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BOLSTERING EUROPE'S POTENTIAL: ASM'S POSITION ON THE EU CHIPS ACT.

ADVANCED MATERIALS UNDERPIN EUROPE'S
TWIN DIGITAL AND GREEN TRANSITION



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Executive summary

- ASM endorses the European ambitions, such as open strategic autonomy and the twin digital and green transition.
- We want to support the European semiconductor ecosystem with our pan-European innovation axis.
- Our capabilities in advanced materials research and industrializing semiconductor deposition technology define the industry four to eight years from now, allowing Europe to set the tone worldwide.
- Our innovations enable smaller and novel transistor and memory structures on a chip, which are pivotal in realizing energy-efficient computing. These new structures require less energy and result in more computing power.
- To fully leverage our capabilities for the EU Chips Act, we welcome a European perspective and levels of support. We advocate a reevaluation of existing semiconductor ecosystems, a reconsideration of first-industrial-deployment demand and recommend the ability for cross-border funding within European programs.
- We see clear opportunities for the European Union to guide the semiconductor industry on sustainability. This involves making chips energy-efficient, improving the operational footprint of our products, and making the company's itself more sustainable.

Around the world, governments are embracing the strategic and enabling role of semiconductors in our current and future lives. The European Union (EU) initiated an ambitious effort to secure and bolster the European position in semiconductor technology. This is done through the EU Chips Act, which aims to secure a 20% market share by 2030. Currently, the Act is being discussed by European Parliament and the EU member states before it is finalized. The European semiconductor industry has been invited to share its views.

Netherlands-based ASM International ("ASM") is the global market leader in single wafer atomic layer deposition (ALD) and has a strongly growing position in epitaxy. Both are critical technologies to enable the inflections on our customer's roadmaps, particularly the increasing adoption of 3D nanostructures, new materials, and further scaling of transistors. Key innovations such as high-k metal gate and ALD multi-patterning films that have brought the semiconductor industry to its current advanced state were

developed by ASM in its European R&D facilities. All cars, phones, and computers rely upon chips enabled by our pioneering innovative semiconductor fabrication technologies over more than 50 years.



Our strategy is *Growth through Innovation*, and for good reason. Innovation is at the core of what we do at ASM. We excel in exploring, developing, and industrializing advanced materials and precursor chemistry in semiconductor manufacturing. With R&D centres in six countries throughout the world, we are close to our customers and have access to world-class professionals in the semiconductor industry.

In our product R&D sites, we develop technology with customers to be used in manufacturing within six years. The pith of our R&D activities – called Corporate R&D – is located in Europe and addresses technology nodes four to eight years away from now. This R&D capability has resulted in state-of-the-art technologies, a treasure trove of knowledge about advanced deposition processes, and ASM's patent position with 2,250+ patents.

A EUROPEAN R&D AXIS

ASM is a strong European innovator, operating along the axis of Finland, the Netherlands, and Belgium. From our headquarters in Almere, the Netherlands, we prioritize our global R&D activities and patent portfolio. Our Dutch activities also include our product division, vertical furnaces.

Through our Finnish activities, we explore advanced precursors, processes, and materials for future applications. Since 2004, ASM Microchemistry has been co-located with the University of Helsinki, the original and current epicenter of academic and applied ALD research. Our ALD Centre of Excellence allows for close collaboration on creating new ALD-based chemistries and materials. This year, we renewed our partnership with the University of Helsinki and announced a plan to double our investment.

ASM Belgium is located on the premises of the prominent and independent semiconductor research institute imec in Leuven. Our 32-year-old collaboration with imec enables us to investigate, both jointly and independently, the integration of individual process steps and new materials in semiconductor devices in imec's state-of-the-art pilot line. Our European integration efforts – encompassing 50 percent of our Corporate R&D – are concentrated at imec. We intend to expand this unique and strategic collaboration by roughly doubling related R&D investments over the next four years.

“We expect that proper implementation of The EU Chips Act will lead to a healthy European semiconductor ecosystem that is competitively positioned in the global semiconductor landscape and will help realize the digital and green twin transition.”

Benjamin Loh, President and CEO

This European innovation axis is our arterial infrastructure, through which we engage with the wider European and international semiconductor R&D ecosystem, including collaborations with technical universities and research institutes in the Netherlands, Belgium and Germany.



Our European R&D locations

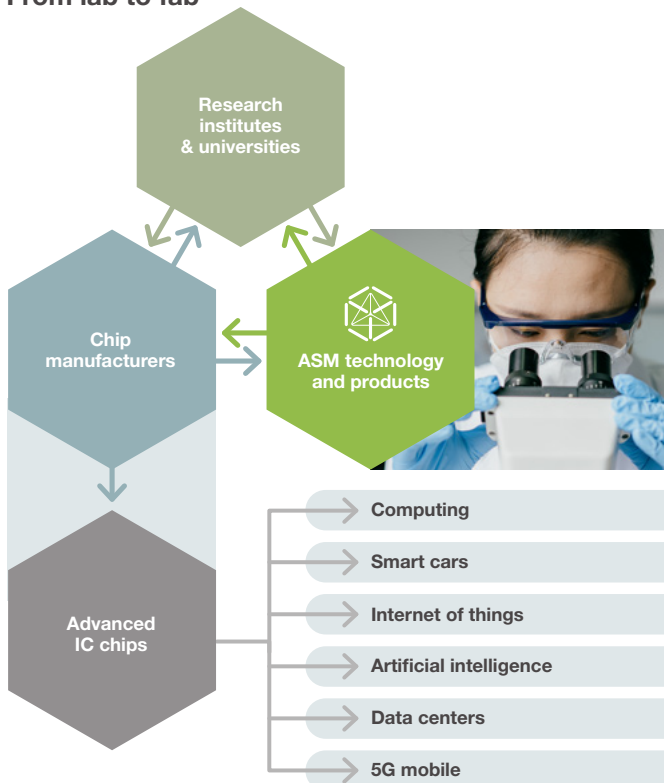
MOVING EUROPE FORWARD

ASM fully endorses the European ambitions regarding the twin green and digital transition and open strategic autonomy. Innovative digital technologies support the transition towards a sustainable economy that only flourishes in a resilient Europe built on multilateralism and an open economy. Therefore, we think the EU Chips Act is well-timed and critical for Europe's and our industry's future. Even more, we are eager to leverage our European innovation axis in line with these European objectives.

The promise of energy-efficient computing for data-intensive applications like artificial intelligence, cloud computing, and autonomous electric vehicles increasingly relies upon advances in material research and the ability to construct 3D nanostructures. To make this possible extensive novel materials research and equipment development is required. ASM's core strength is guiding these innovative processes and materials from lab to fab, i.e., from our European R&D sites, via our global product groups, into the fabs of our customers, and from where they will be found in chips that move into our daily lives.

With our research partners and material suppliers, ASM is at the forefront of digital technologies that enable the EU Green Deal and set the tone for the rest of the world.

From lab to fab



A STANDARD BEARER IN ADVANCED MATERIALS AND DEPOSITION TECHNOLOGY

ASM intends to be a European standard bearer for advanced semiconductor materials and deposition technologies. Our contribution to the EU Chips Act primarily focuses upon the first strategic objective – strengthening the European R&D ecosystem – followed by addressing the talent and skill shortages, enabling advanced semiconductor manufacturing in Europe, and improving insight into the global semiconductor supply chain. We intend to bolster and expand our pan-European research organization, intensify our collaborations with research institutes and increase our efforts in attracting, training, and retaining talent. Furthermore, new European fabs will need our equipment and support.

Through our pan-European activities, we generate spill-over effects that strengthen the European semiconductor industry in general and enhance the capabilities of European material innovation, collaborating with precursor suppliers like BASF, Air Liquide, Dockweiler Chemical GmbH, Nouryon, and other smaller firms. Spill-over effects also emerge through our potential engagement in vertical industry efforts, like the contemplated Mission 10X. In addition, our R&D presence supports the nurturing of knowledge, expertise, and talent in advanced material and semiconductor capabilities at our European research partners. Furthermore, at our R&D sites, we attract and train talents, many of which are university graduates, thus contributing to the overall European talent pool.

ASM's European R&D position underpins efforts to reduce the semiconductor environmental footprint worldwide. Firstly, by enabling energy-efficient computing. According to external studies, 1 kWh spent in production in a new manufacturing line helps conserve 4 kWh of energy globally¹. In addition, smaller and novel transistor and memory structures consume less energy while boosting computing performance.

Secondly, we contribute by limiting the environmental footprint of our products in operation. This accounts for topics like precursor efficiency, limiting heat losses, reducing effluents, and extending the lifecycle of our products through refurbishment. Furthermore, through our membership of the imec 'Sustainable Semiconductor Technologies and Systems' (SSTS) program, the impact of our products in a complete process flow is assessed and addressed. At the same time, we are focused on reducing the footprint of our own operations and our supply chain, underpinned by our Net Zero emissions by 2035 ambition. We see clear opportunities for Europe to lead on sustainability in semiconductor manufacturing.

¹ITRI/ITSI, Stephen Su, Chun-Hao Yueh, Milton Deng, Jean-Baptiste Fichet and Roberto Lai, 'Resilient Manufacturing Ecochains: Human Centric Development for Future Industry Ecochains', 2021 Annual Summit of High Level Forum (9-11-2021 Grenoble).

THE EU CHIPS ACT AND A PAN-EUROPEAN PERSPECTIVE

Europe would benefit from a truly pan-European approach. Fragmentation caused by national policies and politics limits the fulfillment of ASM's R&D potential. Our individual European positions are unique and complement each other. Together they are the base and start of our value chain, enabling the progression of advanced materials and processes in the semiconductor industry worldwide. We advocate nurturing and leveraging what is currently present in Europe, like its world-class R&D ecosystem (including our own) that sets the tone for the rest of the industry four to eight years from now.

Moreover, instead of a nationalistic view, ASM is capable of contributing to the EU Chips Act through a European perspective on our activities. We see our European ecosystem as a textbook example of how an integrated European economic market flourishes and elevates the Union as a whole. Therefore, we would applaud a Dutch government that takes the lead in aligning our efforts with Belgium, Finnish and European authorities with regard to the EU Chips Act. Such leadership would benefit the European ecosystem as a whole and undoubtedly attract more (foreign) investments.

ASM AND EUROPEAN PROGRAMS

Advanced materials and deposition are foundational technologies for leading-edge semiconductors and should be part of the R&D focus areas in the EU Chips Act. If the EU supports R&D in advanced materials and deposition, this will contribute to Europe's broader ambition for technology leadership and digital transition.

Qualification for European programs and funding allows ASM to accelerate material roadmaps, broaden the scope of our activities to address operational sustainability aspects, and enhance the impact of our innovations. Moreover, such support fosters a strong position in deposition technologies - next to Europe's lithography capabilities - which are both essential for the European semiconductor ecosystem.

The EU Chips Act seeks to strengthen the whole European semiconductor ecosystem. To achieve that goal and fully reap the benefits of ASM's innovation axis, a European perspective and level of support are indispensable. A competitive European semiconductor industry by 2030 will be supported by an R&D infrastructure focused on advanced materials and processes for the industry's future needs. We are ready to contribute.



DRIVE INNOVATION • DELIVER EXCELLENCE >



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