

Any shape · Anytime · Anywhere



e-Manufacturing Solutions

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*"e-Manufacturing with laser-sintering is revolutionizing manufacturing processes. With laser-sintering you can create any geometry in any phase of the product life cycle. You can produce fast, flexibly and cost-effectively directly from 3D CAD data. This can help you secure a competitive advantage in any industry."*

*Dr. Hans J. Langer – EOS founder and CEO*





## Fading Economies of Scale

Global markets are facing ever shortening product life cycles. At the same time, product variety is on the rise. Manufacturing methods based on economies of scale are no longer in the position to meet these challenges. The credo underpinning conventional manufacturing means selling high volumes of identical products. This prerequisite, however, can no longer be met in today's competitive environment.

Tool-based manufacturing methods are not suitable for economically fulfilling the increasing demand for customized products. Both product development and manufacturing therefore have to shift their paradigms – moving away from tool-based, static methods in favour of generative and flexible methods. e-Manufacturing with laser-sintering can achieve this.



## EOS

EOS has been offering e-Manufacturing solutions for applications in product development and manufacturing since 1989. EOS gained market leadership by assisting numerous industries in Europe, North America and Asia in making use of laser-sintering. Today, the name EOS is synonymous with e-Manufacturing – the fast, flexible and cost-effective production directly from electronic data.

EOS is the world-wide market leader in laser-sintering systems and materials. These assets form the key technology for e-Manufacturing.

### **Freedom of Design**

Laser-sintering adds flexibility to both product development and manufacturing. The designer no longer has to subject his creativity to the limitations of conventional methods of manufacturing. He can produce geometries that, up until now, were impossible to build or only at tremendous cost. With laser-sintering, it is possible to produce inner structures just as well as undercuts. Mould draught angles are no longer necessary.

Focusing on the final product, the designer sketches out individual, three-dimensional geometries. During manufacturing, this 3D CAD model is sliced into thin layers. EOS's innovative laser-sintering technology consequently creates layer by layer and using only powder-based materials and laser energy, the desired geometry.

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## Think the impossible ...

Laser-sintering is a generative layer manufacturing method. It offers maximum freedom of design. Without tooling or complex programming of a milling strategy, you can efficiently generate any three-dimensional geometry.

### Focus on Customer Value

Laser-sintering allows the designer to concentrate solely on the core of his activity: an end product with high value for the customer.

Liberated from the restrictions of tool-based manufacturing methods, he can create what is in his or the customer's mind. Take, for example, highly integrated parts, manufactured ready to use, with movable hinges, inner structures, undercuts and serial numbering.

Machining and tool-based processes make undercuts a costly and time-consuming endeavour. With laser-sintering they can be added at no extra cost. Therefore, one should feel free to employ undercuts consistently wherever they add value to the customer.

Tool-based manufacturing methods require mould draught angles. From a customer point of view, however, these are of limited value. With laser-sintering, mould draught angles can be ignored. Therefore, feel free to leave them out if they detract from customer value.

Laser-sintering does not subordinate design to the traverse paths of numerous rams. With laser-sintering you can design according to the demands of the customer, not the tool.

*Silver cast model  
of a bonsai.  
The lost pattern was  
laser-sintered.*





# shape

## ... you can get it.

With laser-sintering, material is only used where the designer requires it. This opens up the opportunity for mirroring biological structures, thus adapting design to imposed tension. This saves material and improves product properties at the same time. On the other hand, you can use laser-sintering for implementing conformal cooling in tools, thus reducing cycle time and costs. This enables you to profit from laser-sintering, even if you manufacture using conventional methods.

Adding complexity does not increase manufacturing costs with laser-sintering. You can leverage this effect by integrating several functions into the product design. For example, you can integrate movable hinges. These are manufactured – ready to use – in a single laser-sintering process. This saves you additional assembly costs. Eventually this saves both time and cost.

Customized properties, be they individual functions, the customer's name, or serial numbering, can be integrated into a product at no extra cost. As a result, both customer satisfaction and his willingness to pay increase.

The designer no longer has to subject his creativity to the restrictions of the manufacturing methods employed further down the process. With laser-sintering you can make any shape possible, no matter how complex. This also helps integrating customers with no specific manufacturing knowledge into the product innovation process.

## Laser-sintering ...

You can apply e-Manufacturing with laser-sintering in every phase of the product life cycle: from pre-development to the supply of spare parts.

### **Product Development**

In the early stages of product development, laser-sintering can help by making design and functional prototypes available. As a result, functional testing can be initiated quickly and flexibly. At the same time, these prototypes can be used to gauge potential customer acceptance. Internal communication within and between teams can be facilitated by the availability of product models.

This results in reduced time to market and shortened reaction times to current customer demands. Gradually, the risks involved in developing new products decrease, because problems can be detected sooner and be directly addressed. Development costs are reduced, and at the same time, consumer response is accelerated.

### **Manufacturing**

Laser-sintering is a technology for manufacturing end products. The flexibility inherent in this mode of manufacturing is ideally suited to implementing customer-specific requirements. All you need are 3D CAD data. These can be provided by the customer himself. As a result, you can serve niche markets with low volumes at competitive costs. Laser-sintering is independent of economies of scale. This liberates you from focusing on batch size optimization. Your focus can shift to current demand for a product customized to the specific wishes of the individual customer. With laser-sintering you no longer have to anticipate customer demand. You can manufacture when the customer wants you to – in extreme cases one piece at a time. Tool-less production with laser-sintering makes it possible to manufacture different products, one next to the other, in one single process. Since laser-sintering does not require lengthy lead times, you can respond to individual customer demand very quickly and cost-effectively.

This makes laser-sintering a viable manufacturing alternative.

# time



## ...is a mode of manufacturing.

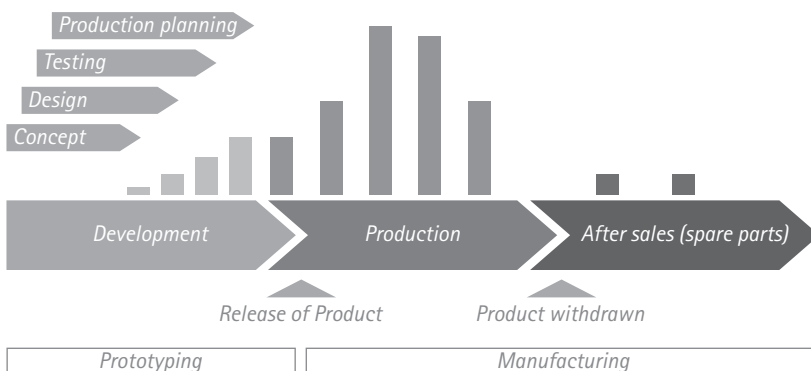
Even if the customer's requirements change suddenly, you can react quickly and flexibly. For example, a customer demands a different shape for the product housing or he would like to integrate an additional function. With laser-sintering you can instantly address this customer demand. All you need is the adapted CAD data. As a result, you can react immediately to a change in customer demand, both in terms of quantity and product properties.

### Spare Parts

With laser-sintering you can also create spare parts, quickly and straightforwardly. All you need are 3D CAD data. These can be provided by the customer if, for example, he scans the broken part for which he needs a replacement. This helps you to keep stocks at a minimum, as you do not need to store finished products or tooling. This reduces the costs of warehousing and administration.

You can create new business models. Think of revolutionizing the supply of spare parts in the commercial aircraft business: you can laser-sinter a spare part for an aircraft at its point of destination whilst it is flying from London to Singapore.

### The Product Life Cycle



*You can employ e-Manufacturing with laser-sintering in every phase of the product life cycle.*

## Laser-sintering is suited...

e-Manufacturing with laser-sintering is suited to every industry. Do your challenges lie in the following fields?

- **Complex, high value products**
- **Need to customize**
- **Multitude of varieties**
- **Ever shortening product life cycles**
- **Hard to anticipate customer demand**
- **Short response time required**

Then e-Manufacturing with laser-sintering can give you a competitive edge.

For example, in the medical device industry, e-Manufacturing with laser-sintering can add significant value. Medical devices are complex, high value products. They have to meet customer requirements exactly. These requirements do not only stem from the operator's personal preferences: legal requirements or norms that differ widely between regions also have to be complied with.

This leads to a multitude of varieties and thus small volumes of the variants offered. Medical devices are subject to short innovation cycles. This results in shortened product life cycles. Sales demand is hard to anticipate. Changes in reimbursement policies or natural disasters can further add to the unpredictability of market demand.

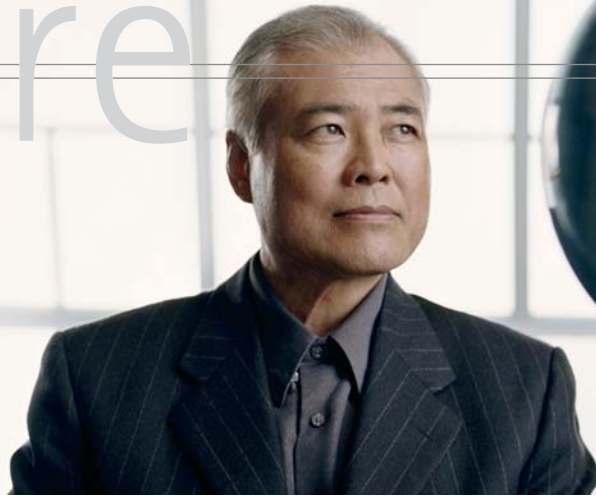
Laser-sintering technology is perfect for manufacturing prostheses or implants. In this case, the patient's individual anatomy is the key factor. Meeting the patient's specific anatomic needs reduces not only the length of time spent in hospital, but also the risk of problems normally caused by ill-fitting implants. This reduces healthcare costs.

A flexible mode of manufacturing that, for example, produces hundreds of individual dental crowns in one batch, offers a continuous competitive edge. Laser-sintering is capable of this.



*Laser-sintered and coated dental crowns, customized to the specific anatomy of the patient.*

# where



## ... to every industry.

In aerospace, e-Manufacturing with laser-sintering can add value where complexity and individuality coincide. Take air ducts, fixtures or mountings holding specific aeronautic instruments – laser-sintering fits both the needs of commercial and military aerospace. In the automotive industry, e-Manufacturing can be utilized in product development, for example laser-sintering prototypes quickly and flexibly. Manufacturing end parts by laser-sintering for special purpose or limited edition vehicles is an economically viable solution. Especially in motor racing, e-Manufacturing is readily embraced, as time is what matters most. New features have to be applied to the racing car as quickly as possible. Architects can illustrate their visions by presenting a laser-sintered model of their project. Interior design can also benefit from laser-sintering by fitting customized objects inside. Imagine lamps that are trimmed in both design and translucency to the individual style of a house.

The jewellery industry can use laser-sintering to industrialize the production of customized filigrees. The machine tool industry too can reap the benefits of e-Manufacturing by adapting flexibly and cost-effectively to customer-specific demands.

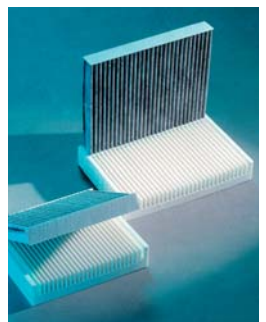
Laser-sintering can support your manufacturing processes, even if this technology is not an option for the final product. Laser-sintering tools and manufacturing aids can add flexibility to your conventional manufacturing environment. For example, you can adapt devices for picking or mounting to your changing requirements.

### **New Business Models**

With laser-sintering you can implement new business models in numerous industries. Imagine a kind of mini factory, located close to the customer, where he designs his individual product. Or take a laser-sintering system to the Formula 1 race track and optimize critical parts during the race.



*Complex aerospace air ducts manufactured by laser-sintering.*



*Laser-sintered manufacturing aid for assembling automotive air intake filters.*



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