

Smart high-tech systems

Proposal for MSc topic with ASM International

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March 10, 2016

Context

High-tech systems of the future will have increased intelligence to improve their performance. The future system will have large numbers of sensor systems, which locally measure the process the system carries out, after which “appropriate action” is taken. This might involve communication of data to users or machine supervisors, but also real-time adjustment of the process. In principle, there are large numbers of parameters that are interesting to measure. On the other hand, new and future sensor technology provide the potential to make this dream a reality. However, major steps have to be made, amongst others on sensor development and integration, control, communication and energy supply.

The challenge

This proposal aims to explore the development and use of multiple and distributed sensors to constantly monitor the status and performance of high-tech systems. The proposal is defined together with ASM International. ASM wants (1) to explore the technical possibilities and limitations of constant data monitoring, and (2) to develop a relevant demonstrator case to show the benefits of intelligent machines, on the basis of one of their current wafer handling robots.

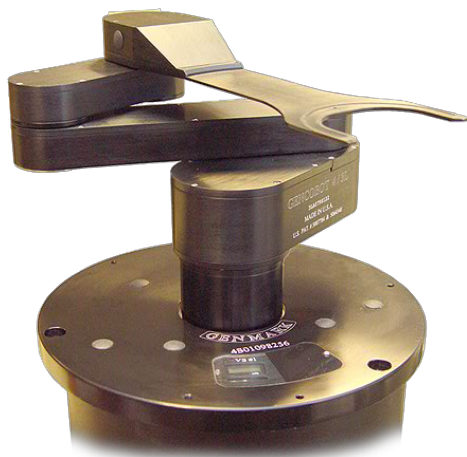


Figure 1 Wafer handling robot

Aspects that may be considered include:

- *Functional integration of (numbers of) sensors.* If the motion of a system is to be monitored, one key question is to which sensors are to be used and how they should be integrated with

the system, in order to provide the relevant feedback. Integration of larger amounts of miniaturised, local sensors needs to be investigated.

- *Development of machine control loops on the basis of wireless sensors.* Wireless sensors are low-power devices, and constant interrogation of the device is not possible. One proposal is to develop event-based schemes for motion control using wireless sensors.
- *Development of power supply mechanisms for wireless sensors.* Wireless sensors are preferred to prevent the problems related to hard wiring. To generate the required power, sensor devices should be autonomous and power should be generated in/near the device. This is referred to as energy harvesting.
- *Development of communication mechanisms.* Wireless communication is allowed in the semiconductor industry but there are limits imposed on this. Another challenge is to handle interference from other systems in a fabrication plant.

This proposal can be carried out in various ways / assignments of different duration (internship, first phase of MSc assignment, complete MSc assignment). The topic is wide, and a specific focus needs to be chosen, depending on the student's interest.

ASM International

ASM is a leading supplier of semiconductor process equipment for wafer processing. We're a truly global company. Based in 14 countries, we benefit from a wider perspective and the advantages of bringing together the best brains in the world to create new breakthrough technologies.

We pioneered important aspects of many established wafer-processing technologies used in industry, including lithography, deposition, ion implant and single-wafer epitaxy. In recent years, we brought Atomic Layer Deposition (ALD) and Plasma Enhanced Atomic Layer Deposition (PEALD) from R&D right through to mainstream production at advanced manufacturers sites.

Our broad portfolio of innovative technologies and products are being used right now by the most advanced semiconductor fabrication plants around the world. Helping them to progress along their technology roadmap. Making integrated circuits or chips smaller, faster and more powerful for everyone.

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Contact and information

If you are interested in the topic and like to learn more, feel free to contact Dr. Marcel Tichem, m.tichem@tudelft.nl.