REGENERATION OF AIRCRAFT TURBINE ENGINE PARTS BY MODERN TECHNIQUES OF SURFACING AND ALLOYING

A. Klimpel*, M. Burda, D. Janicki, A. Lisiecki

*Welding Department, The Silesian University of Technology
ul. Konarskiego 18a, 44-100 Gliwice, Poland
e-mail: andrzej.klimpel@polsl.pl

Key words: Welding, Aircraft, Erosion wear, Abrasion wear, Regeneration

Summary. A significant part of aircraft and helicopters of the Polish army equipment, produced in the Soviet Union, has a glorious years behind. Increasingly frequent failures and high costs of new spare parts makes it necessary to search for new alternatives for used equipment. One is the repair of worn parts.

The aim of this study was regeneration of the RD-33 engine jet flaps used in MIG 29 fighters. Examined jet flaps are a welded constructions of forged WT-20 titanium alloy elements. Work under rugged conditions such as elevated temperatures, corrosion environment, variable load and friction of cooperating metal parts leads to intensive wear of reinforcing ribs and handles.

Research on the development of technological condition of the jet flaps regeneration was carried out on a stand equipped with high-power diode laser HPDL Rofin Sinar DL020 and plasma 2001DC GAP. Detailed studies showed that regeneration by welding requires additional materials providing improved wear resistance of metal-metal type, relative to the base material- WT-20 titanium alloy. The technological conditions of surfacing and alloying using titanium powder Amperit 155 with a granularity of 45-75 [μm] and its mixture with spherical tungsten carbides WC with a granularity of 100-150 [μm] were developed. Visual, metallographic and penetration tests, confirmed the correctness of the developed technologies. In order to evaluate the abrasive wear resistance, regenerated parts were tested according to ASTM G 99-95a "Standard test method for wear testing with a Pin-on-Disk Apparatus". It was found that abrasive wear resistance of 50%Ti+50%WC cermet deposits is significantly higher compared to WT-20 titanium alloy base material.