Opportunities of new technologies at Siemens CT
Laser Melting Technology as a Manufacturing Process

Strategic Visions at Siemens [1]

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Introduction

Today's corporate leaders need reliable forecasts to achieve tomorrow's business success. In an increasingly complex business environment marked by ever-shorter product cycles, the major challenge facing companies is how to organize R&D activities in as focused and success-oriented a manner as possible — while simultaneously making optimum use of available funds. All of this requires a clear vision regarding new technologies, customer requirements and the markets that will emerge in the years and decades to come. But a leading global player like Siemens cannot be satisfied with merely forecasting trends: "Predicting the future works best when you create and shape it yourself," Siemens' former CEO, Dr. Heinrich v. Pierer, once said.
And that's why the motto "Inventing the Future" best describes Siemens' philosophy. Simply chasing after trends isn't enough for a global corporation. Instead, it must identify promising ideas and new approaches at an early stage, lay down a course of action and emerge as an innovation trendsetter.

By combining extrapolation and retropolation — and bringing these two approaches into harmony with each another — Siemens experts can draw up "Pictures of the Future" revealing which changes will impact the company's different areas of activity. However, the purpose of these pictures is not merely to depict visions of the future; as part of a systematic, ongoing process at the company, they also greatly help quantify future markets, detect discontinuities, anticipate forthcoming customer requirements, and identify new technologies with large growth potential and mass appeal. This, in turn, generates new business opportunities for the products, systems
and services of the company's business segments as well as a unified vision of the technological future for Siemens as a whole.

Automation & Control

Three trends in particular will determine developments in industry, trade, logistics and building systems in the coming years: the further penetration of information and communications technologies into these sectors; the expansion of global networks; and customer demand for tailor-made products.

Digital Networking of Production and Logistics

In the coming years, industrial production can be expected to develop in line with the general trend toward "individualization". In other words, manufacturing will move away from the mass production of identical products toward the production of customer specific products. This, however, will require very flexible production processes that guarantee a high level of quality and reliability. The key to achieving this transformation lies above all in the development of new information and communications solutions — e.g., for digital engineering systems involving the complete digital

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networking of all stages in the value chain. Such solutions range from comprehensive computer simulations of products and entire production lines to digital, real-time control of factories and extensive computer training for users and end users.

Development around the globe

In addition to the ability to manufacture products precisely tailored to customers’ needs, there are other strong arguments in favor of a comprehensive digitization of industrial processes. First of all, such digitization is the key to achieving truly global cooperation in development, production and the provision of services around the world and around the clock. It will also bring about even greater productivity and speed up time-to-market. In the future, only those companies that can perfectly coordinate e-business processes with their suppliers, partners and customers will be competitive. These companies will also have to adapt their organizations accordingly — among other things, in terms of strategic partnerships and virtual company structures. In this regard, integrated solutions, platforms and uniform standards are becoming more important than ever, and integration know-how — i.e., understanding how to combine various models into an overall solution — is becoming a crucial competitive factor. The level of automation in both factories and warehouses, as well as in the building management sector, continues to increase. More and more robots are being used, and they are not only capable of learning but can also act autonomously and adapt themselves to different situations, supporting the trend toward flexible, customer-specific manufacturing.

Impact of Materials

Material science has emerged as one of the most important pillars of industrial society. Experts report that more than 70 percent of western industrial countries’ gross national product is based on materials. And in fact materials like silicon or certain plastics do form the basis of value chains that encompass markets worth billions. The driving forces behind materials science are the enormous cost pressure and shorter and shorter innovation cycles. As a result, it is becoming increasingly important to be able to produce new materials for new products much more quickly and efficiently than was previously the case. Another factor is new environmental laws that call for new materials to be developed for use in environmentally friendly cars or low-emission power plants. The most important trends in these areas are nanotechnology, bioengineering, adaptronics and computational material science.

Atomic-level simulations of materials

To achieve success in the development of future materials, a new dimension in interdisciplinary collaboration is needed. However, that means much more than just ensuring that researchers from various areas work hand in hand during all developmental phases. The individual components in a part must also work together optimally. Another vital requirement is the incorporation of a system’s users early in the work. Nowadays, computer simulations are playing a decisive role in all areas of material research. Using them, it is possible to predict how materials will behave at different temperatures, under stress and over their entire life cycle — both on the atomic level and with regard to the entire part. What’s more, new approaches are replacing trial and error in the systematic search to find the best materials.

2. Laser Melting Technology

There are two different laser melting methods available on the market or be under development by a lot of research groups: the laser beam melting using a powder bed and the laser built-up welding (also known as “Laser Cladding” or “Laser Consolidation”).

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Both processes are able to manufacture repetition parts which achieve density nearly 100%. This means conventional, one-component metals could also be used. Following materials for commercial processes are available: titanium, tool and stainless steel as well as cobalt-chrome.
Recent developments on the field of alumina application are published. Due to the handling of original material and the enhancements of high-performance material compositions the possible industrial use is not far away.

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