

I approve:
General director
EnergoTechMash LLC
Ivanov A. N.

Test report on the effect of quasi-crystalline powder on the performance of the DoALL C-670 M band saw reducer.

Purpose of the work: Determination of the effect of quasicrystalline powder of the Al-Cu-Fe system produced by NANOCOM LLC on the performance characteristics of the equipment of EnergoTekhMash LLC.

Place of work:

LLC "EnergoTekhMash", Samara region, Zhigulevsk, st. Morkvashinskaya, 40, procurement shop.

To determine the effect of quasi-crystalline powder on the performance (electrical load) of the gearbox, the DoALL C-670 M band saw drive was selected, the operating mode of this equipment is constant.

Experimental work period:

- 01.18.2021 – 01.29.2021 control of the operating parameters of the DoALL C-670 M band saw before testing;
- 04.02.2021 -17.02.2021 control of the operating parameters of the DoALL C-670 M band saw during the experimental work.

Control devices:

- Current clamp ATK 2200 for measuring electrical load with an accuracy of 0.1 A.

Features of DoALL C-670 M Band Saw Machine

Year of release - 2006

Weight - 5000 kg.

Blade size - 8.450 * 54 * 1.6 mm

Blade speed - 20-100 m / min.

Passport data on the T / O of the gearbox of the DoALL C-670 M band saw machine

- oil volume in the gearbox - 4 l
- Oil change after the first 100 hours
- level check every 2000 hours
- oil change every 4000 hours

Description of work:

Before the introduction of quasi-crystalline powder into the gearbox of the drive of the band saw machine, observations / measurements of the electrical load were carried out for two weeks, the results are presented in Table 1.

Table 1

№	Date	Idle speed, A	Working under load, A	Note
1.	18.01.2021	2,0 (frequency converter)	4,0-4,4	The change in load depends on the overall dimensions of the workpiece during the sawing process
		8,0 (electric motor)	9,2-9,6	
2.	20.01.2021	2,0 (frequency converter)	4,0-4,4	
		8,0 (electric motor)	9,2-9,6	
3.	22.01.2021	2,0 (frequency converter)	4,0-4,4	
		8,0 (electric motor)	9,2-9,6	
4.	26.01.2021	2,0 (frequency converter)	4,0-4,4	
		8,0 (electric motor)	9,2-9,6	
5.	28.01.2021	2,0 (frequency converter)	4,0-4,4	
		8,0 (electric motor)	9,2-9,6	

Observation:

1. In the process of work on the gearbox, a stable decrease in the oil level is observed, there is a systemic loss of oil (the frequency of top-up is on average 100 g per month).
2. At the time of the pilot tests, the operating time of the machine was 3968 hours after the last oil change in the gearbox.

The required mass of quasi-crystalline powder to be added to the gearbox oil system was formed at the rate of 1% of the volume of oil in the gearbox, which was 40 g.

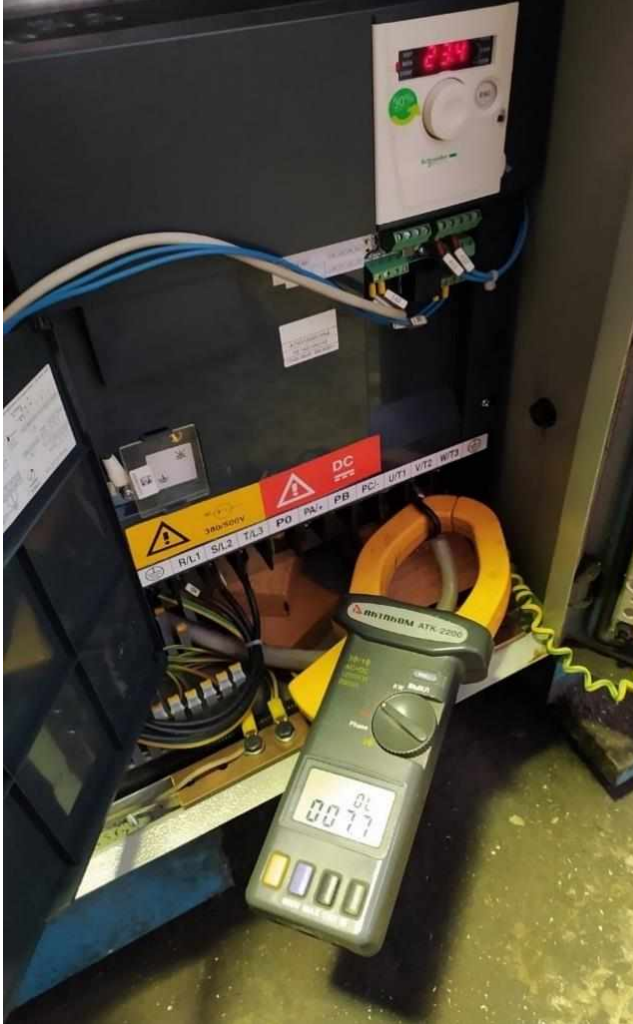
Over the next two weeks after the introduction of the quasicrystalline powder into the oil system of the saw band drive gearbox, observations / measurements of the electrical load were made, the results are presented in Table 2.

Table 2

№	Date	Idle speed, A	Working under load, A	Note
1.	04.02.2021	1,8 (frequency converter)	3,6-3,9	The change in load depends on the overall dimensions of the workpiece during the sawing process
		7,7 (electric motor)	8,6-8,9	
2.	08.02.2021	1,8 (frequency converter)	3,6-3,9	
		7,7 (electric motor)	8,6-8,9	
3.	10.02.2021	1,8 (frequency converter)	3,6-3,9	
		7,7 (electric motor)	8,6-8,9	
4.	12.02.2021	1,8 (frequency converter)	3,6-3,9	
		7,7 (electric motor)	8,6-8,9	
5.	15.02.2021	1,8 (frequency converter)	3,6-3,9	
		7,7 (electric motor)	8,6-8,9	
6.	17.02.2021	1,8 (frequency converter)	3,6-3,9	
		7,7 (electric motor)	8,6-8,9	

Results:

1. During the period of the experimental work, oil was not topped up, the rate of decrease in the oil level (oil loss) decreased;
2. Energy consumption without load at the input to the frequency converter 30 minutes after the introduction of the quasicrystalline powder decreased by 10% and then remained unchanged during all observations;
3. Energy consumption without load at the inlet el. the motor of the gearbox drive 30 minutes after the introduction of the quasicrystalline powder decreased by 4%, then remained unchanged during all observations;
4. The energy consumption under load at the input to the frequency converter 30 minutes after the introduction of the quasi-crystalline powder decreased by 10% and remained unchanged during all observations;
5. Energy consumption under load at the inlet el. the motor of the reducer drive 30 min after the introduction of the quasicrystalline powder decreased by 6.% further during all observations remained unchanged.



Video download link <https://disk.yandex.ru/a/iH7yVZyP9yKdpA>

Findings:

- 1) It is shown that the power consumption of the equipment is reduced by up to 10% as a result of the introduction of quasi-crystalline powder into the oil system of the gearbox.
- 2) A decrease in oil consumption by equipment was noted after the application of a quasicrystalline powder.
- 3) It is recommended to scale up the use of quasicrystalline powder as a modifier of friction systems on enterprise equipment as a tool to increase the economic efficiency of production processes.

Deputy chief engineer**LLC "ETM"****Ivanov A. V.**