workplace accidents in years 2009 - 2015 (**Figure 1**) was constantly changing. The greatest number of such accidents was recorded in 2011 - 1127, whereas the smallest number of workplace accidents took place in 2013 - 887. The decreasing number of workplace accidents in metallurgical industry companies is determined by the changing employment structure.

The number of workers employed by the metallurgical industry companies was reduced from 26k in 2009 to c.a. 20k. in 2015. It is anticipated that eventually, in metallurgical industry will be employed 15.6k workers [6]. The changes in the employment structure were induced by the economical crisis aftermath which also resulted in the total number of workplace accidents. Thus, it is observed the decrease in the number of workplace accidents in comparison with years 2009 - 2011, when the number of workers employed in the metallurgical industry was greater.

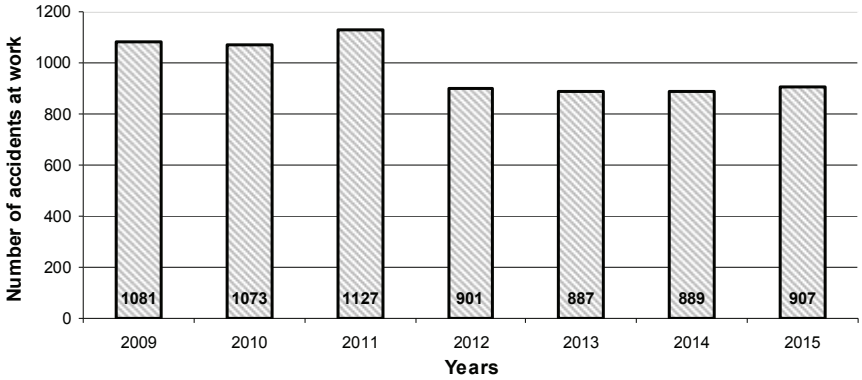

Figure 1 Number of accidents at work from 2009 to 2015 [7]

Among the accidents resulting in the death of a worker in the metallurgical industry, the greatest number of such incidents was recorded in 2011 - 6, and 2009 - 5, whereas in 2015 there were no such incidents recorded. The greatest number of accidents resulting in serious body injuries, longer absence of the worker, was recorded in 2013 - 18 accidents, in 2011 - 12. The smallest number of such accidents in relation to the analysed time period was recorded in 2010 - 5 and 2012 - 6. The decrease of such serious accidents was observed in 2010 and 2012, where the number of this kind of accidents was decreased by 100% in comparison to previous years, i.e. 2009 - 10 and 2011 - 12. The greatest number of the workplace accidents was constituted by other accidents (minor accidents) not resulting in serious injuries, long-term absence - **Figure 2**.

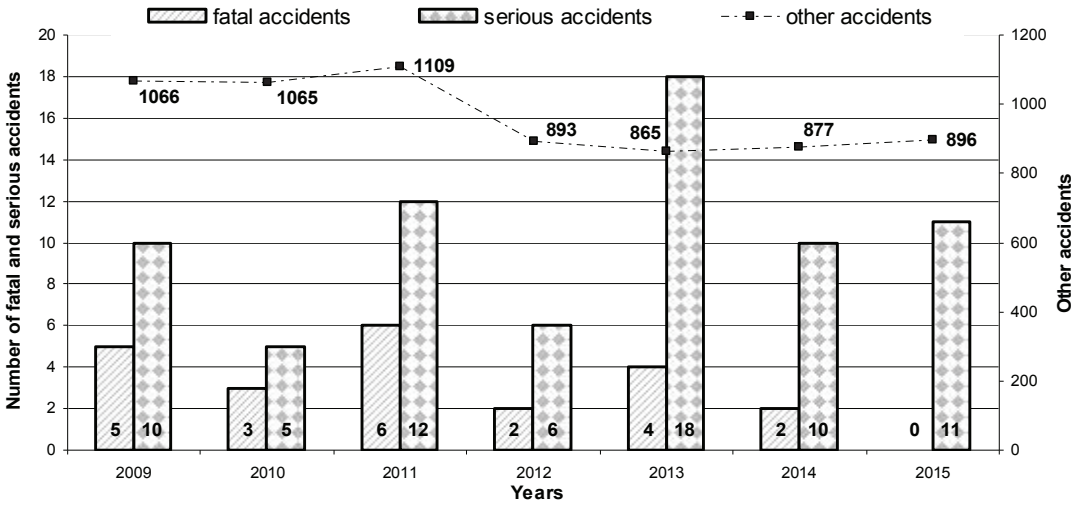

Figure 2 Number of fatal, serious and other accidents at work in metallurgical enterprises [7]

The number of minor injuries decreased in 2012 and represents the similar trend in years 2013-2015. The decrease in the number of accidents in this period may be explained by the employment structure changes, that is the decreasing number of employed workers.

Thanks to the analysis of the accident statistics for the period 2009-2015 [7] for persons injured in workplace accidents it may be concluded that the greatest number of workplace accidents affects workers aged from 20 to 49 years. For this age group, it was recorded respectively in year 2015 - 8, 2014 - 9, 2013 - 11, 2012 - 6, 2011 - 11, 2010 - 6, 2009 - 9 accidents which consequences generate both social and economical costs. The number of serious and fatal accidents among workers aged up to 49 years is much greater than among workers over 50 years old. The only one discrepancy was recorded in 2013, when the number of fatal and serious

workplace accidents was the same for the age groups 20 - 49 and 50 - 59. The statistic data of the injured workers classified by the age is presented in the **Table 1**.

Table 1 Persons injured in accidents at work from 2009 to 2015 [7]

Year	Specification	Age								
		< 18	18 - 19	20 - 29	30 - 39	40 - 49	50 - 54	55 - 59	60 - 64	65 >
2015	Total	-	3	228	246	206	89	96	35	4
	Fatal accidents	-	-	-	-	-	-	-	-	-
	Serious accidents	-	-	2	1	5	-	2	1	-
2014	Total	2	2	218	224	198	100	111	32	2
	Fatal accidents	-	-	-	-	-	1	1	-	-
	Serious accidents	-	-	5	1	3	-	1	-	-
2013	Total	-	5	204	244	191	114	113	16	-
	Fatal accidents	-	-	1	-	2	-	1	-	-
	Serious accidents	-	-	1	4	3	4	6	-	-
2012	Total	-	5	222	200	214	122	106	31	1
	Fatal accidents	-	-	-	1	-	-	-	1	-
	Serious accidents	-	-	1	3	1	-	1	-	-
2011	Total	-	5	274	265	275	164	129	13	2
	Fatal accidents	-	-	-	-	3	1	1	1	-
	Serious accidents	-	-	2	2	4	2	2	-	-
2010	Total	-	3	223	272	272	157	128	16	2
	Fatal accidents	-	-	-	1	-	2	-	-	-
	Serious accidents	-	-	1	1	3	-	-	-	-
2009	Total	-	6	277	259	265	168	93	12	1
	Fatal accidents	-	-	-	1	1	3	-	-	-
	Serious accidents	-	-	2	2	3	2	1	-	-

Four ranges of work experience of the injured in workplace accident workers were distinguished in the analysis of their work experience. This classification was determined by the number of occurring accidents. The first group includes workers employed one year or below. In this group the greatest number of workplace accidents is being recorded in comparison to other workers having longer work experience. The greatest number of accidents in the first group was recorded in 2011 - 319 (including 6 serious accidents). The occurrence of such big number of accidents may be justified by the lack of experience, awareness and knowledge in the field of dangers occurring in work environment. The second group includes workers having from 2 to 10 years of work experience. In this group it is also observed a significant number of accidents. The occurrence of accidents in this group may be caused either by the routine or the familiarization with the existing dangers in the work environment (however in 2013, 2014 the number of accidents was decreased in comparison to previous years). Smaller number of accidents was recorded in the third group, among workers of 11 to 30 year of work experience. The decreasing number of workplace accidents may be a result of greater experience and the awareness of the existing dangers in work environment. The most visible decrease of the accidents number may be observed for workers which have 31 or more years of experience. In this group it is being recorded the smallest number of workplace accidents in comparison with workers having less than 30 years of work

experience. However, fatal and serious accidents are observed in this group of metallurgy industry workers. The greatest number of accidents was recorded in 2013 - 4. The statistic data of the injured workers classified by the work experience is presented in the **Table 2**.

Table 2 Persons injured in accidents at work from 2009 to 2015 [7]

Year	Specification	Work seniority in a given post (in years)							
		1 year and less	2 - 3	4 - 5	6 - 10	11 - 15	16 - 20	21 - 30	31 years and more
2015	Total	300	135	104	143	79	48	61	37
	Fatal accidents	-	-	-	-	-	-	-	-
	Serious accidents	4	-	1	2	2	1	1	-
2014	Total	247	167	71	195	59	50	58	42
	Fatal accidents	-	-	-	-	2	-	-	-
	Serious accidents	4	2	-	1	1	1	1	-
2013	Total	246	177	88	148	70	47	73	38
	Fatal accidents	-	1	-	-	-	1	1	1
	Serious accidents	5	3	-	3	1	-	3	3
2012	Total	273	122	126	160	62	62	56	40
	Fatal accidents	1	-	1	-	-	-	-	-
	Serious accidents	1	4	1		-	-	-	-
2011	Total	319	171	160	153	104	72	82	66
	Fatal accidents	-	1	-	1	2	1	-	1
	Serious accidents	6	1	-	1	-	-	3	1
2010	Total	261	220	102	149	96	88	109	48
	Fatal accidents	-	-	1	-	1	-	1	-
	Serious accidents	3	1	-	-	-	-	1	-
2009	Total	304	229	96	146	105	60	96	45
	Fatal accidents	1	1	-	1	1	-	2	-
	Serious accidents	3	3	2	3	-	1	-	1

The workplace accidents occuring in metallurgical industry companies generate work absence among the employed workers. The number of work absence days depends on the number of workplace accidents and may be also connected with the decreasing number of employees. The greatest number of workplace accidents occurred in 2011 - 1127, which also translated into the number of work absence days, which was 55288 days.

The data collected in the **Figure 3** allows conclusion that since 2012 the number of work absence days in the metallurgical industry decreased in comparison with years 2009-2011, the number of such registered days was 41255. The following years indicate that this number increases in 2013 - 4352, decreases slightly in 2014 - 42578, and increases in 2015 - 47564. The growing trend in 2015 may be explained by the number of serious accidents, having a significant influence on the work absence of workers employed by the metallurgical industry.

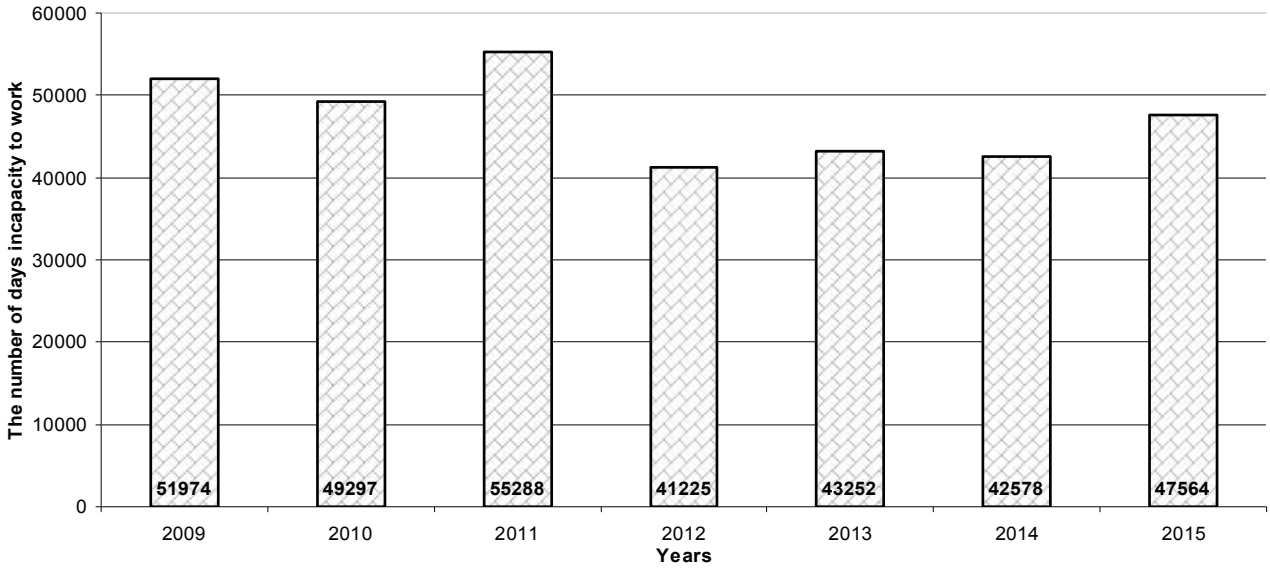

Figure 3 The number of days incapacity to work from 2009 to 2015 [7]

5. CONCLUSION

The issue of the workplace accidents in the metallurgical industry plays a major role due to the social and ecomic costs generated by the occurring incidents. The analysis of the statistic data collected in the article for the period 2009-2015 allows the conclusion that the total number of workplace accidents represents the downward trend since 2012. The greatest number of the accidents constitute the minor accidents, not resulting in the long-term work absence, however it is worth to point out significant number of serious and fatal injuries, which was recorded in the group of workers aged over 20 years old. The most negative year was 2013, when 22 accidents in total were recorded (18 serious accidents and 4 fatal). The accidents occur most frequently in the group of workers aged 20-49 years old. This group stands out among other age groups, and the number of the recorded accidents may be explained by the lack of experience among young people, or the routine among workers having slightly longer work experience. But this does not have to be a generally accepted rule.

REFERENCES

[1] MA ŁYSA, T., NOWACKI, K., FURMAN, J. The risk management methodology in the metallurgical enterprise. In *METAL 2016: 25th International Conference on Metallurgy and Materials*. Ostrava: TANGER, 2015, pp. 1925-1930.

[2] SZLĄZAK, J., SZLĄZAK, N. *Occupational health and safety*, Published by AGH, 2012, 91-92 pp. (in Polish).

[3] Ustawa o ubezpieczeniu społecznym z tytułu wypadków przy pracy i chorób zawodowych (Dz. U. 2016.2255).

[4] www.ciop.pl (30.04.2017).

[5] Ustawa z dania 26 czerwca 1974 r. Kodeks pracy (Dz. U. 2016.1666).

[6] GAJDZIK, B., SZYMSZAL, J. *Forecasting changes in steel production and employment in the Polish steel industry*, Innovation in management and production engineering, Published by PTZP, 2016, pp. 571-578 (in Polish).

[7] Statystyka wypadkowa GUS za lata 2009-2015 - www.stat.gov.pl (01.05.2017).