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BOOK OF ABSTRACTS

PPM-6

E!4548 DE_AMATECH: DEVELOPMENT OF NEW ACTUATORS, MATERIALS AND TECHNOLOGY FOR THE PRODUCTION OF ADVANCED PNEUMATIC AND HYDRAULIC VALVES
materials selection

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The main goal of DE_AMATECH EUREKA project is to develop new actuators and new materials, as well as technology, for the production of piston valves with much better dynamic properties and lesser energy consumption as compared to the traditional ones made of metals [1].

In this work we report the results of our investigation on model systems advanced material/surface coating. Several types of advanced materials have been developed and tested for manufacturing of parts for pneumatic and hydraulic valves, and their basic mechanical properties have been determined. Attempts have been made to use FTIR and micro-Raman spectroscopy for characterization of these systems aimed for the production of the alternative materials for piston valves. PVD magnetron sputtering metal targets were used in order to find best solution for the application of an appropriate thin coating on the surface of the samples. Characterization of the abrasion resistance of the coated samples was performed using internal methods developed by EUREKA partners. Testing of the surface micro-hardness of the coated materials was performed in order to evaluate the quality of the coatings.

Keywords: Advanced materials; Surface coatings

[1] www.eurekanetwork.org/projects

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E14548 DE_AMATECH: DEVELOPMENT OF NEW ACTUATORS, MATERIALS AND TECHNOLOGY FOR THE PRODUCTION OF ADVANCED PNEUMATIC AND HYDRAULIC VALVES MATERIALS SELECTION

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Chairman of the Organizing Committee

Assoc. Prof. Dr. Valentin MIRČESKI

Signature: _____

CE-7

E4548 DE_AMATECH: DEVELOPMENT OF NEW ACTUATORS, MATERIALS AND TECHNOLOGY FOR THE PRODUCTION OF ADVANCED PNEUMATIC AND HYDRAULIC VALVES
Guidelines and approaches to solving target piston properties

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The main goal of DE_AMATECH EUREKA project is to develop new actuators and new materials, as well as technology, for the production of piston valves with much better dynamic properties and lower energy consumption compared to the traditional valves made of metals.

One of the major parts of the whole valve assembly is the piston itself, which contribution to reaching the main goal of the whole project is of crucial importance. The main requirements for the piston are: to be lighter than the metal counterparts; to withstand the working pressure of the valve; to be friction and abrasion resistant – the property which is directly related to the working life of the piston on one hand, and as well as that of the whole assembly (valve) on the other hand.

To meet these requirements we have taken two distinctive different approaches: the first one is, to develop an alternative/advanced material or to choose existing engineering material which will be coated with hard metal layer. This material, besides its mechanical strength to withstand internal (working) pressure of the valve, must be hard enough and high temperature resistant so that it will withstand the coating process, which requires hard substrate and high temperature resistance of the coated material. The second one is to develop an alternative/advanced material which will meet the exploitation requirements for the piston without being metal coated i.e. only "pure" material. This material(s), besides its mechanical strength to withstand internal (working) pressure of the valve, must be friction and abrasion resistant; must be capable of undergoing precise machining and must not swell when dipped in hydraulic oil i.e. it must have very good dimension stability during the working cycle of the valve. In this work we report the results of the preliminary functional test of the pistons. Also we reported about technical advantages/disadvantages and cost effectiveness of each of the two approaches as well as of the potential piston materials for each approach for future developments and improvements i.e. tailoring and fine tuning of the materials and technology to fully meet the target properties for the piston made of alternative/advanced material(s)

Keywords: Advanced materials; Abrasion resistance; Valve piston

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