Increasing Methods of the Car Valve Tappets Durability

I A Shveyov¹,a, A I Shveyov²,b, E I Shveyova¹,c

¹The city of Naberezhnye Chelny, prospect of Hasan Tufan, the house 26, apartment 141, Russia
²The city of Naberezhnye Chelny, prospect of Mira, the house 50/15, apartment 200, Russia

E-mail: aShveev_Ivan777@mail.ru, bShveev_Andrey222@mail.ru, cShveeva_Katya222@mail.ru

Abstract. It is established that the admissible size of wear on the restored cemented (nitrocemented) details depends on specifications on operation of the car. An indispensable condition at the same time is preservation in a blanket (a worn-out detail) of carbon not less than 0.4%. It is offered for high-speed heating of worn-out parts of details under plastic deformation to use induction installation and the offered method of restoration of pushers of valves I have shown that details meet specifications of manufacturer.

1. Introduction
Worn details renewal service is possible in the case of giving them original shape, size and properties for renovation [1, 15, 16, 19]. Details restoration needs to conduct the ways that have the lowest labor and energy cost and ensure the reliability of details quality no less than the new ones.

To overview the possible methods for recovering of "plunger valve timing" showed, that the most promising method is cleaning surfacing using detergent solution and removing wear defects by electromechanical treatment, surfacing on steel base parts onwhite iron induction, tempering at 623K (350 °C) to relieve stresses in the nominal grinding surface size and build-up oxidation in a humidified atmosphere of nitrogen at 450 ± 5 °C.

The choice of items restoring method depends on the details design, material, method of heat treatment, hardness, margin of safety, wear amount (defect). Sketch tappet camshaft is shown in Fig. 1.

Figure 1. Sketch tappet camshaft (the way to implement a device and to recover the detail).

The invention relates to the field of worn parts restoration in the operation process by welding and can be used in repairing enterprises, to restore a working surface exterior of the parts of the highly
rigid alloys, such as a valve pusher in the internal combustion engine (ICE) (Fig. 2), which is a layered metalllokompozit in the form a steel base and surfacing of wear-resistant white cast iron [3, 14, 15, 19, 21].

There is a well-known recovery method using details made of high carbon alloyed steel. Surfacing is carried out by a consumable arc electrode feed in a liquid bath filler wire, insulated from the current electricity [4, 12, 16, 18, 19].

![Figure 2. General view of the tappet camshaft: 1- steel 35 "Select"; 2 - white cast iron.](image)

The known method disadvantage is the inheritance of weld defect layer (oxides, pores, etc.) which formed on the worn surface element during operating. Furthermore, due to the high temperatures in the combustion zone of the arc is not only melt, but overheating during surfacing molten iron, which leads to the formation of pores and cracks in the weld fusion zone and the layer of dissimilar materials. There is a method of recovery products, including mechanic processing of worn surface with blade tool in the repair size, surfacing and subsequent processing in the nominal size [5, 10, 13, 22].

The disadvantage of the method is the impossibility of its usage for the metal-products such as "steel - wear resistant white cast iron" because of low durability and the cutting tool breakage when processing the workpiece surface. That is due to the white iron alloy of high hardness, which is comparable to the hardness of high speed tool steels. Application of a softening heat treatment (annealing at malleable white iron) prior to machining the layered metal parts from unacceptable due to changes in the physical and mechanical properties and dimensions of base steel parts. Known methods for machining of highly rigid (80-90 HRA) alloys by electrochemical machining using a rotating spring-loaded electrode-tool is constructed as a hollow body with an electrolyte supply channel and processing device to remove the products in the form of replaceable cutting tools installed in the slots with the possibility movement in the direction to the working surface [see. Description of the Invention to the AS №1279766, cl. V23N5 / 10].

The disadvantage of this invention is a low processing productivity of very hard alloys used and the tool-electrode complexity [8, 11, 17].

2. Results of Work
The closest solution to the technical essence and attainable effect to the invention is a recovery process of products, including fault detection of worn parts on the magnitude and nature of the wear of the working surface, the preparation of details for cladding by cleaning the worn surface and its mechanical processing for the removal of defects and wear, electric arc surfacing wear-resistant material build-up and polishing the surface to a nominal size [2, 9, 17, 20, 22].

The disadvantage of this method is:
- the blade tool treating impossibility – a.i. because of saving wear on it a material of high hardness;
- white iron alloy layer low quality due to which the high temperatures in the combustion zone of the arc by melting iron and steel cladding on the base;
- reduced wear parts due to scoring in the contact zone of friction parts "camshaft cam - tappet valve" [7, 14, 21].

The aim of the invention is to restore the worn surface of the white iron layered metal-parts such as "steel - cast iron" to yield defect-free deposited layer having a high resistance to wear and resistance to scoring. The proposed method of details includes fault detection parts after their operation on the size
and shape of the working surface wear, the preparation of details for cladding by cleaning detergent solution and defects removal and wear by electrochemical treatment induction surfacing of white iron on steel base parts, tempering at 623K (350 °C) to relieve stresses in the nominal size grinding surface and oxidation build-up in a humidified atmosphere of nitrogen at 450 ± 5 °C.

The proposed method for the products recovering is different for the known (prototype) removal defects and wear from the working surface of the white iron metal parts after operation of the first to use an electrochemical machining method that allows to carry out high-quality hard and superhard materials processing, including white iron and fully preserves the properties and geometric parameters of the base steel parts [6, 11, 18, 19, 21].

Removing worn surfacing layer on the valve plunger is carried out in two stages: the first stage (Fig. 3) uses a hollow electrode with a diameter equal to the cladding, which is made of stainless steel 40X13, with a 7mm diameter of electrolyte supply channel; 2 stage (Fig. 4) removing a part of cladding remaining in its central part by a rod-shaped electrode diameter 8mm, made from the same steel as the electrode springing provided using a rubber insert with the electrolyte supply in its receiving chamber, separated electrodes from the discharge product processing chamber, the electrolyte flow direction perpendicular to the axis of the electrode. Plunger surfacing residue remaining after processing №1 electrode is treated with an electrode using.

![Figure 3](image1.png)

**Figure 3.** electrode №1 for electrochemical processing valve tappet 1 - part; 2- electrolyte outlet; 3 - the rest of the deposited layer; 4 - tubular electrode tool; 5 - plate fixing; 6 - electrolyte flow.

![Figure 4](image2.png)

**Figure 4.** electrode №2 for electrochemical processing valve tappet 1 - part 2- electrolyte outlet, 3 - rubber insert, 4 - electrode tool; 5 - plate fixing 6 - electrolyte flow.

The process is as follows. Push valve taken from an internal combustion engine for overhaul of incoming subjected to inspection by visual inspection and control by the geometric dimensions [7,11]. The most observed working surface pockets of pushers chipping and signs of wear. The working surface estimate of a white cast iron wear is carried out on the size and shape of the wear in the longitudinal and circular cross-sections in each node (Figure 4.7), eg altimeter company Mahr-Digimar 817 CLM Quick Height.
3. Conclusions
1. The way of restoration of metallayered details like the "DVS valve pusher" with a worn-out working surface from wearproof cast iron and the device for its implementation providing giving to details of high consumer properties and ChTD corresponding on all initial indicators is developed.
2. For increase in scoring resistance of a working surface from wearproof cast iron the technology of thermal oxygenating of details is offered and realized in production.

4. References
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