

Dr. Harpreet Singh Grewal, Assistant Professor, Department of Mechanical Engineering receives **Early Career Research Award** (Individual centric) from **Science and Engineering Board (SERB), Department of Science and Technology (DST), Government of India**. He has been awarded the grant of **32 lakhs for a three year project** titled “[Microwave Derived Bi-modular Composite Coatings For Encountering Erosion-Related Problems](#)”.



Another project titled “[Modulating Coating Properties for Enhanced Protection from Erosion-Corrosion: A Systematic Approach on Delineating the Effect of Post-Processing conditions](#)” for **29 Lakhs** has also been awarded by **Naval Research Board (NRB)** for a period of three years.

Summary of the Projects

Degradation of fluid machinery components due to slurry (*SE*) and cavitation (*CE*) erosion and corrosion is a severe problem for agriculture and utility pumps, hydroturbines, ship propellers, valves, and pipelines. The degradation arising from *CE* is inevitable due to fluctuating pressure head and speed. A high silt content in rivers and entrained sand/abrasive particles in pumped water causes severe *SE*. The interaction with corrosion further aggravates the degradation process.

Coatings are economical alternative for improving the tribological properties of materials. The coatings developed using microwave (MW) technique helps mitigate the limitations (anisotropic microstructure, high porosity content, cracks and voids) usually observed in coating developed using conventional techniques such as physical (PVD) and chemical deposition techniques (CVD), thermal spraying, laser , and weld-overlay.

We plan to design and develop bi-modular composite coatings using microwave technique for improving the *SE* and *CE* resistance of the fluid machines. Use of microwave technique ensures microstructural homogeneity with elimination of pores and crack due to hybrid heating (volumetric and conductive) of the feedstock powder. The elimination of splat boundaries and preferential grain growth directions imparts the required isotropic characteristic to the coating. The aim will be to design coatings possessing high hardness and fracture toughness that can directly help improve the erosion resistance. A fundamental understanding to delineate why and to what-extent the bi-modular design can improve the performance of the coatings would be explored. Relationship between the coating microstructure and the underlying erosion mechanisms would also be developed.

We are also trying to improve the performance of the coatings subjected to marine environment through optimum use of various post-processing techniques. Systematic investigation using various post-processing technique will be performed to develop fundamental understanding on the influence of key parameters on the microstructural refinement, mechanical properties as well as structure-property relation of coatings, which is still not well understood.

For more information please visit:

http://snu.edu.in/engineering/harpreet_singh_grewal_profile.aspx