



ROSATOM
ADDITIVE
TECHNOLOGIES



80 YEARS
OF RUSSIA'S
NUCLEAR INDUSTRY

ADDITIVE TECHNOLOGIES

A full cycle of
additive manufacturing



Rosatom Additive Technologies — is an industry integrator of Rosatom State Corporation, established within the structure of TVEL Fuel Company to develop additive manufacturing in Russia.

The integrator combines the expertise of scientific and production enterprises, forming a full-cycle additive manufacturing chain. Rosatom Additive Technologies develops and organises the design and production of powder materials and components, develops and manufactures 3D printing equipment and software, and provides services in the field of additive technologies.

The mission of Rosatom Additive Technologies is to let everyone make innovation a part of everyday life!

Rosatom Additive Technologies is the founder of the Association of Additive Technologies Development, which unites the efforts of industrial enterprises and state corporations in the development of 3D printing in order to form and develop the market of additive technologies in Russia.

Integrator cooperation

The industry chain includes companies involved in the development of additive technologies in various areas: development and production of equipment, 3D printing materials, components and software.



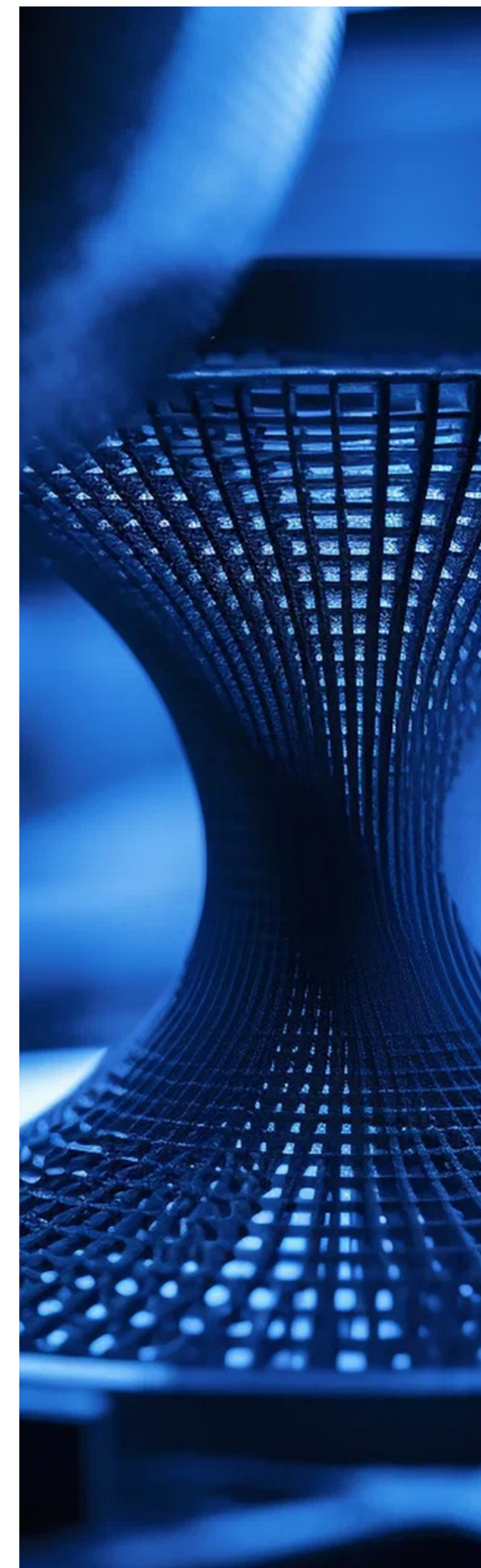
Areas of activities

Products

- Equipment
- Materials
- Components
- Software

Services

- 3D printing
- Topological optimization of the part
- 3D scanning
- Audit of enterprises for the implementation/ optimization of additive technologies
- Trainings and education
- Service maintenance of equipment
- Additive Technologies R&D
- Post-processing

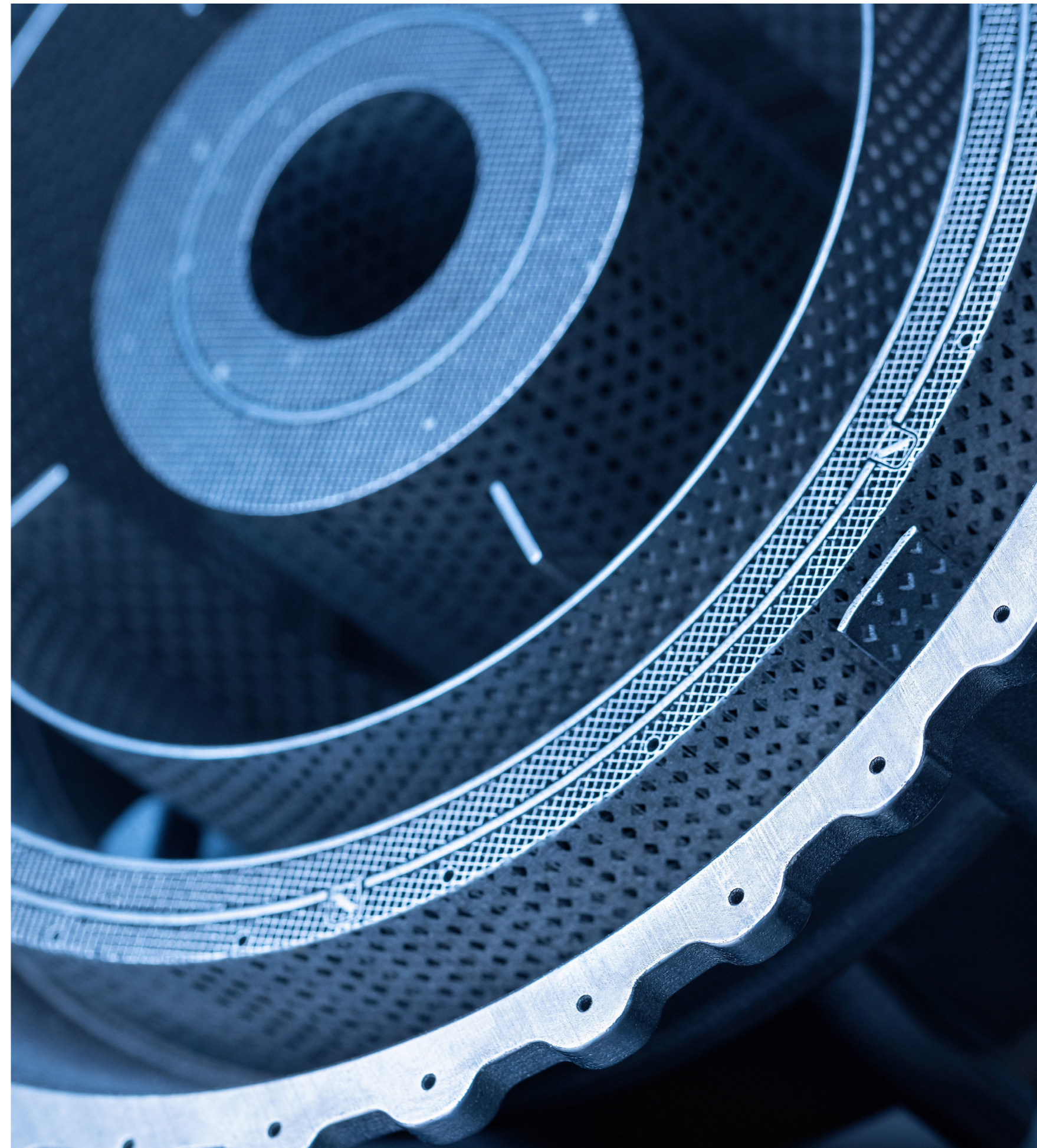


Additive technologies

Application of additive technologies in manufacturing of physical objects made of metal or polymers allows to obtain complex profile thin-walled products, which significantly expands the boundaries of engineering.

No tooling is required to produce prototypes or one-off items, resulting in the shortest possible production time.

The weight of the finished product, production costs and environmental impact are reduced by optimising the use of materials, following the concept of sustainable development.

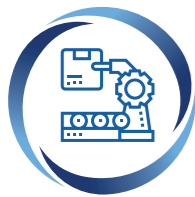


Advantages backed up by numbers



Engineering and product design

- time for new product development is reduced by up to **50 %**
- time to market for new products is reduced by up to **75 %**
- multiple reduction of blank production costs



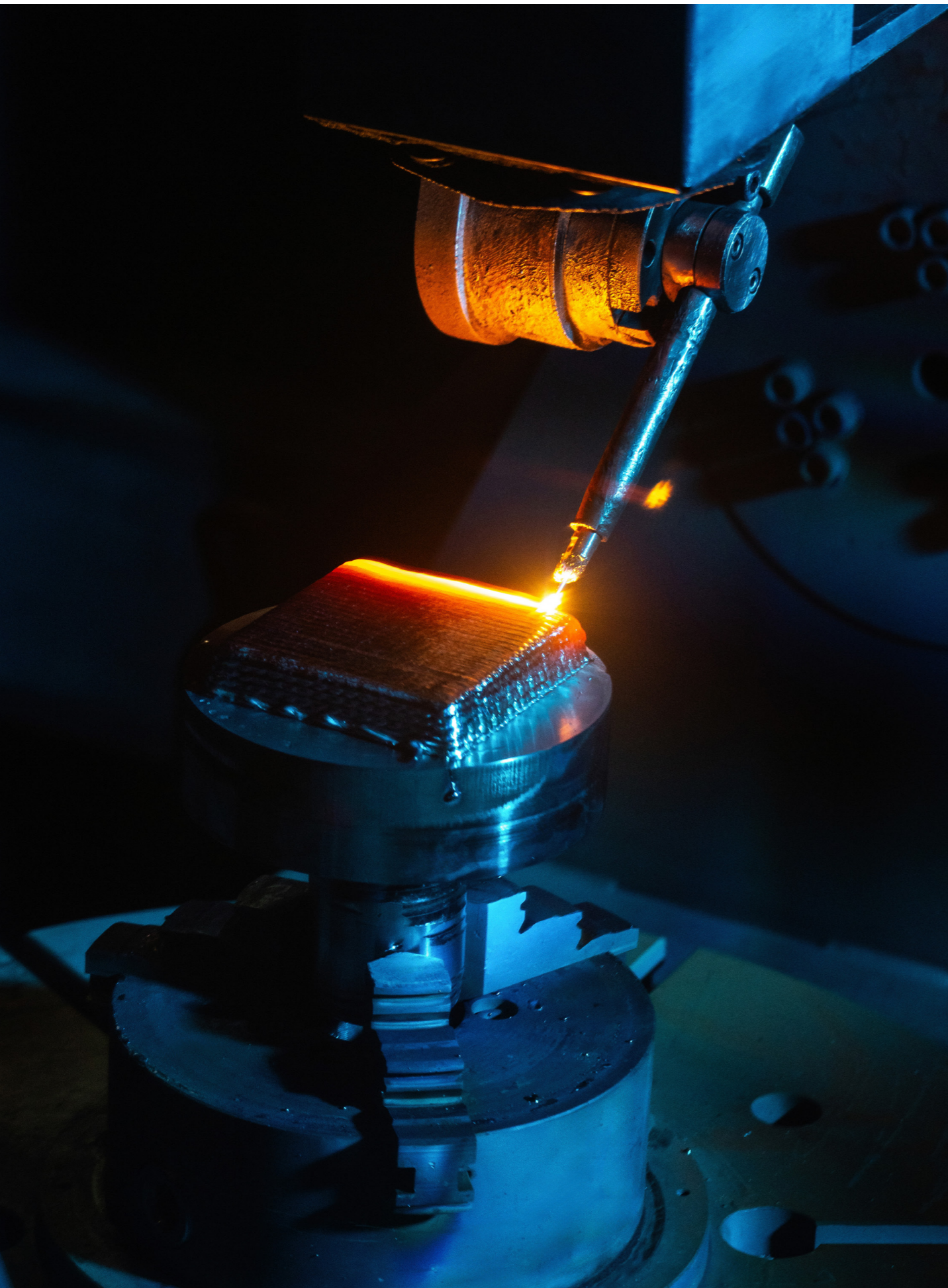
Components production

- material utilisation rate increases by up to **80 %**
- machining costs are reduced up to **2** times
- stock levels are reduced by up to **2** times
- reduction of energy costs by up to **75 %**



Equipment operation and repair

- repair speed of process equipment is increased by up to **60 %**
- costs from production downtime are drastically reduced due to rapid 3D printing of components
- distributed on-demand production without the use of tooling



Products

Rosatom Additive Technologies produces printers for industrial 3D printing using metals, composite, and polymer materials based on SLM, DMD, EBAM, and FDM technologies.

Equipment



Name	RusMelt 600M
Construction area	600×600×600 mm
Number of sources	4 pcs.
Power	4×500 W



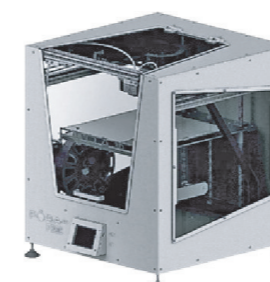
Name	RusMelt 300M (Modification SLS-MPK-310)
Construction area	300×300×370 mm
Number of sources	1-2 pcs.
Power	500 W, 700 W



Name	EBAM Electron beam machine for wire material fused deposition in vacuum
Construction area	1 500×1 200×1 400 mm
Wire diameter	from 0,8 to 3,0 mm
Beam power	up to 60 kW



Name	DMD Laser beam direct energy deposition machine for production of large sized parts
Construction area	1 000×2 000×2 000 mm
Number of working tools	2 pcs.
Capacity	up to 2,5 kg/h



Name	FORA F300 A peripheral device using the fused deposition modeling method (FDM) for production of plastic parts by a digital 3D model
Construction area	300×300×300 mm
Number of extruders	2 pcs.
Table temperature	up to 150 °C
Nozzle temperature	up to 270 °C

Products

Components

Ytterbium fibre laser is a device used for material processing in various additive manufacturing equipment, spectroscopy and rangefinders requiring high level optical power.



Two-axis and three-axis laser scan system is designed for positioning a laser beam in the working area of equipment and integrated in the machines for selective laser melting of metal- and polymer-based powder materials.



Materials for 3D printing

Nickel-based and stainless steel metal powder compositions with target size fractions of 20–63 μm (SLM) and 40–160 μm (DMD) are produced with the pilot production facility. A project is also being implemented to organize the mass production of titanium-, cobalt- and nickel-based powder materials. Materials can be manufactured according to customer specifications.

Stainless steel powder 12X18H10T (Russian analog of AISI 321)

Chemical composition

Element	Cr	Ni	Mn	Ti	Si	Cu	C	P	S	O	Fe	N
Content, %	17-19	9-11	up to 2	5-C-0,8	up to 0,8	up to 0,3	up to 0,12	up to 0,035	up to 0,02	up to 0,03	base	up to 0,03

* "C" specifies the amount of carbon in the steel.

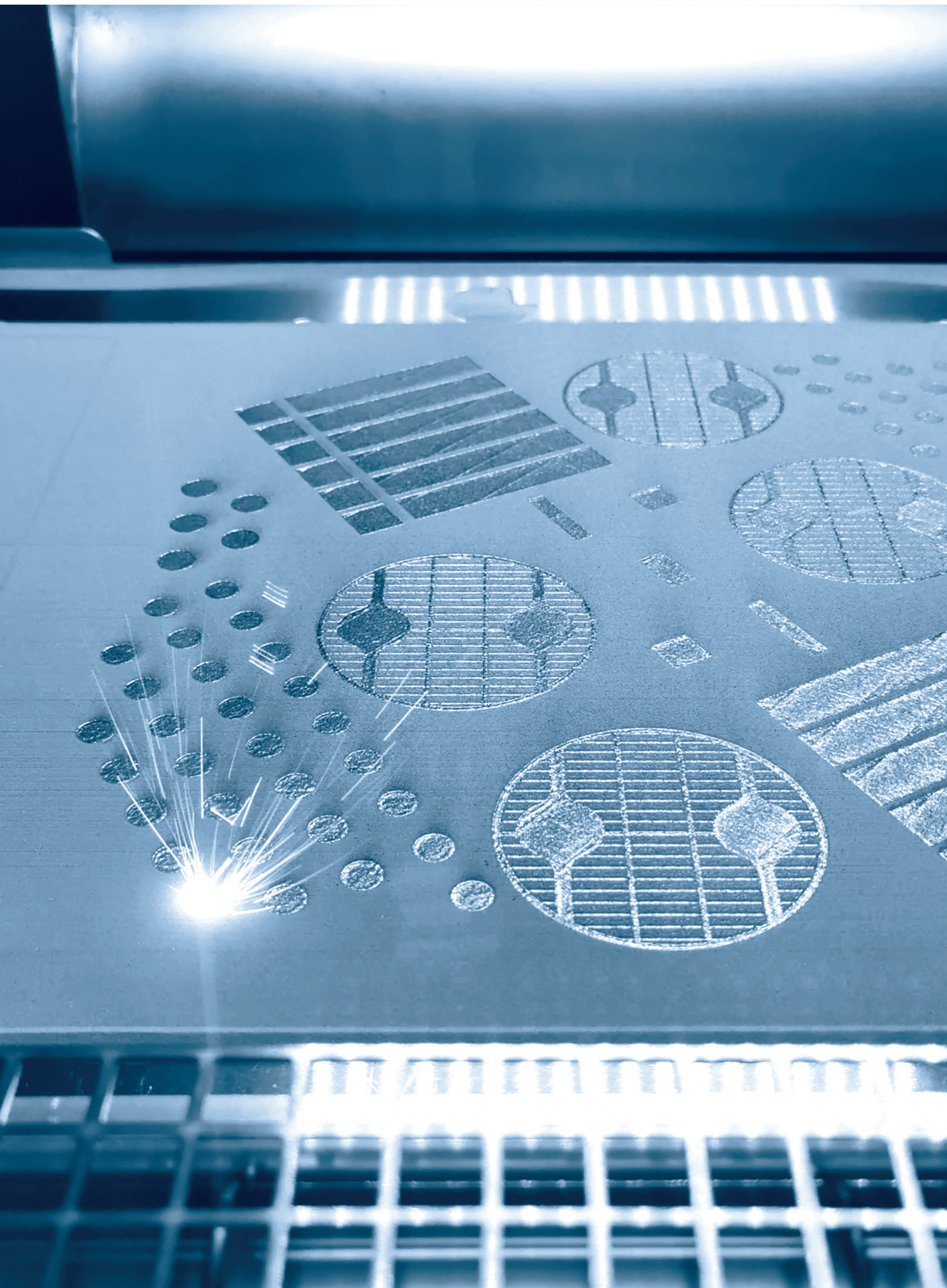
Physical properties of the powder

Weight percent of the base fraction	minimum 90.0 %
Fluidity	maximum 20 sec
Bulk density	minimum 4.5 g/cm ³

Powder particle shape

Spherical (l _{max} /l _{min} from 1.0 to 1.2)	minimum 70 %
Rounded (l _{max} /l _{min} from 1.2 to 2.0)	maximum 25 %
Other shape (l _{max} /l _{min} over 2.0)	maximum 5 %





Company services

Rosatom has established Additive Technology Centres which are demonstration and production sites with a single engineering and development centre to solve innovative tasks of industrial enterprises.



3D printing

The Additive Technologies Centre provides 3D printing services for both metal and polymer products of various complexity and volumes. The Centre uses printers of its own design and those of partner companies, which allow printing products of various sizes in the build area up to 600x600x500 mm.



Training

The course programmes in the field of 'Additive Technologies' are designed to fully immerse specialists in the topic of additive manufacturing - from theoretical foundations to the practical application of additive printing, 3D scanning and software technologies.



Topological optimization of the part

Topological optimization makes it possible to change the standard geometry of a part to geometry specially adapted for additive technology with preservation or improving the functionality of the part



Service maintenance of equipment

Rosatom Additive technologies carries out warranty and post-warranty maintenance of additive equipment, both of our own production and of third-party manufacturers, which includes diagnosis, troubleshooting, operational repair of additive machines.



3D scanning

It is the process of creating a digital copy of a physical object which allows to obtain the most accurate volumetric and mathematical digital models. The use of 3D scanners is effective for copying unique piece parts.



R&D

Research and development work to create equipment, additive manufacturing of products, new materials for 3D printing made in Russia, technologies for their production, as well as the development of normative and technical documentation, technological modes of 3D printing, heat treatment, post-processing.



Audit of enterprises for the implementation/optimization of additive technologies

Rosatom Additive Technologies provides full-cycle services for setting up additive manufacturing. If a company already has 3D printing equipment, Rosatom Additive Technologies specialists will conduct an efficiency analysis and provide recommendations on how to maximise benefits or optimise production processes.



Post-processing

The equipment at the Additive Technologies Center allows the heat treatment of workpieces after a 3D printing cycle, finishing the external and internal surfaces of products (including internal complex-profile channels and cavities).

Industry application of additive technologies



Civil aviation

Unstrained members of fuselage structure and aircraft engines



Space

Elements of liquid-propellant rocket engines



Shipbuilding

Manufacture of propellers, elements of power units



Automobile industry

Engine components, elements of braking systems, lighting, interior



Nuclear power

Manufacture of parts of various dimensions, including internal partitions, anti-debris filters



Medicine

Endoprosthetics, implants, complex surgical instrument



Power engineering industry

Blades and other components of power turbines



Architecture and design

Art objects and prototypes of architectural objects creation



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