



## 2007 Frost & Sullivan Excellence in Research Award for Europe

F R O S T   &   S U L L I V A N

### **Award Description**

Frost & Sullivan's Excellence in Research Award is bestowed upon the company that has carried out new 'disruptive' research; and has, in general, a strong commitment to research and development. This award recognizes a company's research and development program that has or is expected to bring significant contributions to the industry in terms of adoption, change, and competitive posture. The fruits of this research may already have or will potentially impact certain market sectors. The award also recognizes the overall research excellence of a company as well as its commitment towards differentiating itself based on science-backed services or solutions.

### **Research Methodology**

To choose the award recipient, Frost & Sullivan's analyst team tracks research and innovation in key hi-tech markets. The selection process includes primary participant interviews and extensive primary and secondary research via the bottom-up approach. The analyst team shortlists candidates won the basis of a set of qualitative and quantitative measurements. The analyst also considers the pace of research and technology innovation and the significance or potential relevance of the research to the overall industry. The ultimate award recipient is chosen after a thorough evaluation of this research.

### **Measurement Criteria**

In addition of the methodology described above, there are specific criteria used to determine the final rankings. The recipient of this award has excelled based on one or more of the following criteria:

- Number or type of research projects
- Significance of research in the industry, and across industries (if applicable)
- Absolute R&D expenditures (vis-à-vis industry norm), and % growth (if applicable)
- Caliber/reputation of research staff
- Potential of products of research to become industry standard(s)
- Breadth of intellectual property ownership (patents, scientific publications, papers in peer reviewed journals, etc)

## **Award Recipient – Obducat AB, Sweden**

The 2007 Frost & Sullivan European Excellence in Research Award for the field of Nano Imprint Lithography (NIL) goes to Obducat AB of Sweden for its outstanding research and development efforts that led to the introduction of the cutting edge Sindre™ series of NIL tools. It is the first in the world to offer a high volume manufacturing solution based on the NIL technology.

In general, it is important to understand that NIL technology provides a cost-effective solution to the lithography challenges of future semiconductor technology nodes and many other applications. In addition, NIL stands out among other next generation lithography techniques, in terms of throughput capability and ease of implementation. The introduction of NIL technology would be truly revolutionary and set industry standards to the new lithography approach.

### **INTRODUCTION**

Obducat AB is based in Malmö, Sweden. It is a prominent European developer and a market leader in NIL equipment and electron beam recorder (EBR) solutions. In addition, the company also provides stamp manufacturing technology for replicating patterns with feature size from 50 nm to the micrometer range, using polymer, silicon, nickel and quartz stamps. This 18-year-old company is listed on Nordic Growth Market Exchange in Stockholm, and the company's equity is owned by over 16,000 shareholders.

Obducat's NIL, EBR and stamp manufacturing technologies have already been implemented in volume production of optoelectronics. Its technologies are also applicable for organic light emitting devices (O-LED), bio-devices, liquid crystal display (LCD), microelectromechanical systems (MEMS), nanoelectromechanical systems (NEMS), polymer and molecular electronics, semiconductors and high density interconnects.

Obducat's clientele spans across three major continents that comprises top universities and multinationals such as General Electric, STMicroelectronics, LG Electronics, Stanford University, Cambridge University, Peking University and the National University of Singapore.

Obducat's NIL technology is becoming very popular. In 2006, the company's NIL-related sales surged by 57% and the 4<sup>th</sup> quarter gross margin rose 60%. The company has signed exclusive distribution agreements with Canon, Japan, and launched the world's first high volume manufacturing (HVM) equipment based on NIL technology.

### **TECHNOLOGY OVERVIEW**

The semiconductor industry needs to constantly introduce new technology node in every 2 to 3 years to support burgeoning industry demands. Each new generation of semiconductor devices brings about a corresponding decrease in device feature sizes and an increase in performance. However, the downsizing of device scales has brought about a plethora of issues and challenges. The industry is now confronted with the major limitation in the existing lithography tools for 45 nm and beyond. Photolithography with immersion lens is facing restrictions in meeting future requirements and the semiconductor community is searching for viable replacement technologies that could serve next generation lithography. This is a challenging issue as the semiconductor industry grapples with cost of ownership (CoO) issues, rising mask cost and throughput levels. It is against this backdrop that NIL technology has been introduced. It offers good CoO, low mask cost and high throughput capability.

### **INNOVATIVE FEATURES**

Obducat is the first company to commercialize NIL and EBR technologies. Obducat also holds the market leadership and largest installed base worldwide. The company offers two important proprietary technologies. First, Obducat's Simultaneous Thermal and UV<sup>TM</sup> (STU<sup>TM</sup>) technology allows both ultraviolet radiation and thermal treatment for the resist. This option is highly attractive for curing thermoplastic pre-polymers at constant

temperature, thus not exceeding the thermal budget. Its Soft Press™ technology ensures that imprint pressure is impact on the resist evenly across the entire wafer. This produces a highly uniform thickness of imprinted resist at all locations on the wafer.

Obducat's second major technology is the Intermediate Polymer Stamp™ (IPS™) imprint process that is able to minimize contamination and extend stamp life. This is accomplished by applying a two-step process to prevent any contact between the master stamp and substrate. IPS also uses a soft intermediate stamp that helps reduce chances of contamination.

### **BEST PRACTICES**

Obducat has invested significant resources in developing its expertise in NIL technology. The company currently holds 18 United States patents and has 92 new patents granted in 2006 around the world. Altogether, Obducat's IP comprises a total of 222 active patent applications pertaining to 44 inventions. A majority of these inventions involve industrial equipment design and NIL processes focusing on high volume production.

The company's business concept is *to develop and supply lithography solutions for production and replication of advanced micro- and nano structures for mass replication as well as for research & development (R&D) purposes*, and it spares no effort in R&D. The company has established partnership with many leading companies as well as clients such as Samsung, General Electric Plastics and LG Electronics.

It is also important to note that NIL is a relatively new technology, and it is important to educate the user community of its applications and advantages. To promote NIL tools and educate users, Obducat has set up the Obducat Academy™. This will serve as a venue to respond to customer needs and provide training programs for industry.

## **CONCLUSION**

Obducat holds the distinction of being the first company to successfully develop a NIL-based high volume production solution (Sindre™) for the lithography requirements of future semiconductor devices and nanotechnology, a feat that is underpinned by the company's exceptional research and development effort. Frost & Sullivan is pleased to present Obducat AB with the European Award for Excellence in Research.