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TO THE QUESTION OF INCREASING RELIABILITY COMBINE A COALFACE 1K101U

The paper presents and analyzed indicators of the reliability of the shearer type 1K101У in representative conditions. Identified functional system combine reliability which is crucial to the reliability of the machine as a whole.

Keywords: combine a coalface, 1K101U, the system is functional and reliability parameters, the failure

The problem and its relation to the scientific and practical problems. Digging coal working face using mostly shearers. The effectiveness of treatment is determined by the work, including the performance characteristics combine indicators of reliability. To study the operational reliability of the system need to be identified combine a coalface(CC) functional (SF) combine the reliability of which is essential to the machine as a whole.

Analysis of studies and publications. In this paper we present data describing the reliability of the combine cleaning 1K101U that the mines operated by the industry a long time.

Statement of the problem. This article is devoted to the important topic for the coal industry - to increase the reliability of the combine cleaning 1K101U. In this paper, obtained and analyzed indicators of the reliability of the functional systems of the shearer 1K101U in representative conditions. The aim of this study is to determine the functional systems of CC, the reliability of which is crucial to the reliability of the machine as a whole.

Presentation of the material and results. The primary source of information about the reliability of 1K101U authors used actual statistics obtained when operating the combine in the geological reservoir conditions h8 Mine "Shahtersk - deep". These data were obtained as a result of long-term observation of the work combine service personnel. Harvester operated in the representative for the purposes set out in Article, the conditions of excavation of the mine. Take out the power of 1.25 m, with the angle of incidence of 12-13º, coal resistance to cutting 160 N/mm.

Mode at the bottom of the combine - working three shifts and one repair and preparation .

Background information on the reliability of CO contained data for the period from the date of installation of the combine in the development and prior to removal for the issue to the surface. The observations were differentiated for the work of such major SF combine as: SF- system failure ; SCP- system change the position of the workers (WB) , SP- transfer system CC ; DSSC - dust suppression system and the cooling MS - mount system .

No structural modifications harvester spent 23 months and 18 days and is still used in the operation. Moving speed harvester was 2 m / min.

Faultlessness of combine we will estimate middle work on a refuse.

Statistical evaluation of the mean time to failure calculated by the formula [1] :

$$T = \frac{1}{n} \cdot \sum_{i=1}^{n} t_i \qquad (1),$$

where t_i – the operating time to the i-th failure; n - the number of failures occurring in the course of this operating time.

Maintainability combine to estimate the average recovery time Тв. Statistical evaluation of the Тв is defined by the formula:

$$Тв = \frac{1}{n} \cdot \sum_{i=1}^{n} t_{вi} \qquad (2)$$

where - time to repair after the i-th failure. As the reliability of complex 1K101U use the coefficients: Preparedness - Кг and technical use - Кти:

$$K_{Г} = \frac{T}{(T + T_B)} \qquad (3),$$

$$K_{ТИ} = \frac{\sum tp}{\left(\sum_{i=1}^{n} t_i + \sum_{i=1}^{n} t_{вi} + \sum_{i=1}^{n} t_{TOP} \right)} \qquad (4),$$

where $\sum t_p$ - total operating; $\sum_{i=1}^{n} t_{TOP}$ - the total time scheduled maintenance and repairs.

$$К_{г(КО)} = \frac{1}{1 + \left[\left(\frac{1}{K_{Г(СР)}} - 1 \right) + \left(\frac{1}{K_{Г(СП)}} - 1 \right) + \left(\frac{1}{K_{Г(СиП)}} - 1 \right) + \left(\frac{1}{K_{Г(СППиО)}} - 1 \right) + \left(\frac{1}{K_{Г(СК)}} - 1 \right) \right]} \qquad (5)$$

Analysis of baseline data to determine the reliability of the functional systems combine (Table 1) shows the following. During operation of the combine was recorded 244 failure pa operability elements of its functional systems (excluding incisors). The total time to repair harvester was approximately 581 hours, which corresponds to 4.5% of the total working time of planned operation (12906 hours).

Table 1 - Baseline data to determine the reliability of the functional systems combine

Name of the Functional system, SF(to her component part)	Name Element of SF	Kind repair element SF	Amount refuses, n, things	Total work on a refuse,hr $\sum_{i=1}^{n} t_i$	Time renewals , (limits measuring), hr	Total time of renewal, hr $\sum_{i=1}^{n} t_{ei}$
SF	cutter (ZR4.80)	repair	7754	12673,4	0,02-0,04	232,6
	auger	replacement, repair	5	12861	9	45
	billow-cog-wheel P79.01.013.-02	repair	12	12762	12	144
	electric motor 4ЭДК04-110У5	repair	4	12862	10-12	44
	Muffs of output billow EM	replacement, repair	8	12850	6-8	56
in all taking into account chisels			7783		0,02-12	521,6
in all without the account of chisels			29		6-12	289
SCP	Drive star	repair	3	12888	5-7	18
	Cuffs of drive star	replacement, repair	20	12836	3-4	70
	round link chain	replacement, repair	2	12894	5-7	12
	Supporting ski	repair	20	12786	5-7	120
	The hydraulic motor DP 510	repair	11	12898,8	0,3-1	7,2
	Pupm NP120	repair	11	12898,8	0,3-1	7,2
	Violation of impermeability of sleeves	replacement, repair	48	12889,2	0,2-0,5	16,8
in all on SCP			115		0,2-7	251,2
SP	Pump KA80	repair	12	12897	0.5-1	9
	hydraulic jack	repair	23	12768	6	138
	Working liquid	repair	30	12900,7	0,1-0,25	5,25
In all on SP			65		0,1-6	152,2
DSSC	Sprayers of irrigation	repair	15	12894,7	0,5-1	11,25
	Violation of impermeability of sleeves	replacement, repair	2	12905,5	0,25-0,5	0,45
in all DSSC			17		0,25-1	11,7
MS	Gathering(hairpins)	repair	18	12789	5-8	117
in all on DSSC			18		5-8	117

Table 2 shows data describing the quantitative reliability functional systems combine. Indicators of reliability of the systems as a whole (Total SFi) in Table 2 are given in the form of weighted averages.

Table 2 - Reliability of functional systems combine

Name of the Functional system, SF (to her component part)	Name Element of SF	Middle work on a refuse, T, hr	Mean time of renewal of Тв, hr	Factor of readiness of Кг
CF	cutter (ZR4.80)	1,6	0,03	0,982
	auger	2572,2	9	0,997
	billow-cog-wheel P79.01.013.-02	1063,5	12	0,989
	electric motor 4ЭДК04-110У5	3215,5	11	0,997
	Muffs of output billow EM	1606,2	7	0,996
in all without the ac-count of chisels		2114,4	9,8	0,979
SCP	Drive star	4296	6	0,999
	Cuffs of drive star	641,8	3,5	0,995
	round link chain	6447	6	0,999
	Supporting ski	639,3	6	0,991
	The hydraulic motor DP 510	1172,6	0.65	0,999
	Pupm NP120	1172,6	0.65	0,999
	Violation of impermeability of sleeves	268,5	0,35	0,999
in all on SCP		2150,4	3,2	0,973
SP	Pump KA80	12897	0,75	0,999
	hydraulic jack	12768	6	0,989
	Working liquid	12900,7	0,175	0,999
in all on SCP		12855,2	2,3	0,987
DSSC	Sprayers of irrigation	12894,7	0,75	0,999
	Violation of impermeability of sleeves	12905,5	0,225	0,999
in all on DSSC				0,998
MS	Gathering(hairpins)	710,5	6,5	0,991

Conclusions and directions for further research .

After analyzing the data we see that the grain cleaning 1K101U generally characterized by very high reliability, which can be explained by a sufficiently high level of service combine custodial staff and strict compliance manuals combine. So , for 1K101U Кг = 0.93 ; Кти = 0.87. System turned out to be the most problematic change the position of the workers , describing the lowest level of reliability of all the above components combine cleaning .In the future, in order to obtain other

performance indicators of the work of the shearer 1K101U , will conduct research on the loading of electric organ failure and specific energy consumption for the destruction of the array.

List of sources

1. Государственный стандарт союза ССР. Надежность в Технике. ГОСТ 27.002-89.- Издательство стандартов, 1990г. – С. 7,29.
2. Комбайн очистной узкозахватный 1К101У. Руководство по эксплуатации 1К101У.00.00.000 РЭ. «Горловский машзавод». 117с.

В.Г. Потапов, А.О. Бікс. **До питання про підвищення надійності комбайна очисного 1К101У.** *У роботі приведені і проаналізовані показники, що характеризують надійність роботи очисного комбайна типу 1К101У в показних умовах експлуатації. Виявлена функціональна система комбайна, надійність якої має визначальне значення для машини в цілому.*

Очисной комбайн, 1К101У, експлуатаційна надійність, відмова, поломка, втрати часу

V. Potapov, A. Biks. **To the Question of Increasing Reliability Combine a Coalface 1K101U**

In the work presented and analyzed indicators of the reliability of the shearer in the flashy type 1K101U conditions. The observed functional systems combine the reliability of which is crucial for the machine as a whole.

Combine a coalface 1K101U, operational reliability, failure, failure, loss of time