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name of the unit: DIVISION OF MACHINE TOOLS Institute of Machine Tools and Production Engineering		symbol: I-13 http://www.ioitbm.p.lodz.pl
head of the unit: Witold Pawłowski, PhD, DSc, TUL Prof.	potential promoters: Witold Pawłowski, PhD, DSc, TUL Prof. Andrzej Kosucki, PhD, DSc	contact person: Norbert Kępczak, PhD phone: 48-42-631-39-36 norbert.kepczak@p.lodz.pl
scope of activities: The main areas of activity of the Machine Tools Division are scientific research conducted with the use of modal analysis. Modal analysis is an analysis of dynamic properties of mechanical objects. As a result a modal model is obtained in the form of free vibration frequencies, amplitudes and damping coefficients. Modal analysis is divided into 3 basic types: theoretical modal analysis, experimental modal analysis, and operational modal analysis. The theoretical modal analysis is carried out based on a 3D structural model. It is used most often at the design stage. The experimental modal analysis is carried out by means of an identification experiment, which consists in exciting the vibrations of the object with simultaneous measurement of the exciting force and the response of the system. On the other hand, the operational analysis is performed during the actual work of the machine or device with the simultaneous measurement of the system's response to the actual inputs.		
present activities: Currently, the scientific activity of Machine Tools Division is focused on research on the influence of doping polymer concrete with rubber granules on the dynamic and mechanical properties of the composition and the possibility of using this modern engineering material in the construction of machine tools. A hybrid solution is proposed (a combination of cast iron and polymer concrete), which will allow the use of the advantages of both construction materials. Both simulation and experimental studies are carried out. The use of a polymer concrete filling in deep hole boring bar tools is also considered. Theoretical and experimental research is also conducted for this purpose. Another conducted research is the determination of the dynamic properties of the SOH-10 internal cylindrical grinding machine, which is the equipment of the Institute of Machine Tools and Production Engineering. It is also here that simulation and operational tests are planned.		
future activities: Research on the wide application of polymer concrete in the field of machine tool construction and tools for machining. Development of an oscillation-assisted grinding method for the basic types of grinding.		



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[publications/patents, awards, projects:](#)

- Kępczak N., Pawłowski W. Dynamic Properties of Hybrid Machine Tool Body – Theoretical and Experimental Investigation Journal of Mechanics and Mechanical Engineering 2021; artykuł przyjęty do publikacji
- Deredas K., Kępczak N., Urbaniak M. Influence of doping with styrene-butadiene rubber on dynamic and mechanical properties of polymer concrete, Composite Structures 2021; 268: 113998
- Kępczak N., Bechciński G., Rosik R. Experimental verification of the deep hole boring bar model, Eksploatacja i Niezawodność – Maintenance and Reliability 2021; 23 (1): 55–62
- Pawłowski W., Kaczmarek Ł., Louda P. Theoretical and experimental modal analysis of the cylinder unit filled with pur foam, Eksploatacja i niezawodność – Maintenance and Reliability 2016; 18 (3): 428-435
- Kępczak N., Pawłowski W., Kaczmarek Ł. Cast Iron and Mineral Cast Applied for Machine Tool Bed – Dynamic Behavior Analysis, Archives of Metallurgy and Materials, 2015, Volume 60, Issue 2A, pp. 1023-1029

[keywords:](#)

modal analysis, dynamic properties of mechanical objects, frequencies of free vibrations, amplitudes of free vibrations, damping coefficients of free vibrations

[list of internship proposal in this research team:](#)

- conduct the research of dynamic properties of internal cylindrical grinding machine (theoretical and experimental analysis);
- conduct the research of dynamic properties of hybrid machine tools body (theoretical and experimental analysis).