AEDS 2005 WORKSHOP
3 – 4 November 2005, Pilsen - Czech Republic

INTERDISCIPLINARY KNOWLEDGE TRANSFER AT MODULAR CONSTRUCTION LEVEL USING SPECIALIZED SOFTWARE

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Keywords: Engineering Design, Technical System, Methodology, Software

1. Introduction

The objective of knowledge transfer is a transfer of ideas and information about technical products, technical systems and their components among different technical branches. The developed methodology of knowledge transfer [Formánek 2004] is based on general knowledge transfer among engineering design fields [Hubka 1996]. A model of such transfer with support of the generalized Transfer Box (TrB) interface is shown in Fig.1. General knowledge transfer can be performed from branch X to branch Y or to other branches and vice versa. At present, new possibilities based on Engineering Design Science have arisen for knowledge transfer during the design of new technical systems (TS) with the same or similar properties and functions.

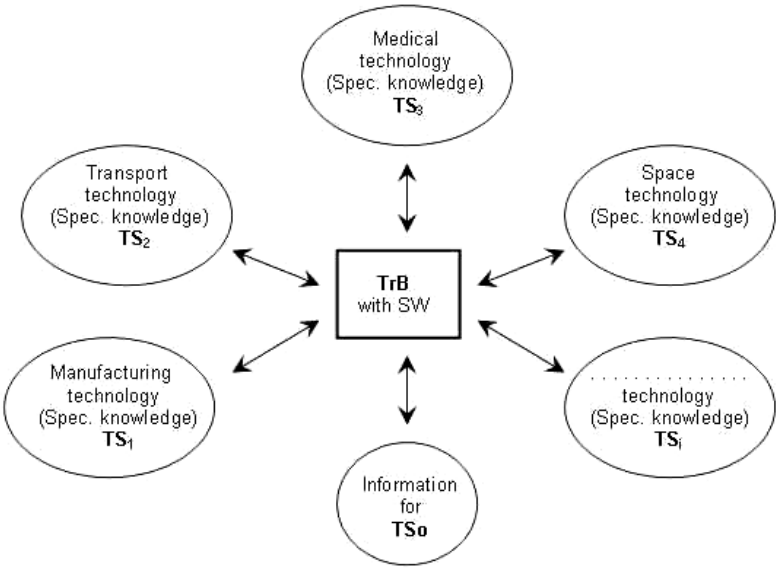

Figure 1. Model of interdisciplinary knowledge transfer

2. General knowledge transfer

During knowledge transfer it is necessary to include personal knowledge and experience and at the same time to enhance this knowledge by feedback or with the use of specialised SW systems. This knowledge transfer thus enriched contributes more to the complex upgrading of all its involved elements.

3. Case study - application

As mentioned above the developed methodology of knowledge transfer has been piloted on the use of materials for reducing noise and vibration in transport technology and other areas in Figure 2 (medical, manufacturing and etc.) as sources.

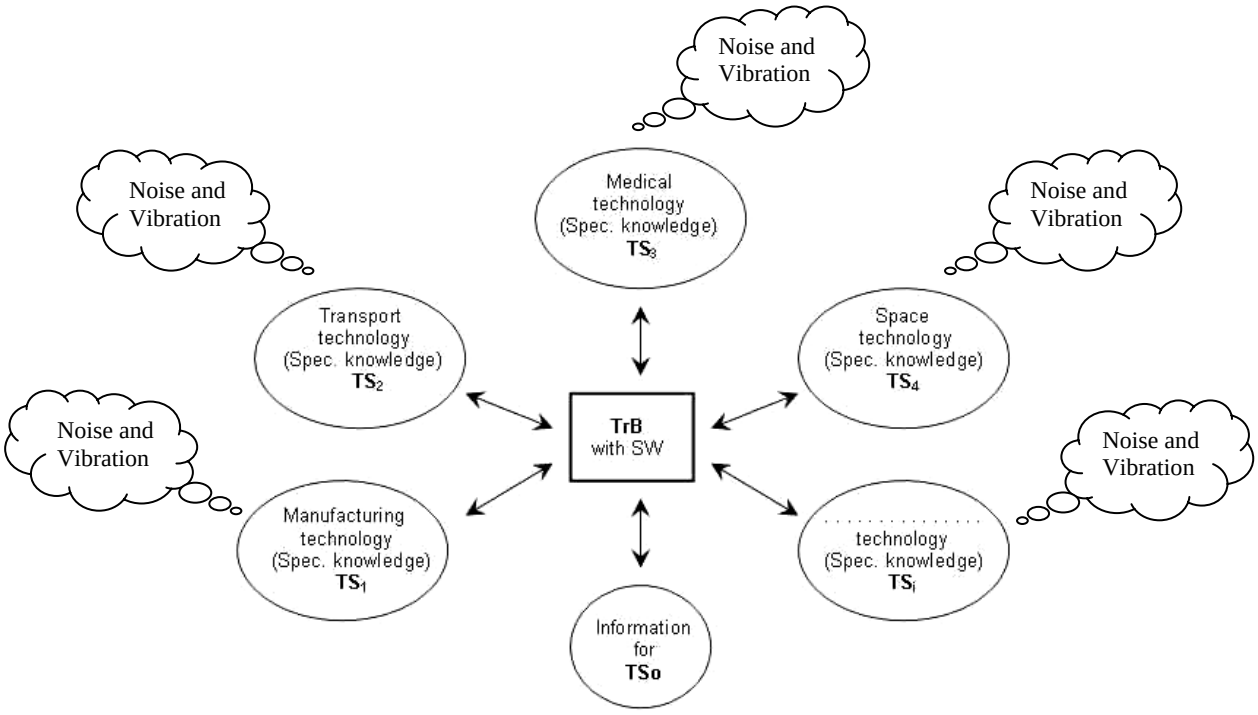

Figure 2. Case study - application of required property via SW box

3.1. Determination of material properties for transport technology

Material properties for an interactive database were determined experimentally for several combinations of materials. The results obtained, i.e. dampening properties, have been entered into an interactive electronic database (see Fig. 3) which could serve as an aid for designers to help select required materials and properties with respect to the dampening of noise and vibrations.

3.2. TrB with SW – interactive expert database

A demonstration of the database is shown in Fig. 3. It allows proper selection of dampening materials by searching in accordance with required damping properties.

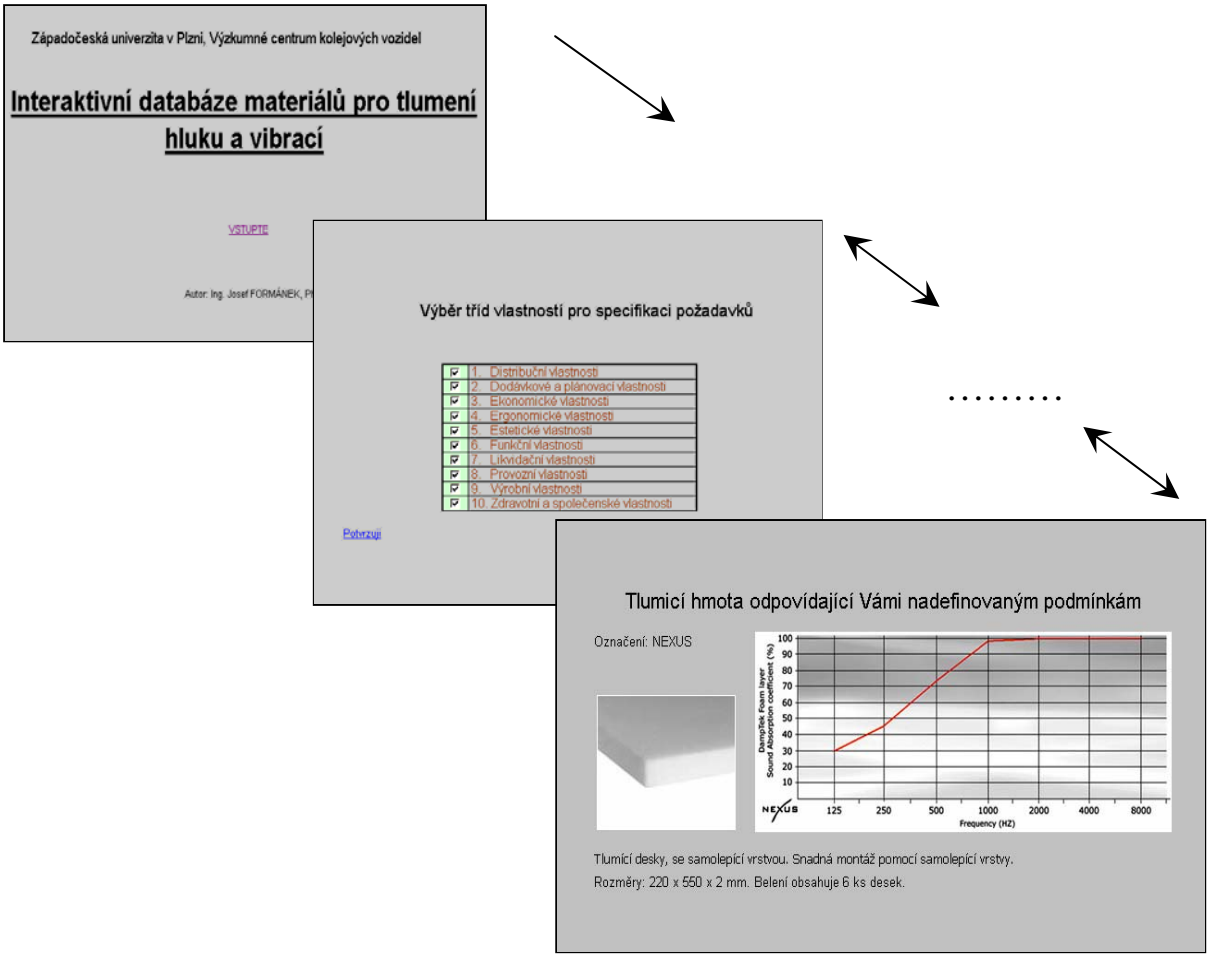

Figure 3. Interactive database – procedure during design

3.3 Information for TSo – Real application

The use of a database allows proper selection of material with specified damping properties for real applications including instructions for installation. The information from assembly can be used as feedback for other branches.

Figure 4. Installation of chosen damping material

4. Conclusion

This research deals with the mapping of materials and their properties which can be used to lower the emission of noise and vibration and create an active database to be used in companies which are involved in the development of railroad vehicles.

The basic concept of the general methodology for knowledge transfer has been outlined. The methodology developed in this way can improve knowledge transfer in the course of the engineering design of technical products. The methodology is suitable for computer and database processing.
A systematic approach based on Engineering Design Science has been used to minimise possible mistakes and errors in designed technical systems (products) because even small omissions caused by an intuitive design approach can result in health risks or even loss of life.
Further development of the methodology is intended by developing a more detailed description of the respective steps and in the development of active supporting SW and other tools for engineering designers. This should help them to find new solutions more simply and thus to achieve effective innovations of current products, which should have a greater potential of being successful on the market.

Acknowledgements

This paper includes partial results from the Research Project MŠMT 1M0519 – Research Centre of Rail Vehicles supported by the Czech Ministry of Education and from the Research Project “IGFS 2005 - SbDR: Engineering Design Science based Integrated Engineering Design Research” supported by the Faculty of Mechanical Engineering, University of West Bohemia

References

Hubka, V. and Eder, W.E. “Design Science.” London: Springer-Verlag, 1996.
Roth, K. “Basic function structures, their variation of machines, their active and passive branch.” Konstruktion 1/2, 2000
Formanek, J., Hosnedl, S. “Transfer of Knowledge among Different Branches with use of the Theory of Technical Systems” INTERNATIONAL DESIGN CONFERENCE - DESIGN 2004, Dubrovnik, 2004
Formanek, J. “Transfer of Knowledge among different Branches at the Level of Constructional Structure.” NordDesign2004 – Product Development in Changing Environment, Tampere University of Technology, Tampere, Finland, 2004, p. 98-103, ISBN 952-15-1227-X

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