

CONTRIBUTIONS REGARDING TO UTILIZATION THE PLATES OF METALLIC CARBIDES AT THE TAMPING TOOLS

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Abstract: World wide using of some materials and technologies to increase the wear resistance of the active part (tine) of the tamping tools is less known and spread, one example in this case is the usage of tungsten carbides. Internal matters aren't accomplishments in this area, because it isn't information and there are a lot of difficulties.

Keywords: tamping operation, tamping tools, wear, lastingness, metallic carbides,

1. INTRODUCTION

Mechanized tamping consists in the vibration (oscillation) and squeeze of the ballast under the inferior part of the sleeper, at frequencies by 35 Hz, amplitude of the oscillation is 3÷5 mm and the force is 1000 kf (10 KN). Most of the cases, the mechanized tamping is executed with pairs of tamping tools (Fig. 1), which are disposed symmetrically face to face, on both sides of the sleeper, doing opposite movements. The tamping tools are mounted on the tamping mechanisms (Fig. 2). These pairs of tamping tools are placed on both sides of the track [1, 2]. The tamping tool is working similarly as the cutting tools, with the difference that during the technologically tamping process doesn't results splinters, but is taking place the vibration (oscillation) and squeeze of the ballast under the sleeper.

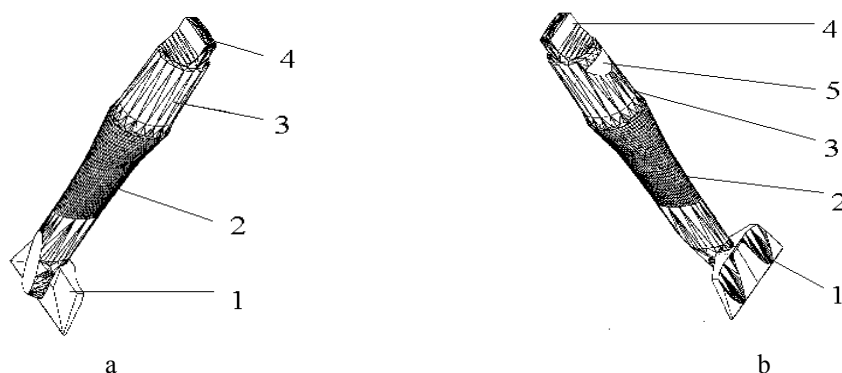


Fig.1 The tamping tool P&T 08-275 UM, for the mechanized tamping:

1-active part – tine (a-main surface; b-secondary surface); 2-body of the tool; 3-the part of the tamping tool which is attach to the port tool ; 4-part of the tamping tool which prevent the rotate of the tamping tool into the port tool ; 5- technological surface for fixing the tamping tool into the port tool

The body of the tamping tool is supporting the active part and helping to fix the active part into the port tool and to transmit the working movements.

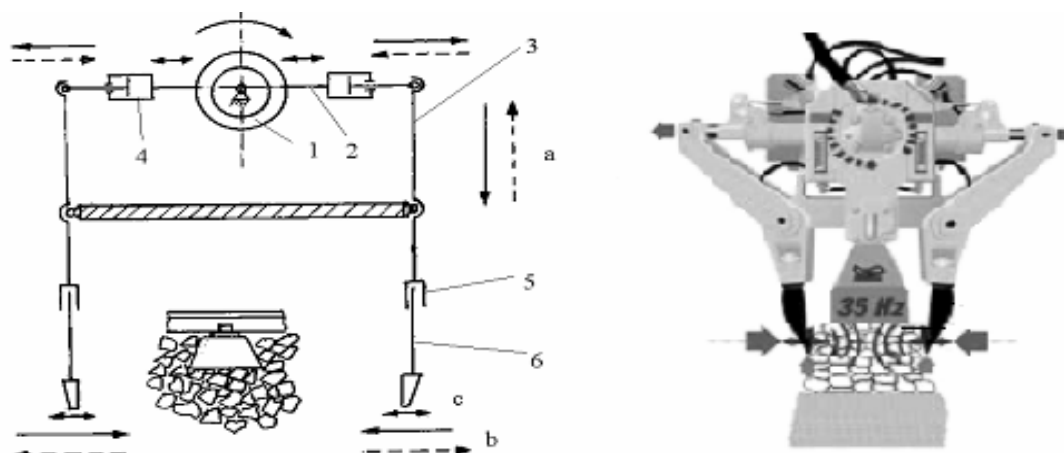


Fig.2 Tamping mechanism

1-axe with eccentric for oscillation movement (vibration)-c ; 2- connecting rod ; 3 - port tool arm ; 4- hydraulic cylinder for b movement – squeeze ; 5-port tool; 6-tamping tool; a –ascension and descend movement

The researches in specialized literature regarding at the actual stage of the researches, design, manufacturing and exploitation of the tamping tools have showed a low level of information and technical details regarding these types of tools. The collected information is in the most cases summary information, with general character and especially commercial, with few references at dimensions, geometrical shapes of different parts and surfaces of the tamping tools, of the reciprocal positions, the qualities of surfaces, the materials and technical process used to manufacture the tamping tools. The information is even more summary or is missing regarding the lastingness of the tamping tools, the wear and evolution of this (about the wear curves).

In literature and technically practice are known materials and technical processes to obtain a satisfactory wear for a specific type of tool which works in a specific technical system (the work regimen, the work environment). In the case of the tamping tools, the using of some materials (alloys) having in their composition in different percents Cr, Mn, Mo, W and some adequate technical process, like forging in the matrices to maintain the materials fibres and thermic or thermochemical treatments, offers special mechanical properties (breakage resistance, shock resistance, wear resistance).

In the actual stage, from the determined factors, we have established [3] that the main factor which has the primordial influence is the wear of active part of the tamping tool. It is necessary to concentrate the study and the research to find some ways, materials and technical processes for using these, in the purpose of increasing the lastingness of active part of the tamping tools and the research of the behavior of these in exploitation.

2. THE EXPERIMENTAL RESEARCHES

The experimental researches regarding the lastingness of the tamping tools were concentrated at the active part (tine) of the tamping tools, having in view the evolution of the wear depending by the quantity (the length) of tamping accomplished, identification the factors and elements that influences the lastingness, also the solutions for increasing it.

In the course of researches we have been in view [3] the assemble of factors that influence the lastingness of tamping tools, from manufacturing, exploitation and reconditioning of these, also the advantages and disadvantages which appear in the case of using some hard or extra hard materials and the technological processes for application of these, on the active part of the tamping tool.

We have established so, to reach the objective, two directions for main research:

1 – the identification, selection and utilization of some hard or extra hard materials which have superior mechanical characteristics and can be exploited to obtain a high wear resistance of the active part of the tool, having in view the usage of these materials through the optimization of the influences of the opposite mechanical characteristics (once the hardness of the materials is increasing, which influences in a positive mode the wear resistance, in negative mode are decreasing the bending and shock resistances), in the hard conditions of working of the tamping tools.

2 – the identification and selection of some technological processes for applying these hard or extra hard materials on the active part (the tine) of the tamping tool, so that it is necessary to maintain the main mechanical characteristics of the tamping tool material (bending resistance, tenacity, tiredness, wear and shock resistance) and on the other hand to obtain the mechanical resistance in the assembly which is realizing between the tamping tool base material and the hard or extra hard material used.

Regarding to the hard or extra hard materials which can be used to increase the lastingness, having in view the specifically conditions of functioning of the tamping tools, we have identified and selected [3] for researches the metallic carbides (tungsten carbides).

In the case of tamping tools type P & T 09 – 32 CSM – curved, the experimental researches regarding to utilizing the plates from metallic carbides consisted in the experimental plating (armed) of 7 pieces of tamping tools type Plasser&Theurer 09-32 CSM – curved, having following identifications numbers: 92 N, 150 N, 169 N, 36, 123, 67 and 217. The tamping tools having identification numbers 150 N, 169 N, 36, 123, 67 and 217 were mounted and tested on the tamping machine type Plasser & Theurer 09 – 32 CSM, in September 2004 ÷ June 2005 (Fig. 3, 4 and 5). The tamping tool having identification number 92 N was preserved as model.

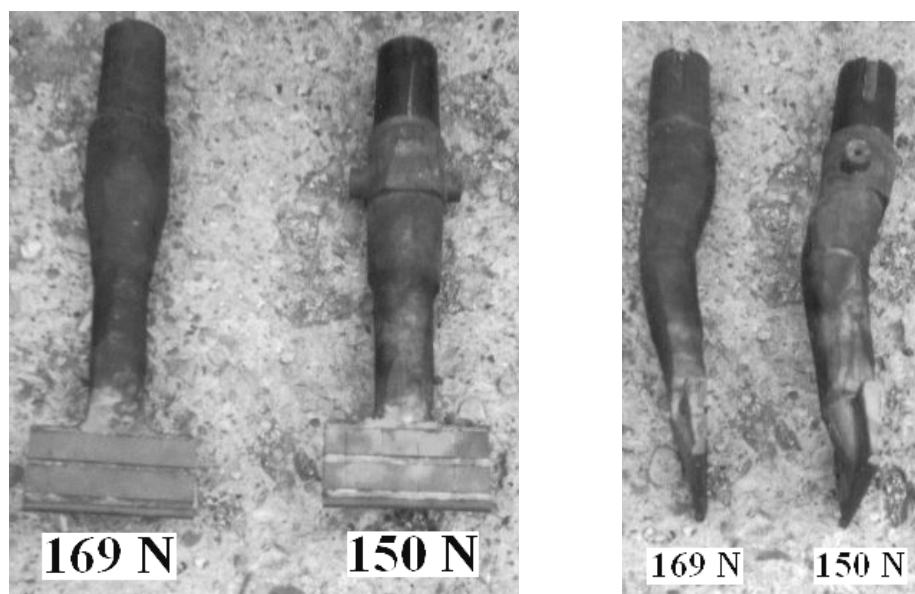


Fig. 3 Tamping tools type P & T 09 – 32 CSM – curved nr. 169 N, 150 N plated (armed) on the active part with plates by metallic carbides

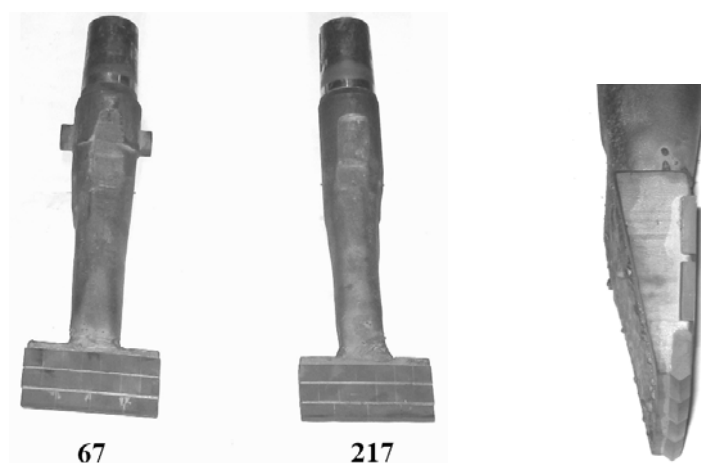


Fig.4 Tamping tools type P & T 09 – 32 CSM – curved nr. 67, 217 plated (armed) on the active part with plates by metallic carbides

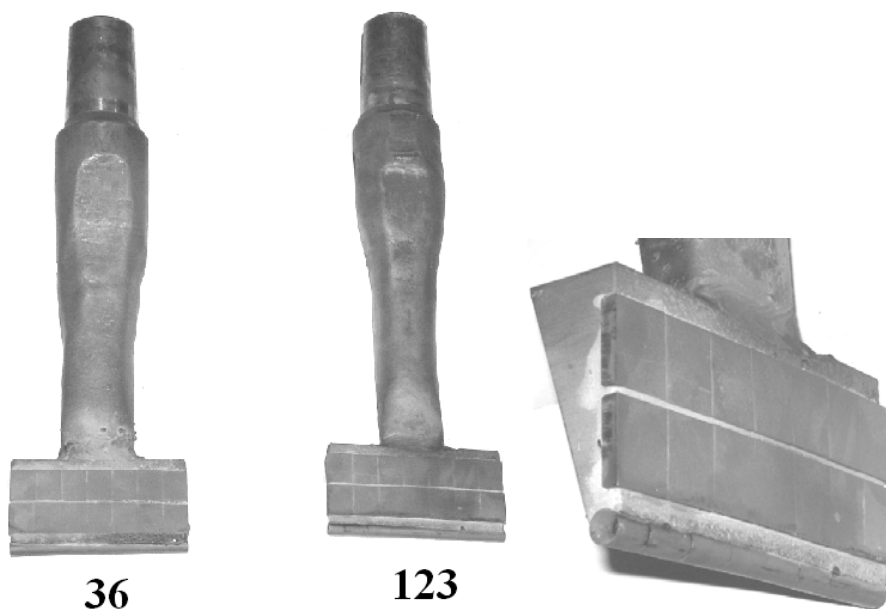


Fig. 5 Tamping tools type P & T 09 – 32 CSM – curved nr. 36, 123 plated (armed) on the active part with plates by metallic carbides

3. THE EXPERIMENTAL REZULTS

For the drawing of the graphic regarding the evolution of the wear we measured the wear of the active part of the tine on the vertical direction in 4 equidistance points (Fig. nr. 6) and we have determined the average wear as arithmetical mean between these 4 measured values. The wear value [mm] in these 4 points was determined by calculation as being the difference between the nominal value of the high of tine and the measured value in that point.

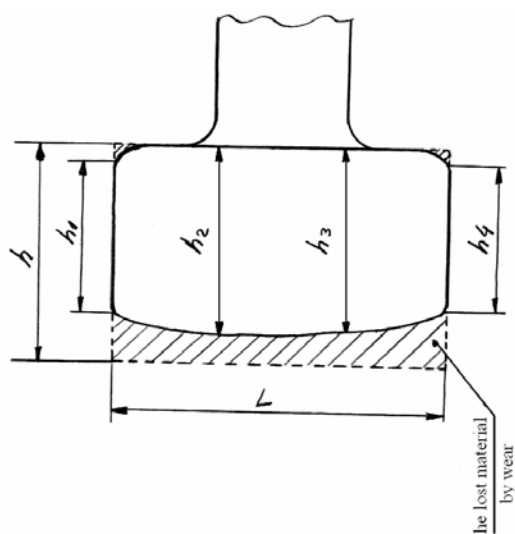


Fig 6 Points of measures for tamping tool type P & T 09 – 32 CSM – curved

The obtained results in the course of the experimental researches were concentrating in tables (table 1) and processed under graphic charts [3] (regarding the evolution of wear U_h [mm], depending on km of tamping Fig. 7).

Table 1

The average intensity of the wear of the tamping tools

Nr.	L [km]	Type and number of the tamping tool / Average intensity of the wear [mm/km]					
		P&T 150N	P&T 169N	P&T 123N	P&T 67M	P&T 36N	P&T 217N
1	0 ÷ 1,550	1,290	0,065	0	0	0	0
		$I_{\text{med P\&T}} = 0,226$ [mm / km]					
2	2,500 ÷ 5,500	0,267	0,033	0,733	0	1,267	1,733
		$I_{\text{med P\&T}} = 0,672$ [mm / km]					
3	0 ÷ 5,500	0,927	0,036	0,485	0,103	2,242	4,236
		$I_{\text{med P\&T}} = 1,338$ [mm / km]					
4	0 ÷ 10,585	1,134	0,586	-	2,040	2,324	2,778
		$I_{\text{med P\&T}} = 1,772$ [mm / km]					
5	0 ÷ 12,037	1,279	0,523	-	2,226	2,409	2,559
		$I_{\text{med P\&T}} = 1,799$ [mm / km]					
6	0 ÷ 17,942	1,783	1,282	-	-	-	-
		$I_{\text{med P\&T}} = 1,533$ [mm / km]					

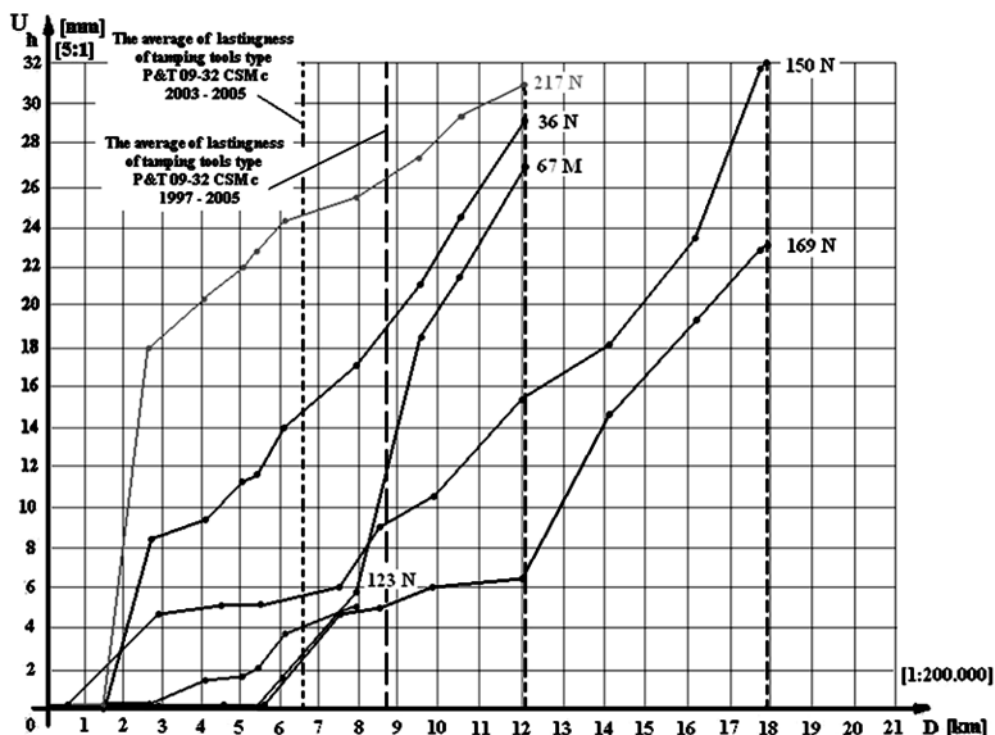


Fig. 7 – The wear curves experimentally determined, for six pieces of tamping tools type P&T 09 – 32 CSM, experimentally armed at the active part of the tools with plates from tungsten carbide attach with hard paste process (brazing)

CONCLUSIONS:

By experimentally covering with plates from metallic carbide of the tamping tools type P & T 09 – 32 CSM, using hard paste process (brazing), the obtained lastingness is until 270 % higher (Fig. 7) than the lastingness obtained in the present.

For the first time in Romania, it was obtained the first tamping tools having the active part (tine) plated with plates of metallic carbide through brazing [3].

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