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ROZPRAWA DOKTORSKA

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**WPŁYW NAPRAW SPAWALNICZYCH NA
WŁAŚCIWOŚCI EKSPLOATACYJNE ELEMEN-
TÓW NOŚNYCH POJAZDÓW CIĘŻAROWYCH**

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SUMMARY

The investigations in my PhD thesis could be divided into two groups: preliminary investigations and principal investigations. Investigations of the first group consisted of, metallographic investigation. The aim of these investigations was to determine the relationship between content of oxygen in weld metal deposit with are most profitable from plastic properties phase - acicular ferrite (*ferrite AF according to. MIS.*) Method of welding recommended by manufacturers for trucks to welding the elements of bearing frames and the TIG method were tested in preliminary investigation. Additionally in order to analyse the influence of oxygen on forming acicular ferrite in weld metal deposit, the coated electrodes prepared in laboratory conditions were analysed. In preliminary investigations weld metals deposits prepared by the following methods: the coated electrodes with the use of basic electrodes, rutile electrodes, and electrodes produced in laboratory conditions, MAG method, TIG method were tested. The studied area of welding methods was represented by average and low-oxygenic methods according to the existing oxygenic criterion. In preliminary investigations the size and chemical composition of non metallic inclusions were analysed. The recapitulation of this part of investigations was to make a formula binding the content of oxygen in weld metal deposit with the size of non metallic inclusions seen in WMD. The metallographic structures of WMD were analysed as far as to content of polymorphic changes of ferrite (*GBF, SPF and AF*) this three changes creates the metallographic structure of WMD. The formula binding the content of oxygen with amount of acicular ferrite was made.

The principal investigations of weld metals deposits were carried out in order to state usefulness of the low oxygen methods (*large content of ferrite the AF in WMD*) to repair and reconstructions trucks frames. Welded joints in bearing frame were exposed to tensions of different character and values. The field conditions of vehicle used on the building site, generate the dynamic tensions like strokes. The welded elements of frame in semitrailer car are subject to the considerable from expansion tensions. In every movement conditions truck frame are exposed to comparatively small forces - however repeating in time. Forces as well tensions can cause the formation of fatigue cracks. It had been proved that large parts of fine-grained ferrite the existing in metallographic structure of weld metal deposit cause WMD to have good plastic properties (*toughness*) – it was also confirmed in conducted investigations. The investigation of smashing energy was carried out in two temperatures + 20°C and -40°C, investigations were also conducted for WMD prepared with additional materials with were obtained by laboratory methods.

The next step of investigations of exploational character was the investigation of toughness od WMD initially deformed and straightened out. Such a way of preparing samples was to simulate welded joint in plastically deformed frame of truck after straightening. The samples were deformed by static and dynamic burden - this had to simulate the different ways of deformation of trucks frame. Investigation of toughnees showed that weld metals deposit of low oxigen welding methods characterized higher smashing energies.

The stamina property of weld metals deposits with different content of oxygen were analysed. As resulted showed obtained apart from higher smashing energy the WMD with the largest content of fine-grained ferrite (*WMD made witch coated basic electrodes- low oxigen method*) had better expansion endurance.

The next step of principal investigations were the fatigue investigations of weld metal deposits with different content of oxygen. The conducted investigations also demonstrated the superiority of metal weld deposit proprieties obtained by low oxygen welding methods over proprieties of WMDmade with midium oxygen welding methods.

Additionally in order to compare their results to real exploational conditions measurement of real tensions were conducted. These investigations started with execution of numeric analysis of frame model of a self - dumping semitrailer. To verify value of tensions in indicated by FEM programme, deformeters were stuck in places shown by programme FEM and the measurement of tensions was conducted in real conditions. The results of these investigations were compared with the results of investigations of temporary endurance results.