Analysis of the motivational nature of remuneration in the light of production and efficiency in hard coal mining in Poland

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Abstract. In the course of management, three basic resources are used: material, financial and human resources. However, the last of the above resources - employees, is a demographic and unpredictable resource that rarely performs what is required by the employer or supervisor, loyally and with appropriate commitment. Therefore, effective methods of motivating employees are needed, and in mining enterprises with a small range of other incentives, the most common incentive should be a financial factor. For this to happen a remuneration structure should include, among others, a variable bonus based on the work results obtained by an employee or related to the effects of the entire enterprise. With rational rules for its allocation, it can be one of the key elements of improving production efficiency in mining enterprises. Well-designed remuneration should stimulate employees to work and develop. Analysing the structure of an average wage of a physical underground worker in a randomly selected mining company in Silesia, such pro-effective structures have not been found, which is a very unfavourable situation. In addition, in the search for the incentive nature of these wages, the changes in their amount have been analysed in the light of changes in the volume of hard coal production and labour productivity in hard coal mining in Poland.

1. Motivational nature of the remuneration structure in mining
The increase in the management efficiency of mining enterprises can be achieved by activating activities in areas that are sometimes overlooked and marginalized, e.g. in the area of human resources management. These activities and the resulting changes can often be implemented at a low cost, using the competences and involvement of supervisory staff employed in mining. Such activities in the author’s opinion include, among others, the basic functions of human resources management, in particular in the following areas: measurable, effective motivation related to the expectations of employees (also non-financial motivation), an effective information flow system, real periodic appraisals translating into a promotion system or an effective, real bonus and allowances added to the applicable remuneration. These areas can be a rich source of pro-effective activities and solutions. Contemporary management theories indicate that potentially large areas in mining enterprises require mental changes in human resources, awareness of the importance of management functions in effective management and their use, and these activities are in fact often a struggle between conservative and adaptive management processes implemented in mining enterprises.

The final result obtained in the course of operations of mining enterprises (mining hard coal with particular emphasis on separate mining plants - hard coal mines) depends on such factors as: financial, material or personnel resources. Among these resources, employees are the most variable and difficult factor in management, but at the same time they condition the most effective effects. Currently, no one
questions the thesis that every enterprise (regardless of its nature) is as effective as its personnel, led by the leader, with employees being a demographic and unpredictable resource that rarely does what the employer or a supervisor demands, loyally and with proper commitment. Therefore, effective methods of motivating employees are needed, and in mining enterprises with a small range of other incentives, the most common incentive should be the financial factor. It should be, because, as shown by the analyses of remuneration systems and their components [1], remuneration in mining enterprises due to their small variable component that depends on the effects achieved by the employee, do not constitute an effective incentive to increase the efficiency and commitment of the personnel. Well-designed remuneration should stimulate employees to work and develop more efficiently. These goals are met when its structure or level influences the growth of behaviours desired for work performance and above all, this increase is related to the results of employees’ work and the effects of the entire enterprise. As the analyses presented below show, this basic condition in mining enterprises is not met. This is an unfavourable situation, which has persisted for many years as indicated by the data presented in figures 3-5 and requires urgent changes. Moreover, in the report of the NIK (Supreme Audit Office) concerning assessment of the hard coal mining industry for the years 2007-2015 in the light of the government programme, attention was also paid to the problem of low production efficiency, overstaffing and the inefficient remuneration system, which translates into a high share of fixed costs and their high susceptibility to fluctuations in coal demand and prices [2].

High labour costs and low effectiveness are the main personal factors of the crisis in the hard coal mining industry that require economic rationalization [2]. The main component determining the cost of extracting a ton of coal are unit labour costs. The average annual production in 2016 per worker in the hard coal mining industry in Poland was about 827 tonnes/employee/year. This is a low result comparable to the old mines intended to be liquidated in Western Europe and about 5 times lower than the performance of workers in underground US mines. It can therefore be concluded that the improvement of efficiency - productivity of Polish hard coal mines means some potential for better production effectiveness and reduction of coal production costs. But what is important, commonly used in the Polish hard coal mining industry, the remuneration system is not conducive to improving work efficiency. The majority of coal mining employees are covered by the pay, which includes, among others, apart from basic remuneration and bonus, additional 13th and 14th month pay, a length-of-service allowance, jubilee bonuses and coal allowances. The basic remuneration allowances are so complex that the importance of basic remuneration and bonus is lost, where the bonus should be an effective motivating tool for efficient and safe work. This is an unfavourable situation, which requires simplification and restoration of the bonus of its basic function to motivate to achieve a certain level of employee productivity correlated with their earnings. At the same time, in the context of the improvement of economic results, recovery programmes often include employment reduction as one of the solutions, which is caused by a large share of remuneration costs amounting to approx. 60% [3] of total costs and 100% of fixed costs [4]. Although economic effects are fast, it does not always affect the long-term improvement of the enterprise's situation. In addition, such lay-offs are not analysed in terms of the loss of competency resources, and in subsequent years when the economy grows, employing new workers additionally generates costs related to employee fluctuation. Currently, the miner's remuneration consists of more than 30 elements, and 30% of the remuneration fund includes the so-called non-periodic benefits, including, for example, the equivalent for school aids for employees' children [5].

The basic remuneration in the structure presented in figure 1 constitutes only 27.24% of the total remuneration. The rest - 72.76% are fixed allowances, not related to the effects of work, but to the position or work in harmful conditions. This is a very irrational situation from the point of view of an effective management process, in particular the employee's motivation for more efficient or safe work. Such remuneration is practically independent of the effects and quality of work - the employee can expect a similar level of remuneration in the following months. This strongly demotivates the employee's committed work or creativity. As it follows from direct interviews with physical workers employed underground in two different mining companies, the situation is similar in both companies, although one of them previously had a variable bonus depending on the efficiency of work, which,
however, in the process of consolidation of the company and organisational changes was transformed into a fixed allowance permanently associated with the type of the position occupied.

The plans for changes in this area are a source of hope, which, among others, were declared in an interview in April 2017 by Jerzy Janczewski, responsible for employee matters in PGG, a company employing over 43 thousand people: "A key element of the new system must be the unification of the remuneration system in the company, which currently utilises six different bonus regulations. The uniform system should be composed so that an employee is paid for real, well-done work" [5].

2. Changes in the average remuneration in the light of production and performance in hard coal mining in Poland

The basic objective in managing each enterprise should be to provide conditions conducive to its long-term operation and development, and consequently to strengthen its position and make profit. This can be achieved by effective connection and use of material and financial resources, but above all, the employees' activities and their commitment. This commitment demonstrated by high work efficiency can be stimulated by an efficiently functioning incentive system, based on rational financial and non-financial incentives. The theory of expectations, which should be the basis for the design of effective motivational systems, indicates [6] that the behaviour of an employee in the work environment depends on the benefits that can be achieved at work. At the same time, an employee needs to know and understand what level of work performance leads to certain values in the form of awards - bonuses. This theory indicates that the employee's behaviour in the work environment is shaped not only by the expected benefits, but also by the relationship noticeable for him between the behaviour and the benefit. Employees are as effective at work as to achieve what they want [7]. With the structure of remuneration presented in figure 1, it is impossible to achieve this type of relationship. Considering the above, the author decided to examine the motivational nature of remuneration in mining, also looking for a correlation between the average remuneration and productivity and efficiency in hard coal mining in Poland. An increase in the level of remuneration related to the increase in underground output or production may indicate their motivational dimension.

Correlation (interdependence of features) defines interrelations between selected variables. It ranges from -1 to 1. Positive correlation (value of the correlation coefficient from 0 to 1) - informs that an increase in the value of one characteristic is accompanied by an increase in mean values of the other characteristic, negative correlation (correlation coefficient from -1 to 0) - informs that an increase in the value of one characteristic is accompanied by a decrease in the mean values of the other characteristic. If the correlation coefficient is negative, it can be said that when the values of one variable increase, the values of the other variable decrease (and vice versa, the first variable decreases - the other increases). In the analysis, the author used the Pearson correlation coefficient. This coefficient is used to study linear relations of studied variables, in which an increase in the value of
one of the characteristics causes proportional changes in the mean values of the other characteristic (increase or decrease). Poor dependence or lack of it occurs at values below 0.2. The study of interdependencies of characteristics presented in figure 2, i.e. the average wage in mining and extraction indicates a strong so-called negative correlation. The calculated Pearson's linear correlation coefficient is -0.8. Thus, in the presented analysis for the years 2004-2016, there is a strong negative relationship between the set characteristics, where an increase in one parameter - average monthly remuneration in mining in Poland accompanied by a decrease in the value of the other parameter - production.

![Graph showing relationship between remuneration and production](image)

**Figure 2.** Relationship between average monthly gross remuneration and production. Own study based on data [3, 8].

As can be seen from the changes calculated and presented in figure 3 and table 1, an increase in remuneration in mining did not affect the improvement of the volume of production. In the extreme case, in the year in which remuneration increased by 31%, a 2% drop in the volume of production was recorded.

**Table 1.** Percentage changes in average remuneration in mining and volume of production compared to previous year.

| Years | Changes in % of underground productivity compared to previous year kg/rdn | Changes in % in average remuneration in mining compared to previous year |
|-------|-------------------------------------------------|--------------------------------------------------|
| 2004  | 4%                                              | 0%                                              |
| 2005  | 31%                                             | -2%                                             |
| 2006  | -14%                                            | -3%                                             |
| 2007  | 8%                                              | -8%                                             |
| 2008  | 15%                                             | -4%                                             |
| 2009  | 3%                                              | -7%                                             |
| 2010  | 4%                                              | -2%                                             |
| 2011  | 5%                                              | -1%                                             |
| 2012  | 6%                                              | 5%                                              |
| 2013  | 3%                                              | -3%                                             |
| 2014  | -18%                                            | -8%                                             |
| 2015  | 23%                                             | -1%                                             |
| 2016  | -6%                                             | 1%                                              |
The study of interdependencies of characteristics presented in figure 4, i.e. the average remuneration in mining and underground mining productivity, indicates a very weak so-called negative correlation (calculated Pearson correlation coefficient is -0.24). In this analysis for the years 2004-2015, there is a weak relationship between the set characteristics, where an increase in one parameter - average monthly remuneration in mining in Poland accompanied by a decrease in the value of the other parameter - underground productivity and vice versa (for different time intervals). However, a positive trend when analysing the data on underground productivity and the average monthly remuneration can be observed. From 2014, the growth of both analysed volumes is visible.
From the point of view of the motivation theory, this phenomenon confirms the lack of incentive nature of remuneration in hard coal mining. In a well-designed motivating system, a decrease in the effect achieved by the personnel (in the described situation a decrease in productivity is the effect) should be at least a proportional drop in the average remuneration, and this is not the case. In the analysed period 2004-2009 the situation was quite the opposite. A drop in underground production was accompanied by a clear increase in the average remuneration in hard coal mining. Percentage changes in the average remuneration in mining and underground mining compared to the previous year, table 2, indicate in extreme cases a rise of up to 31% in remuneration, up to a 31% increase in remuneration, and in a 7% drop in productivity, a 15% increase in average remuneration.

![Percentage changes in average remuneration in mining compared to previous year](image_url)

**Figure 5.** Percentage changes in average remuneration in mining and underground productivity compared to previous year. Own study based on data [3, 8].

**Table 2.** Percentage changes in average remuneration in mining and underground productivity compared to previous year.

| Years | Changes in % of underground productivity compared to previous year kg/rdn | Changes in % in average remuneration in mining compared to previous year |
|-------|-------------------------------------------------|-------------------------------------------------|
| 2004  | 4%                                               | 4%                                               |
| 2005  | 5%                                               | 31%                                             |
| 2006  | 1%                                               | -14%                                            |
| 2007  | -2%                                              | 8%                                               |
| 2008  | -7%                                              | 15%                                             |
| 2009  | -14%                                             | 3%                                               |
| 2010  | 9%                                               | 4%                                               |
| 2011  | 3%                                               | 5%                                               |
| 2012  | 1%                                               | 6%                                               |
| 2013  | 3%                                               | 3%                                               |
| 2014  | 0%                                               | -18%                                            |
| 2015  | 12%                                              | 23%                                             |
3. Summary and conclusions

When looking for areas of rationalization of hard coal mines during restructuring, organizational factors, such as labour productivity, or the applied remuneration system can be indicated as one of the key factors in improving the economic results of Polish hard coal mining companies. For this to happen, remuneration should depend on the company’s current economic situation and result from the effect of work achieved by employees. Then the remuneration is motivational, and thus a decrease in productivity or volume of coal production should be reflected in a proportional drop in remuneration. This is one of the basic rules of effective management. A properly designed incentive system and the related remuneration system must stimulate an employee to effective and safe work with penalties or rewards proportional to the obtained effects. In the remuneration system, they are expressed through a variable part of remuneration, such as a bonus, which the employee receives by implementing the objectives set by the employer in a given period of time. An extremely important factor affecting also how such a system will function in the human resources management process is its transparency and simplicity. It will motivate only an employee who understands the rules of the system and will consciously undertake appropriate actions at the workplace, striving to achieve the highest possible bonus.

Meanwhile, the research results presented in the article indicate the lack of such characteristics of remuneration in mining. The analysed structure of the average remuneration is not motivating, which was confirmed by the study of the relationship between the average remuneration and the production and underground productivity in hard coal mining in Poland. A strong correlation negative relationship between the average remuneration and the production characterised by an increase in one of the analysed variables was observed. In addition, a weak correlation between the average remuneration and underground productivity was observed. As an analysis of statistical data from years 2004-2015/2016 showed, an increase in remuneration occurred in the majority of analysed years when the production dropped. In the case of underground productivity, its correlation with the amount of the average monthly remuneration was poor, which is confirmed by the data presenting a comparison of the percentage changes of both variables in subsequent years. In extreme cases, with a 5% increase in underground productivity, a 31% increase in remuneration can be observed, and in other analysed year, a 7% decrease in productivity was accompanied by a 15% increase in wages.

The results of the presented analysis indicate an urgent need to restructure the remuneration systems in hard coal mining. As demonstrated by the presented research, the lack of incentive character of the components of remuneration may be one of the factors negatively affecting productivity or mining production - an increase in remuneration did not improve them. Therefore, rebuilding and linking the amount of remuneration to achieved work results should be the basis for their optimisation. It is also necessary to restore proper proportions between the amount of basic and total remuneration. At present, the allowances to the employee's remuneration, which constitute up to 70% of his total remuneration, do not depend on his effective work, but are permanently related to the job position he occupies. This situation is unacceptable and demotivating in terms of greater commitment. In order to give motivational character, the following changes in the structure of the average remuneration are proposed:

- simplifying the remuneration structure by limiting the number of its components to the basic and variable remuneration, incentive bonus and obligatory allowances resulting from the position held and working conditions,
- giving a monthly bonus the character of a reward for over standard work and higher than average commitment to work,
- linking the amount of a monthly bonus to the work results of individual employees based on established standards and criteria
- setting an annual or semi-annual bonus linked to the effects of the entire enterprise, the amount of which is determined, for example, based on the results of an employee’s periodic appraisal.
The described activities in the scope of changes in the structure of remuneration, in addition to the improvement of production efficiency, may also have a very positive impact on the rationalisation of fixed costs in the long run, and thus also the improvement of total hard coal production costs.

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References
[1] Trzakuś-Żak B, Gałaś Z, Sierpień M and Borowiec R 2015 Koszty pracy przedsiębiorstwa górniczego Przegląd Górnicy 8 pp 104–7
[2] https://www.nik.gov.pl/plik/id,13913,vp,16351.pdf
[3] Korski J, Wyganowska M and Tobór-Osadnik K 2015 Ocena zdolności konkurencyjnej polskiego górnictwa węgla kamiennego w świetle danych historycznych Przegląd Górnicy 6 pp 9–15
[4] Jonek-Kowalska I and Turek M 2016 Koszty stałe i zmienne a efektywność produkcji w polskich kopalniach węgla kamiennego Źeszyty Naukowe Politechniki Śląskiej seria Organizacja i Zarządzanie 97 pp 154–67
[5] http://gornictwo.wnp.pl/nowy-uklad-zbiorowy-w-pgg-do-polowy-przyszlegoroku,295915_1_0_0.html
[6] Penc J 2000 Motywowanie w zarządzaniu (Warszawa: Wyd. Profesjonalnej Szkoły Biznesu) pp 136–98
[7] Kozłowski W 2017 Motywowanie pracowników w organizacji (Warszawa: CeDeWu) pp 33–50
[8] https://stat.gov.pl/obszary-tematyczne/rynek-pracy/pracujacy-zatrudnieni-wynagrodzenia-koszty-pracy/zatrudnienie-i-wynagrodzenia-w-gospodarce-narodowej.html