

Hot Judder in Wheel Brakes

Relevance to the Automotive Industry:	Comfort is one of the key requirements in the development of modern wheel brakes. Consequently, the phenomenon of hot judder, which is a forced vibration of the wheel brake, cannot be tolerated, especially in high value vehicles. Selective countermeasures do not yet exist. An objective of this research project is therefore to develop such a countermeasure.	
Research Location:	TUD Fahrzeugtechnik (FZD)	
Homepage (Engl.):	http://www.tu-darmstadt.de/fzd/index_en.html	
Faculty Mentor:	Prof. Dr. rer. nat. Hermann Winner	
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Graduate Mentor:	Dipl.-Ing. Sebastian Fischer	
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Project Description:	<p>FZD is researching the phenomenon of hot judder in wheel brakes to identify the governing parameters. What part in the functional chain of hot judder does the brake pad fulfill? What are the key parameters of the brake pad that influence hot judder? These questions are still not answered.</p> <p>The purpose of this research project is therefore to identify the parameters that influence hot judder, and to build a catalog of countermeasures regarding changes in the brake pads. Prototype brake pads with various brake pad ingredients and geometries will be manufactured and then analyzed on a flywheel brake dynamometer using, for instance, thermal imaging and capacitive range sensors.</p> <p>The current use of copper-free brake pad materials, especially in the U.S., results in problems regarding their hot judder related performance. The NSF REU student will work with his or her graduate mentor to identify objectively comparable characteristic values that identify the phenomenon of hot judder. The student will test two prototypes of copper-free brake pad materials in a test program within the brake dynamometer here at FZD to obtain these characteristic values. The interpretation and analysis of the measurement data is a key element of his or her work.</p>	
May 21 - Jul 13, 2012; (8 weeks, 40h/week)		
Target publications:	<ul style="list-style-type: none"> • Wear (Journal on the Science and Technology of Friction, Lubrication and Wear) • SAE Brake Colloquium & Exhibition • JEF (European Conference on Braking) 	
Necessary Skills/ Knowledge:	<ul style="list-style-type: none"> • MS Excel • Basic knowledge of mathematics and theory of oscillations (applying FFT (Fast Fourier Transformation)) 	
Desirable Skills/ Knowledge:	<ul style="list-style-type: none"> • Basic knowledge of automotive engineering (brakes) • Basic knowledge of MATLAB (manipulate data and plotting) 	
Additional Online Resource(s):		

NSF REU Students must have completed at least two semesters of engineering studies prior to the proposed summer research, and they must have at least one semester remaining before they can earn their BS in Engineering.