

MHS : Innovation is the key

Up and down the value chain

MHS Electronics has so far been active as a semiconductor foundry. But in the meantime additional legs have been set up along the value chain in both directions: SOI-substrates on the one side, ASIC development and finished products on the other side.

"Today MHS achieves the major part of its turnover with foundry services in the mixed-signal area. We are not concentrating on high volumes, we also serve niche markets, which have very high requirements with regards to reliability of the components and request a Zero-failure-quality", explained Gaétan Beaulieu, Vice President Marketing and Sales of MHS. The foundry is specialized in Mixed-Signal CMOS and BiCMOS processes down to 0.5µm structures. Beaulieu: "With our processes we do address applications in critical environments like for example Medical, Bionics, Avionics and Space, military and the high-end automotive market." MHS owns a fabrication capacity of 2.000 6-inch-wafers per weeks, which can be extended up to 2.800 wafers/week.

The company is offering to its customers a variety of 60-70 different process options. However, all process options are based on the same family processes and the same design-kits." This has the advantage that the customer only needs to get trained on the design-kit once and they only need to pay for the options, which they will really use", Beaulieu continued to explain. When Beaulieu is talking about small volumes, he does mean that explicitly. "Low volume can really start with 1 wafer or 25 wafers. We first have a look at the product and after that we will decide, if it makes sense", explained Beaulieu. For prototyping MHS is offering a MLM (Multi Layer Mask) and MPW-Service (Multi Project Wafer). Using the MLM approach, customers can put up to four mask layers on one reticle and thus reduce the initial mask cost. For special cases (Obsolescence Solution, Addition of capacity, Second sourcing) MHS is also offering the possibility to transfer whole processes to their foundry in Nantes. In addition to that, MHS also has the capability to speed up the production. In extreme it would mean to bring the turn around time down to as low as two weeks for prototyping.

So far MHS Electronics does not differ too much from their competing foundries in this area. Why is this company different from the competition? "We can guarantee a high Radiation Tolerance for a Full-Custom-Design, including the analog part. There is no other supplier in Europe, who could do that and only very few worldwide", said Beaulieu. Just recently in January this year, MHS Electronics has, with its SCMOS3RT, introduced a Radiation Tolerant 0.5µm CMOS technology with 3 metal layers and a radiation tolerance of 60krad with different process options. Beaulieu: "Shortly we will introduce a technology that has a Radiation tolerance of 300krad".

In addition to that, According to Olivier Brière, Marketing Manager Advanced Technologies at MHS Electronics, MHS Electronics is working on the integration within CMOS technology of micro relays, based on a MEMS structure licensed from an innovative Spanish R&D SME. Using this approach, the company will be in the position to implement relay-arrays on a CMOS chip. Brière is seeing a

number of advantages through the integration of micro-relays. CMOS integration will give major benefit to product designers, allowing RF-signals low-voltage switching with low coupling effects, low parasitic capacitances and low contact resistances. Miniature integrated elements help to reduce system cost, with lower power consumption and improved reliability. Currently there is a feasibility study going on using test chips, "we expect, that we can offer micro relays as part of our design library starting from 2008", Brière continued. Target applications include switching matrix for telecom, reconfigurable antennas, automated test equipments, reconfigurable analog matrix, and others.

MHS Electronics is also developing thin-film on-chip Analog capacitors with a target capacity of up to 20 to 30fF/μm² and thin film Analog resistors with (10kOhm.μm), that can be integrated within CMOS processes. "These developments, in collaboration with the local university experts, are only possible, because we have developed our own ultra-high-vacuum deposition equipment in collaboration with our sister company (MHS Equipment). Also this option will be available by 2008".

As already mentioned before, MHS Electronics is underway to implement additional business areas. Uwe Stock, Business Development Manager MHS Germany, explained that the new business areas will extend the initial foundry business. One direction of the extension of MHS Electronics will be the implementation of a full ASIC Design service in addition to the existing foundry. "We are currently on the way to build up a worldwide network of design houses", explained Stock. As one example of such a design house he mentioned HMT MicroElectronics in Switzerland. Stock explained that the conditions to become one of these design houses would require the following attributes:

- Very good understanding of the Silicon processes at MHS Electronics
- Expertise in design of Mixed Signal products based on customer specifications
- Experience with ASIC products for the High Reliability markets
- Guaranteed product support during the whole product lifetime

Why is MHS not doing this on its own? "By using external Design houses, our customers don't need to be afraid, that their IP will be used elsewhere", Stock guaranteed. However, this still doesn't mean the end of the road. MHS Electronics will go one step ahead and will, besides the foundry services and ASIC design, also offer the design and commercialization of the whole system. This offer is especially directed to small and medium enterprises. Stock: "For such kind of companies, we can investigate their product idea and will lead this idea from concept up to the industrialization and commercialization of the product". However, MHS will also here concentrate on the markets which require high reliability, because this will allow to make use of the synergy effects within the company.

In the last step MHS Electronics will also develop its own finished products. One example is a UV-Sensor for dermatologists, which allows doctors to record the exposure of their patient's skin to UV radiations over a long time. In this case MHS Electronics is closely working with the medical department of the University of Nantes. "For this system we have done a proof of concept using our CMOS technology and we will also take over the marketing and sales", explained Stock. Furthermore: "The complete system will be released

to the market by the end of 2007." Another example is a biochip sensor for DNA analysis. Stock: "Using this chip we can identify parts of a DNA within one our." In this case a French University was again the godfather of this device. Currently, first samples are under evaluation, and samples will be available for customers by October this year. "The product introduction to the market is planned for April 2008", explained Stock.

MHS Electronics has not only expanded its activities in this direction, also the lower part of the value chain has been addressed now. The company has, by the end of last year, introduced its own SOI technology (Silicon-on-Insulator) based on a patented deposition technique : FlexEpi™. According to Olivier Brière, this patented technology shows a number of advantages: Improved substrate material Quality due to process simplicity, Better control of thicknesses and their uniformity especially for ultra-thin layers, Low surface roughness, Possibility to have a High Resistive Substrate for better RF performances The FlexEpi™ technology is a real competition against the Smart Cut technology of SOITEC, it does even have significant advantages. "Smart Cut becomes more expensive, if the active layers have to become thinner. This will automatically result in restrictions concerning the thickness in the Smart Cut technology", explained Brière. MHS however, will use a standard virgin wafer and will construct the BOX and active layers on top of it. "We can control the thickness of the layers atom-by-atom. Thus we can achieve a layer thickness between 10 and 100nm", Brière continued. The production is much easier, so that it will become less expensive at the end. In addition to that, all process steps will take place in a single equipment under Ultra High vacuum, which will also have an influence on the substrate quality, because we can avoid problems with contamination. Finally the new MHS process will lead to much lower stresses for the wafers and no waste (ecological friendly). Currently MHS Electronics is testing its SOI Technology on 200mm wafers, but Brière is sure that also 300mm wafers can be handled properly. MHS can offer capacities in House, but they will not be sufficient for high volumes. Therefore: "Over the medium term we would like to license the technology to other companies, in order to allow the delivery of high volumes", so Brière. It is for sure that FlexEpi™ SOI substrates will also be used in the MHS foundry, but the schedule has not yet been fixed.

Looking at the size of the company – approximately 300 employees- and the number of activities, the question comes up, whether MHS doesn't diversify too much. But Stock refuses: "MHS is only doing a part by its own. The rest will be handled through a network of partner companies and universities. And all that we are doing by ourselves fits into the whole picture."

Picture: Gaétan Beaulieu, MHS : "We are interested in a long term relationship with our customers. We don't have any Last-Time-Buyout. We guarantee the availability of our processes over 10-15 years."

Picture: Uwe Stock, MHS : " Currently we are looking for suitable design houses that will extend our network in Europe."

Picture: Olivier Brière, MHS: "The whole process to make a SOI wafer from a standard wafer takes less than an hour. The Flexepi technology is already patented and also be used for other future technologies."

Add info: The exiting history of MHS Electronics

- 1979- The name "MHS" has been selected with regards to the origin of the company: Matra Harris Semiconductor, that was established in 1979 through a merger of the French High Tech group Matra and the US Semiconductor company Harris Semiconductor
- 1991 – AEG, at that time a daughter company of Daimler-Benz, is taking over 50% of MHS
- 1992 – DASA (Deutsche Aerospace) and AEG concentrate their activities in microelectronics in a new company TEMIC Semiconductor and MHS is getting a part of it.
- 1998 – ATMEL is taking over the IC-Division of TEMIC Semiconductors
- 2005 – The French Technology group XBYBUS is taking over 100% of the ATMEL Foundry in Nantes and opens MHS SAS.
- April 2007- MHS is renamed MHS Electronics, Xbybus Holding is renamed MHS Industries and Aprim Vide is renamed MHS Equipment

Add info: MHS in an overview

MHS stands for "Microcomposants Haute Sécurité". The company is 100% owned by the MHS Industries Holding. The company structure is lean and allows, according to Gaétan Beaulieu, Vice President Marketing and Sales of MHS Electronics, fast decisions. Beaulieu proudly adds: "We are without any debts!".

The origin of MHS lies, thanks to the history of the company, in the area of Military, Space and avionics. According to this the credo today is still: "Reliability and Innovation. This is what MHS was known for and we stick to it."

Last year the company achieved a turn over of 26Mio. Euro and for this year they expect an increase by 38%. 65% of the turnover is achieved in Europe, 14% in the US and 21% is Asia. Looking at the applications, they come from "Avionics and Space", "Automotive", the segment "Civil and Military Security" and from "others", which includes also medical applications.

Part of the MHS Industries Holding is MHS Equipment. MHS Equipment, with 10 years experience in Vacuum and Ultra High Vacuum, designs, produces and distributes a wide range of systems and their related components for research laboratories and the industry in the field of thin layer deposition.