

## PROGRAMME

### Flanders Make seminar: *Design & Optimisation*

Thursday 9 May 2019  
BluePoint Antwerpen, Filip Williotstraat 9, 2600 Berchem

**12h30**    **Lunch**

**13h30**    **Welcome & introduction**  
*Paola Campestrini, Cluster Manager, Flanders Make*

#### **PRODUCT FAMILY DESIGN**

**13h45**    **Cost optimization of drivetrain product family**  
*Chris Ganseman, Project leader, Flanders Make*

Design and optimisation of a drivetrain towards a specific customer request, involves optimisation of both the physical and control parameters of this drivetrain. Expanding the design question from one individual drivetrain to a product family of drivetrains that covers a whole range of loads, powers and functionalities adds a considerable opportunity for cost optimization. Sharing components between individual drivetrains enables lower development and testing costs, lower economy-of-scale purchase prices and more efficient production processes. An integrated approach for optimisation of the component sharing and physical and control parameters towards minimal cost will be presented.

**14h15**    **Managing the development of (embedded) software for a family of system variants**  
*Davy Maes, Project leader, Flanders Make*

Today, systems are offered in a wide range of variants. Instead of developing software for each system variant independently of another, companies embraced the concept of a common modular software platform from which the individual software variants can be derived. The enormous amount of possible feature combinations and their effect on the system's behaviour is leading to highly complex variability of the software platform. This presentation will demonstrate how one can better manage this variability.

**14h45**    **Managing the assembly process of customized products**  
*Bart Meyers, Researcher, Flanders Make*

In order to remain competitive, many companies move from mass production to mass customization. The goal is to offer variety in products to satisfy consumer needs, while maintaining an affordable assembly cost. In this presentation a technique is explained to better manage the assembly process for customized products based on the introduction of central variability modeling. Also a small demonstration (Lego factory) will be given.

**15h15**    **Coffee break**

#### **DESIGN FOR MANUFACTURING AND PERFORMANCE**

**15h45**    **Closing the loop between design, manufacturing and product performance: overview of and outlook on research activities**  
*Elke Deckers, Senior Researcher, DMMS-D, KUL-PMA, Flanders Make*

Machine and vehicle manufacturers face the challenging task to meet several, often conflicting design requirements. Additionally, to remain competitive in a fast evolving

market, the time to market has decreased. With the advent of powerful Computer Aided Design and Engineering (CAD/CAE) tools and the exponential increase in computational power, full-scale virtual prototypes of large structures can be built to virtually assess their performance under operating conditions. They allow the design engineer to evaluate the sensitivity of different parameters on the design criteria and limit the need for time consuming and expensive prototypes. Besides, to some extent, the manufacturing process can be digitally represented as well, allowing to, amongst others, predict e.g. functional gradients, stress concentrations, local thinning, induced by the intrinsic characteristics of the production method. Currently, the results from a manufacturing simulation are most often not directly linked with a subsequent product performance simulation, though crucial for an accurate assessment of a product "as built" rather than "as designed". Closing the (digital) loop between design, production and product performance is thus crucial. A representative link between a digital twin of a (polymer based) product and its measured real counterpart and companion production process allows for integrated lightweight design, reduced costs and time but also enables process monitoring and virtual sensing, thus increasing efficiency. The development of these digital twins, together with their real-life validations, ensures to be in line with Industry 4.0.

**16h15 Concepts evaluation, including manufacturability, in early design stages**

*Suzanne van Poppel, Core Lab Manager, Flanders Make*

The early product design phase offers a lot of potential for product innovation. Yet the more innovative a new concept may be to the design team, the less likely it is that comprehensive design knowledge is available. Lacking an objective way to evaluate new concepts on performance and manufacturability could lead to sub-optimal concepts and could favour the more familiar but less innovative concepts. This presentation explains a systematic and objective method which supports designers in the evaluation of new concepts in the early design phase. The method compares, filters and ranks the different concepts based on attribute models that assess the performance, cost and manufacturability.

**16h45 Component topology optimization using multi body dynamics system models**

*Frank Naets, Professor, DMMS-D, KUL-PMA, Flanders Make*

In mechanical engineering practice, component design in mechanisms has classically been a time consuming task with a constant switching between CAD and CAE software by engineers in order to update and validate their designs. In modern commercial and research tools, structural topology optimization has come to the fore for designing complex optimal component geometries. However, current methods rely on the quasi-static isolated response of these components, such that their inherently coupled interaction with other components in a mechanism is not correctly accounted for. In order to improve this design process for mechanical engineers, we present a novel approach for this optimal component design where the dynamic interaction between the different components is taken into account by combining efficient flexible multibody simulation with topology optimization methods. This novel approach has the potential to streamline the entire mechanism and component design into a single consistent process. A view on future research on integrating manufacturing information in the topology optimization process will also be shared.

**17h15 Conclusions**

*Paola Campestrini, Cluster Manager, Flanders Make*

**17h30 Networking reception**