VOLODYMYR DAHL
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Department "Logistics management
and traffic safety in transport»

PJSC «UKRZALIZNYTSIA»
Regional branch «Donetsk railway»

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IN LUHANSKAYA REGION

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Table 1

The calculation of the projected economic effect

Years	Plan of pellet cars purchases	The projected economic effect of improving the design, thousand UAH	The projected economic effect of improving the design and operation of cars, thousand UAH
2016	250	24250	26375
2017	150	14550	15825
2018	10	970	1055
2019	100	9700	10550
2020	100	9700	10550
Sum	**610**	**59170**	**64355**

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SYNOPSIS OF THE THERMAL METHOD FOR STRAIGHTENING TECHNOLOGICAL-DEFORMED CAR PARTS

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Welding production, as one of the leading technological processes in the creation of welded structures, is of great importance in the development of car building, the use of which provides significant savings in materials and manpower. The successes of welding science and technology made it possible to carry out a real revolution in car building, to create fundamental-

ly new, competitive, highly economical rail car designs in which the productivity of labor in their manufacture was many times increased [1 - 3]. Currently, welding is the basis for making the components of the cars and largely determines their reliability and durability. Compared to other types of permanent joints, the advantages of welding are obvious, but post-weld residual deformations and stresses can significantly reduce the quality of the welded structures. The main reason for their appearance is the formation of the so-called zone of thermal influence or the zone of plastic deformations. It is also known that residual welding stresses increase the potential energy accumulated in the construction, which in turn increases the negative consequences of fatigue failure [4], and under operating conditions, residual deformations and stresses reduce the strength, corrosion resistance and accuracy of the welding structure. Traditional methods of reducing them to which include increasing thickness by carrying out stabilizing treatment of post-welding operations, removal of allowances does not always correspond to modern requirements for labor, energy and metal capacity of structures. Due to the fact that none of the existing welding methods provide a guaranteed defect-free welding joint, much attention is paid to post-welding methods of processing welded joints, namely, straightening methods that allow to restore the geometric shapes of parts after welding. These include general or local heat treatment, as well as appropriate mechanical treatment by rolling, impact pneumatic tools, shock-ultrasonic treatment, active loading, cold and hot deformation, etc. According to the normative documentation, the technologically deformed components of the wagons are subjected to mechanical (cold) or thermal correction to ensure their strength [3, 5, 6].

The method of cold dressing consists in stretching or shortening the elements of welded products to the design size, with the editing done with presses, jacks, rolls or manually with a forging tool. Currently, the cold correction of car parts is the simplest and most common way, but it often does not provide a stable form of corrected parts and in the process of operation, the deformed correction can occur again. The reason for the unstable shape of the corrected parts during cold correction is due to the heterogeneity of the residual stresses that arise as a result of the uneven deformation of the metal. In addition, the properties of the base metal deteriorate, namely, the toughness decreases and the yield strength rises. Due to the fact that the devices for cold dressing are bulky stationary equipment for its application, it is usually limited by the design and geometric characteristics of the presses.

One of the most rational from the point of view of reducing residual deformations and stabilizing the structure is the thermal method of straightening, by which the dressing of welded products is carried out due to plastic deformations arising from local high-temperature metal heating by a gas

burner. This is explained by the fact that when the article is heated to a temperature equal to $0,8-0,9$ melting points, the plastic deformation forces are reduced by $12-15$ times without significant changes in the physico-mechanical properties of the metal. Compared with the cold-edging method, thermal correction does not require any special equipment, other than a conventional gas welding machine.

One of the most economically viable methods of thermal straightening of technologically deformed car components, as shown by the analysis of the scientific literature, is the method of thermal dressing with local heating [1, 6 - 8]. The main advantage of this type of dressing is its versatility, that is, it can be used to fix any welding structure, which has a complex configuration and dimensions (for example, the girder beam of a gondola car). Thermal correction consists in heating the corresponding sections of the welding structure and then cooling them. At a heating temperature of the deformed portion that fluctuates within $750-850^{\circ}C$, the heated portion tends to expand, but the surrounding cold metal surrounds this possibility, resulting in plastic compression deformations. After cooling, the linear dimensions of the heated section decrease, which leads to a reduction or complete elimination of deformations.

It should also be noted that thermal corrections with local heating can be performed in almost the entire range of work to correct the vertical deflection of the elements of the car's bearing systems (in particular the spinal beams) and the body's mushroominess, while cold straightening has areas where it is impossible to implement. Thus, the potential for thermal edging is higher than cold.

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THE STRUCTURING POSSIBILITIES OF RESISTANCE OF USE TATINIUM LOAD WAYS THE OPPOSITE OF THE STRESS AND/OR STRAIN STATE OF WAGON DESIGNS

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At present after prolonged use a large number of railway cars has signs of physical deterioration. There is an urgent need for strengthening of structures by physical aging and during maintenance and repair [1, 2].

Perspective directions of constructive solutions to these problems may be:

- development and implementation in the design of freight cars of advanced engineering solutions;
- development of methods of finding and implementing resource-saving designs, designs of freight cars;
- search designs wagons places with insufficient or excess reserves of strength.

Significant potential in solving this problem is to introduce a method of creating controlled stress and/or strain state of structures.

There is a need to analyze the application schema loads, which is necessary when estimates of the strength of body components for cars modes Normy [3].