

# **Tribo-Mechanical Comparison of Uncoated and PVD Coated D2 Material**

<sup>1</sup>Prof. Mayur Devdhe, <sup>2</sup>Maskare Bramha Yashwant, <sup>3</sup>Malavkar Ajinkya Shivaji,

<sup>4</sup>Wagh Aniket Somnath, <sup>5</sup>Dhore Yash Nitin

<sup>1</sup>Assistant Professor, Department of Mechanical Engineering

<sup>2,3,4,5</sup>Student, of Department of Mechanical Engineering

JSPM's Bhivrabai Sawant Institute of Technology & Research, Wagholi, Pune, Maharashtra, India

**Abstract:** *The present study investigates the tribo-mechanical behavior of D2 tool steel in both uncoated and Physical Vapor Deposition (PVD) coated conditions. D2 steel is widely used in tooling applications due to its high hardness and wear resistance. However, surface coating technologies such as PVD are often employed to further enhance its performance under demanding wear conditions. In this project, D2 samples were subjected to surface coating via PVD using a selected hard coating material (e.g., TiN, TiAlN). Mechanical properties including hardness and surface roughness were measured using standard techniques. Tribological performance was evaluated using pin-on-disc wear testing under dry sliding conditions to determine wear rate and coefficient of friction (COF). Results demonstrated that the PVD-coated samples exhibited significantly improved wear resistance and reduced COF compared to uncoated D2. The coated samples also showed a slight increase in surface hardness due to the hard coating layer. SEM analysis of the worn surfaces confirmed a more uniform and less damaged wear track on coated specimens. The study concludes that PVD coating significantly enhances the tribological and mechanical performance of D2 tool steel, making it more suitable for high-wear industrial applications.*

**Keywords:** *tribo-mechanical behavior*

