EPIC Members Event Report

IMEC TECHNOLOGY FORUM 2015 - BRUSSELS, JUNE 23 -24

FOR THE BUILDERS OF TOMORROW

TOWARDS SMART LIVING

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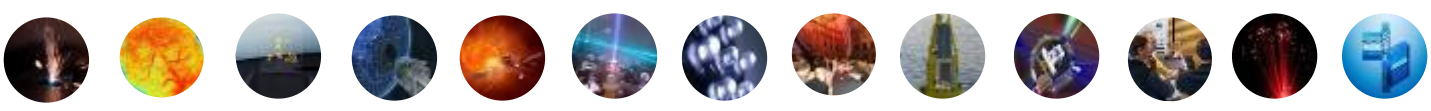
About the EPIC Members Event Reports

Initiated by the founder of EPIC Dr. Thomas Pearsall in 2003, these reports are prepared by members of EPIC to the benefit of the wider community. If you did not have a chance to attend the event but would like to know some key highlight, this report is for you. Emphasis is placed on exploring technical and business opportunities for the members of EPIC.



The imec Technology Forum is an annual event organized by imec that is primarily intended to present and share roadmaps and future scenarios and allow attenders plenty opportunity for networking. ITF2015 took place in Brussels, Belgium.

DAY 1

09:00 imec Lifetime of Innovation Award Ceremony

Morris Chang founded in 1987 TSMC and with this new business model he revolutionized the semiconductor industry. Thousands of fabless design houses got enabled to contribute to development and innovation in the industry and in such a way kick started a new growth cycle. For this, Morris Chang was presented with a lifetime award by imec. Unfortunately he was not able to accept the award in person, but through a pre-recorded video the thanked imec and the audience for this honour.

09:30 Luc van den hove, President and CEO, imec

Luc van den hove opened the Technology Forum with an overview presentation entitled “From the happy few to the happy many”. He explained how the semiconductor industry has improved the living conditions of many people and tried to share his insights how the industry would keep doing so in the next years to come. He identified 3 different groups: happy senior citizens, the happy (but) worried well and finally the many happy youngsters. New technical developments in interconnectivity, ultra-low power, sensor technology, (big) data management will enable new solutions in healthcare, energy management, transportation (autonomous cars) and environment. Solutions need to be seamless, smart, intuitive and affordable. For the 3 different age categories different examples of (possible) devices were discussed, such as wearable electronics, new medical monitoring and diagnosing equipment, energy management (“smart city”) and others.

10:15 Lip-Bu tan, President and CEO, Cadence Design Systems

Lip-Bu Tan gave a presentation entitled “System Design Enablement for Smart Living”. He explained how customers take more control of the total value chain all down to chip and system design for dedicated solutions. Systems are key to the performance of “the internet of everything”. Systems are also getting connected: “systems of systems” are being created. Additionally, as customers are going “from chips to solutions”, the chips are getting more and more complex. With increasing complexity packaging demands are getting integrated on different levels. Lip-Bu Tan explained how Cadence is enabling its customers to optimize system design in an increasing collaborative industry (i.e. in combination ARM, TSMC and imec) to mobilize high-end solutions for customers.

11:15 Padmasree Warror, Strategic Adviser and former CTO and Strategy Officer, Cisco

Padmasree gave a well-received presentation entitled “Our Digital Future”. She explained how digital platforms require new business models (eg Amazon). New business models create new competitors which evolve faster and are more agile. As a result, mature companies are changing. Cisco supports this drive towards market transitions. They are connecting companies and people to devices, data and processes. Most of the physical world is not connected yet and consequently there is a great opportunity for interconnectivity still waiting to be tapped into. She explains how the modern economy is centred around applications (“apps”) and everything becomes a service. This requires BIG data, but data needs to be turned into insights. Big data will also require security and Padmasree predicts that security will evolve into platforms. Real-time decisions will become important, which will be difficult considering the enormous amount of data. As a consequence data needs to be combined with analytics to convert data into useful and general information Cisco creates new architectures that enable new digital companies to create new applications using big data and internet of everything.

11:45 Peter Wennink, President and CEO, ASML

Peter Wennink gave a presentation entitled “The challenges of tomorrow’s chip manufacturing: a lithography view”. The presentation was less well received as it forfeited the subject of internet of things and focused almost solely on the development of the ASML EUV lithography tool. He explained how lithography has come to a point where an holistic approach is needed to achieve maximum results. In this approach imaging, modelling and measuring needs to be mutually optimized. He explained how the current generation of EUV tools is being developed to meet these and other customer’s needs. All existing EUV tools will be upgradable in the future towards all new developments that are still being done. The costs of these systems is growing rapidly, but the total cost per device is still going down, This should make the investment for customers affordable, but the economy of scale that is needed to achieve break-even is high. ASML admits that this can only be achieved with increased collaboration between customers, peers and suppliers.

12:15 Simon Segars, CEO, ARM

Simon Segars gave a presentation entitled “The changing face of computing, from servers to sensors”. He explained how the internet of things will still need computers, but in a new form factor. Mobility is already using massive computer power, but computers are not actively “used” anymore. They are “just all around us”. A computer, as Simon explained, is nothing more than memory, CPU and IO combined. But the IO is changing rapidly. Costs have gone down, so everybody is able to design software and applications. This is driving the internet of things. Sensors combined with connectivity provide the IO. Strong CPUs enable data crunching. The end-point node is a small compute that drives a device. RF and memory are all on-chip, but need to be (ultra) low power and low cost. On chip-level the driving voltage needs to be reduced to enable ultra-low power consumption. This is also necessary for mobile devices to enlarge life time of the battery. Since the form-factor of computers is

changing, packaging requirements will also change. We will need packaging with more IO and lower cost. As a result, computing power will no longer be in one point, but distributed over the whole system. Since the enormous amounts of data will need to be compressed before they are distributed, the computers need to be close to the source.

14:15 Robin Murdoch, Global Managing Director, Internet and Social, Accenture

Robin Murdoch was unfortunately unable to attend the meeting. Paul Heremans (Technology Director Holst Centre and imec Fellow) did the honours instead with a presentation entitled "Disappearing electronics". According to Heremans modern devices are supposed to be invisibly smart. Electronics are moving into lower value items (eg clothing and other wearable electronics), but also into custom assemblies of capital goods (eg custom assembly of cars). For many applications we need a unique electronic identifier, but not as complex as an IP address. We need "smart labels for many applications, such as food packaging. But even very simple functionality requires already complex capabilities: sensors, CPU, memory, radio, display, etc... Imec is working on thin-film electronics as an enabler for these kind of applications. By stacking films, individual functionalities can be combined into systems. They started with NFC (Near Field Communication) tags because they are easy to use, but are meanwhile extending to sensor films, display films, and more. They are also working on solid state batteries. Imec has meanwhile proven all building blocks, but are still aiming to combine them into a system. They have proven electronics in textiles. But in order for these systems to become commercially viable, they need innovation from the whole value chain. They think that eventually a "foundry model" will be necessary for these kind of products.

14:45 Jean-Marc Chery, COO, STMicroelectronics

Jean-Marc Chery gave a presentation entitled "Enabling the digital transformation for a smarter life". According to Jean-Marc digital technology is meanwhile penetrating all aspects of life. In order to manage all this innovation, we need to innovate fast and get fast feedback. This also means fast measurement of the total performance of a device. Connectivity is important, but also large computer power at low power consumption. As a result, silicon technology/industry will need to improve. Not only on technical (system) level, but also in terms of business innovation. To enable these innovations, ST offers building blocks in sensors & actuators, processing & security, power management, interfaces and connectivity & RF. Fast prototyping and measuring to get feedback is necessary to get fast innovation (from customers or value chain). Especially for this purpose, ST developed a stacked board for fast prototyping. Early customer involvement is very important. Jean-Marc showed a number of products in which ST technology was used. He also showed some advance technical developments that enable low-power consumptions in RF systems, power management, micro controllers and automotive (FD SOI SoC technology). Finally he indicated that there is a trade-off between "general purpose" devices and security. Security is also important in relation to sensors: the coupling between the user and the sensor needs to be secure. He pointed out that low-power and form-factor will be key to sensors and imaging sensors/cameras alike.

15:15 An Steegen, SVP process technology, imec

An Steegen gave a presentation entitled “Infrastructure for IoT”. Her presentation focused on the server in the cloud. For this, dimensional scaling will be necessary. Nodes continue to get smaller and contain more transistors per chip. This requires increasingly difficult patterning, for which the development of EUV lithography seems necessary, in addition to novel architectures and materials (eg FinFET transistors with nanowires). Imec managed to make FinFETs with smaller power usage but still better performance. Improved front-end innovation will eventually also require improved back-end innovation for these small devices. Furthermore: low k materials, better air-gap and metallization will improve performances further, as well as circuit scaling or functional scaling (the third “knob” to influence performance). She pointed out that spin wave devices use very little power, but unfortunately they are very slow. Can we combine them with other technologies to make them fast? The same holds for tunnelling FETs. She hinted to monolithic stacking of devices as a potential way to combine technologies. Next she discussed memory. Slow memory is cheap and can prove mass-storage capabilities. But fast memory is expensive. Imec is investigating several techniques (STT MRAM and RRAM technology) to get the cost down. Finally she looked at the memory requirements to support large bandwidth communication. Through Silicon Vias (TSV) technology is key in fast memory cubes. This makes memory fast and enables big data processing. Also high bandwidth communication becomes possible through this technology. Imec wants to reduce the cost of TSV. But also silicon interposes are being used. Ultimately she expects that also optical connections will be needed to achieve the necessary bandwidth in future systems.

16:15 Martin Anstice, President and CEO, LAM Research

Martin Anstice gave a presentation entitled: “Technology, Productivity and Collaboration: the Foundation to Enable Smart Living”. Martin started his presentation by stating that ultimately always tools are needed to make any vision reality. He observed that there is a wave of consolidation going on in the industry at the moment. In principle this is good, it preserves competition and creativity in the industry. The cyclicality in the semiconductor industry is reducing and customers are investing heavily in equipment at their own risk. Unfortunately for material/machine suppliers this could mean that in any single quarter their whole business could only be coming from one or two customers. Martin realizes that machine builders have a duty to deliver enabling technology, which means technology that is affordable. In principle each year seven percent more silicon is required. Thus leading technology investments go hand in hand with economics (economic risk gets bigger). The roadmaps of fabless companies are becoming more important in this way. On the technical side, the machines need to gather data during processing that enables improvements in the machine itself. So the same rules of development that apply on device level apply to machines as well. Packaging will ultimately be needed on wafer level to meet the cost targets and thus wafer-level packaging will become very important. As a result, collaboration is getting more important in the industry to enable the necessary innovations. Martin consequently focused a bit more on LAM. LAM does etch, deposition and cleaning, but only for the semiconductor industry. Many demanding technology roadmaps have still many unanswered questions about the installed base of equipment and new equipment as well. As he explained the cost and complexity of equipment is growing, although the cost per device can or will (or should) go down. Martin stated that this cost growth of equipment is maybe not sustainable. Even the availability of a killer product or killer application can maybe not change this. As a result we might need to develop equipment that is producible and upgradable for a life time. Thus collaboration becomes necessary in the supply chain or semiconductor ecosystem to sustain the innovation that is needed to achieve these demanding roadmaps.

16:45 Tim Harris, Director of Applied Physics, Janelia Farm

Tim Harris gave a very enthusiastic presentation entitled “Opportunities for Advanced Microelectronics in Research and Clinical Neuroscience”. Tim is not from the semiconductor community, but presented a novel application of advance semiconductor technology in the neural sciences. He explained that a (human) neuron is in principle a transistor with thousands of inputs and thousands of outputs. The basic principles in neurology are known, but the neurology on system level (human brain) is too complex to measure and understand. So they tried a collaboration with imec in the neuropixels project, in which they made micro (neuro) sensors with semiconductor technology. The results are – in his words – phenomenal! The sensors create so much data that they don’t know where to start (explaining). Based on the current (first) results they have meanwhile defined the requirement for a device that simply didn’t exist until very recently. In addition to the current electrical sensors, he discussed some optical techniques that can image the brain activity. He discussed some advanced microscopy techniques that will require advanced phase-gratings. Luckily, as Tim remarked, phase gratings are the domain of semiconductor lithography, so he has all the confidence that this will work. Although this presentation was not really related to “the internet of things”, it was one of the better presentations as observed by the author of this report.

17:15 Caroline Hillegeer, SVP Strategy and Technology, GDF Suez

Caroline Hillegeer gave a presentation entitled “Towards Smaller Living”. She is also not from the semiconductor community (GDF is an energy company), but the concept of “smart energy for smart living” is enabled by semiconductor technology. (ie GDF is a customer of our semicon technology). She explained that the energy sector is changing very quickly whereas it used to be a very conservative sector. There are important transitions happening from carbon energy to sustainable energy. We want to capture CO2 (reduce global warming) and decentralization of production is happening (from power plant to delocalized solar and wind energy). The local energy production is on small scale (compared to the power plant) and therefore storage is more and more needed because production is less planned (because of the unpredictability of sun and wind). Digital electronics is becoming enabling for new services to customers (apps). They can also follow, measure and control customers much better (digital metering). Smart grids are becoming possible with better reactive performance. How can this enable smart living? Caroline observed that the customer is becoming more central. There are many different customers: like industry, cities, and individuals. Also new technology allows energy systems in remote locations with wind and sun only. An energy management systems in remote locations needs to be fully self-sustaining in all aspects: generation, storage and consumption. New systems enable this autonomy. She also explained that energy usage in industry is huge. Saving even a little bit means huge gains can be achieved. However, (large) industry infrastructure is rigid and conservative. If you can give the industry better measurement systems on their energy usage, it would give huge (objective) insights for savings. This is even more important since excess heat in industry is unfortunately difficult to use. Caroline gave other examples of innovations in energy management: they are now for instance managing energy on building level. (Smart) Buildings give in turn much information on usage of energy and how to optimize the consumption. Also cities are becoming bigger and bigger. Energy consumption (as well as water and other resources) need to be managed. City energy management is effectively big data management. These are all examples on how the technology of the “internet of things” is enabling new innovation in other industries. GDF is also working on electric mobility with a grid of electrical charging stations, as well as hydrogen and biogas for mobility. For household they are looking into autonomous homes with their own energy generation and storage. All required technology is in principle available, but getting all steps together with an accurate result is difficult.

17:45 imec researchers

In the last session of this day, multiple imec employees hosted a final session on different examples on how semiconductor technology can be applied in novel life science applications. A laboratory-on-a-chip application was shown where multiple analysis steps can be done on a single chip (diagnostic testing). It is shown that (for a selected example) imec achieved similar sensitivity and selectivity as a conventional laboratory analysis, but much faster. In these kind of systems, mobile phone technology provides strong but inexpensive calculation power. In another example, a novel photonic chip was presented to measure bio-fluorescence. A lot of individual building blocks have been created in CMOS compatible technology. Several examples were shown: light-guides, spectrometers, fiber couplers and more. With integrated micro-fluidics, complex chips can be built that can replace large, bulky and expensive systems. Some results were shown of a cytometric measurement system (measuring and identifying blood cells). In the third and last example,

the same sensor was shown that was also presented by Tim Harris. But in this application, the devices was not (only) used to measure the response of (human) cells, but also used to stimulate cells. In this way researchers have been able to "talk to cells"...

DAY 2

09:00 Babak Parviz, Vice President, Amazon

Babak Parviz gave a presentation entitled "Computers that we can wear". This presentation was not in name of Amazon but reflected his personal opinion (author: in fact, it dealt with his previous employer Google). Babak argued that computers have become mobile and personal. Google glass is an example for that. The idea of wearable computers is actually quite old, Babak showed a video from 1992 with that exact notion. Next, he discussed the concept of Google glass in quite some detail. It has a screen, camera, full audio, sensors and touch-panels. It has radios, a CPU and memory. It was actually quite difficult to develop the GUI (IO). How do you interact with a pair of glasses? The form factor was or is unique. It's very personal: it sees what you see and it hears what you hear. It sees the world through your eyes. It enables the use of augmented reality. What was the driver to start this development? Initially "seeing the world through your eyes for others" was an important driver, like maybe for applications such as Facebook. But it has also shown that access-time-to-knowledge can be reduced. Digital information can be assessed relatively quickly now, but only from your computer or phone. If data would become instantly available the notion of knowledge itself will change. Google glass could provide a platform to do just that. Why has this technology become possible? Mainly because of the smart phone ecosystem. Cameras, CPU, data processing, connectivity: all can be taken from the phone world. The cloud is also very important with cloud computing (processing power). If we want to progress this notion even further, we need more development to create break-through optics, computing power, ultra-low power, smaller dimensions, and finally more and better transducers. We will ultimately get glasses and watches as form-factors, maybe even contact lenses

9:30 imec researchers

In the second session of this second day, multiple imec employees hosted a session on different examples on how semiconductor technology can be applied in wearable healthcare applications. Chris van Hoof (and several colleagues) argued that prevention in healthcare will become an important building block (service) for these applications. Prevention is an important way to increase life expectancy. As an example the notion of "heart-failure over time" was discussed. Imec has developed wearable sensors that measure fluid in lungs, which are an important indicator of imminent heart-failure. Sleep apnea was shown as a second example. Comfortable wearable electronics that can reliably detect sleeping disorders can contribute significantly to the prevention of serious health problems. On a different level, Chris showed how electronics can add to the comfort of our lives. He presented a project from imec were interactive contact lenses are used to autocorrect prebiotic view (limited near field vision, typically at older age). The advantage is that it gives a much larger field of view compared to reading glasses. The concept could be augmented with embedded electronics with solar cells for power and LCD display and autofocus lenses. Another example that was presented is obesitas. Our behaviour is what actually most affects our health. But it is difficult to change behaviour because the brains are fixed in habits (they need habits to organize the multitude of problems we face daily). Changing habits is possible

but it is as a result very difficult. You need a goal and a plan, self-awareness, strong motivation and continuity of training. Sensors can actually help with self-awareness. But these sensors or wearables need to be invisible or people will not use them for long. Imec is developing personalized algorithms to correct for individual variations (ie choices that impact your behaviour). The final example that was shown was sensors for maternal and foetal health during pregnancy. Linked to a mobile phone platform these sensors provide valuable health related data for both mother and child.

10:00 Meg Doherty, Coordinator of Treatment & Care in the Dept of HIV/AIDS, WHO (World Health Organization)

Meg Doherty gave a presentation entitled "WHO global HIV and Hepatitis guidelines: How Innovations and technology can pave the way to achieving new ambitious targets to end AIDS and eliminate Hepatitis C in the next decade". Similar to a number of speakers of the first day, Meg is not a member of the semiconductor industry, but her work can benefit significantly from break-through developments in this industry. She explained how the WHO would like to end HIV and Hepatitis C by 2030. To that end they need diagnostic drugs, data processing and data analysis power. But most importantly, they need it rapidly, affordable and durable, especially in low and mid-income countries. As an example she explained how imec contacted WHO recently with the idea of a viral counter chip in a mobile phone. Smart phone extensions are interesting because they are affordable and very much available. Treatment in itself is important, but also measuring and mapping data. In the past WHO shipped a lot of equipment to the third world, but it was not being used (for multiple reasons). Thus cheap tests are necessary, that are easy to use, that can create a simple reminder for the patient to get health care (with sms, mail, apps, etc). In this way we can create a home self-management system for important diseases that stimulate the use of available means. Meg explained that the HIV/AIDS epidemic is getting smaller, but the rate of change needs to grow (for which these tools are necessary). Similarly, Hepatitis has seen new drugs over the last two years that are very promising. But they need point of care tests, diagnosis, tests, toxicity monitoring and treatment monitoring to become effective. Ideal would be multiplex tests: molecular testing of drug resistance where the data goes straight to somebody's phone. Phones should/can then calculate risks and prognoses. If we then had fast and easy drug delivery, we could achieve the WHO goals. However, Meg observed: "We can get coca cola everywhere, but not yet drugs".

11:00 Steve Beckers, General Manager imec IC-link

Steve Beckers hosted a session entitled "Turning Ideas into Reality" in which several companies presented some applications that were realized with or through the work at imec or similar institutes. Steve explained how the technology that is developed for the "internet of things" enables many different segments of different industries, specifically also through the advanced of ASIC (Application Specific Integrated Circuits) developments. ASIC are favourable because they provide to some extend IP protection. In combination with specific hardware, many applications can be tackled. William Yang from BaySpec explained how they have developed a fully integrated optical device into an analytical device. Their vision is to develop the "optical tricorder" in analogy of the Star Trek device. Steven Nietvelt from Cartamundi, a huge manufacturer of playing cards and advertisement materials, explained how they use flexible electronics to produce NFC in their products to create interactive games and promotion material. It created not only new products for Cartamundi, but also

new business (with a new business model). Finally Cees Links from Greanpeak explained how his company developed a home bases “care taking” proposition comprising of a number of zigbee radios connected to a number of sensors. Based on regular observations the system identifies “normal behaviour” during a “learning period”. After that learning period the system can identify abnormalities in behaviour and send appropriate messages via the mobile phone.

11:45 Stephen Turner, Founder & CTO, Pacific Biosciences

Stephen Turner gave a presentation entitled “Bringing Nanotechnology to Light: the Development of Single Molecule Teal-Time DNA Sequencing”. He explained how MEMS-like (Micro-Electro Mechanical System) technology enabled a revolution in DNA sequencing. They pioneered single molecule detection using fluorescent labelling and evanescent wave detection (essentially tunnelling of light through sub-micron structures). Eventually they managed with MEMS-like optics to enhance the efficiency of the system to a level where they can now analyse 10 thousands of base pairs. This has essentially revolutionized gene sequencing. He showed an example where they can use it to measure viral genome and show how quickly it can change (within 4 hours). It was also used on E.coli bacteria where they were able to show that a virus copied itself into the new E.coli bacteria that was an outbreak in Germany recently. They are now improving the tool. One example is a protection for damage of non-stokes emission of photons to the DNA (i.e. non-fluorescence).

13:45 Koenraad Debackere, Managing Director KU Leuven Research & Development and General Manager KU Leuven.

Koenraad Debackere gave a presentation entitled “Fostering competiveness through ecosystems”. Koenraad argued that some important areas of technologies don’t get enough attention and money. Although everybody knows that innovation is important for growth. In his opinion ecosystems can foster innovation and growth. There is in general a trend to move from creation towards co-creation, also because investments are becoming too large. But in order to be most effective, some aspects need to be taken into account. In his opinion small and medium companies (SMEs) also need to be involved. Governments need to move from their current policies to policies that favour open-innovation. We need to transform research into innovation into application into business. In order to be successful in Europe, we need to force cross-border projects. Europe is already stimulating start-ups and spin-outs with booth camps and other support. Examples are DSP Valley, Nano for Health and Flandersbio. ASML was also mentioned as a company that created an ecosystem around itself. Finally he told the audience that if you work with customers and supplier, you can improve you existing product. But if you work with academia and research institutes, you can actually increase the number of new products.

14:05 Harmke de Groot, Sr Director imec/Holst Centre

Harmke gave a presentation entitled “An intuitive home brought to you by the internet of things”. Harmke claims that connectivity is a self-fulfilling prophecy. Previously separate domains will ultimately interconnect, but especially the hardware is struggling to keep up. The available bandwidths can be limiting for different applications. As a result, they are getting married to laptops and smart phones. In the home there is a need for seamless GUIs (other than loads of remote controls) and it needs to be safe. The market is getting ready though. Sensors are game-changers in this. But in the end we want more than only data on

smart phones which is just sensor data and a smart phone that acts as a remote control. We want real services and real added value. To achieve this we need generic and low-cost nodes: low-power, low-memory, low-CPU, radio, etc. However, SOME nodes need the flexibility to scale up in both power and CPU power. The imec platform is an early investigation, but they do apply themes like security and some other requirements. Open-hardware and -software is combined with new technology to generate new application concepts. An example is the measurements of air quality data. Imec made an air quality application, real time with all the hardware for indoor and outdoor. It utilizes a GaN MEMS sensor. Since low power radio is very important, imec works on that as well. The same technology is used in an application called "perceptive kitchen and shopping". In this application for professional kitchen, the menu is adjusted to the available food in the shop and advertisement of sales. In her final statement, Harmke concluded that if we work together, we can improve time-to-market and identify quickly possible killer applications.

14:25 Françoise Chombar, CEO, Melexis

Françoise gave a presentation entitled "Smart living? You'll need Sensors!". According to Françoise sensors are necessary for internet of things. Melexis is a sensor builder and has for instance ICs in all the brands in automotive. Melexis measures not only a lot of data, but they also process data and communications and combine them into smart systems. Smart living will accelerate according to her opinion. It will enable safer, healthier and more comfortable living. She explained that autonomous driving of cars actually was pioneered by technology that was originally created to reduce CO2 emissions. Cleaner cars had/need a lot of sensors. Melexis has created the platform of these clean sensors that afterwards enable autonomous driving. Examples were shown like infrared person detection, wireless sensing for cars and others. She also shared a "secret example": the "scan to cook" application. A microwave brand has teamed up with food supplier with special tags in the packaging. The microwave oven scans the package and tells you the recipe and cooking time. Another example was magnetic/current sensing for smart cars. A hall-effect sensor of Melexis was already done in 94. Magnetic and current sensors can actually measure really a lot. Now 3D magnetic sensing is possible and it enables for instance motion sensors in robotics and current sensing in solar panel systems to identify the weakest panel (to optimize solar power generations). And the speed of innovation is accelerating….

14:45 Joost Wille, R&D Director, Sioen Industries

Joost gave a presentation entitled "looking at the potential of electronics in technical textiles". Sioen is a major player in the field of industrial textiles (professional clothing, shielding, packaging using textiles). If you want to combine electronics in textiles, integration is the key word. It should provide functionality such as added value in safety, comfort, communication or intelligence. Integration can have different levels: you can go add-on, semi add-on, hybrid structure, or full integration. However, in the experience of Sioen, the professional market is not willing to pay for the cost of (any) integration. So the add-on solutions is the best (and only) solution in terms of economy in this market. This is partially explained by the fact that in the professional business legislation and comfort are extremely important. This creates a threshold for the acceptance of any level of integration. According to Joost, electronics in textiles on gadget level (for consumers) might be nice. But in professional market it is very difficult to get acceptance. He showed a few examples where they were successful, but business cases are very hard: positioning systems in soft-covers of

trucks to prevent theft and illuminated textiles in architecture. The business case becomes even harder since the supply chains are very long in these industries and every layer adds cost (and profit)…

15:05 Nicolas Vergauwe, Manager Technology & Business Development, Biocartis

Nicolas gave a presentation entitled: "Personalized Healthcare: Applying cutting edge technologies for near-patient testing." Nicolas discussed the role of diagnostics in healthcare. He claimed that personalization is coming up and that the point of impact (or point of care) is moving from the lab to the patient. He showed that in the traditional situation pathology is a slow and labour intensive operation. Key questions are: "what do you want to measure", "what samples do you want to measure", and "what information do I want to deduct?". Biocartis has developed a system called Idylla which is essentially a generic analytical station which is very flexible. Although the system integrates a lot of functionality and is much smaller than the space needed for traditional pathology, it is by no means "mobile". Unfortunately dedicated or wearable devices are not feasible (yet) whilst keeping the same impact.

15:25 Filip Pintelon, SVP & General Manager Healthcare Business Group, Barco

Filip gave a presentation entitled: "Touching people's lives with technology". Filip showed how technology affects people in so many ways: smarter places for playing, smarter places for healthcare, smarter places for working or learning and smarter places for smart cities where we live, eat and transport. From their own experience he showed how Barco changes our experience in a movie theatre. They want to create an immersive and interactive environment in the cinemas. Many technologies are used to create this added value and new content. A second example that is shown is in the hospital space. Barco tries to improve medical diagnosis using medical images. They bring better vision systems into the operating room and enable collaborative meetings with medical specialist (virtually). The same technology can be used for interactive working and some learning situations. In essence this system resembles an interactive beamer display. In his final example he showed an application of a "safe city" where interactive video can provide security. It is a challenge to keep these systems from infringing privacy. Filip showed that the development of each of these systems proved to be a "technological tornado" and their realization was only possible through collaboration with many partners in different areas.

15:45 Phillip Vandervoort, CMO, Proximus

Phillip gave a presentation titled: "Putting the Consumer central while we unravel the Smart Living Eco System". Phillip stated that 2 concepts are leading in his presentation: "consumer" and "connectivity". In the past, data used to be discreet. But now everything is becoming a "stream" (i.e. continuous data). As a result data bandwidths are exploding. What is driving this growth? Phillip gave several reasons: the aging population with growing health demands, the tendency of everything to become mobile and the development of what he calls "self-service" economy. As an example of the latter he showed the self-check-in at airports. But there are also some challenges. The number of connected devices is exploding on the internet. Security of this big data becomes a big issue. According to Phillip is it key to turn all this data into "information". This will create a lot of opportunities for niche business generation. However, right now it is a jungle out there: different protocols, different devices and different platform. A clear standardization would go a long way….

16:05 Geert Palmers, CEO, 3E

Geert gave a presentation entitled: “The Internet of Power – towards sustainable living”. He explained the impact that recent technology developments are having on the traditional energy and infrastructure sector. He stated that the power utility sector is changing quickly (as also stated in a previous presentation). Also the building sector used to be stable and profitable, so there was no incentive to change. But that has changed. Geert identifies 4 important trends: peer 2 peer, the aging population, big data and affordable sustainability. He gives several examples of these trends. In peer 2 peer he shows how business models have changed in real estate through for instance crowd-funding. Consumers are taking the lead in big projects where they were previously not involved. For the aging population he shows how mobile and adaptive housing is being developed for elderly people that challenges the traditional way of building. He shows how big data can help consumers, for instance with a learning thermostat in the house. But he also recognizes that big data is power, since utility companies now can get much more information from their customers. He also shows how big data can contribute to energy management by enabling localized energy generation sources (wind, solar) to be managed as a virtual power plant. This makes it for energy companies much easier to manage the local energy sources (and their own plants in relation to demand and supply). Furthermore, the consumer needs to be un-burdened with the validation of affordable sustainability through the introduction of relevant standardization. This would benefit the faster introduction of these opportunities. In his final statements Geert concludes that for all the applications that he presented the technology is there and ready. However, in order to reap the fruits new business models need to be created and accepted.

16:30 Closure

The meeting was closed by Jo de Boeck from imec. Parallel to all the sessions in the main hall, there were several workshops on the second day. Unfortunately I was not able to attend these workshops simultaneously, therefore I refer to the imec organizat ion for more information regarding these sessions.

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