



ENVIRONMENTAL REPORT

January 2021

SLM
SOLUTIONS



Sam O'Leary (CEO)

Dear SLM Solutions Stakeholders,

I am pleased to share with you SLM Solutions' first environmental report. While sustainability and environmental consciousness have long been part of SLM Solutions' day-to-day operations, we have for the first time created a comprehensive summary of our internal initiatives, efforts, and targets regarding our environmental footprint. In this report, we will also illustrate the positive environmental impact of our technology on the future of manufacturing.

Through our environmentally related ISO certifications and through many characteristics of our products – including the use of high-efficiency lasers and pumps, and our fully automated closed loop powder supply system – SLM Solutions demonstrates that environmental consciousness is already deeply rooted in our products and our daily operations. Moreover, we have once more intensified our focus on sustainability during the past year. We have established dedicated internal teams which are actively working on enhancing our environmental impact. These groups, together with all our employees and senior management, have already launched a wide range of additional initiatives and targets. Some examples include:

- A 5% reduction in the power consumption of our systems over the next five years (2020 – 2025)
- A 10% reduction of the hazardous metal sludge produced from our systems over the next five years (2020 – 2025)
- The development of a comprehensive waste concept for metal powder for our customers

I am therefore very proud to say that we, at SLM Solutions, have created a culture which is not only innovative in terms of our technological advancements, but has also a deeply internalised mindset of environmental consciousness.

In addition to our internal efforts, we maintain an ongoing dialogue with customers, public authorities, and investors to emphasize the positive environmental impact which is naturally embedded in the Additive Manufacturing technology. When compared to traditional manufacturing methods, Additive Manufacturing has a wide range of environmentally related advantages ranging from substantially reduced waste production to optimized products regarding weight and assembly steps, to simplified supply chains. We are very proud that we can thereby contribute to the transition to greener manufacturing.

While we at SLM Solutions are keenly aware that sustainability and an improvement of our environmental impact requires continuous effort, we are happy to share with you our good progress and are confident that we have set a solid basis for the years to come. In the future, we plan to expand on our ESG related reporting to further enhance transparency and to strengthen our active dialogue with all our stakeholders regarding Environmental, Social and Governance matters.

I am happy that you are following our journey towards protecting our planet's scarce resources and I hope that you will find this report both informative and interesting.

Yours sincerely,

Sam O'Leary
Chief Executive Officer
SLM Solutions Group AG

SLM Solutions Direct Environmental Impact and Initiatives for the Conservation of Nature and Resources

Environmental protection and a resource-saving production are part of our core principles and day-to-day activities. Additionally, they are naturally embedded in the core of our technology: Additive Manufacturing. Through our Additive Manufacturing technology, we inherently have not only a significant positive direct environmental impact when compared with traditional manufacturing techniques, but components produced with Additive Manufacturing also have a substantially better environmental footprint:

- **Waste Production:** In comparison with traditional manufacturing methods like casting or machining, Additive Manufacturing produces near zero waste because almost all the metal powder can be processed into a finished metal product. The metal powder which is not directly transformed into the final solid product is up to 95% recyclable.
- **Parts:** Additive Manufacturing allows the reduction of weights and assembly steps due to its design flexibility.
- **Supply Chain:** Additive Manufacturing enables onsite production and therefore significantly reduces the dependency on global supply chains and the negative environmental impact from global logistics (i.e., transportation).

At the same time, environmental consciousness is deeply rooted in our operational practices and systems:

- We use high-efficiency fibre lasers to achieve low power consumption. The efficiency of these lasers is similar to or even higher than the efficiency of LEDs for general lighting.
- Our latest machine generation NXG XII 600 uses the highest efficiency pump on the market for circulating inert gas (65% efficiency).
- The production process takes place in a sealed system. Highest standard fine filters (H14) are used when venting the machine to the atmosphere.
- Any excess metal powder used in the machine gets automatically recycled and is automatically reused during the production process. This is achieved through our fully automated closed loop powder supply system.

Our supply chain is highly localized and most of our suppliers are located in Germany (~86% in 2020)

While we have already achieved key milestones on our way to greater sustainability, we constantly strive to improve our direct environmental footprint with a broad range of processes and initiatives.

Product Stewardship

For newly designed products, we keep a close eye on the environmental sustainability and the efficient use of energy. We are continuously implementing improvements, ideally such that go beyond pure compliance with present statutory requirements. Therefore, we maintain an ongoing dialogue with all relevant stakeholders, among others employees, public authorities, customers, suppliers and investors, on topics of environmental and energy management.

Moreover, we are part of the Additive Manufacturing Green Trade Association (AMGTA), a global trade group that seeks to educate the public and industry about positive environmental benefits of our technology and promotes the adoption of Additive Manufacturing as an alternative to conventional manufacturing methods.

Our engineering and supply chain teams are dedicated to improve the environmental footprint of our existing products. Accordingly, during the last year, we set for ourselves a range of targets and launched several initiatives. These include, but are not limited to:

- 5% reduction in the power consumption of our systems over the next five years (2020 – 2025)
- 10% reduction of the hazardous metal sludge produced from our systems over the next five years (2020 – 2025)
- Initiation of a life cycle assessment for our systems
- Development of a waste concept for metal powder for our customers

Energy Management

We are committed to responsible energy management. Wherever it is cost-effective and technologically possible, we implement energy efficiency measures at our locations and our systems.

ISO Certifications

Besides ISO 9001 (quality management system), we have successfully achieved the ISO 50001:2018 (energy management system) and ISO 14001 certificates (environmental management) confirming that we have already deeply integrated environmental consciousness in our daily operations.

Internal Working Groups

We at SLM Solutions aim to leverage as much internal knowledge, ideas and experiences as possible to generate concepts to improve our environmental footprint. We have therefore established two working groups which strive to actively enhance our environmental impact as well as our energy usage. Both working groups consist of members of all internal departments (procurement, logistics, production, financing, etc.). In regular meetings, progress is discussed, and new actions are initiated. Group members are responsible for the implementation of the defined actions in their respective departments. The topics covered by the working groups include, but are not limited to:

Working group energy

- Energy management, energy savings and energy supply

Working group environment

- Production, reduction, selection and transport of raw materials and inventory
- Water management and water conservation
- Avoidance, recycling, reuse, and disposal of waste
- Environmentally relevant changes to existing production processes and systems

In 2020, these working groups have met regularly and have, together with senior management, agreed on and started a wide range of initiatives:

- Initiation of a R&D project to improve the energy efficiency of our machines
- Definition of electricity consumption and waste reduction targets for our machines

- Initiation of a life cycle assessment project for our machines
- Support in the redesign of the supplier selection and audit questionnaire to incorporate ISO certification, environmental, energy and waste related questions
- Initiation of a project to develop a global waste concept for metal powder for our customers
- Installation of electricity consumption measuring devices for our machines used at the Lübeck site
- Programming of a new electricity and gas monitoring tool

Consumption Data

At our sites, we primarily consume electricity, heat from natural gas, diesel and water. The data for the consumed resources is recorded and analysed regularly in the central energy register. Thus, we can observe trends and identify further reduction potential.

During the last year, we have made considerable progress in monitoring and managing our energy consumption data. The number of electricity meters in Lübeck has been increased considerably, allowing for a more targeted analysis of our electricity consumption. This has facilitated the development of more effective and specific energy saving initiatives. Further, the purchase of electricity has been centralized.

At our sites, a total of 2,782 MWh of electricity was used in 2020, 1,348 MWh of heat (natural gas), 81,446 litre of diesel and 1,813 m³ of water.

Green energy and reduction of energy consumption

With the construction of the new headquarter in Lübeck, which was completed in 2018, we have made a big step towards greener manufacturing. The state-of-the-art building complies with the highest regulatory standards in terms of energy efficiency and insulation. Further, we have decided to install a 191 kWp photovoltaic system on the headquarters' roof which has produced 186 MWh of electricity in 2020. Thus, we have managed to source approximately 7% of our total electricity consumption (2,782 MWh in 2020) through our own PV system. During the summer months, more than 10% of our electricity need was met by our PV system. Currently, already 60% of our externally purchased energy is generated from renewable energy sources.



Picture 1: Modern new SLM Solutions headquarter in Lübeck

CO₂ Emissions

Apart from operating buildings and a vehicle fleet, we do not produce any noteworthy NO_x, SO_x or other particle emissions. Nitrogen and argon gases, which are used in the printing process, are introduced and discharged to the process in a closed loop system to prevent leakage to the atmosphere. Furthermore, both gases are not classified as environmentally endangering.



Picture 2: Solar roof on SLM Solutions headquarter

Corporate Vehicles

We also tackle emissions created by our corporate vehicle fleet. We aim that 75% of our corporate (and employee leased) vehicles either have a plug-in hybrid or are electric by 2030. Currently, our vehicle fleet encompasses 39 vehicles of which 4 (approximately 10%) are equipped with a plug-in hybrid system. The amount of emitted CO₂ is expected to decrease significantly with the gradual transition to plug-in hybrids and electric vehicles.

Scope 1 and 2 (direct and indirect) emissions

The use of a total of 1,348 MWh of heat from natural gas generated 297 tons of CO₂, and the use of 81,446 litre of diesel generated 212 t CO₂ (both classified under Scope 1 ("direct emissions"). Based on the use of 2,782 MWh of electricity, which falls under Scope 2 (indirect emissions), a total of 1,302 tons of CO₂ was generated.

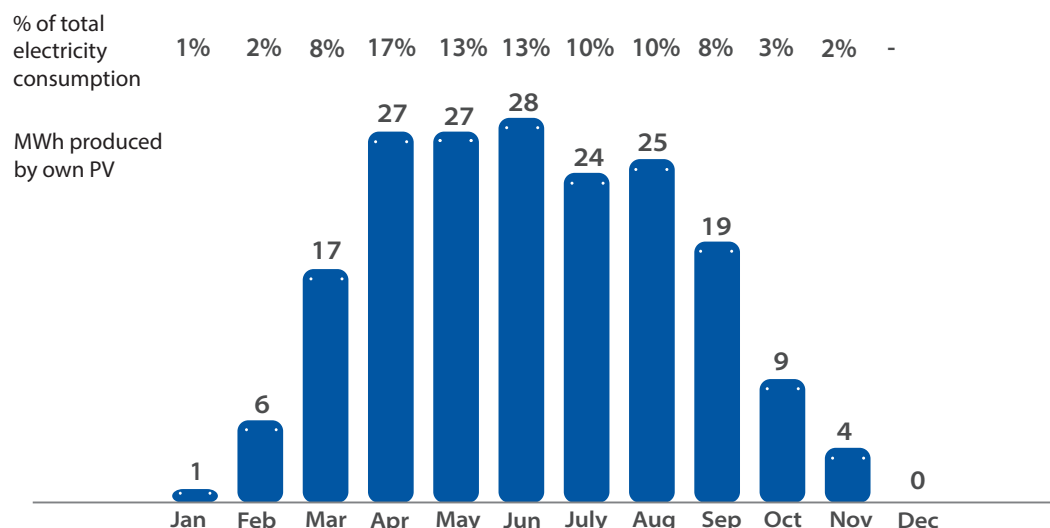


Figure 1: SLM Solutions produced electricity by solar roof and respective contribution to total electricity consumption

Waste Management

We strive towards a responsible and sustainable approach to waste. Our first principle is therefore the avoidance of waste, followed by recycling or other forms of reuse. Only if none of these options are available, we chose an appropriate way of waste disposal. These principles apply both to our daily operations and to our approach in the development process of our technology.

We have created a waste management concept which includes sufficient waste collection points and separates waste according to the statutory requirements

Waste by Category

<i>(in tons)</i>	2020	In % of total
Wood	20.0	22%
Carton, Paper	16.6	18%
Metal Sludge	15.6	17%
Chemicals	15.6	17%
Metal	12.2	13%
Other	12.3	13%
Total Waste	92.3	

Metal sludge

Metal sludge - the part of the metal powder which is not usable anymore - is the main type of waste produced by our machines. For the metal sludge, which at the Lübeck site is predominantly produced through the research and development process, we have established a structured and secure disposal process.

Inside the machine, the metal sludge is collected in a sealed tub. The metal sludge tub is then transferred to a special container, which has advanced characteristics in terms of durability as well as water- and drip-proofness. The sludge is stored at a dedicated, sealed area outside of the production area and is collected by local disposal partners, which dispose the sludge in accordance with statutory requirements. We are in close interaction with these disposal partners to ensure the orderly disposal of the metal sludge.

Waste reduction initiatives

We have already achieved a very high rate of metal powder reusability in our machine. 95% of the powder which is not melted, is sieved within the machine and returned to the printing cycle.

Additionally, we have set ourselves ambitious targets and plan to reduce the waste produced by our machines by a further 10% during the next five years through the

expansion of our PFM (Powder Feed Method) technology as well as through improvements in the powder recycling process.

Further, we see our responsibility to reduce waste along the value chain and this responsibility goes beyond the sale of the machine. Therefore, we are currently developing a global waste concept for metal powder for our customers. This concept aims to provide our customers with the necessary tool kit and knowledge to dispose metal sludge waste in the most environmentally friendly way.

To ensure that broken machine parts are repaired, recycled, or properly disposed of, we currently offer our customers the option to send these parts back to us. In the future, we plan to provide our customers with the necessary knowledge and toolkit to orderly dispose of such parts themselves to further reduce the environmental impact. Therefore, we have started an initiative to develop a machine life cycle assessment.

Hazardous Substances

We currently use 211 hazardous substances at our site in Lübeck. On a regular basis, we perform a substitution test for hazardous substances according to the respective German regulation ("Gefahrenstoffverordnung").

For hazardous substances, we place a focus on the appropriate handling, labelling and storage of these substances. For further information regarding the treatment of hazardous metal sludge, please refer to the section Waste Management.

Water

Water usage

Water does not play a significant role in our production process except for the use of fresh water at our sites. There is no negative impact of the water sources used.

The total water consumption at Lübeck amounts to 1,813 m³ in 2020. We aim to operate and use water sources in a sustainable way and with the overall goal to further reduce freshwater usage.

Secure storage of water hazardous substances like metal sludge

For water-endangering substances, we place a particular focus on the appropriate handling, labelling and storage of these substances.

Packaging

Metal sludge, which is a by-product of the printing process, is collected in containers and stored in a specially built area outside of the production area, preventing it from entering the wastewater system or the ground water. The containers with the sludge are sealed, drip-proof and waterproof. Our storage concept of water hazardous waste is in line with the statutory requirements of the water resource law ("Wasserhaushaltsgesetz") and is approved by the environmental authority.

We have optimized our packaging in two regards: we are using an optimized form factor and significantly increased the amount of renewable materials used, namely cardboard replacing foam and plastics, where possible. As a result, machine packaging for transportation consists of 90% recyclable materials.

Indirect Environmental Impact of SLM® Technology

With our Additive Manufacturing technology, we at SLM Solutions are at the forefront of the transition to greener manufacturing. In comparison to traditional manufacturing methods like casting or machining, Additive Manufacturing and especially our applied technology, Laser Power Bed Fusion (LPBF), will contribute substantially to enhancing the impact of manufacturing on the environment. Additive Manufacturing not only requires less resources but produces more efficient parts and enhances supply chain processes, which all improve the environmental footprint of manufacturing and thus contribute to the global effort to save our planet's resources.

Additive Manufacturing Technology with Significant Environmental Benefits Through Reduced Waste

In Additive Manufacturing, almost all the metal powder can be turned into a metal product. The metal powder which is not directly transformed into the final solid product is up to 95% recyclable and can simply be reused in the next printing job, thus wasting extremely little resources.

From an environmental perspective, this near zero waste manufacturing process is a major improvement to traditional manufacturing methods like machining or casting, where either a significant share of the metal is subtracted or molds are wasted.

Additionally, prototyping with Additive Manufacturing spares significant resources as it allows for easier modifications and eliminates tooling, thus significantly reducing the waste produced.

Parts Produced by Additive Manufacturing Offering Substantial Advantages

Additive manufacturing enables more complex part geometries. The design possibilities enabled by our technology allow our customers to produce parts which not only are better for their intended purpose but also offer distinctive advantages in terms of their environmental impact. The parts produced on our systems show superior characteristics in terms of weight, performance, durability and part count.

Reduced weight of components

Parts manufactured on SLM® machines can be designed and produced with significantly reduced weight compared to traditional manufacturing solutions. Lower weight significantly reduces the fuel and energy consumption of operating for example cars, airplanes and other transportation systems.

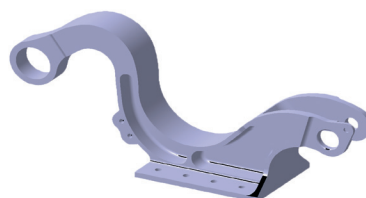
The gooseneck bracket shown in the following pictures is a structural component from a Krueger flap actuation mechanism for an aircraft. Produced on our SLM® 280 2.0, the weight of the component was reduced by 31% from 2,050 g to 1,416 g. According to a study by Deloitte, removing one pound of weight from each aircraft of a 600+ fleet of commercial aircrafts could save about 11,000 gallons of fuel annually.¹

¹ Cotteleer Mark, Holdowsky Jonathan, Mahto Monika, Coykendall John. "3D opportunity for aerospace and defence – Additive Manufacturing takes flight". Deloitte online publication, 13th June 2014

Goseneck bracket: Structural component from Krueger flap actuating mechanism for airplanes

Traditional Manufacturing

Metal Additive Manufacturing



Weight	2.1 kg	1.4 kg	-31%
Buy-to-fly Ratio between weight of raw material & weight of part	17x	1.5x	-91%
# of parts	3 parts	1 part	-67%

As a second example of the successful application of our Additive Manufacturing technology, the lightweight hood hinge² for an automotive engine produced on our SLM® 280 offers weight saving of 52% compared with the existing sheet metal construction.

performance and efficiency. At the same time, parts can be produced with enhanced durability and extended lifetime e.g., by improving the cooling structure which is integrated into the component.

These products do not only increase efficiency and thereby play a substantial part in reducing greenhouse gases by limiting e.g., CO₂ production; but they also save resources as the longer lifespan reduces waste and resources needed for replacement products.

For example, our machines can be used to produce parts for power generating gas turbines. The new design possibilities of our technology enable increased power plant efficiency and thus reduced CO₂ production. The improvements in gas turbine efficiency are achieved by improved cooling solutions which are possible through the production of the part on our machines. Combustor components and turbine components can be designed with more effective cooling channels and cooling air holes. That enables higher turbine inlet temperatures and reduced cooling air consumption, which both improves overall gas turbine efficiency. The same applies to aero engines. Our machines can also be used to produce gas turbine components that lead to reduced NOx and CO emissions into the environment. This is possible by advanced burner designs that are enabled by the geometric freedom of our manufacturing technique.



Picture 4: Weight reduced lightweight hood hinge using SLM® technology (left) and sheet metal part (right)

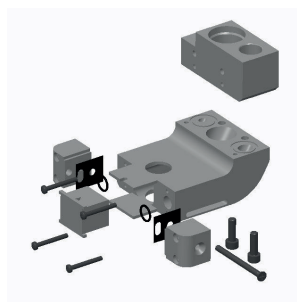
Improved performance and durability increasing efficiency

Making more complex geometries possible, additive manufacturing enables the creation of parts and products that could not have been created with conventional manufacturing methods. This allows our customers to design and produce products with significantly increased

² EDAG, voestalpine Additive Manufacturing and simufact engineering

Reduced number of parts; significant assembly and part consolidation

Due to the design of new and complex shapes, Additive Manufacturing enables the consolidation of components consisting of multiple parts into less or even one single part. This allows not only for significant weight savings and more durable, functionally optimized parts but also reduces energy usage for assembly requirements. The pictures below show an example for a machine component that was consolidated from 18 parts (left image) to one single part through application of our manufacturing technology (right image).



Picture 5: Parts consolidation of a cross-jet unit through application of SLM® technology for Fronius International GmbH

Additive Manufacturing Reducing Supply Chain Complexity

Traditional manufacturing is based on global and complex supply chains. On the contrary, Additive Manufacturing enables the relocation of manufacturing close to the end customers given production costs are largely independent of production location. Our technology therefore enables decentralized, local on-site production, significantly reducing transportation needs and improving of the environmental impact of manufacturing.

Imprint

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