PROJECT FACTSHEET

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NANOPIMS

Developing new high-temperature performance PVD coatings for high speed machining technology

Inspiration

With a comprehensive range of hard carbide cutting inserts suitable for different types of high speed machining, such as precision turning, drilling, milling or grooving, CERATIZIT today faces two major trends on the cutting tools market. On the one hand, manufacturers are moving towards 'green machining' associated with the concept of reducing the amount of lubricant used (Minimum Quantity Lubrication – MQL), or near-dry machining. On the other hand, the market is displaying a growing demand for coatings obtained by physical vapour deposition (PVD), that can withstand high temperatures.

The cost optimisation and reduction of environmental risks to a maximum by using MQL as sought by the machining trades has two consequences: not only an increased tool surface temperature during cutting, but also a reduced life span. Coatings a few microns thick, made from titanium nitride and aluminium, are currently used as these perform well up to temperatures of 850°C. By optimising both composition, through the addition of another oxidation resistant element, and the microstructure at the nanometric level of such coatings, it is now possible to increase tool operating temperatures with equivalent performance.

Innovation

Through NANOPIMS, LIST and CERATIZIT will share their skills and experimental facilities in order to develop new PVD coatings that perform at high operating temperatures (> 850°C). To achieve this, the partners will try to optimise chemical composition, microstructure and adhesion, as well as the final coating's resistance to plastic deformation and wear and tear.

In order to determine the properties of the coating created by this process, analyses and mechanical tests will be carried out at the LIST laboratories in Belvaux. These tests, such as measuring hardness, and wear and tear at high temperature or determining oxidation kinetics, will be supported by surface characterisation exercises.

These new coatings will subsequently be deposited on cutting tools and their performance will be assessed by machining tests carried out at the CERATIZIT Group facilities. Once performance has been proven, new product classification tests may be launched to ascertain the potential markets for this product.

Impact

Through the project, the partners hope to develop new PVD coatings offering a 15-30% improvement in the life span of the cutting inserts produced by CERATIZIT.

From a scientific perspective, the NANOPIMS project should help provide additional knowledge about improving PVD coating resistance to oxidation and wear and tear at high operating temperatures. These findings will be crucial for steel and titanium-based alloy milling activities, for example, as well as for refractory material turning activities.

Partners

CERATIZIT (LU)

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Contact

5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
phone: +352 275 888 - 1 | LIST.lu

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST