## NATIONAL TECHNICAL UNIVERSITY OF UKRAINE "IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE"

## RESOURCE SAVING HIGHLY EFFICIENT TECHNOLOGY OF LIGHT CONSTRUCTIONAL ALLOYS SURFACE STRENGTHENING BY ULTRASONIC KICK TREATMENT (UKT)

## **APPOINTMENT**

Increasing the operating life of products made from light constructional alloys in the aircraft industry, space technology, machine engineering and medicine (including – in orthopedics)

## **ADVANTAGES**

- More efficient compared with traditional thermo-mechanical treatment of aluminum alloys surface strengthening (up to 600%) due to low temperature mechanical nanostructuring under quasi-hydrostatic compression.
- The ability to conduct of UKT in an inert gas medium with controlled pressure without treated metal surface oxidation.
- The increasing of modified layer thickness (up to 200  $\mu$ m) due to UKT during cryogenic temperatures (77.4 K).
- Metal products' wear resistance increasing (up to 6 times) due to synthesis of high strong (up to 10 GPa) nanocomposite coatings using dispersed powders of carbides, borides, nitrides oxides, carbon nanotubes.
- Synthesis of strong (12HPa) oxide coatings with thickness of several tens of micrometers due to UKT on air.
- Improving of adhesion between hard coating (prepared by chemical or physical vapour deposition) and a substrate, which has been strengthened preliminarily by UKT.
- Operating life of medical products titanium hip implants increases due to deposition of cylindrical grooves grid by UKT method:
  - > specific surface area increases in 2 times compared with untreated surface;
  - surface layer strength and hole implant bending strength increases in 3 times;
  - fatigue strength increases in 2.5 times due to compressive stresses formation;
  - > adhesion of implant with bone patient's tissue increases.