WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 3, Issue 10, Oct., 2022

INCREASING THE DURABILITY OF GEAR TRANSMISSIONS OF ASYNCHRONOUS TORSION ELECTRIC MOTORS

Ergashev O. E.
Assistant, Tashkent State Transport University

Abduvakhabov M.E.
Assistant, Tashkent State Transport University
mr.muslim9397@mail.ru

Khamidov O. R.
Associate Professor, Tashkent State Transport University

Tursunov N. K.
Ph.D., head of the Department of Materials Science and Mechanical Engineering, Tashkent State Transport University

Toirov O. T.
Ph.D. student of the Department of Materials Science and Mechanical Engineering, Tashkent State Transport University

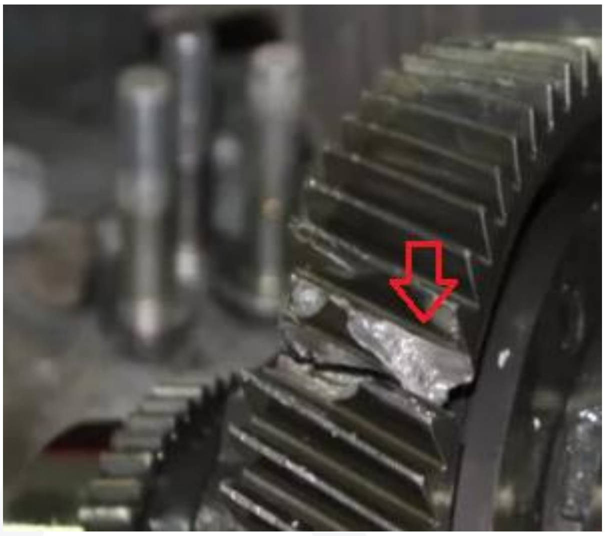
ANNOTATION

According to 2015 data, 11 UZ ELR electric locomotives were imported from China. The electric locomotive is equipped with a modern control system TCMS, manufactured by TOSHIBA, which protects the electric locomotive from overloads, faults and notifies the driver in a timely manner. In other words, the electronic equipment of the electric locomotive shows through the monitor the settings of the systems. However, the transmission of gears in the traction reducer has some disadvantages. To prevent such inconveniences, it is necessary to improve the quality of timely technical inspection and repair of electric locomotives UZ ELR.

Keywords: gear extension, temperature, reducer, pressure, manometer, indicator, shaft, asynchronous, electric locomotive, technology.

Uzbekistan's railways have had a number of modern freight and passenger electric locomotives in recent years. In order to extend the working life of these electric locomotives, their various units are repaired or undergo technical inspection. In particular, there are a number of shortcomings in the repair of the drive gears of asynchronous torque electric motors. We know that usually the drive gear of many torque electric motors is installed on the torque electric motor rotor shaft at a certain temperature. A number of the following unpleasant situations are observed when the 18 CrNiMo7-6 drive gear is heated in the SEA-107E asynchronous torque electric motors of the UZ ELR electric locomotive (1-future. A and B):

- breakage of the teeth of the driving gear;
- loss of accuracy of installation on the rotor shaft as a result of overheating;
- loss of properties of the material composition of the driving gear;
- reduction of working life efficiency, etc.;



A

B

Figure 1. Errors in the warm-up of the drive gear

The technical parameters of the pulley reducer are shown in the table below.

Table -1

Technical indicators of the puller reducer	
Transmission ratio	101/21=4,81
Dental module	9
Twist angle	8℃
Pressure angle	20℃
Gear transmission material	18CrNiMo7-6

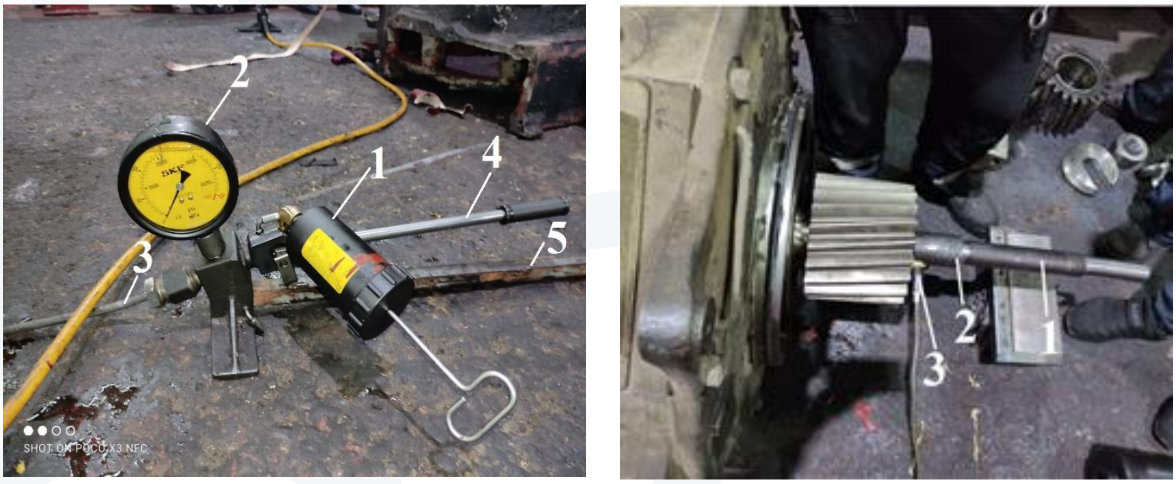
The technical parameters of the 18CrNiMo7-6 drive gear are shown in Table 2 below.

Chemical composition of 18CrNiMo7-6 gear in %

Table - 2

C (Carbon)	Si (Silicon)	Mn (Manganese)	P (Phosphorus)	S (Sera)	Cr (Chrome)	Mo (Molybdenum)	Cu (Med)	Ni (Nickel)	Fe (Iron)
0,15-0,21	0,15-0,40	0,5-0,9	<0,025	<0,035	1,5-1,8	0,15-0,35	<0,4	1,4-1,7	Rest

Increasing the content of silicon (Si) up to 0.10% leads to an increase in recyclability. In this case, the content of manganese (Mn) can be increased to 0.15%.
In order to avoid the situations in the above picture, when installing the driving gears in this type of asynchronous torque electric motors, heating installations at a certain temperature are abandoned and the cold condition is installed by applying hydraulic pressure. In this article, we will consider the procedure for installing the drive gears on the rotor shaft in a cold state in asynchronous torque electric motors. In this case, we use hydraulic pressure devices with two different types of pressure manometers. These devices have almost the same structure and perform two different tasks (Figure 2). So, our first hydraulic pressurization device is composed of an oil storage box 1, a pressure gauge 2, a tube 3 for sending liquid under pressure, a handle 4 for driving liquid under pressure, and a support 5.



a b

Figure 2. a) gear cold pressing device,
b) connecting the tube of the pressing device to the cylindrical support.

The other end of the pipe 3 is connected to a cylindrical support fixed in the center of the rotor shaft, and the fluid under pressure leaks out under high pressure through the inner channels of the rotor shaft between the outer diameter of the shaft and the inner diameter of the driving gear, expanding the inner diameter of the gear.

ISSN: 2776-0979, Volume 3, Issue 10, Oct., 2022

The second device is installed in the same way. These two devices are almost identical in structure and perform two different functions. So, the first hydraulic pressurizing device expands the gap between the outer surface of the rotor shaft and the inner surfaces of the gear as mentioned above, and the second device, under full pressure, makes horizontal displacements of the gear along the axial direction of the shaft. This process can be seen in full in Figure 3 below.

Figure 3. The process of cold fitting the gear to the rotor shaft

In this case, the first and second hydraulic pressurizing devices are parallel, that is, when the first device is given a pressure of 50 MPa, the second device is also given a pressure of 100 MPa. Then, due to the pressure of 50 MPa provided by the first device, the internal diameter of the gear expands, and at the same time, the second device, with a pressure of 100 MPa, ensures that the gear moves inwards in the direction of the rotor axis. In this case, it will be possible to see how far the gear has moved with the help of an indicator installed on the side of the gear. This process is repeated several times, and the pressure in the first device is brought up to 600-650 MPa, and the pressure in the second device is brought up to 1200-1300 MPa. In these pressure readings, it is possible to see that the desired result has been achieved by moving the indicator pointer along the shaft axis in the range of 1-2 mm. In this process, the main thing to pay attention to is the correct installation of the pressure pipes, that oil does not leak out of them, the change of the manometer indicator, it is necessary to constantly monitor the movement of the indicator.

Conclusion

It is known to us that the UZ ELR electric locomotive is the most modern freight electric locomotive on the Uzbek railways, and the efficiency of its work is also very high. Based on this, it is necessary to carry out repairs based on the technical indicators of its parts even in the process of maintenance and repair of this electric locomotive.

References

1. Абдувахобов, М. Э., & Хамидов, О. Р. (2022). Forecasting the Residual Life of the Main Frame and Fitting the Electric Locomotive into the Curve by the Method of a Parabolic Diagram. International Journal of Formal Education, 1(10), 148-153.
2. Абдувахобов М.Э., Хамидов О.Р. ВЛ60к электровози аравачасининг рамасининг техник холатини бахолаш, "Республика жанубида транспорт - йўл комплексини ривожлантириш истиқболлари республика илмий-техник анжуман" материаллари тўплми 2017 йил 31-март Термиз "Сурхон нашр"
3. МЭ Абдувахобов, СМ Гултораев Тяговые Качества Железнодорожного Участка Каттакурган-Навои При Дизельной Тяге, Интеллектуальная энергетика на транспорте и в промышленности, 191-196 2018-год
4. Абдувахобов, М. Э., & Мавлонов, А. А. (2018). Об эффективности тепловозов 3тэ10m на участке каттакурган-навои узбекской железной дороги. In Интеллектуальная энергетика на транспорте и в промышленности (pp. 197-202).
5. М.Э Абдувахобов, О.Р. Хамидов, А.К Жураев "Исследование дифектов подшипников качания локомотивных асинхронных электродвигателей средствами вибродиагностики" Локомотивы. Газомоторное топливо (Проблемы. Решения. Перспективы) материалы I Международной научно-практической конференции, 29 июня - 1 июля 2016 года
6. Хисматулин, М. И., Абдувахобов, М. Э., & Сотволдиев, А. Р. (2018). К исследованию транспортной логистики электровозами 3ВЛ80С на участке Мароканд–Каттакурган узбекской железной дороги. Экономические аспекты логистики и качества работы железнодорожного, 28.
7. Кушаков, Ф. А. (2022). Перспективы развития современной философии техники. World scientific research journal, 4(2), 74-80.
8. Хамидов О.Р. Разработка методики комплексного диагностирования асинхронного тягового электродвигателя подвижного состава железнодорожного транспорта / О.Т. Касымов // Материалы конференций ГНИИ «Нацразвитие», сборник избранных статей.2017 – С. 32-39.

9. Хамидов О.Р. Вибродиагностика повреждения подшипников качения локомотивных асинхронных электродвигателей / Грищенко А.В. // VIII Международная научно-техническая конференция «Подвижной состав XXI века: идеи, требования, проекты», Петербургский гос. ун-т путей сообщения, 3-7 июля. – Санкт-Петербург, 2013г.- С. 174-176.

10. Xamidov, O., Ergashev, O., Abduvahobov, M., & Nematova, S. (2022). “O‘zbekiston” elektrovozi va TE10M teplovozining tortuv reduktori texnik holatini baholash. Current approaches and new research in modern sciences, 1(4), 37-42.

11. Kayumjonovich, T. N., Pirmukhamedovich, A. S., & Teleubaevich, U. T. (2022). Justification and choice of rational operating current frequency in induction crucible furnaces. Innovative Technologica: Methodical Research Journal, 3(06), 40-47.

12. Urazbayev, T. T., Tursunov, N. Q., Yusupova, D. B., Sh, V. D., Erkinov, S. M., & Maturaev, M. O. (2022). Research and improvement of the production technology of high-manganese steel 110G13L for railway frogs. Web of Scientist: International Scientific Research Journal, 3(6), 10-19.

13. Kayumjonovich, T. N. (2022). Research and improvement of steel refining modes in induction furnaces in order to improve the products quality. Web of Scientist: International Scientific Research Journal, 3(5), 1713-1719.

14. Riskulov, A. A., Tursunov, N. K., Toirov, O. T., & Kuchkorov, L. A. (2022). Features of minerals and mineral-based materials. Web of Scientist: International Scientific Research Journal, 3(6), 1310-1320.

15. Kayumjonovich, T. N., Pirmukhamedovich, A. S., & Teleubaevich, U. T. (2022). Influence of coating formation conditions in chlorine-containing media on the corrosion properties of titanium. Web of Scientist: International Scientific Research Journal, 3(5), 1692-1701.

16. Riskulov, A. A., Alimukhamedov, S. P., Tursunov, N. K., Nurmetov, K. I., Nigmatova, D. I., & Toirov, O. T. (2022). Briefly about the problems and achievements of materials science. Web of Scientist: International Scientific Research Journal, 3(6), 1269-1275.

17. Kayumjonovich, T. N., & Zokirov, R. V. (2022). The metal refining problem and technical solutions for the active slag formation in induction furnaces. Web of Scientist: International Scientific Research Journal, 3(5), 1755-1760.

18. Sh, V. D., Erkinov, S. M., Kh, O. I., Zh, A. S., & Toirov, O. T. (2022). Improving the technology of manufacturing parts to reduce costs. Web of Scientist: International Scientific Research Journal, 3(5), 1834-1839.

19. Kayumjonovich, T. N. (2022). The problem of metal refining and technical solutions for the formation of active slag in induction furnaces. Web of Scientist: International Scientific Research Journal, 3(5), 1996-2001.

20. Riskulov, A. A., Tursunov, N. K., Gapirov, A. D., Toirov, O. T., & Turakulov, M. R. (2022). Analysis of the coatings selection for machine-building parts. Web of Scientist: International Scientific Research Journal, 3(6), 1285-1297.