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A TIME PICTURE OF WORK AND TRANSPORTATIONAL COMPLEX DOWNTIME/FAILURE ON SEPARATION OF SC COAL MINE „GRAČANICA“ LLC GORNJI VAKUF – USKOPLJE

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ABSTRACT

The review and analysis of a timeline work and stoppage/failure of transportational complex on separation in SC coal mine „Gračanica“ LLC Gornji Vakuf – Uskoplje has been given in this work.
The work is based on collecting and analysing data. Collecting data lasted for one year and it is analysed and shown in this work. Rightfully determined the state of work and stoppage/failure, allows precautions and choice of strategy for the next period. Conclusions about which stoppage/failure affected the stoppage of transportational system and separation in full are derived from the research, and based on those conclusions, suggestions about activities which would minimize these stoppages on acceptable value are given.

Key words: mine, coal, effective work, stoppage, failure, transportational complex, separation, belt conveyor, scraper.

1. INTRODUCTION

Subsidiary company Coal mine „Gračanica“ LLC Gornji Vakuf – Uskoplje is placed on the right shore of river Vrbas, 7 kilometers northwest of Gornji Vakuf – Uskoplje and 8 kilometers southeast of Bugojno. Coal mine is working on production and preparation of coal lignite. Currently, the mine is working on exploatation of coal on SM „Dimnjače“. Surface mining „Dimnjače“, objects of coal separation, as well as accompanying objects of mechanical workshops and administration building are placed on the teritory of municipality of Gornji Vakuf – Uskoplje.

Exploatation on surface mine „Dimnjače“ began in 1986, and coal separation was done by separation whose capacity was approximately 50 t/h and it mostly gave fractional coal (0 – 60 mm). Because of increased production of coal, and the surface mining „Gračanica“ was in final stage of exploatation, the building of new separation on surface mining „Dimnjače“ was approached. The building of separational objects was shortly finished by 1987. Technological scheme of separation SC Coal mine „Gračanica“ LLC Gornji Vakuf – Uskoplje is shown on picture 1.

Through this work, all individual working units (system elements: scraper transporter and belt conveyors) are observed, as well as system as a whole. To get full information about behaving of continuous transportational system, as well as elements of system, is it neccessary to dispose to a big number of data about time of work and stoppage/failure of transporters (elements of system) at separation of coal at surface mining „Dimnjače“.

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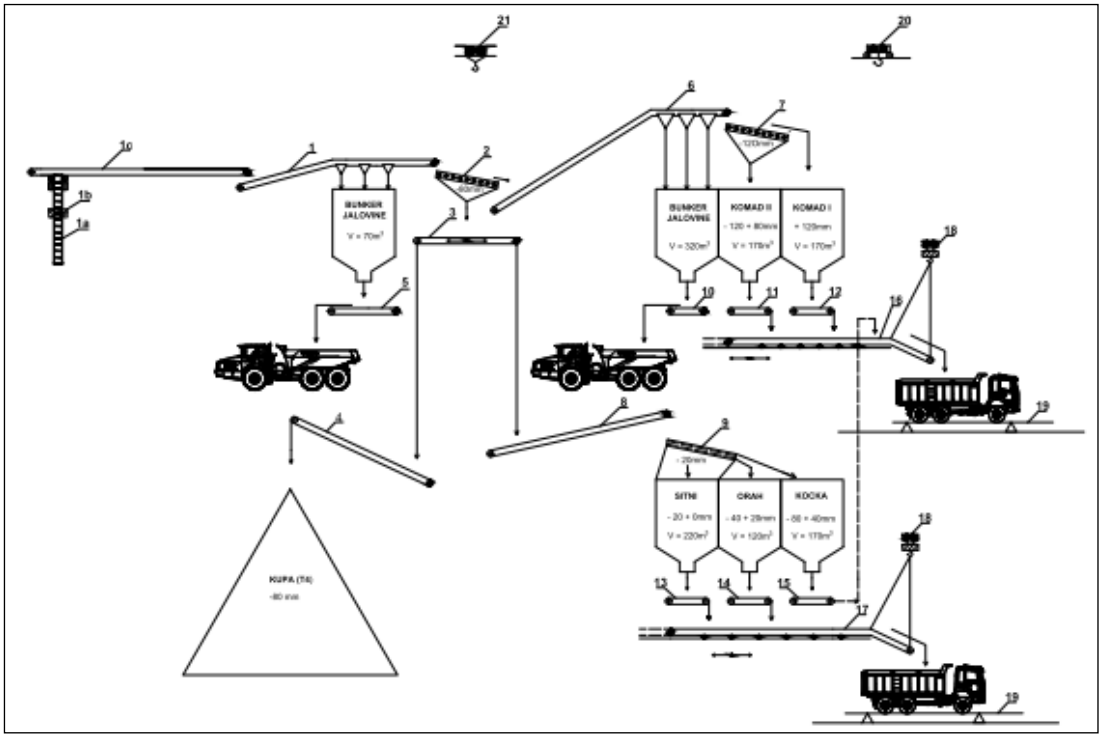
Transportational system at separation has 13 belt conveyors (T1A, T1, T3, T4, T6, T8, T11, T12, T13, T14, T15, T16, and T17), three scrapers, caliber sieve 80x80 mm, caliber sieve 120x120 mm, single-stage sieve and command desk.



Picture 1. Transportational system of separation (technological scheme)

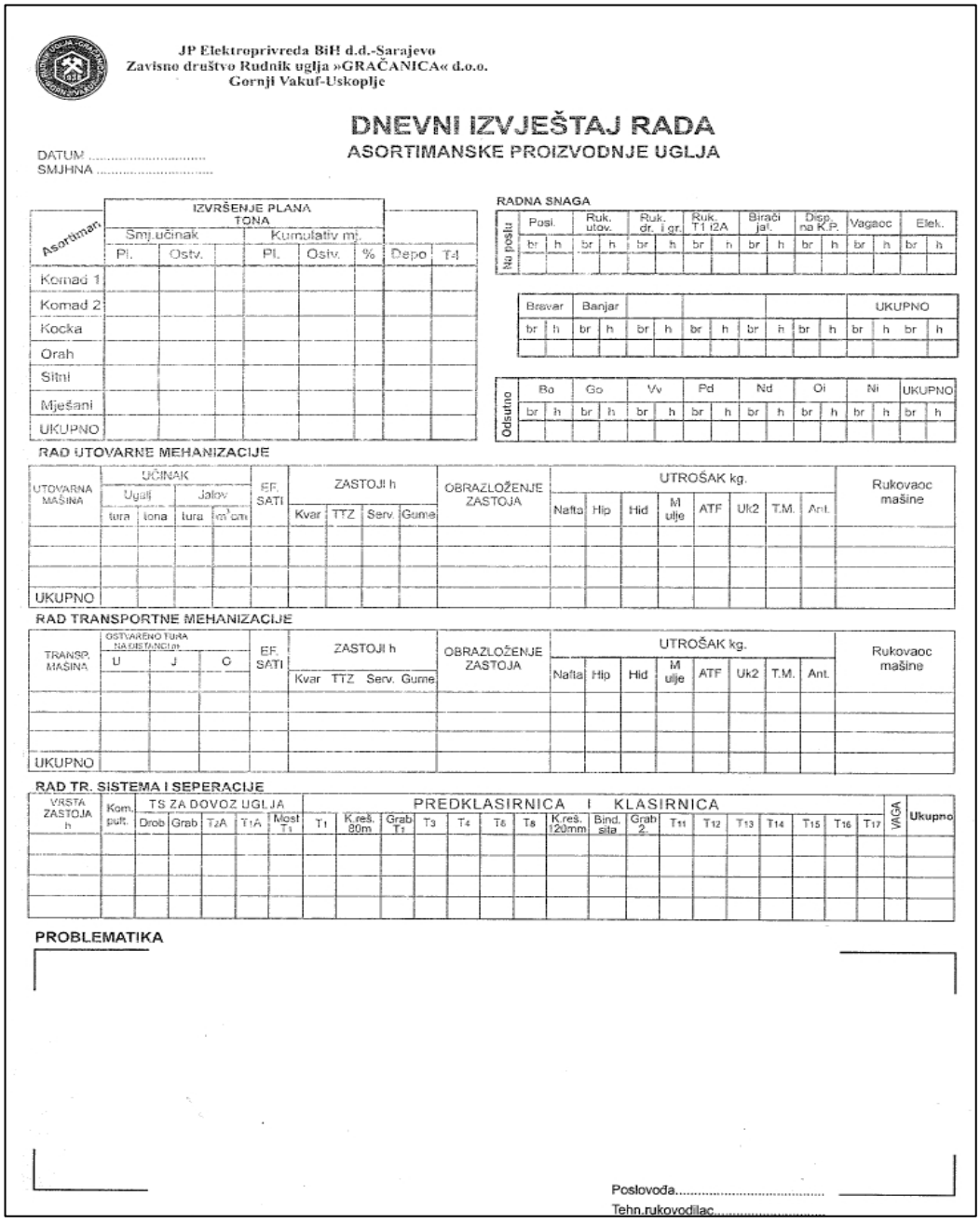
2. COLLECTING DATA ABOUT WORK AND STOPPAGE (DOWNTIME) OF ELEMENTS OF TRANSPORT AT SEPARATION

The exchange of information between supervisory – technical staff and operator of machines, auxilliary equipment, as well as communication between machines operators themselves, has been done by telephone connection. Telephones are installed as stable in separation, administration and repeairing workshops.

Manager and supervisor of coal separation communicate and exchange information with the dispatcher of command desk, scraper operator and operators of loading machines via radio and telephone connections. Shift managers or separation supervisors direct trucks, auxilliary equipment and other mechanizations via radio or oral connection according to the situation in production process and determine priorities by directing to serving certain segments of separation.

At the end of the shift, shift mechanic or locksmith and electrician write in the observatory book all fixtures that occred at separation during the shift describing malfunction, as well as time required for the fixture.

Shift manager controls and writes all collected information into the shift report book, and hands it over to technical operator of the mining and separation (picture 2.).



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Zavisno društvo Rudnik uglja »GRAČANICA« d.o.o.
Gornji Vakuf-Uskoplje

DNEVNI IZVJEŠTAJ RADA
ASORTIMANSKE PROIZVODNJE UGLJA

DATUM .....
SMJHNA .....

Asortiman	IZVRŠENJE PLANA TONA							
	Smj.učinak			Kumulativ mj.				
	Pl.	Ostv.		Pl.	Ostv.	%	Depo	T4
Komad 1								
Komad 2								
Kocka								
Orah								
Sitni								
Mješani								
UKUPNO								

RADNA SNAGA

	Posl.		Ruk. utov.		Ruk. dr. i gr.		Ruk. T1 i2A		Birači jal.		Disp. na K.P.		Vagaoc		Elek.	
Na poslu	br	h	br	h	br	h	br	h	br	h	br	h	br	h	br	h

Brsvar		Banjar										UKUPNO			
br	h	br	h	br	h	br	h	br	h	br	h	br	h	br	h

Odsutno	Bo		Go		Vv		Pd		Nd		Oi		Ni		UKUPNO	
	br	h	br	h	br	h	br	h	br	h	br	h	br	h	br	h

RAD UTOVARNE MEHANIZACIJE

UTOVARNA MAŠINA	UČINAK				EF. SATI	ZASTOJI h				OBRAZLOŽENJE ZASTOJA	UTROŠAK kg.								Rukovaoc mašine
	Ugalj		Jalov			Kvar	TTZ	Serv.	Gume		Nafta	Hip	Hid	M ulje	ATF	Uk2	T.M.	Ant.	
	tura	tona	tura	m³/dm															
UKUPNO																			

RAD TRANSPORTNE MEHANIZACIJE

TRANSP. MAŠINA	OSTVARENO TURA NA RASTANCIJI			EF. SATI	ZASTOJI h				OBRAZLOŽENJE ZASTOJA	UTROŠAK kg.								Rukovaoc mašine
	U	J	O		Kvar	TTZ	Serv.	Gume		Nafta	Hip	Hid	M ulje	ATF	Uk2	T.M.	Ant.	
UKUPNO																		

RAD TR. SISTEMA I SEPERACIJE

VRSTA ZASTOJA h	Kom. puit.	TS ZA DOVOZ UGLJA					PREDKLASIRNICA I KLASIRNICA															VAGA	Ukupno
		Drob	Grab	T2A	T1A	Most T1	T1	K.reš. 80m	Grab T1	T3	T4	T6	T8	K.reš. 120mm	Bind. sita	Grab 2	T11	T12	T13	T14	T15	T16	T17		

PROBLEMATIKA

Poslovođa.....
Tehn.rukovodilac.....

Picture 2. Daily report of distributional coal production

The systematization of data about working times and **downtime** /failure of all members of transportational system has been conducted for a period of 12 months.

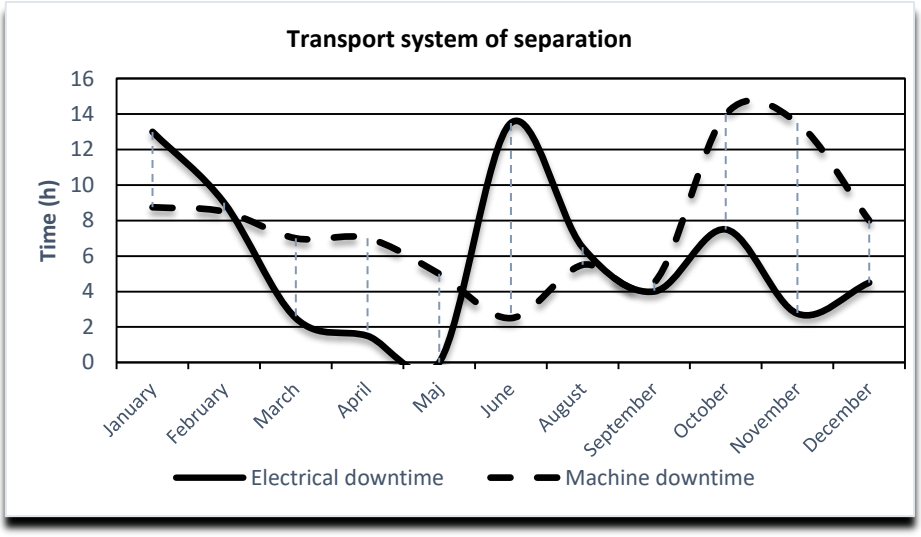
3. TIME PICTURE OF WORK AND DOWNTIME/FAILURE OF TRANSPORTATIONAL COMPLEX AT SEPARATION

To get basic parameters, observing and gathering of time information about work and **downtime** /failure of transportational units had to be done. Based on gathered information about basic transportational equipment on separation, the time picture of work and stoppage/failure has been researched.

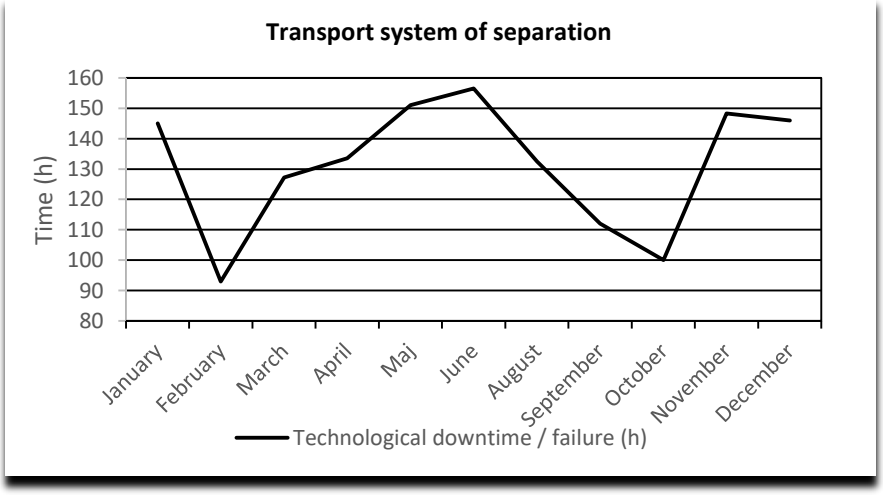
The review of registered data of **transport system of separation** has been shown in **Table 1.**

Table 1. Registered time data about work and downtime/failure for transportational system

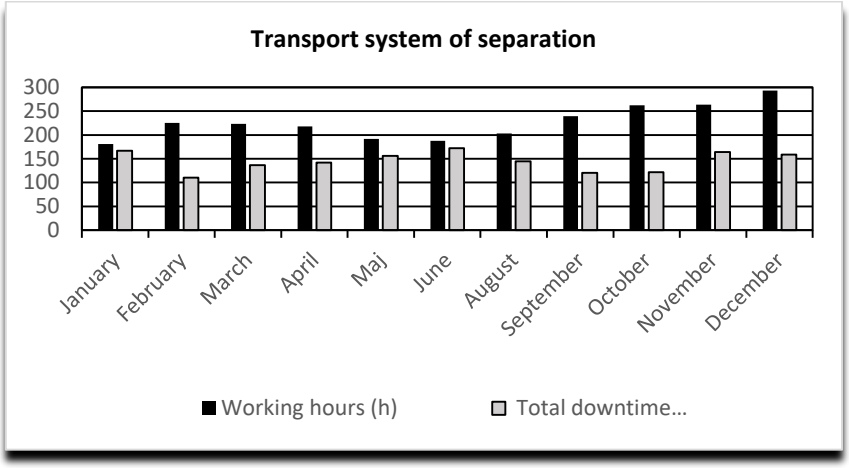
Transport system of separation						
Month/2013	**Working hours (h)**	**Technological downtime / failure (h) (h)**	**Electrical downtime / failure (h)**	**Machine downtime / failure (h)**	**Total downtime / failure (h)**	**Total time during the month (h)**
January	181,25	145	13	8,75	166,75	348
February	225,5	93	9	8,5	110,5	336
March	223,25	127,25	2,5	7	136,75	360
April	218	133,5	1,5	7	142	360
Maj	192	151	0	5	156	348
June	187,5	156,5	13,5	2,5	172,5	360
August	203,5	132,5	6,5	5,5	144,5	348
September	239,5	112	4	4,5	120,5	360
October	262,5	100	7,5	14	121,5	384
November	263,5	148,25	2,75	13,5	164,5	428
December	293,5	146	4,5	8	158,5	452
UKUPNO	**2662,25**	**1641**	**67**	**85,75**	**1793,75**	**4456**



Picture 3. Review of mechanical and electrical downtime /failure by observed months



Picture 4. Review of technological downtime /failure by observed months



Picture 5. Review of effective work time and total downtime /failure by observed months

Based on the data about time condition of work and **downtime /failure**, transportational system of separation by position 7 and position 9 in researched time (12 months), can be concluded that:

-Total duration time of effective work for observed period is 2662,25 h. Average work time for one month of observation is 221,85 h

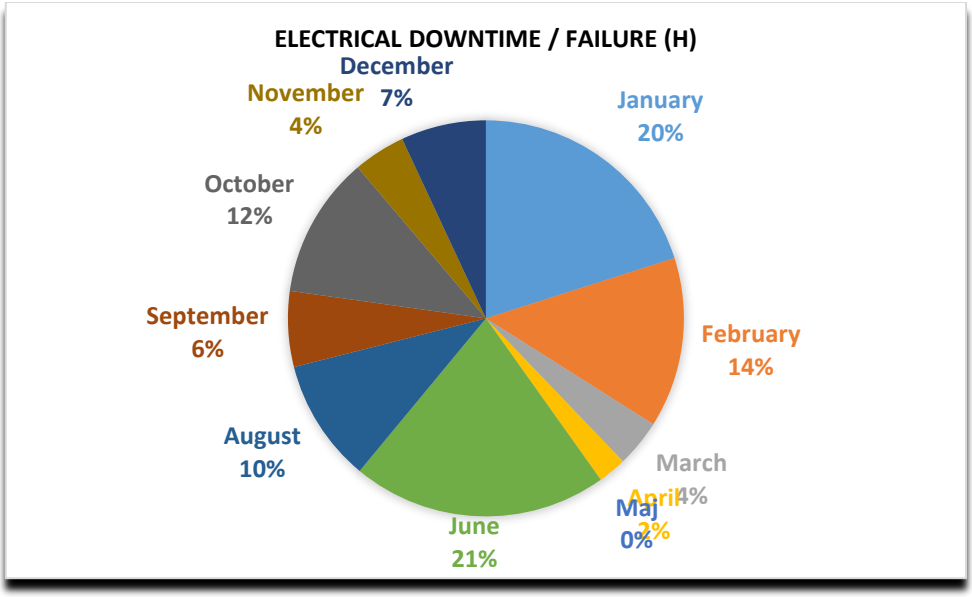
-Total duration time of electrical downtime/failure for observed period is 67 h. Average duration time of electrical downtime/failure or one month is 5,58 h

-Total duration time of mechanical downtime/failure for observed period is 85,75 h. Average duration time of machanical downtime/failure for one month is 7,15 h

-Total duration time of technological and organizational downtime/failure for observed period is 1641,00 h. Average duration time of technological and organizational downtime/failure for one month is 136,75 h

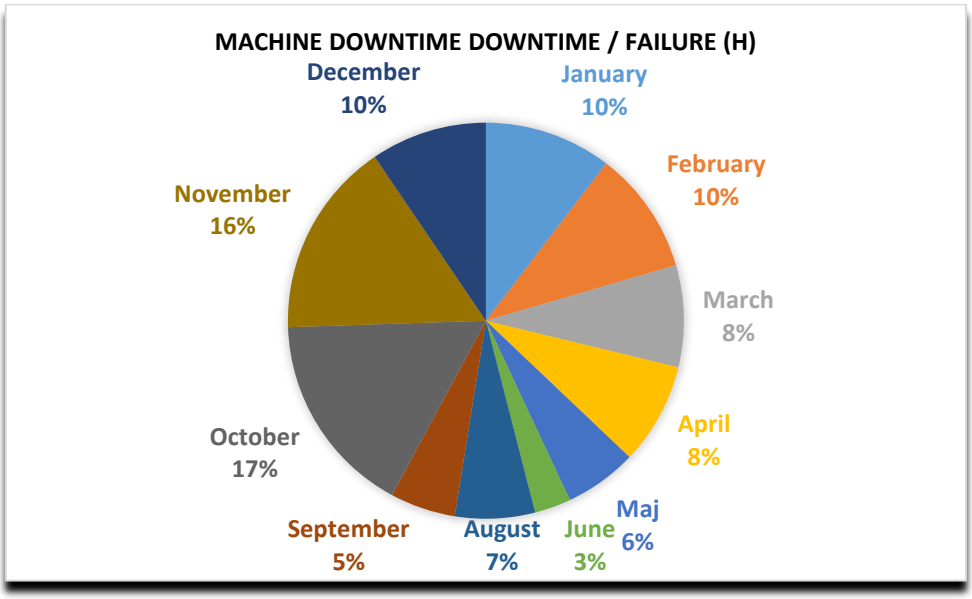
-Total duration time of all downtime/failure for observed period is 1793,75 h. Average time of all downtime/failure for one month is 149,48 h

Based on latter data, it can be concluded that transportational system of separation by position 7 and position 9, 59,75% of available time has spent working, 1,5% of time has spent in electrical stoppage/failure, 1,9% in mechanical stoppage/failure, and 36,83% of available time has spent in technological and prganizational stoppage/failure.



Picture 6. The percentage of electrical downtime/failure by observed months

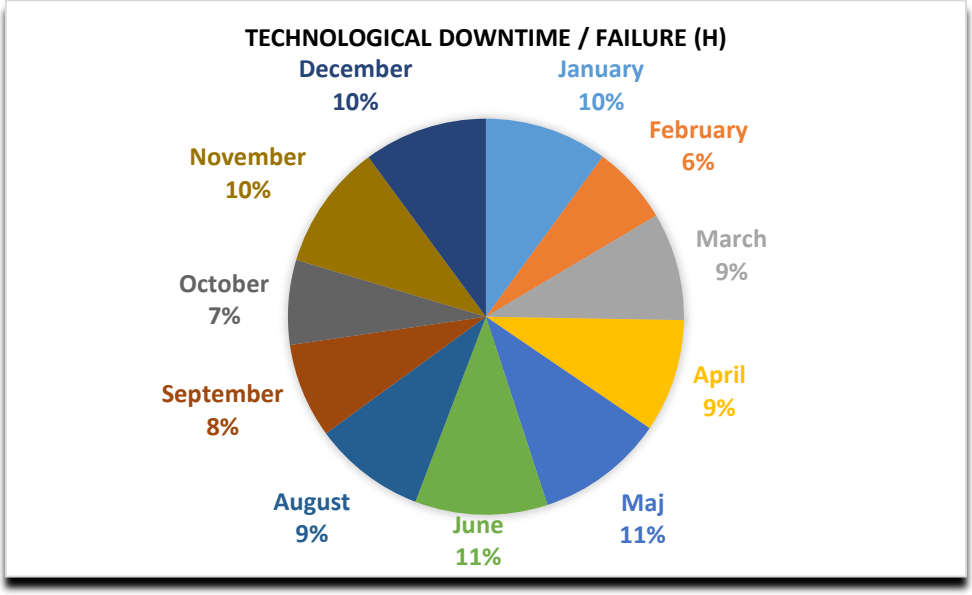
Electrical downtime/failure have been recorded during 11 months, but in May hasn0t been any downtime/failure, the rest of the months had 2 – 20% of stoppage, and the most common malfunctions were repair of outlet, repair of switch, fixture of junction box, replacement of side switch, insertion of side switch assembly, replacement of sound signal, power outage, unblocking of pull-out switch, repair of distribution cabinet, repair of sound signalization, turning on the pull rope, seized valve stem, repair of buttons, replacement of electrical engine, replacement of direction of movement, engine bearing replacement, repair and posture of sound signal.



Picture 7. The percentage of mechanical stoppage/failure by observed months

Registered mechanical downtime/failure have been moving from 2 to 16% (1,5 h to 14 h). downtime/failure that follow these transporters of mechanical type are tape centering, rollers changing, scraper changing, replacement of chain clips, doping oil into reducers, oiling, cutters' defrosting in winter period, mixed cutters, oiling, cutters' malfunction (beds), oiling, tape splicing (stitching), oiling of rollers,

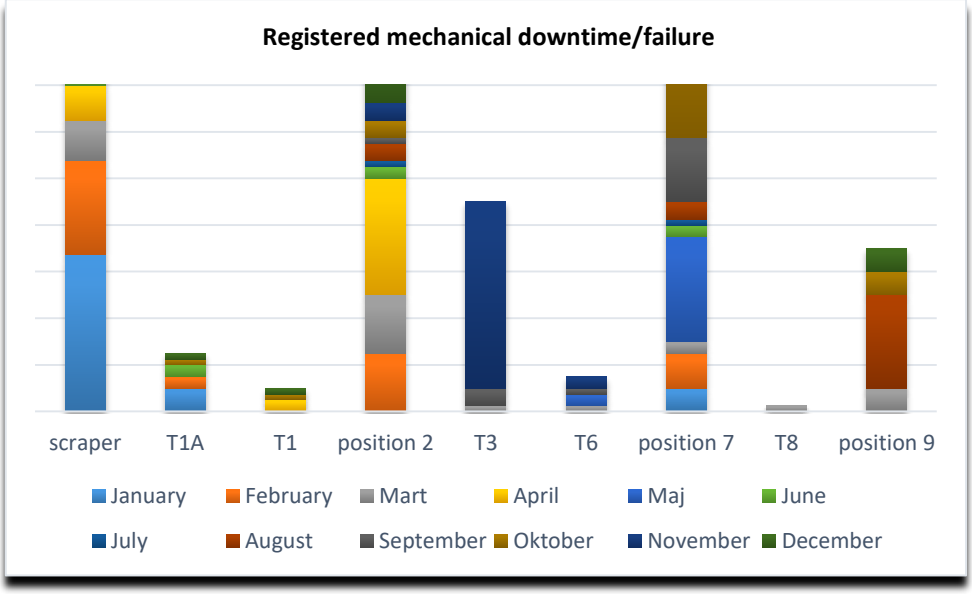
replacemtn of side rollers, tape popup, replacement of beds, oiling the chain, slipped hydro coupling, chain binding and cutters repair, case welding, shield welding etc.



Picture 8. The percentage of technological stoppage/failure by observed months

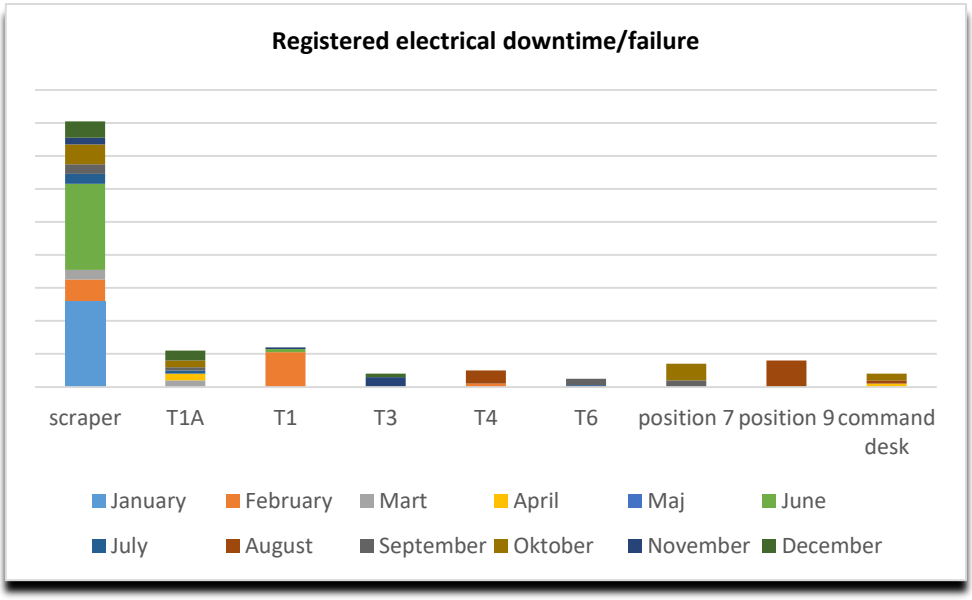
During 12 months of observation, transporters had the most technological downtime/failure in July, 12%, while in other months downtime/failure were between 6, 7, 8 and 9%. Technological failures that follow these transporters are mostly caused by human factor, waiting for loader or separation not included into work, as well as some of the transporters.

All elements in transportational complex system had registered technological downtime/failure in period of 12 months. Some elements in part of the transportational systemon separation during the observation had registered mechanical and electrical downtime/failure, while some of them did not.



Picture 9. Registered mechanical downtime/failure by individual months

The element of position 7 had registered downtime/failure during 11 months, while the scraper had registered downtime/failure during 10 months. The element of position 2 had registered downtime/failure during 10 months, and position 9 had failures during 4 months, while the transporter T1A had failures during 6 months, T1 during 3 months, transporter T8 during one month and T6 during 4 months. The remaining transporters and positions didn't have registered failures.



Picture 10. Registered electrical downtime/failure by individual months

The element of position 7 had registered downtime/failure during 2 months, scraper had failures during 9 months, transporter T1A during 6 months, T1 during 3 months, T3 during 2 months, command desk during 3 months, T6 and position 7 during 2 months, transporter T4 during 2 months and position 9 during one month.. The remaining transporters/elements didn't have registered mechanical failures.

4. CONCLUSION

Based on the conducted research, it can be concluded that the transportational system didn't work because of the following technological failures:

- Human factor,
- Waiting for loader,
- Usual failures on T6 conveyor because of separating the tailings,
- Empty baskets,
- Cleaning and washing the doser,
- Separation was not included into work.

Suggestion of activities to reduce failures to acceptable rate:

- Stoppages related to human factor were 246 hours due to lateness of workers to workplace. With strict supervisor of technical and supervisory staff, these stoppages could be reduced to acceptable rate.
- It's neccessary to have 2 loaders in production, but to reduce stoppage of waiting separation due to loaders, there is need for a third one.
- T6 transporter is the transporter that is used for segregating tailings. The content of tailings that is not segregated from it is crucial for the quality of coal in baskets.Due to that problem, in the period when there is a big amount of tailings in material on belt transporter T6 , that transporter is mostly

stopped, which leads to stoppage of remaining transporters. To have less stoppages of transporter, it is neccessary to secure better quality of pit coal and increase number of workers who are working on segregating the tailings of T6 transporter.

- Empty baskets are related to dosing transporters and they are in waiting mode. To improve production system and material floww on belts, it is neccessary to spread material evenly on the belts and that is possible with just 2 loaders that shift material from terminal to scraper which transports in further to separation. In this way, the baskets would be loaded faster and more evenly, and dosing transporters would have less technological stoppages.
- The work on separation has to be stopped due to the need of cleaning and washing the separation. The separation doesn't work while power outage, but during that time, the old separation that crumbles material which is transported to terminal is working, so the production is not endangered.

The presented methods of treatment, analysis and seclusion of relevant information about work parameters and transportational system downtime/failure in separation has been done for the first time in this way and in these areas and can be repeated for continuous transportational systems on other separations.

Contribution of this work to professional literature is that, for the first time, certain time picture of work and downtime/failure of transportational system on separation has been determined and based on the data can give suggestions for activities that lead to increasing effective work time.

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