

11. Визначення коефіцієнта пророблюваності структури трубних заготовок зі сталі 09Г2С / К. Г. Дьоміна, Ж. А. Дементьєва, О. С. Миргородська, Д. В. Гунченко // II Всеукраїнська науково-технічна конференція молодих вчених «Наука і металургія» – Дніпро: Інститут чорної металургії ім. З. І. Некрасова НАН України, 2018 – С. 32. – Електронне видання: режим доступу: <http://isi.gov.ua/wp-content/uploads/2018/07/тези-укр-2018-1.pdf>.

12. Анализ прорабатываемости структуры стали 09Г2С в процессе горячей прокатки непрерывнолитой заготовки / Е. Г. Дёмина, Ж. А. Дементьєва, А. С. Миргородская, Д. В. Гунченко // Наука і металургія. Електронне видання збірки наукових праць. – Випуск 2. – Дніпро, 2018. – С. 4 - 18.

13. Колосов М. И. Качество слитка спокойной стали / М. И. Колосов, А. И. Строганов, Ю. Д. Смирнов, Б. П. Охримович – М.: Металлургия, 1973. – 408 с.

14. Голиков И. Н. Дендритная ликвация в сталях и сплавах / И. Н. Голиков, С. Б. Масленков – М.: Металлургия, 1977. - 223 с.

15. Дендритная ликвация в никелевых сплавах / Е. А. Кулешова, Е. Р. Черкасова, А. В. Логунов // Металловедение и термическая обработка металлов. – 1981. – № 6. – С. 54 – 59.

16. Высокие очаги деформации. [Электронный ресурс]. Студопедия – лекционный материал для студентов. Режим доступа: https://studopedia.su/9_54796_visokie-ochagi-deformatsii.html.

DEVELOPMENT THE METHOD OF THERMOMECHANICAL LOADING MANAGEMENT OF TRIBOLOGICAL CONTACT

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Purpose. At present, rail transport in connection with the economic situation is very important for solving the problems associated with increasing the efficiency and economy of the railway transport. It is necessary to modernize not only the infrastructure, but also locomotives and other railway equipment.

Methodology. It is proposed for the most rational use of air from brake cylinders, which, after release of the brakes, is vented into the atmosphere, passed through the Rank-Hilsh vortex tube, and by means of a flexible hose system to be sent to the friction zones requiring cold (in the contact area of the brake pad and wheel or brake pad and brake disc while braking) or hot air (to the contact area of the wheel with the rail when started).

Findings. It is established that when the compressed hot air is fed into the contact area of the wheel with the rail, the drying from the moisture and the

cleaning of the zone of friction contact from the "third body" occurs. Such a technical solution will reduce the wear of the wheels of the locomotive and rails, reduce the consumption of equipment and eliminate clogging of the ballast prism. In this case, the coupling properties of the surfaces of the wheels and rails will be increased due to their preliminary heating and cleaning from the unfavorable "third body".

Excessive heat emission leads to a decrease in the strength of the surface layers, the destruction of the binder in the composite materials of brake pads locomotives, thermal stresses, the dissociation of adsorbed films on the metal. The analysis of the temperature curves of the friction characteristics and of the physical and mechanical properties of steels shows that at a temperature of 350 ° C there is a decrease in the values of tangential stresses and the coefficient of friction, but with increasing this temperature, the diffusion mobility of the atoms and the tendency of the steels to grip increase. The achievement of the surface temperature in a local contact over 450 ° C leads to a significant deterioration of the mechanical properties of the interacting surfaces, which leads to a decrease in the frictional force and their intense wear of the contact surfaces. The authors of the work propose the control of the process of frictional interaction of the contact by controlling the temperature by forced cooling, which will stabilize the coefficient of adhesion.

Conclusions. The principle of using compressed air from brake cylinders, which is fed into the atmosphere during braking, is proposed to improve the coupling properties of friction surfaces when moving and braking. It has been established that by selecting rational structural parameters of the Ranka-Hilsha tube and the basic parameters of the flow of compressed air at the inlet, it is possible to control the temperature in the zone of the tribological contact, creating conditions for controlling the clutch process, and the forced maintenance of the constant of the temperature in the contact leads to stabilization of the coefficient of adhesion at the maximum level, providing optimal contact conditions.

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Keywords: rail transport, coefficient of friction, Rank-Hilsh tube, temperature

References

1. Основы трибологии (трение, износ, смазка). Учебник для технических вузов / Под ред. А.В. Чичинадзе. – М.: Центр «Наука и техника», 1995. – 778 с.
2. Озябкин А.Л. Развитие теории и методов динамического мониторинга фрикционных систем железнодорожного транспорта: автореф. дис. - док. техн. наук: 05.02.04 / А.Л. Озябкин; ФГБОУ ВПО РГУПС. – Ростов-на-Дону, 2014. – 43 с.

3. Праведников И.С. Контактное взаимодействие твердых тел с учетом давления, температуры и твердости / И.С. Праведников. – Уфа: Нефтегазовое дело, 2005. – С. 1-11.

4. Колесников И.В. Системный анализ и синтез процессов, происходящих в металлополимерных узлах трения фрикционного и антифрикционного назначения: дис. - док. техн. наук: 05.02.04 / И.В. Колесников; ФГБОУ ВПО РГУПС. – Ростов-на-Дону, 2016. – 394 с.

5. Лужнов Ю.М. Сцепление колес с рельсами. Природа и закономерности / Ю.М. Лужнов. – М.: Интекст, 2003. – 144 с.

6. Gorbunov M. The multifunctional energy efficient method of cohesion control in the «wheel-braking pad-rail» system / M. Gorbunov, R. Domin, M. Kovtanec, K. Kravchenko // Prace Naukowe Politechniki Warszawskiej. – Zeszyt 114, 2016. – Pp. 115-126.

7. Gerlici J. Slipping and skidding occurrence probability decreasing by means of the friction controlling in the wheel-braking pad and wheel-rail contacts / J. Gerlici, M. Gorgunov, K. Kravchenko, R. Domin, M. Kovtanets, T. Lack // «Manufacturing Technology». April 2017, Vol. 17, No 2. – p. 179-186.

STUDY OF EXISTING MODES OF REDUCTIONS DURING PRODUCTION OF RAILWAY AXLES

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Purpose. Study of existing modes of reductions during production of railway axles.

Methodology. The study was carried out through considering the influence of deformation modes in the production of railway axles.

Findings. The article deals with the influence of deformation modes in the production of railway axles on the working of the metal structure of the central zone. Studies have been carried out for existing production regimes and deformation schemes.

It is shown that the use of box gauges is inefficient for better working out of the metal structure of the central zones of the billet. The best characteristics, from the point of view of working out the structure, have a rolling scheme in smooth rolls. The use of box gauges allows you to better work out the surface layers of the billet.

Keywords: the regime of reduction, the scheme of deformation, the caliber, the railway axle

References

1. Klinger C. Axle fracture of an ICE3 high speed train / C. Klinger, D. Bettge // Engineering Failure Analysis. - 35 (2013). - P. 66–81