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Fab Management Forum (FMF)

Drivers of Digitalisation: What is Digitalisation and why can it change so much?

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DHBW
Duale Hochschule Baden-Württemberg

Abstract
Digital Transformation is often misunderstood as a mere collection of computer-based technologies which allow for more efficient processes and possibly new product or service features. The change brought about by digitalisation however is more fundamental. The keynote will present and discuss the underlying powers of change which drive the digital transformation and which need to be understood in order to grasp and utliize its full powers of “creative destruction”.

Biography
Prof. Dr. Gregor Hopf received his PhD at the London School of Economics and is Professor for Digital Transformation at Baden-Württemberg’s State Cooperative University. In his research he specialises on questions of digital transformation namely online business models and online communication. Until 2016 he was the Head of the Taskforce for Digital Transformation of the State of Baden-Württemberg, coordinating all aspects of the government’s digital transformation agenda directly reporting to the prime minister.

Industrial Internet of Things in Western Digital Wafer Operation

F. Zhang
Director
Western Digital, Advanced Data Analytics,
Fremont, United States

Abstract
Industrial Internet of Things (IIOT) is a network of sensors, connections, data storage, data processing, data analytics, and automation. It is an important part of industrial 4.0.

WDC HDD Wafer Operation has aged tool bases, many of which are not supported by the vendors any more. To replace the obsolete tools, it would require huge capital investment. At the same time, in order to deliver better performance, every new generation of magnetic head design post more and more challenge on the equipments. IIOT becomes a cost effective solution to address the equipment challenges.

We have developed an IIOT infrastructure with standard components, of which leverages the existing factory system and state-of-art IT platforms. The internal IIOT solution considers the scalability, safety, support, latency, and automation. Several hundreds of sensors were deployed in the production. The internal solution is cost effective and significantly improved the yield. We has demonstrated millions dollars of capex and opex savings from IIOT projects.

Biography
Feng is the Directior of Advanced Data Analytics in WDC Wafer Operation. His team works on IIoT and advanced analytics. Feng has more than 15 years experience in magnetic head industry from research, failure analysis, yield engineering, to data analytics. He had a PhD degree in Materials Science from Columbia University in the City of New York.

AMLS Hybrid implant technology and product

G. Horn
Director
Middlesex Industries SA, Sorengo, Switzerland

Abstract
Automated **M**aterial **L**ogistic **S**ystems (AMLS) are the infrastructures of modern manufacturing. In semiconductor factories there have been a) **M**anual **D**iscrete **L**ot (**MDL**), b) **A**utomated Discrete **V**ehicle (**DV**), and c) **A**synchronous **T**rack (**AT**) Work in Process transports employed. DV and AT systems span the 200 to 300 mm Wafer format manufacturing. Capabilities and shortcomings characterize each of the above. Integrating the two is superior to either one alone. A new technology c) Hybrid, is the implantation of AT networks into existing DV installations.

b) DISCRETE VEHICLE (DV) AMLS. Conceptually simple discrete vehicle delivery is popular. Discrete vehicles delivering wafer lots is easily understood. It is exactly as manual delivery before, but automated. Also easily understood is the dropping of wafer lots from overhead. Therefore, AMSL systems combining these concepts are dominant. They simply automate the manual delivery method. But discrete delivery logistics has no absolute mathematical solution. It works with heuristics. Capacity constraints and system instability, requiring storage, are the draw backs.

c) AT NETWORKS. Asynchronous Track AMLS is based on continuous flow of work, massively parallel, and asynchronous. Such networks are always, and immediately available to transport, without capacity constraints. And can respond to load spikes, eliminating instability. And so, reduce fab cycle times. However, they need external hoists to connect to tools.

d) DV & AT HYBRID AMLS. Asynchronous Track (AT) network island implants into Automated Discrete Vehicle (DV) AMLS impart greatly increased fab capacity, (balanced process capacities).

Ref: Nonlinear growth of Variance in the Process Gaps. A cause of long Cycle times. G. W Horn, W. Podgorski, PhD, CSTIC, 2020

Biography
George W. Horn

Mr. Horn received his BA degree from Harvard University in 1961, and his BS/MS degree in Applied Physics in 1963, also from Harvard University. He spent 7 years working at Ilikon Corporation in space technology. The company was a contractor for the Gemini and Apollo space programs. Later he focused on manufacturing science and statistical process control. He is a past director of the Washington based Automation Forum.
During his years at Ilikon he served as Director of Applied Physics (Special Applications of Kinetic Theory). In 1970 Mr. Horn joined Middlesex General Industries as a founder, and served there as Applications Manager. In 1998 He founded Middlesex Industries SA, Switzerland and Middlesex Industries KK in Japan. He now serves as Chairmen for all Middlesex corporations. Mr. Horn has several publications and holds patents related to upper atmosphere simulation, and manufacturing technologies. He has developed the guiding principles for AMHS in Clean manufacturing industries such as Disk Memory Media, Pharma, and primarily Front end Semiconductors, concurrently developing the principles for conveyor based transport of Silicon Wafer Carriers. Globally first, his design was used to build integrated AMHS, direct tool to tool method, in IC manufacturing. His latest studies in AMHS are published in IEEE transactions. He is holder of numerous recent US, China, Taiwan, EU, and Korea patents in AMHS technology.

Mr. Horn is a 20-year resident of Switzerland, where he lives today.

Cost-effective automation for legacy factories

D. Suerich
Product Evangelist
PEER Group, Kitchener, Canada

Abstract
The Industrial Internet of Things (IIOT) and rise of 5G have increased demand for electronics, and have introduced renewed need for automation at existing 200mm facilities. These “legacy” factories already run at full capacity and have little or no room for expansion, so manufacturers are seeking innovative ways to introduce Smart Manufacturing initiatives, increase productivity, and optimize throughput and yield to meet the increased demands. New facilities built to support older nodes sizes also want to capture market share, and have the same needs as their legacy counterparts.
Although older node sizes and technologies are back in fashion, that doesn’t mean these facilities are limited to outdated manufacturing paradigms. Ambitious factories are looking at hyper-automated 300mm facilities to learn best-in-class methods for deploying automation and advanced manufacturing techniques. The SEMI® automation standards related to 300mm manufacturing describe efficient ways to implement automation, and these same models can be used in any facility, new or retrofit, to achieve major gains.
PEER Group® provides products and solutions (including our PEER FACTORY® Station Controller, PFSC™) to rapidly update factory-wide connectivity, data collection, and control systems and allow any factory to integrate new and existing equipment efficiently. We help customers leverage best practices for factory automation and enable the latest advancements in analytics, scheduling, advanced process control, and predictive maintenance.

Biography
Doug Suerich is Product Evangelist at The PEER Group Inc., the semiconductor industry’s leading supplier of factory automation software for smart manufacturing and Industry 4.0. Doug focuses on big data and remote connectivity solutions that help manufacturers collaborate securely on tools and data in production environments. A passionate advocate for smart manufacturing, Doug serves as an active member of the SEMI® SMART Manufacturing Technology Community, Americas Chapter.

Doug has over 20 years of experience leading software teams for a variety of industries including semiconductor, manufacturing, and transportation. Most recently, he was involved in architecting PEER Group’s remote connectivity solution, Remicus™, and he was a champion in promoting the use of cloud computing and latest-generation web technologies.

Prior to joining PEER Group, Doug was a software development manager, automation engineer, information systems specialist, and consultant. He has extensive experience designing and integrating robust automation software solutions. Doug holds a Bachelor of Applied Science with Honours in System Design Engineering from the University of Waterloo.

Correct Material Selection and Life-Time Prediction of Elastomer Parts Using FEA Simulations

M. Gulcur
Material Development Manager
Trelleborg Sealing Solutions, Tewkesbury, United Kingdom

Abstract
Choosing the right elastomer sealing material has utmost importance to maintain vacuum integrity in semiconductor processes therefore keeping the tool downtimes at minimum. Qualification of a new elastomer sealing material brings some risks for the end user as installing a new material can cause contamination or premature failures which can cause more damage than the benefits of the new sealing material. At this point, it is important for an elastomer part manufacturer to provide relevant data to prove the suitability of the material to the application such as plasma exposure tests in various different process gasses, outgassing, trace metal and extractables analyses results and to help understand other factors like the damping behaviour of the material.
During a new material qualification another important topic is to determination of the lifetime of the sealing materials. It is extremely important for semiconductor OEMs to specify the right sealing material and microchip manufacturers to maximize the mean-time between cleans (MTBC). Sealing force created by a sealing part and its decrease over time. By using correct tests on this behaviour for input in advanced Finite Elemental Analysis (FEA), it is possible to predict the lifetime of the sealing parts by simulation. Such an analysis allows to capture the influence of both material properties and seal design on the lifetime. By combining data measured at elevated temperatures, a lifetime prediction for long time scales can be carried out based on test data of short time scales. The FEA will provide a prediction on the loss of sealing force over years and these results allow to estimate how many years the function of the seal can be fulfilled.

Biography
Murat Gulcur is Material Development Manager at Trelleborg Sealing Solutions UK. He has 17 years of experience in the field of elastomer technology and semiconductors, mainly single molecule/organic electronics. He holds a PhD degree in chemistry from Durham University (UK), has co-authored research papers in renowned journals and holds several patents.

Incorporating Subfab into Factory and Tool Digital Twins

M. Neel
Marketing Manager - Intelligent Manufacturing Systems
INFICON, Intelligent Manufacturing Systems, Boston, United States

Abstract
The impact that facilities and subfab components has on the performance of process equipment is important at all levels of manufacturing. As part of an Industry 4.0 Smart factory, the ability to sense all relevant parameters, connect the subfab components to the Digital Twins, and predict performance degradation or failure is critical to providing much needed information and enabling better operations and process control. This discussion will focus on multiple integration and interoperability points allowing for: 1) Integrating pump and abatement systems with a factory-wide FDC system to provide better data collection and analysis to the tool-based Digital Twin, 2) Providing process data and state information from the FDC system to the pump control framework to allow for better predictability of future failure, 3) and FDC system providing full health and state information from the equipment and subfab components to the factory Digital Twin and WiP Scheduling system to provide optimal operational efficiency.

Biography
Michael Neel is the Marketing Manager for INFICON's Intelligent Manufacturing Systems (IMS) focusing on process control and factory operations optimization. Michael has worked in the Semiconductor Industry for 26 years of which half has been with INFICON providing leadership in process control and factory optimization software systems. Michael graduated from Texas State University with a Bachelors of Science in Chemistry, Masters in Technology, and a Masters of Business Administration from St. Edwards University.

From smart manufacturing vision to Innovative Advanced Service Solutions

E. Shekel
Tokyo Electron Limited, Hadera, Israel

Abstract
AI technology continuously becomes a key enabler for smart manufacturing. We / Tokyo Electron（TEL） see our equipment on a development roadmap from Single Standalone Tool to providing integrated manufacturing solutions enabled by AI. TEL will provide an insight where we see the actual benefits of data analysis in the process from R&D and Ramp Up, to High Volume Manufacturing. (e.g. Process Optimization and Virtual Metrology.)
Through TEL SERVICE ADVANTAGE, we can respond to our customers' requests and technical advancements promptly. An important component is our remote connection and data analysis capability. TEL analyzes equipment data from various sensors without the need of a physical on site presence, and provides solutions matched to customer-specific needs.

Biography
Eyal is a twenty-seven years veteran in the Semiconductors industry. Upon his graduation as a Mechanical Engineer from the Technion (Israel leading technical institute), Eyal has joined Applied Materials. In 1997 he has moved-on to Tokyo Electron, served as the Regional Service Manager of Israel, and soon after appointed as the company General Manager.
Since 2005 Eyal has been part of the TEL European senior management, and up to 2019 was responsible for the Service and Support Operations for TEL Europe as a Senior Vice President.
Last year, Eyal has transferred this responsibility onwards, and is now SVP for Service Strategy and Excellence. In parallel Eyal co-leads (as two in a box) the corporate Global Service Committee in TEL Japan.