

Analysis of SRK S.A. mining rescue costs

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Abstract. In connection with the mining reform, which took place in 2015, and the necessity to liquidate some of the active mining plants, the Management Board of SRK S.A. established the Emergency Rescue Station. Below article describes the beginnings of SRK mining rescue organization and its current situation. The main intention of this paper is to present an analysis of SRK S.A. mining salvage costs in 2015-2017 related to its equipment, maintenance and operations. Next important aspect is a presentation of the results of the SWOT analysis, which tries to answer the question if having its own mining rescue services bring SRK S.A. losses or financial benefits. The presented results are an interesting case study that illustrate the actual level of annual expenses and capital expenditures borne by SRK S.A. in order to ensure the safety of people working underground in liquidated mining plants and the savings brought by own mining rescue services.

1. Introduction

Every enterprise running a business has to bear a lot of expenses and costs to achieve the intended goal, because in the modern economic world there are no activities without costs. Costs differ from revenues in that the former arise inside the enterprise, whereas revenues are generated externally (on the market). The company's costs are a complex structure that consists of many items and groups. They are expressed in money and reflect the expenses that have been incurred in connection with the business. They result in products or services.

The company's own costs are an indicator of economy and reflect the accuracy of management decisions. Generally, they can be divided into fixed costs and variable costs. Fixed costs are that part of the company's operating costs, which does not change at certain intervals of its manufacturing or service capacity and they shape invariably in individual periods. Variable costs increase with the increase in manufacturing, service and sales [1].

The subject of a broader analysis in this article is one of the components of fixed costs resulting directly from valid mining regulations in Poland and related to the maintenance of mining rescuers. The aim of analysis of SRK S.A.'s expenses for mining rescue was to obtain information necessary to make decisions regarding the future of SRK S.A. mining rescue station from the economic point of view. Another aim was to plan activities to ensure the safety of people employed underground in liquidated mines. The article also attempts to determine the amount of financial expenses that SRK S.A. would have to bear in case of entrusting the obligation resulting from having mining rescue services to another entity.

2. Legal basis for mining rescue of the entrepreneur

According to the mining regulations applicable in Poland, the Entrepreneur is obliged to:



The Geological and Mining Law - in particular chapter 3 [2].

"Art. 122.6 1) Have their own mine rescue services or entrust this obligation to all entities professionally involved in mine rescue services, in whole or in part; 2) have a mining rescue plan; 3) provide a permanent opportunity to participate in the rescue operation of professional specialized services of an entity professionally engaged in mining rescue services."

Art. 122.1 "Mining rescue consists of: 1) mining rescue service of the entrepreneur; 2) entities professionally engaged in mining rescue services."

Article 122.15. "Entrepreneur entrusting a mining profession with an entity professionally involved in mining rescue services in whole or in part fulfills the obligation to have its own mine rescue services based on a contract, with the prior consent of the competent mining supervision authority, expressed in a decision, if the entity meets the requirements of the regulations issued on the basis of art. 124."

Regulation of the Minister of Energy regarding mining rescue - in particular:

Chapter 2. "Organization, detailed tasks and requirements for mine rescue services of an entrepreneur and an entity professionally engaged in mining rescue services", which includes the entry:

§ 5. para. 1. "The organizational unit of the mining rescue service of the entrepreneur is the rescue team, the rescue team consists of: 1) the manager of the mine rescue service station; 2) deputy manager of a mine rescue service station; 3) mine rescuers; 4) mechanics of rescue equipment."

§ 7. para. 1. "The number of mine rescuers in the rescue team of an underground mining plant depends on the number of people staying underground during the day and is not less than:

- 1) 15 mine rescuers - in the case of employment up to 500 employees;
- 2) 50 mine rescuers - if there are at least 501 employees and no more than 2000 employees;
- 3) 80 mine rescuers - in the case of employment of at least 2001 employees "

Paragraph 2. "In a mining plant carrying out more than one mining plant operation, the number of mine rescuers in each of these movements must meet the requirements set out in paragraph 1".

Chapter 6. "Cases in which preventive work is carried out. The manner of conducting rescue operations depending on the type and intensity of threats occurring in a mining plant".

§ 74. para. 1. point 5) "The operator of the rescue operation directs the emergency crew on duty to participate in the rescue operation";

§ 74. para. 2. point 4) "The mining plant operations manager after taking over the rescue operation determines the number of rescue crews and the number of other mining plant employees needed to liquidate the threat and determines the manner of coordination of performing the works".

§ 74. para. 3. "The course of preventive work is documented in the book of these works and on the pages of the participation of the rescue team in preventive work" [3].

Regulation of the Minister of Energy on detailed requirements for the operation of underground mining facilities - which defines, among others, scope and method of implementation of activities undertaken by the Head of the Mining Plant Movement and subordinate employees in the scope of combating threats and implementation of provisions included in the Mining Rescue Plan [4].

3. Organization of SRK S.A. mining rescue

Spółka Restrukturyzacji Kopalń S.A. (Mine Restructuring Company) based in Bytom was established on August 21, 2000 as a result of the adoption of the government program entitled "The hard coal mining reform in Poland in the years 1998 - 2002. The main reason for its creation was the separation of the mine decommissioning process from the repair processes of the remaining mines. Partial objectives were: more effective management of the decommissioning of 29 hard coal mines, mainly by reducing costs and shortening the decommissioning period, rational use of budget funds allocated for financing the costs of mine closures and effective management of the assets of liquidated mines. Employment at SRK S.A. in Bytom as at August 21, 2000 stood at 1112 people [5].

Despite such a broad activity and extensive area of operations, SRK S.A. since its inception in 2000 until May 2015 did not have its own mine rescue services capable of taking action in situations of optional danger. At individual pumping stations of the Central Mine Drainage Plant (CZOK) only

the so-called "guide rescuers" were employed, they originated from manual workers and supervising persons performing everyday functions, for example a worker servicing the main drainage pump, shaft inspectors, supervisors or traffic dispatchers. All duties resulting from the Geological and Mining Law in the organization of emergency services were commissioned by the Management Board of SRK S.A. to the Central Rescue Station S.A. in Bytom. As a result of this take-over a substitute rescue team for the CZOK branch was created, which included 27 supervisors and 26 manual workers and the Rescue Station Manager. Mobility and training of these people was very poor because it was a group of random people with emergency rights. The CZOK branch did not have its own Mining Rescue Station or rescue equipment, therefore it was not able to undertake any mining rescue operations apart from acting as guides for professional mining rescue teams in a chosen plants. [6]

The situation changed in 2015, when in connection with the new mining reform, SRK S.A. took over the following mines: KWK "Brzeszcze Wschód" (4/5/2015), KWK "Centrum" (08/5/2015), KWK "Kazimierz Juliusz" (1/6/2015), KWK "Mysłowice" (1/6/2015), KWK "Boże Dary" (1/7/2015), KWK "Rozbark V" (1/10/2015), and then the Board of the Central Mining Rescue Station S.A. (CSRG S.A.) with letter no. 2546 dated on 07/07/2015 informed the Management Board of SRK that "they cannot take over the duties of the organization of the rescue services of the entrepreneur ... and proposes the creation of a rescue team in the structures of SRK S.A on the basis of the mine mining station KWK "Centrum".

According to this situation, the Management Board of SRK S.A. was forced to create its own Mining Rescue Station on the basis of a mine rescue station included in the liquidation of KWK "Centrum" with headquarters in Bytom. As a result of the actions taken:

1. The rules for the operation and organization of mining rescue services in SRK S.A in Bytom have been agreed and approved by mining supervision authorities.
2. On 1 September 2015, the SRK S.A. Mining Rescue Station was established to secure both the then and future plants as well as departments of the Company Restructuring of the Mine in Bytom (figure 1).



Figure 1. Mining Rescue Station SRK S.A.

3. The personnel of the rescue team was increased to the requirements of the valid Geological and Mining Law and a mobile emergency team was introduced.
4. The SRK S.A. Rescue Station was provided with rescue equipment necessary to conduct rescue and prophylactic operations. Specialized vehicles for transporting 14 persons were purchased ensuring the mobility of the rescue teams.
5. A contract was signed with the management board of CSRG S.A in Bytom to entrust some of its responsibilities in the field of mine rescue:
 - organizing and conducting training courses in the field of mine rescue,
 - conducting exercises in the field of mining rescue,
 - organizing and conducting medical examinations at a specialized research center,
 - participation in rescue operations of specialized ambulances [7].

In 2015-2017 the SRK S.A. Mining Rescue Station located in the KWK "Centrum" protected and represented the first crop of mutual assistance in life, human health or plant operation situations for 13 SRK S.A. departments in which underground works were carried out (table 1).

Table 1. Employment in SRK S.A branches, including outside companies in 2015 -2018.

No.	Administration and SRK S.A. departments in liquidation (date of commencement of liquidation)	SRK S.A underground mine workers + companies			Surface workers and administration		
		2015	2016	2017	2015	2016	2017
1.	SRK S.A. Office of the Management Board	2	2	0	198	205	380
2.	Administration of Residential Resources	0	0	0	82	86	118
3.	Central Mine Drainage Plant CZOK	550	550	540	127	127	127
4.	Hard coal mines KWK in total liquidation	0	0	0	54	57	93
5.	KWK „Kazimierz-Juliusz” (1/6/2015)	65	53	1	44	23	16
6.	KWK „Mysłowice” (1/6/2015)	68	76	53	52	30	27
7.	KWK „Rozbark V” (11/11/2015)	26	20	15	16	10	10
8.	KWK „Anna” (1/04/2016)	0	84	70	0	42	35
9.	KWK „Makoszowy” (1/1/2017)	0	0	380	0	0	180
10.	KWK „Brzeszcze Wschód” (5/1/2016)	0	126	67	0	32	27
11.	KWK „Centrum” (8/5/2015)	658	380	281	75	65	71
12.	KWK „Boże Dary” (1/7/2015)	874	368	283	54	43	35
13.	KWK „Jas-Mos” (1/10/2016)	0	1380	276	0	34	23
14.	KWK „Pokój I” (1/1/2017)	0	0	138	0	0	68
15.	KWK „Krupiński” (1/4/2017)	0	0	334	0	0	86
16.	KWK „Wieczorek I” (1/4/2017)	0	0	87	0	29	29
Total SRK S.A.+ companies		2243	3039	2525	702	783	1325

The employees of the mining rescue station, if necessary, served the help to the other three administrative departments of SRK S.A. In personal terms, the SRK S.A. mining rescue station secures an average of 2.200 to 3.100 underground workers, of which 71.6% was own crew of SRK S.A. employed under the terms of a contract of employment and 28.4% employees of third-party companies that work for SRK S.A. The state of the rescue team SRK S.A. during that time it grew from 91 people in 2015 to 214 in 2017. The maintenance costs of SRK S.A. Rescue Station include only emergency rescue workers (table 2). The remaining members of the SRK rescue team (guards rescuers) are paid in accordance with their function at the given SRK unit (locksmith, electrician, senior foreman, dispatcher) [8].

Table 2. Number of members of the rescue team in SRK S.A. in 2015 – 2017.

Rescue team	2015	2016	2017
Rescuer	53	80	80
Mechanic of rescue equipment	11	6	6
Rescue service	12	5	5
Rescuer in KWK "Makoszowy"	0	0	15
Mechanic of rescue equipment in KWK "Makoszowy"	0	0	4
Total emergency rescue service	76	91	105
The rescuer guide in other units of the company	15	57	109
Total rescue team SRK S.A.	91	148	214

4. Maintenance costs of SRK S.A. mining rescue

Maintenance of the SRK S.A. Mining Rescue Station and securing by it over 2 thousand underground workers in all units is associated with the annual disbursement of financial resources related to own costs, i.e. maintenance and repair of the station building, remuneration of mining rescuers and supervisors, purchase of rescue and preventive equipment, its service, repair and legalization as well as costs resulting from contracts concluded with other entities. These costs include: rescue courses and trainings, medical examinations of rescuers, readiness to participate in the action of the mining rescue unit and medical protection (figure 2).

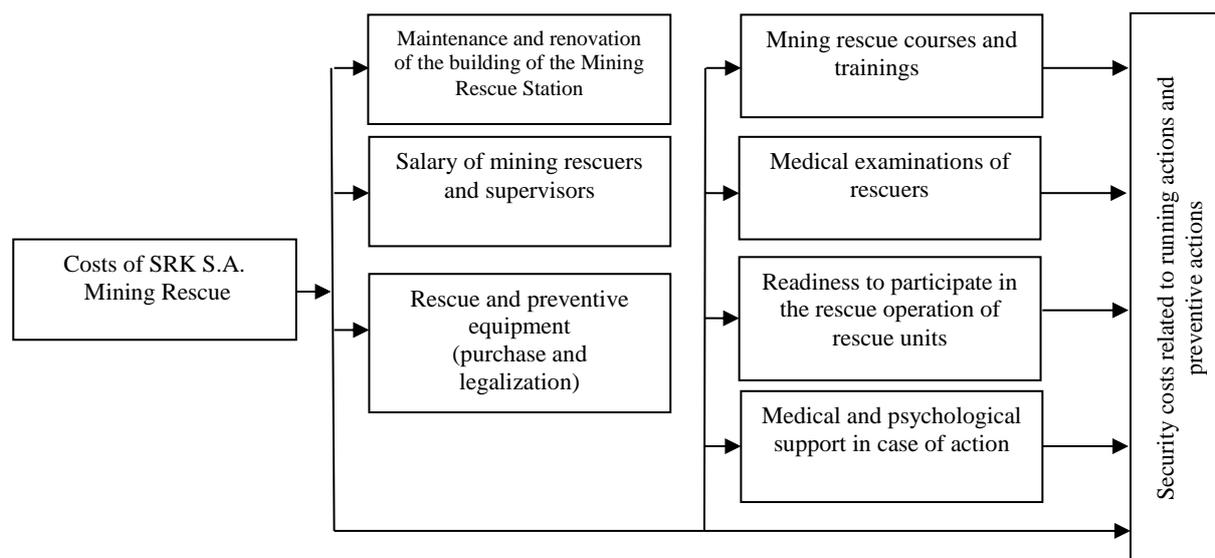


Figure 2. Distribution of maintenance costs of SRK S.A. Rescue Station.

When considering the structure of company’s own costs (table 3), it can be seen that SRK S.A., the lowest costs associated with maintaining a mine rescue station, in the amount of 4 million 783 thousand incurred in 2015, i.e. in the initial period of taking over mining plants and creating the foundations of mine rescue. However, these costs cover only the period of eight months of the calendar year, because as a result of the mining reform, the first mines intended for liquidation became a part of the SRK S.A. in May 2015. Having reached full readiness, the own costs of maintaining the SRK S.A. Mining Rescue Station fluctuate around the amount of PLN 11 million. The largest part of these costs is the payment of people who are part of the SRK emergency service, which consists of such components as: basic wage, bonus, miner's card, harmful additive, etc. (table 4):

Table 3. Maintenance of the SRK S.A. Mining Rescue Station in 2015 -2017.

Elements	Costs in thousands of PLN gross		
	2015	2016	2017
1. Maintenance of the station building (taxes, water, electricity, sewage, services)	54.5	59.7	60.3
2. Renovation of the station building (replacement of windows, roofing)	0.0	142.0	0.0
3. Salaries of the rescuers	4564.3	7213.2	10200.0
4. Purchase of equipment	82.3	1546.3	600.3
a) Vehicles	0.0	425.3	0.0
b) measuring and control equipment,	12.3	215.3	47.7
c) emergency communication,	0.0	152.8	148.0
d) pump aggregates,	0.0	143.3	0.0
e) small mechanization,	0.0	326.7	0.0
f) accessories for power tools,	1.3	15.4	6.5
g) hand tools,	2.1	45.8	10.7
h) parts for oxygen apparatus W-70	50.1	154.0	300.0
i) office equipment	4.5	29.1	12.3
j) additional equipment: cooling vests, medical kits, pulsometers, motionless sensors, others.	0.0	38.6	54.0
5. Service, legalization and repairs of equipment	12.0	87.0	79.4
6. Vehicle maintenance (fuel, insurance)	0.0	25.3	22.2
Total costs	4783.4	10619.8	11541.4

Table 4. Components of employees' salaries.

Components of salary	Variables	Miner [PLN]	Rescue Team Leader [PLN]	Rescuer [PLN]
Basic wage		1512.00	1596.00	1512.00
Bonus		18% 272.16	26% 414.96	26% 393.12
Miner's Card		70% 1058.40	70% 1117.20	70% 1058.40
Guaranteed allowance		693.00	693.00	693.00
Allowance for harmful work conditions		153.72	217.77	217.77
Night allowance	7 days/ month	141.68	141.68	141.68
Coal ration		474.96	474.96	474.96
Prevention	10 days*6h*12	0.00	720.00	720.00
4 working days during weekend		1010.96	1225.36	1178.00
Total: employer net		5316.88	6600.93	6388.93
(gross employee)				
Gross paid to ZUS by employer	21.34%	6450.65	8009.57	7752.33
Average gross value of working day		258,03	320.38	310.09
14th salary		460.80	560.29	541.92
Payment on the occasion of the miners' holiday St. Barbara		474.13	573.62	555.25
School aids		25.00	25.00	25.00
Tickets from KG		22.50	22.50	22.50
Total		982.43	1181.41	1144.67
ZUS Social Security	21.34%	209.65	252.11	244.27
Jubilee awards	200%	184.32	373.53	361.28
Retirement and pension severance pay		66.67	66.67	66.67
TOTAL		250.99	440.20	427.95
Preventive meal	18.90 zł	472.50	472.50	472.50
General costs	35%	2928.18	35% 3624.53	35% 3514.60
TOTAL		11294.40	13980.32	13556.32
Average value of a working day [PLN]		451.78	559.21	542.25

In addition to the above-mentioned costs of maintaining the Rescue Station, SRK S.A. also incurs costs resulting from contracts concluded with other entities on the basis of art. 122 of the Geological and Mining Law Act on entrusting some of the obligations incumbent on the entrepreneur in the field of mining rescue.

These costs include costs of readiness and medical protection in the event of a rescue operation at one of the SRK S.A. unit which would be carried out by employee companies ARC-MED and KOP-MED, it includes also the costs of the contract with the Central Mining Rescue Station S.A. in Bytom in the field of: medical examinations of rescuers, courses and trainings in the field of mine rescue and readiness to participate in rescue operations at SRK S.A. professional rescue teams.

The economic analysis shows that medical costs incurred by SRK S.A. remain at a similar level and amount to around PLN 330 000 annually. The costs of the contract with CSRG S.A. in three years have grown significantly, that is by PLN 3264.3 (over 250% compared to 2015), despite the fact that the professional hosts of CSRG S.A. did not take part in any work for SRK S.A. (table 5) [8].

Table 5. Mine rescue costs related to the provision of partial security for SRK S.A. by outside companies CSRG S.A., ARC-MED. Sp.p and KOP-MED Sp.p. in 2015-2017.

Elements	Costs in thousands of PLN gross		
	2015	2016	2017
1. CSRG S.A.	1957.9	4935.4	5094.4
a) Readiness to participate in rescue operations	1531.9	3844.9	4381.3
b) Medical examinations in the field of mining rescue	104.6	328.6	220.8
c) Courses and trainings in mining rescue	321.4	761.9	492.3
2. ARC-MED Sp.p.	204.3	0.0	0.0
a) Readiness and medical protection in case of an action	204.3	0.0	0.0
3. KOP-MED. Sp.p.	0.0	346.4	332.1
b) Readiness and medical protection in case of an action	0.0	346.4	332.1
TOTAL	2162.2	5281.8	5426.5

Analysis of the maintenance costs of the SRK S.A. Rescue Station showed that the largest financial component of the costs is the salary of mine lifeguards, although in comparison to the miner employed in SRK S.A. lifeguard earns just over PLN 90 more for a working day (table 4).

However, the reliability of the above mentioned economic analysis requires consideration of the scope of work that the rescue teams carry out for other SRK S.A. and deducting these costs from their actual remuneration.

5. Costs of services provided by SRK S.A rescuers to other units and entities

The SRK S.A mine rescue station was established as a requirement of the provisions of geological and mining law to ensure the safety of employees hired underground. However, unlike the professional rescue teams from CSRG S.A., the rescue teams of the SRK S.A Rescue Station perform a series of daily work for the units of SRK S.A. related to, among others:

- full rescue services for units,
- preventive work minimizing mining hazards in branches,
- liquidation of units' mining excavations,
- process of filling mining pits,
- loading and transport of materials necessary for the process of liquidation of surface and underground infrastructure of SRK S.A.,
- reconstruction and strengthening of mining excavations,
- opening and penetrating closed excavations on the basis of rescue operations,
- rescue operations carried out in own units and other entities running mining activity.

Under normal circumstances SRK S.A. would have to pay for carrying out above mentioned works to other entities. Station maintenance costs related to the remuneration of lifeguards, for the correctness of economic analysis presented in table 3 should therefore be reduced by the incomes of

works performed for other units according to free market hourly rates. For this purpose in table 6 the number of lifeguards' working days in individual years were listed. Table consists of days worked for the benefit of the SRK S.A units as well as for other entities.

The conducted research (table 6) shows that if these works were performed by outside companies, with the assumption of the same number of working days in particular years, the cost of their salaries would amount from PLN 2214.7 thousand in 2015 to PLN 5189.5 thousand in 2017, which makes approximately 50% of the annual salary of SRK S.A. lifeguards. At this point, it should be mentioned that some types of work performed by the rescue team, i.e. rescue operations, preventive work, combating threats require appropriate qualifications, skills and powers that are not available to employees from external companies and therefore they cannot perform them. In this situation, SRK S.A. would have to use the rescue crews of the Central Mining Rescue Station S.A. in Bytom, whose average working day is over PLN 300 higher than the day of the rescuer employed in SRK S.A. and amounts to PLN 854.32 (Data based on preventive work carried out by the OSRG Bytom depots at KWK "Piast-Ziemowit").

Table 6. Costs of lifeguards work for SRK S.A. and external entities.

Threats/ Works	Type of liquidation/ works	Number of working days in a year		
		2015	2016	2017
The number of rescuers' working days associated with the elimination of mining hazards				
Fire risk	prevention	566	1858	2264
Water threat	slurring	164	1260	1600
Coal burst danger	reconstruction	0	960	1560
The number of rescuers' working days associated with filling of workings				
Region 501	ashes	0	460	940
Region 510	ashes	436	1474	816
Region 615	ashes	954	350	0
Region 620	ashes	0	478	340
Incline 48	ashes	0	486	404
The number of rescuers' working days associated with the performance of such work as				
Loading and unloading of materials	manual works	656	978	1020
Transport of materials for the liquidation process	railway	448	748	940
Maintenance of the ventilation network	manual works	64	380	174
Reconstruction of high voltage cable	manual works	0	26	104
Construction and reconstruction of pipelines	manual works	326	1600	1110
Inerting	manual works	0	470	850
Reconstruction and strengthening of mining housing	manual works	56	1402	1210
The number of rescuers' working days associated with the liquidation of excavations				
Execution of insulation dam	manual works	854	1620	989
Execution of explosion proof insulation dams	manual works	1106	440	369
Execution of backfilling underground headings	manual works	452	660	0
The number of rescuers' working days related to the secondment to the District Mining Rescue Station OSRG				
Rescue Team Leader	secondment	210	210	288
Rescuer	secondment	1125	1125	1584
The number of rescuers' working days connected with carrying out rescue operations				
Zakład Górniczy Eko- Plus Sp. z o.o.	action	0	324	0
KWK „Murcki- Staszic”	action	0	168	0
KWK „Piast-Ziemowit”	action	0	28	0
Unit SRK S.A. KWK „Niwka- Modrzejów”	action	0	21	0
Unit SRK S.A. KWK „Szombierki”	action	0	0	21
Unit SRK S.A. KWK „Boże Dary”	action	0	0	42
TOTAL:		7417	17526	16625
The average cost of an external company's day work in SRK S.A. [PLN]		298.60	306.04	312.15
Total costs [thousand PLN]		2214.7	5363.7	5189.5

In addition, rescue operations require the use of specialized rescue equipment that is not owned by external companies and leasing it from a mining rescue unit is very costly. It happens that after a dozen or so days of using such equipment its price exceeds the value of its purchase (table 7).

Table 7. The payback period for the purchase of rescue equipment by SRK S.A in 2016.

Equipment purchased for the SRK S.A. Mining Rescue Station	Net purchase price [PLN]	Lease from CSRG S.A. net [PLN/ day]	Number of days to be depreciated
Device for obtaining nitrogen from atmospheric air with a capacity of 900 Nm ³ / h	2100000.00	5588.98	375
Pump PSZ-125	58500.00	971.08	60
Aggregate for the production of binders and mineral foams	46800.00	1061.91	44
Continuous measurement device CO-PAC 7000	1750.00	72.65	24
Continuous O ₂ measuring device - PAC 5500	850.00	72.65	12
A communication set between the base and the lifeguards	12300.00	259.29	47
Motionless sensor	474.15	10.84	44

6. Practical evaluation of the research topic based on the SWOT analysis

The SWOT analysis, as a tool used to determine the best directions of development of the studied facility, gives the opportunity to evaluate the actions taken and indicates the opportunities and threats that are lurking for a given project, which can be eliminated by pointing out weaknesses of the organization and the system. Bearing in mind the above in relation to the problem of operation of the SRK S.A. Mining Rescue Station, this analysis is as follows:

Strengths:

- refusal to take over the duties of the emergency services organization of the entrepreneur SRK S.A. by the Board of the Central Mining Rescue Station in Bytom in 2015,
- establishing rules for the organization of the operation of the SRK S.A. by mining supervision authorities of WUG. OUG and Central Mining Rescue Station S.A. and entrepreneur,
- creation of the SRK S.A. mining rescue station and allocation of funds for its organization.
- employment of experienced mine rescuers and managerial staff.,
- purchase of rescue equipment that has reduced or eliminated the huge costs of its lease,
- partial self-financing of the SRK S.A. Rescue Station thanks to the work carried out by rescuers to the units of SRK S.A. and other entities,
- knowledge of threats and underground infrastructure of SRK S.A.,
- mobility of rescue teams confirmed by participation in preventive work. trial fire alarms and rescue operations.

Weaknesses:

- confusion around the operation of the SRK S.A. mine rescue station,
- suspension of funds for the development of SRK S.A. mine rescue station,
- underestimation of the risks in the mines closed down by the current and former Board of SRK S.A.,
- lack of understanding of the SRK Management Board for the purposefulness of maintaining and developing mine mining rescue services,
- lack of proper preparation of the SRK S.A. in Bytom to take over 13 coal mines in liquidation in such a short time,
- staff shortages. especially among people responsible for the liquidation process in acquired mining plants.

Chances:

- competitiveness of the SRK.S.A. Mining Rescue Station in relation to other entities,
- specific financial savings presented in the above analysis,

- full mobility of the crews of the SRK S.A. Rescue Station to participate in the work in each unit of SRK S.A.,
- knowledge of underground infrastructure and threats of each of SRK S.A. unit,
- independence from external entities,
- the ability to control mining hazards on an ongoing basis and to take preventive measures quickly,
- professional and qualifying comprehensiveness of the members of the rescue team.

Threats:

- emerging concepts for the dissolution of mining rescue services in SRK S.A.,
- limitation of free market rules in the scope of rescue protection for mining entities in Poland,
- reducing the safety of SRK S.A. underground mining workers in case of liquidation of the entrepreneur's own mining emergency services,
- change of Polish mining law regulations in the field of mine rescue which could partially close the Polish market for EU companies,
- apparent financial savings in planned emergency rescue, in the case of SRK S.A. duties resulting from art. 122 Geological and Mining Law would be transferred to CSRG S.A. in Bytom.

An analysis of the strengths and chances of the SRK S.A. mining rescue station has shown that with a little good will of all parties, i.e. supervisors, entrepreneurs, executives and employees, mining rescue in liquidated mining plants and mines will defend itself. Already today, after 3 years of activity, it brings measurable and tangible, not only financial, benefits.

7. Conclusions

1. Analysis of the maintenance costs of the SRK S.A. showed that despite the expenses and financial resources from the state budget incurred. The decision to establish a Mining Rescue Station was right for the safety reasons of mining workers employed in liquidated mines as well as economic reasons.
2. After taking into account the work performed by lifeguards at SRK S.A. in favor of the company's units and external entities, the costs of their salaries decrease by 50% in annual terms and are significantly lower than the costs of remuneration for CSRG S.A. lifeguards.
3. Decision on purchasing own rescue and preventive equipment for the SRK S.A. Rescue Station was well-thought-out and accurate from the economic point of view. The value of its purchase has already been returned and its further use brings measurable savings for the entire SRK S.A. company.
4. Having own mining rescue services allows for quick response in case of danger.
5. The operational experience of active mining plants shows that the preventive and joint actions conducted by them are based mainly on their own rescue teams because it is supported by the economic calculation and knowledge of the plant.
6. The proposal of a full takeover of the SRK S.A. rescue security submitted by CSRG S.A. as demonstrated by the cost analysis carried out has no economic justification.

References

- [1] Sawicki K 2000 *Analysis of company costs. Chapter 4.1. The essence and classification of costs* (Warszawa – Poznań: PWE)
- [2] Announcement of the Speaker of the Sejm of the Republic of Poland of October 16. 2017 regarding the publication of a uniform text of the Act - Geological and Mining Law *Journal of Laws of the Republic of Poland 2017 item 2112*
- [3] Regulation of the Minister of Energy of March 16.2017 on mining rescue *Journal of Laws of the Republic of Poland 2017 item 1052*

- [4] Regulation of the Minister of Energy of November 23.2016 on detailed requirements for the operation of underground mining facilities *Journal of Laws of the Republic of Poland 2017* item 1118).
- [5] Mine Restructuring Company 2005 *Monograph* Katowice
- [6] Mocek P 2016 *Organization of mining rescue in liquidated mining plants in Poland. Public security organizations in the face of crisis management challenges in Poland* ed. J Zych (Poznań: Wyższa Szkoła Bezpieczeństwa) pp 95–109
- [7] Mocek P 2018 Mining rescue in SRK S.A. - economics and business *Syst. Wspomag. Inż. Prod.* **1** pp 155–171
- [8] <http://bip.srk.com.pl/>