

**DEPARTMENT OF MECHANICAL ENGINEERING  
ACADEMIC YEAR 2023-24 (EVEN)  
INTERNAL STAFF SEMINAR REPORT**

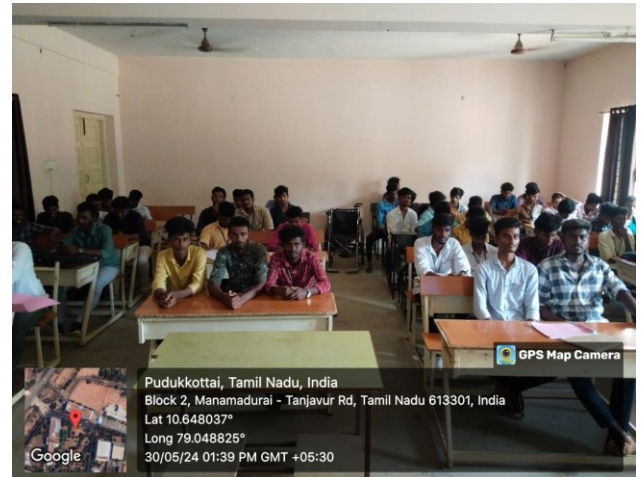
Date& time : 30.05.2024 & 12.30 P.M.  
Venue : Department Smart Classroom  
Topic : Seminar on “Heat treatment process”  
Resource person : Mr. N. Magesh  
Assistant Professor,  
Mechanical Engineering,  
Kings College of Engineering-Punalkulam.

On behalf of the Department of Mechanical Engineering organized an Internal Seminar on “Heat treatment process” for faculty members of the Mechanical Department on 30.05.2024 at smart class room. The main objective of the internal seminar is to provide exposure to our faculty members on various research areas in materials and metallurgy.

**The Following Points were discussed during the Session:**

- Thermally assisted surface hardening techniques have led to a surge in research efforts and industrial applications, with emphasis on strengthening of metallic materials with high work hardening, high strength and poor deformability.
- The common surface hardening techniques such as warm shot peening, warm laser shock peening and thermally assisted ultrasonic surface hardening are discussed. Also the development and working principle for each of the techniques are discussed.
- As compared with conventional surface hardening techniques, thermally assisted surface hardening techniques with optimum processing temperatures can further increase the surface and subsurface hardness, thickness of the hardening layer, fatigue life and wear resistance of mechanical components.
- Thermal energy can soften the materials, allowing plastic deformation to produce higher magnitude and deeper region of work hardening, allowing plastic deformation to produce higher magnitude and deeper region of work hardening.
- The coupled thermal-dynamic effect enables a broader design space for alloy hardening,

- The thermo mechanical treatment can also induce dynamic strain aging and dynamic precipitation in some metallic alloys, which leads to precipitation strengthening and enhanced stability of dislocations and compressive residual stress.



**Snapshots of the Session**

### **Chapters Discussed:**

- Surface Hardening Techniques
- Metallurgical Properties Changing During the Vacuum and Surface Hardening.
- Benefits and Limitations.
- Research Scopes in Heat Treatment Techniques.

### **Outcomes:**

Upon listing of this seminar the participants can able to

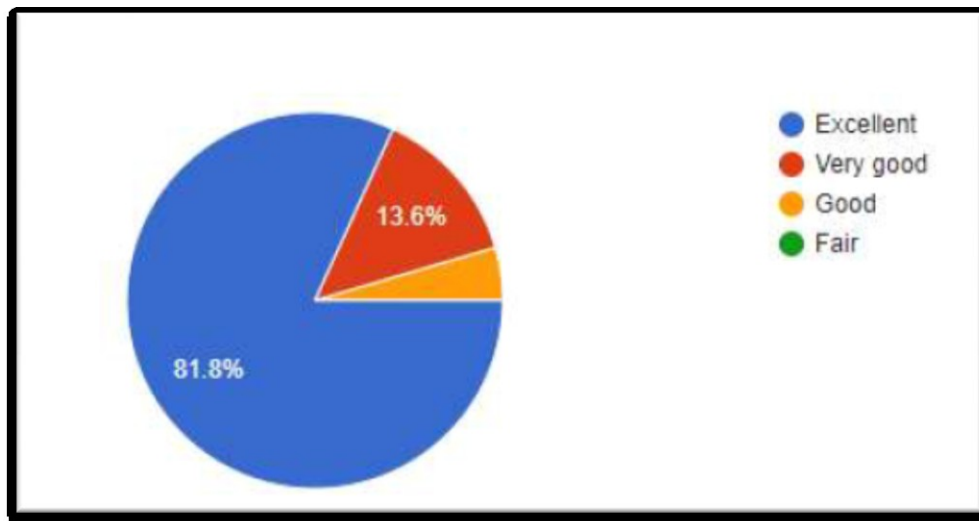
- Understand the various types heat treatment techniques.
- Understand the concepts work hardening and surface hardening.
- Able to understand the concept of metallurgy in recent advancements.

### **References:**

1. W.H. Peng, et all. "Effects of WC Grain Size on Surface Hardening of WC-10 Co Cemented Carbides by Pulsed Electron Beam Irradiation" - Vacuum, Volume 207, January 2023, 111613.

2. Gang Hee Gu, et all. "Unprecedented Bake Hardening Responses of Interstitial High-Entropy Alloy by Synergistic Effect with Lattice Distortion" - Materials & Design, Volume 233, September 2023, 112289.
3. Ziwei Qin et all. "Strain-Hardening, Impact Protective and Self-Healing Supramolecular Polyurethane Nanocomposites Enabled by Quadruple H-Bonding, Disulfide Bonds and Nanoparticles" - Chemical Engineering Journal, Volume 467, 1 July 2023, 143434.
4. Shixiong Wu et all." Microstructure and Mechanical Properties of Superficial Surface and Subsurface Layers in the Cutting of Hardened Steel Under Cryogenic Cooling" - Journal of Materials Processing Technology, Volume 322, September 2023, 118165.
5. Jun Liu et all. "Recent Development of Thermally Assisted Surface Hardening Techniques" - Advances in Industrial and Manufacturing Engineering - Volume 2, May 2021, 100006.

**Feedback Analysis:**



*[Signature]*  
Staff Incharge

*T. Prabhakar*  
HOD/MECH

*T. Prabhakar*  
05/06/2024  
Principal