

## 47<sup>th</sup> CIRP Conference on Manufacturing Systems (CMS 2014) Keynote Speakers



### **Collaboration Moves Productivity to the Next Level**

Prof. Günther Schuh

*Chair of Production Systems at the RWTH Aachen*

*Co-Director of the WZL and the Fraunhofer IPT at the RWTH Aachen University*

*Director of the FIR (Institute for Industrial Management)*

*Professor, WZL RWTH Aachen University, Germany*

**Abstract:** Driven by cyber physical systems, industrialization is on the edge of its fourth revolution, denominated 'Industry 4.0' in Germany. With Industry 4.0 cyber physical systems will make the availability of information and the real-time assessment of data pervasive, e.g. by interconnecting virtual representations of physical objects through networks. The keynote suggests that this development will considerably intensify collaboration in companies and will increase productivity by giving a better basis for decision making on all levels of hierarchy. For example, simulation as a technique of evaluating alternative conditions and courses of action can prove to become an essential basis for decision making. In this context the role of management and the potential for increasing productivity in overhead is examined.



### **Controls Engineering Drives Manufacturing in America**

Mr. Michael Bastian

*Controls Manager, Global Controls Engineering for Powertrain Manufacturing*

*FORD Motor Company, Livonia, MI USA*

**Abstract:** The automotive industry can be credited to be the core of manufacturing, starting mass production paradigm 100 years ago when Henry Ford launched his company. Such revolution put the world on wheels. Today a plethora of companies followed and a variety of cars are produced which segmented the market and rendered mass production obsolete. Flexible and Reconfigurable paradigms are adopted to respond to market fluctuations. Recently the automotive industry got hit by the economic turmoil that battered the world economy. Fortunately things improved since and American car manufacturers regained record sales and growth in 2013. MarketResearch.com announced in Datamonitor's new report "Car Manufacturing: Global Industry Guide" that the car industry will reach \$904 Billion by 2014. Goals shifted from survival to market share growth again, but many challenges remain ahead. Not only government regulations for gas consumption that need to be met, 50 miles per gallon is the set target in the USA by 2025 but also fierce competition from low wages countries, leaving American companies at a disadvantage to find ways to reduce cost. Ford Motor Company stayed loyal to its founding father's vision that once said "I will build a motor car for the great multitude... constructed of the best materials, by the best men to be hired, after the simplest designs that modern engineering can devise...so low in price" To fulfill that and build new edges that will allow us to survive in the new global market new technologies and innovations are needed. The most valuable asset and key for success in such market is know-how, technical expertise and the human factor. Companies can design the best policies and have the best plans but will still require engineers to develop, implement, and improve them. This paper discusses Ford Motor Company's strategy for controls engineering and the challenges to execute such vision in order to stay ahead of competition.



### **Cyber-physical production systems: roots, expectations and R & D challenges**

Prof. Laszlo Monostori

*President, International Academy for Production Engineering (CIRP)*

*Deputy Director, Research; Chairman of the Research Division, SZTAKI*

*External Professor, BME, Faculty of Mechanical Engineering*

*Head of the Research Group on Intelligent Manufacturing and Business Processes, SZTAKI*

*Professor, Budapest University of Technology and Economics (BME), Hungary*

**Abstract:** One of the most significant directions in the development of computer science and information and communication technologies is represented by *Cyber-Physical Systems (CPSs)* which are systems of collaborating computational entities which are in intensive connection with the surrounding physical world and its on-going processes, providing and using, at the same time, data-accessing and data-processing services available on the internet. *Cyber-Physical Production Systems (CPPSs)*, relying on the newest and foreseeable further developments of computer science, information and communication technologies on the one hand, and of manufacturing science and technology, on the other, may lead to the 4th Industrial Revolution, frequently noted as *Industry 4.0*. The keynote will underline that there are significant roots generally – and particularly in the CIRP community – which point towards CPPSs. Expectations and the related new R&D challenges will be outlined. Some approaches will be presented illustrating the versatility of achievements which can be realised by pilot CPPSs.



### **Scalability and Capacity Planning**

Prof. Yoram Koren

*James J. Duderstadt Distinguished University Professor of Manufacturing, Mechanical Engineering*

*Paul G. Goebel Professor of Engineering, Mechanical Engineering*

*Director, NSF Engineering Research Center for Reconfigurable Manufacturing System  
The University of Michigan, College of Engineering, Ann Arbor, Michigan, USA*

**Abstract:** When planning for a new manufacturing system to produce products over a planning horizon of several years, firms face an important decision regarding the selection of the system capacity, namely the maximum products that can be produced annually. Traditionally, the capacity of a new system is designed to meet the maximum forecasted product demand as predicted by the business unit of the firm. This may create two types of losses. When the real production is significantly lower than the full designed capacity, a financial loss occurs because of unutilized capital investment. But even larger financial loss occurs when the product demand is larger than the system's maximum capacity, and the firm is losing sales. Reconfigurable manufacturing systems (RMS) can be easily designed for future capacity expansion. Scalability is a key characteristic of RMS, which allows the system capacity to be rapidly adjusted to changes in market demand. Scalability allows investments in additional capacity to be delayed until it is really needed, enabling reduced risk and reduced initial capital investment. Scalability design methodologies are utilized to incrementally scale the system capacity to match the market demand exactly when needed. Optimization algorithms based on Genetic Algorithm may be utilized to determine the most economical way to reconfigure existing systems to match new demand. Adding CNC machines to match the new throughput requirements and concurrently rebalancing the system for each configuration, accomplishes the system reconfiguration.



### **De-Manufacturing Systems**

Prof. Tullio Tolo

*Professor of Manufacturing and Production Systems*

*Director of Institute of Industrial Technologies and Automation of the National Research Council of Italy (ITIA-CNR)*

*Politecnico di Milano (TU Milan), Milan, Italy*

**Abstract:** De-Manufacturing Systems allow implementing optimized End-Of-Life strategies and are necessary to support a sustainable and competitive Manufacturing/De-Manufacturing integrated paradigm. However, available technologies, management methods and business models present several limitations that make landfill and, at a lower extent, materials recycling, the most diffused End-Of-Life practices. To overcome these limitations, this paper proposes an integrated multi-disciplinary research framework addressing single technologies improvement, system integration and business model coherency. The main challenges and research opportunities are presented that can boost the development of sustainable De-manufacturing Systems at industrial level.



### **Innovation is the Cornerstone of Competitiveness -- How to Turn Canada into a Globally Recognized Hub of Innovation**

Mrs. Linda Hasenfratz

*Chief Executive Officer, Linamar Corporation, Guelph, Ontario, Canada*

**Abstract:** Importance of manufacturing to a successful economy will be discussed and the factors driving prosperity in a company with particular focus on innovation alongside efficiency as key drivers of competitiveness will be reviewed. The importance of Innovation to Prosperous Businesses including product and process design innovations will be discussed as well as continuous improvement being a key to innovation evolution and innovation and ingenuity as the key to drive results cost effectively. Discussion of what our Governments can do to Foster Innovation – the Goal is to turn Canada into a global hub for innovation, importance of education as key first step to creating the scientists, engineers, technologists and skilled trades people we need to drive innovation and other supporting factors important to drive innovation such as financial support, IP laws, and streamlined regulatory environment.



### **Control Theoretical Modeling of Transient Behavior of Production Planning and Control: A Review**

Prof. Neil Duffie

*Professor and past Chair in the Department of Mechanical Engineering, College of Engineering  
University of Wisconsin-Madison, Wisconsin, USA*

**Abstract:** To remain competitive, manufacturers need to adapt to increasingly dynamic and turbulent markets; therefore, production engineers and business managers need tools for mathematically modeling, analyzing and designing agile and changeable production systems that incorporate policies that are robust in the presence of disturbances and mitigate the negative impacts of turbulence in the production environment. The spectrum of

potential contributions of control theory to understanding the dynamic behavior of production systems in the presence of turbulence is broad. In this paper, the focus is on classical control theoretical modeling of the transient behavior and fundamental dynamics of production planning and control, which generally is considered to include scheduling, sequencing, loading and controlling. Publications in this area in recent years are reviewed, with contributions reported in publications of the CIRP (International Academy for Production Research) receiving particular emphasis.