

Dr. Tej Singh

Assistant Professor

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ACADEMIC EDUCATION

- 2013/08** **Ph.D. in Mechanical Engineering**
Title of dissertation: *Tribo-performance evaluation of fiber reinforced and nano-filled composite friction materials*
Mechanical Engineering Department, National Institute of Technology, Hamirpur, India
- 2008/11** **Master of Technology: Nanoscience and Nanotechnology**
Centre for Emerging Area in Science & Technology, Panjab University, Chandigarh, India

PROFESSIONAL CAREER

- 2018 –** **Assistant Professor**
Eötvös Loránd University, Faculty of Informatics: Savaria Institute of Technology
- 2013 –2018** **Assistant Professor**
Mechanical Engineering Department at Manav Bharti University Solan, India

RESEARCH INTERESTS

- Wear performance of composite (polymer/metal/ceramic matrix) which includes sliding (dry and lubricating), erosive (dry and slurry), abrasive (two and three body).
- Biosynthesis of nanoparticles and their use in potential applications.
- Dental materials.

EDUCATION ACTIVITIES

- Subject (B. Tech.): Material Science
- Subject (B. Tech.): Manufacturing Technology

LANGUAGE SKILLS

- English: Writing, reading, speaking (Fluent)
- Hindi: Native

SCIENTIFIC ACTIVITIES

PhD candidates in progress:

- Naresh Kumar. PhD title: *Tribo-performance evaluation of natural fiber reinforced automotive brake friction composite materials*. Expected defense: 2019.

Scientific reviewer

- Reviewer Archives of Civil and Mechanical Engineering; Wear; Tribology International; Journal of Radiation Research and Applied Sciences; Food Hydrocolloids - ELSEVIER
- Reviewer of Journal of Industrial Textiles - SAGE
- Reviewer of Polymer Composites; Material Science and Engineering Technology; Polymers for Advanced Technologies - WILEY
- Silicon; Friction - SPRINGER
- International Journal of Management Science and Engineering Management - TAYLOR & FRANCIS

PUBLICATIONS

Book, book chapter, monograph:

1. Chandramani Goswami, Amar Patnaik, I.K. Bhat, **Tej Singh**. Synthesis and characterization of Al₂O₃-Cr₂O₃-based ceramic composites for artificial hip joint. Innovative Design, Analysis and Development Practices in Aerospace and Automotive Engineering (I-DAD 2018). Lecture Notes in Mechanical Engineering. ISBN: 978-981-13-2717-9.
2. **Tej Singh**, Amar Patnaik, Ranchan Chauhan. Tribo-performance evaluation and optimization of fibre-reinforced phenolic based friction composites. "Primary and Secondary Manufacturing of Polymer-Matrix Composites" CRC Press, USA (Taylor and Francis Group), 2017, pp. 143-153.
3. **Tej Singh**, Brijesh Gangil, Amar Patnaik. Influence of nano fillers on the tribo-performance of brake friction materials. "Nanotechnology: Novel Perspectives and Prospects". McGraw-Hill, USA, 2015, pp. 403-409.
4. Kumari Jyoti, Ajeet Singh, **Tej Singh**. A comparative study on the antibacterial activity of silver nanoparticles synthesized from the leaf and endophytic fungal extract of *Raphanus Sativus*. "Nanotechnology: Novel Perspectives and Prospects". McGraw-Hill, USA, 2015, pp. 513-518.

Peer reviewed journal papers with impact factor:

1. **Tej Singh**, Brijesh Gangil, Amar Patnaik, Sandeep Kumar, Ankit Rishiraj, Gusztáv Fekete. Physico-mechanical, thermal and dynamic mechanical behaviour of natural-synthetic fiber reinforced vinylester based homogenous and functionally graded composites. Materials Research Express, 2019, 6 025704. (IF=1.151)
2. Sandeep Kumar, V.K. Patel, K.K.S. Mer, Gusztáv Fekete, Brijesh Gangil, **Tej Singh**. Influence of woven bast-leaf hybrid fiber on the physico-mechanical and sliding wear performance of epoxy based polymer composites. Materials Research Express, 2018, 5 105705. (IF=1.151)
3. Sachin Tejyan, **Tej Singh**, Amar Patnaik, Gusztáv Fekete, Brijesh Gangil. Physico-mechanical and erosive wear analysis of polyester fiber based nonwoven fabric reinforced polymer composites. Journal of Industrial Textiles, 2018. <https://doi.org/10.1177/1528083718787524>. (IF=1.283)
4. **Tej Singh**, Amar Patnaik, Gusztáv Fekete, Ranchan Chauhan, Brijesh Gangil. Application of hybrid analytical hierarchy process and complex proportional assessment approach for optimal design of brake friction materials. Polymer composite, 2018. <https://doi.org/10.1002/pc.24907>. (IF=1.943)
5. Chandramani Goswami, I.K. Bhat, Sivaiah Bathula, **Tej Singh**, Amar Patnaik. Physico-mechanical and surface wear assessment of magnesium oxide filled ceramic composites for hip implant application. Silicon, 2018. DOI: 10.1007/s12633-018-9880-6. (IF=1.246)
6. Ranchan Chauhan, **Tej Singh**, N.S. Thakur, Nitin Kumar, Raj Kumar, Anil Kumar. Heat transfer augmentation in solar thermal collectors using impinging air jets: A comprehensive review. Renewable and Sustainable Energy Reviews, 2018; 82(3): 3179-3190. (IF=9.184)

7. **Tej Singh**, Ranchan Chauhan, Amar Patnaik, Brijesh Gangil, Ramesh Nain, Anil Kumar. Parametric study and optimization of multi-walled carbon nanotube filled friction composite materials using Taguchi method. *Polymer Composites*, 2018; 39(S2): E1109-E1117. (IF=1.943)
8. **Tej Singh**, Avinash Tiwari, Amar Patnaik, Ranchan Chauhan, Sharafat Ali. Influence of wollastonite shape and amount on tribo-performance of non-asbestos organic brake friction composites. *Wear*, 2017; 386-387: 157-164. (IF=2.960)
9. Ranchan Chauhan, **Tej Singh**, Avinash Tiwari, Amar Patnaik, N.S. Thakur. Hybrid entropy-TOPSIS approach for energy performance prioritization in a rectangular channel employing impinging air jets. *Energy*, 2017; 134: 360-368. (IF= 4.968)
10. Ranchan Chauhan, **Tej Singh**, Nitin Kumar, Amar Patnaik, N.S. Thakur. Experimental investigation and optimization of impinging jet solar thermal collector by Taguchi method. *Applied Thermal Engineering*, 116; 2017: 100-109. (IF= 3.771)
11. Ashutosh Sharma, Ranchan Chauhan, **Tej Singh**, Anil Kumar, Raj Kumar, Anil Kumar, Muneesh Sethi. Optimizing discrete V obstacle parameters using a novel Entropy-VIKOR approach in a solar air flow channel. *Renewable Energy*, 106; 2017: 310-320. (IF= 4.9)
12. Anil Kumar, Ranchan Chauhan, Raj Kumar, **Tej Singh**, Muneesh Sethi, Anil Kumar, Ashutosh Sharma. Developing heat transfer and pressure loss in an air passage with multi discrete V-blockages. *Experimental Thermal and Fluid Science*, 84; 2017: 266-278. (IF= 3.204)
13. **Tej Singh**, Amar Patnaik. Thermo-mechanical and tribological properties of multi-walled carbon nanotube filled friction composite materials. *Polymer Composites*, 2017; 38(6): 1183-1193. (IF=1.943)
14. **Tej Singh**, Amar Patnaik, Ranchan Chauhan, Pankit Chauhan. Selection of brake friction materials using hybrid analytical hierarchy process and vise kriterijumska optimizacija kompromisno resenje approach. *Polymer Composites*, 2018; 39(5): 1655-1662. (IF=1.943)
15. **Tej Singh**, Amar Patnaik, Ranchan Chauhan, Pankit Chauhan, Naresh Kumar. Physico-mechanical and tribological properties of nanoclay filled friction composite materials using Taguchi design of experiment approach. *Polymer Composites*, 2018; 39(5): 1575-1581. (IF=1.943)
16. Ranchan Chauhan, **Tej Singh**, N.S. Thakur, Amar Patnaik. Optimization of parameters in solar thermal collector provided with impinging air jets based upon preference selection index method. *Renewable Energy*, 99; 2016: 118-126. (IF= 4.9)
17. **Tej Singh**, Amar Patnaik, Ranchan Chauhan. Optimization of tribological properties of cement kiln dust- filled brake pad using grey relation analysis. *Materials and Design*, 89; 2016: 1335-1342. (IF=4.525)
18. Shiv Ranjan Kumar, Amar Patnaik, I.K. Bhat, **Tej Singh**. Optimum selection of nano- and micro sized filler for the best combination of physical, mechanical, and wear properties of dental composites. *Proceedings of the Institution of Mechanical Engineers, Part L: Journal of Materials Design and Applications*, 2018; 232(5): 416-428. (IF=1.281)
19. **Tej Singh**, Amar Patnaik, Brijesh Gangil. Thermal stability analysis of nano particulate filled phenolic based friction composite materials. *Journal of Industrial Textile*, 2016; 45(6): 1335-1349. (IF=1.283)
20. **Tej Singh**, Amar Patnaik, Brijesh Gangil, Ranchan Chauhan. Optimization of tribo-performance of brake friction materials: Effect of nano filler. *Wear*, 2015; 324-325: 10-16. (IF=2.960)
21. **Tej Singh**, Amar Patnaik. Performance assessment of lapinus-aramid based brake pad hybrid phenolic composites in friction braking. *Archives of Civil and Mechanical Engineering*, 2015; 15: 151-161. (IF= 2.763)
22. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy. Friction braking performance of nanofilled hybrid fibre reinforced phenolic composites: Influence of nanoclay and carbon nanotubes. *NANO*, 2013; 8(3): 1350025: 1-15. (IF= 1.10)
23. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy, Bharat S. Tomar, Mukesh Kumar. Effect of nanoclay reinforcement on the friction braking performance of hybrid phenolic friction composites. *Journal of Materials Engineering and Performance*, 2013; 22(3): 796-805. (IF= 1.340)

24. Swati Gangwar, Vikas Kukshal, Amar Patnaik, **Tej Singh**. Mechanical and fracture toughness behavior of TiO₂ filled A384 metal alloy composites. *Science and Engineering of Composite Materials*, 2013, 20(3): 209-220. (IF= 0.619)
25. Sunil Kumar, Nitu Kumari, Sudhanshu Singh, **Tej Singh**, Sanyog Jain. Doping studies of Tb (terbium) and Cu (copper) on CdSe nanorods. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 2011; 389(1-3): 1-5. (IF= 2.829)

Peer reviewed papers:

1. **Tej Singh**, Kumari Jyoti, Amar Patnaik, Ajeet Singh, S.C. Chauhan. Spectroscopic, microscopic characterization of *Cannabis sativa* leaf extract mediated silver nanoparticles and their synergistic effect with antibiotics against human pathogen. *Alexandria Engineering Journal*, 2018. <https://doi.org/10.1016/j.aej.2018.04.002>.
2. Rahul Nadda, Raj Kumar, **Tej Singh**, Ranchan Chauhan, Amar Patnaik, Brijesh Gangil. Experimental investigation and optimization of cobalt bonded tungsten carbide composite by hybrid AHP-TOPSIS approach. *Alexandria Engineering Journal*, 2018. <https://doi.org/10.1016/j.aej.2018.07.013>.
3. Vedant Singh, Akshay Kumar, **Tej Singh**. Impact of TQM on organisational performance: The case of Indian manufacturing and service industry. *Operations Research Perspectives*, 2018; 5: 199-217.
4. **Tej Singh**, Dharmender Singh Shekhawat, Kumari Jyoti. Spectroscopic and microscopic characterization of silver nanoparticles synthesized using *Justicia adhatoda* flower. *American Institute of Physics Conference Proceeding*, 2018; 1953: 030155.
5. Mukesh Kumar Rathi, **Tej Singh**, Ranchan Chauhan. Dynamic mechanical analysis of waste tyre rubber filled brake friction composite materials. *American Institute of Physics Conference Proceeding*, 2018; 1953: 090082.
6. Naresh Kumar, **Tej Singh**, G.S. Grewal. Tribo-performance evaluation of ecofriendly brake friction composite materials. *American Institute of Physics Conference Proceeding*, 2018; 1953: 090083.
7. Rohit Khargotra, Sunil Dhingra, Ranchan Chauhan, **Tej Singh**. Performance investigation and comparison of different turbulator shapes in solar water heating collector system. *American Institute of Physics Conference Proceeding*, 2018; 1953: 130029.
8. Ranchan Chauhan, N.S. Thakur, **Tej Singh**, Muneesh Sethi. Exergy based modeling and optimization of solar thermal collector provided with impinging air jets. *Journal of King Saud University: Engineering Sciences*, 2018; 30(4): 355-362.
9. **Tej Singh**, Amar Patnaik, Ranchan Chauhan, Ankit Rishiraj. Assessment of braking performance of lapinus-wollastonite fibre reinforced friction composite materials. *Journal of King Saud University: Engineering Sciences*, 2017; 29: 183-190.
10. **Tej Singh**, Kumari Jyoti, Amar Patnaik, Ajeet Singh, Ranchan Chauhan, S.S. Chandel. Biosynthesis, characterization and antibacterial activity of silver nanoparticles using an endophytic fungal supernatant of *Raphanus sativus*. *Journal of Genetic Engineering and Biotechnology*, 2017; 15(1): 31-39.
11. **Tej Singh**, Amar Patnaik, Ranchan Chauhan, Naresh Kumar, Pankit Chauhan. Dry sliding wear assessment of organic-inorganic fibre reinforced friction composites using design of experiment approach. *Advanced Science Letters*, 22(11); 2016: 3958-3960.
12. Naresh Kumar, **Tej Singh**, R.S. Rajoria, Amar Patnaik. Optimum design of natural fiber reinforced brake friction material using hybrid entropy-VIKOR approach. *Advanced Science Letters*, 22(11); 2016: 3961-3964.
13. Ranchan Chauhan, **Tej Singh**, N.S. Thakur. Investigation of the thermal performance of solar thermal collector provided with impinging air jets. *Advanced Science Letters*, 22(11); 2016: 3928-3932.
14. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy. Development and optimization of hybrid friction materials consisting of nanoclay and carbon nanotubes by using analytical hierarchy process (AHP) and technique for order preference by similarity to ideal solution (TOPSIS) under fuzzy atmosphere. *Walailak Journal of Science and Technology*, 2013; 10 (4): 343-362.
15. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy. Thermo-mechanical characterization of nano filled and fibre reinforced brake friction materials. *American Institute of Physics Conference Proceeding*, 2013; 1536: 259-260.

16. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy, Mukesh Kumar. Performance analysis of organic friction composite materials based on carbon nanotubes-organic-inorganic fibrous reinforcement using hybrid AHP-FTOPSIS approach. *Composites: Mechanics, Computations, Applications. An International Journal*, 2012; 3(3): 189-214.
17. Swati Gangwar, Vikas Kukshal, Amar Patnaik, **Tej Singh**. Computational optimization of TiO₂ filled A384 alloy composites in erosive environment. *International Journal of Computational Material Science and Engineering*, 2012; 1(3): 1250025: 1-23.
18. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy. Effect of carbon nanotubes on tribo-performance of brake friction materials. *American Institute of Physics Conference Proceeding* 2011; 1393: 223-224.

Conference proceedings:

1. **Tej Singh**, Kumari Jyoti, Amar Patnaik, Ranchan Chauhan, Naresh Kumar. Application of silver nanoparticles synthesized from *Raphanus sativus* for catalytic degradation of organic dyes. *International Conference on Advancements in Engineering and Technology (ICEAT) at Bhai Gurdas Institute of Engineering and Technology Sangrur*, 18-19 March 2016.
2. Naresh Kumar, **Tej Singh**, R.S. Rajoria, Amar Patnaik. Optimum design of brake friction material using hybrid entropy-GRA approach. *International Conference on Advancements in Engineering and Technology (ICEAT) at Bhai Gurdas Institute of Engineering and Technology Sangrur*, 18-19 March 2016.
3. **Tej Singh**, Vipul Sharma, Ravinder Singh, Sachin Tejyan, Brijesh Gangil. Selection of brake friction materials using compromise ranking method. *International conference on mathematics and engineering sciences (ICMES) at Chitkara University, Himachal Pradesh*, 20-22 March 2014.
4. **Tej Singh**, Ravinder Singh, Vipul Sharma, Sachin Tejyan, Brijesh Gangil. Compatibility of cement kiln dust (CKD) with different phenolic resin for friction braking applications. *International conference on advances in engineering and technology (ICAET) at Chandigarh*, 7-8 February 2014.
5. **Tej Singh**, Sachin Tejyan, Brijesh Gangil, Amar Patnaik. A decision-making structure for friction material selection problem using a preference selection index method. *International conference on advances in materials and manufacturing technology (AMMT) at Chitkara University, Chandigarh*, 20th September 2013.
6. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy. Investigation of physical, chemical, mechanical and thermal properties of nanoclay filled friction composite materials. *International conference on advances in mechanical and computer engineering (ICAMCE) at Yamuna Nagar*, 18-19 January 2013.
7. **Tej Singh**, Chirag, Naresh Kumar, Vipul Sharma. Thermo-gravimetric analysis of metal sulphide filled composite friction materials. *National Conference on "converging technologies beyond 2020 (2CTB-2020) at Kurukshetra University*, 28-29 November 2014.
8. **Tej Singh**, Vipul Sharma, Naresh Kumar, Ranjeet Singh. Physico-mechanical properties of metal-sulphide filled brake friction materials. *National conference on mechanical engineering (NCME) at PU regional centre, Hoshiarpur*, 7-8 November 2014.
9. Naresh Kumar, **Tej Singh**, Vipul Sharma, Ranjeet Singh, R.S. Rajoria. Potential exploration of natural fibres in brake friction materials. *National conference on mechanical engineering (NCME) at PU regional centre, Hoshiarpur*, 7-8 November 2014.
10. **Tej Singh**, Brijesh Gangil, Sachin Tejyan. Dry sliding wear performance of Kevlar-lapinus fibre reinforced phenolic based composite friction material. *National conference on recent advances in mechanical engineering (NCRAME) at Govind Ballabh Pant Engineering College, Pauri*, 26-27 September 2014.
11. **Tej Singh**, Sachin Tejyan. Thermal stability analysis of cement kiln dust (CKD) based composite friction materials. *National conference on interdisciplinary approaches for engineering innovation and scientific development-impact on society and environment (IAEISDISE) at Manav Bharti University, Solan*, 12-13 September 2014.

12. Sachin Tejyan, **Tej Singh**. Mechanical Characterization of Nonwoven Reinforced Laminated Composites by FEM. National conference on interdisciplinary approaches for engineering innovation and scientific development-impact on society and environment (IAEISDISE) at Manav Bharti University, Solan, 12-13 September 2014.
13. **Tej Singh**, Ranchan Chauhan. Determination of metallic and semiconducting transition in single-walled carbon nanotubes by UV-Vis spectroscopy. National conference on multifunctional advanced materials (MAM) at Shoolini University, Solan, 11-13 June 2014.
14. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy. Thermal and mechanical properties of multiwalled carbon nanotube filled composite friction materials. National conference on recent advances in mechanical engineering (NCRAME) at Govind Ballabh Pant Engineering College, Pauri, 8-9 July 2013.
15. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy. Selection of nano filled friction composite materials based on physical, mechanical and thermo-mechanical properties by using TOPSIS approach. National conference on recent advances in condensed matters physics (RACMP) at National Institute of Technology, Hamirpur, 1-2 June 2013.
16. **Tej Singh**, Amar Patnaik, Bhabani K. Satapathy. Characterization of physical, mechanical and dynamic mechanical properties of carbon nanotube filled brake friction materials. National conference on recent advances in polymer nanocomposites (NCPN) at Zakir Husain College Delhi, 14-15 January 2011.
17. **Tej Singh**, Bhabani K. Satapathy, Amar Patnaik. Synergistic effect of lapinus and Kevlar fiber for friction applications. National conference on advances in polymer science and technology (APST) at National Institute of Technology, Hamirpur, 22-24 October 2010.