



Our Impetus

Our sustained success in the optical disc arena has afforded us the opportunity to expand into completely new areas of vacuum thin film application. Our goal is to increase our share of new fields of business to more than 20 % within five years.

Vacuum Thin Film Deposition Technology in Three Application Areas

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Vacuum Thin Film Deposition Technology in Three Application Areas Optical Disc

THE FORMATIVE VACUUM THIN FILM TECHNOLOGY.

SINGULUS TECHNOLOGIES' principal business is the development and manufacture of all components for optical data storage replication systems. The company's replication systems for prerecorded CDs and DVDs, i.e. the SKYLINE and SPACE-LINE models, have averaged over 50 % of world market share for years. With more than 1700 SKYLINE systems installed around the world, this replication line has become an unrivaled industry benchmark. The metallizer, which applies thin and extremely uniform layers of metal such as aluminum and silver or even silicon onto any given substrate by means of vacuum thin film technology, is the foundation for the company's technological market dominance.

SKYLINE II SETS NEW INDUSTRY STANDARD. Improvements to the SKYLINE CD/DVD 5 replication system have been underway since 2002. The integration of the new SINGULUS V metallizer was at the core the entire re-engineering process. The market launch for this new concept occurred in May 2003 at the Media-Tech Expo trade show in Las Vegas. The demands on the machine redesign included smaller size, faster speed, and increased performance that was ultimately more cost-effective for customers than any other machine on the market.



SKYLINE II
New CD/DVD 5 - Replication Line

The redesigned metallizer incorporated the most impressive advances: Improved reliability, shorter cycle times and reduced maintenance generated a real jump in productivity which has since been acknowledged by the market. Of the 310 CD/DVD 5 lines delivered in 2003, 126 were the new SKYLINE II model.

SPACELINE II IN BETASITE LOOP. In the Fall of 2003, key customers took receipt of DVD 9 SPACELINE II replication line prototypes for betasite trials. Initial trial results in the rigorous daily production environment have already shown that this exemplary machine will become the new industry benchmark in terms of reliability and yield. This will reinforce and enhance SINGULUS TECHNOLOGIES' exceptional position in the prerecorded disc market.

STREAMLINE II. The next cycle of development has also begun in the new DVD-R growth market and will conclude with the May 2004 introduction of the redesigned STREAMLINE II at the Media-Tech Expo in Frankfurt. The new system concept meets the most stringent demands made to machine and process technology. The STREAMLINE II has sufficient reserves to keep pace with additional process developments even if advances in injection molding technology reduce cycle times below their current level of approx. 4 seconds. The new system can also be used for CD-R production and at the same time is equipped with 3 molding machines.

**STREAMLINE DVDR / SP-A
Replication Line for the
Production of DVD-R**



MODULUS AND SUNLINE. Rewritable DVD formats impose the most stringent demands in our industry on systems engineering and coating technologies/demands that can be met by only a few manufacturers. Our MODULUS coating system and SUNLINE replication system allow us to supply that market segment with general purpose manufacturing equipment that has proven itself in actual practice and is capable of turning out all rewritable DVD-formats (\pm RW/RAM).



SUNLINE - Replication Line for DVD-RW Discs

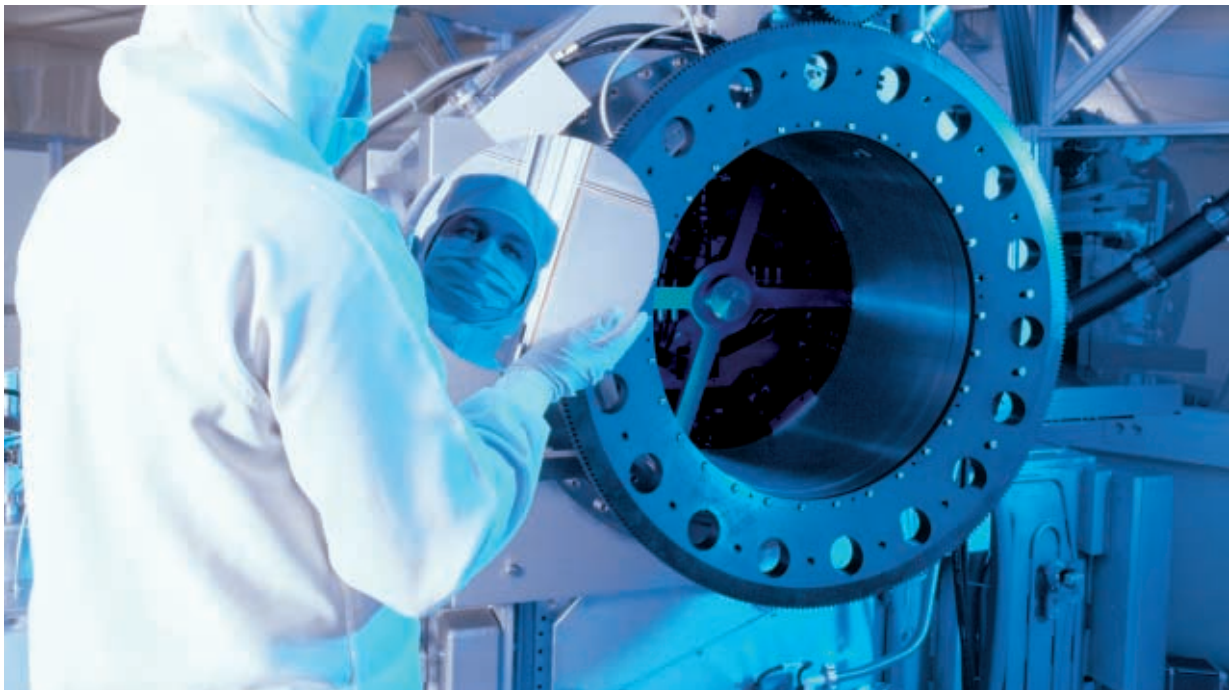
TMR Technology

TIMARIS COATING SYSTEM FOR MRAM-WAFERS.

SINGULUS is establishing two new fields of business in addition to its optical data storage replication systems. The SINGULUS TIMARIS machine concept has enabled the company to become one of the first to enter the realm of TMR (tunnel magnetic resistance) technology. SINGULUS engineers have been working on the TIMARIS since 2002 and the machine was introduced to the public at the Semicon Europe semiconductor trade show in Munich in April, 2003. It was also shown at the largest trade show for the semiconductor industry, the Semicon West, San Francisco, as well as at the Semicon, Taiwan, and, finally, the Semicon, Tokyo, in late December, 2003. Interest among various manufacturers was high in this new key technology for depositing multilayer coatings having ultrathin layers and high uniformities over the entire area of a 300-mm-dia. silicon wafer.

Two areas of application are accessible to this new technology: a semiconductor application for MRAM (magnetic random access memory) as the base technology for the emerging generation of silicon storage chips, and an application in the area of thin film read heads for magnetic hard disk drives.

TIMARIS
TMR - Deposition System
for MRAM - Semiconductor
Wafer



Optical Coatings

OPTICUS INLINE COATING SYSTEM FOR OPHTHALMIC LENSES.

The company's second new business domain is ophthalmic lens coating. This involves the precise yet economical application of scratch-resistant and optically functional layers, i.e., vacuum layering systems that are much more cost-effective than conventional systems.

PROTECTIVE AND FUNCTIONAL FILMS ON OPHTHALMIC LENSES.

Synthetic lenses are much more susceptible to becoming scratched than conventional glass lenses but are increasingly preferred by people who wear glasses because of their light weight. A scratch-resistant protective coating must, therefore, be applied to the surface of synthetic lenses. In the past, this has generally been achieved by means of an immersion process that applies a hard lacquer to both sides of the lens which then undergoes a curing process.

In addition, eyeglass lenses reflect incident light to varying degrees causing the wearer to notice undesirable reflective lens glare which can impede the person's vision. These optical distractions can be virtually eliminated by applying an anti-reflective (AR) coating. Vacuum chamber systems using an electron beam evaporation process for multiple layer applications were developed and are employed around the world. For the past few years, the AR coating treatment has increasingly gained market share.

The application of dual-sided hard and multiple AR coatings on synthetic lenses is a difficult technical challenge for all production facilities offering these services for the refinement of eyeglass lenses. Because conventional machines and processes, particularly single batch recipe manufacturing, have never been able to integrate hard and AR coatings in an inline process or completely automate the process technology, the search for a simpler and more cost effective solution has lasted years.

The company's second new business domain is ophthalmic lens coating.



In close cooperation with our key customer Rupp+Hubrach, a renowned manufacturer of eyeglass lenses within the ESSILOR group, an in line coating and systems technology was developed for single substrates in which hard as well as multiple AR coatings are applied exclusively by means of vacuum thin film technology. This new combination of processing stages in the coating of ophthalmic lenses represents a true innovation and provides substantial benefits to customers, since the total coating costs may be reduced significantly. Additionally, full automation results in reduced order throughput times at specialized coating centers, which means that opticians will be able to fill customer orders faster than ever before.

Furthermore, the OPTICUS system can be employed for coating precision optics, such as those used in LCD projectors, cameras, and many other applications employing multiple AR coatings and other optical filters. In addition to existing eyeglass lens coating, the future upside potential for SINGULUS TECHNOLOGIES is significant and will be systematically tapped in the years ahead.

The unique combination of PECVD and sputter-technology represents a true innovation and provides substantial benefits to customers.

OPTICUS
Inline Coating System for
Ophthalmics



