



## Press Release

### **Electron beam melting enables customized orthopedic surgery at scale in China**

August 03, 2020 – AK Medical deploys a fleet of eight GE Additive Arcam EBM additive manufacturing machines to address the country’s growing need for orthopedic implants

With the Chinese population aging at a faster pace, each passing year sees an increase in patients with orthopedic conditions. Problems associated with knee joints, hip joints, and the spine have resulted in strong demand for orthopedic products in the country.

[AK Medical](#), a leading player in the domestic orthopedic implant industry, has been successfully using electron beam melting (EBM) additive technology, for over a decade, to create a diverse range of customized implants and devices that respond to Chinese market’s specific needs and to scale its business.

The company ranks as the market leader in China for joint prostheses and was the first company to be approved by the country’s National Medical Products Administration (NMPA) to introduce metal 3D-printed implants to the local market.

Continuous investment in research and development has resulted in five metal 3D-printed orthopedic implants manufactured by AK Medical being certified by the NMPA.

Produced on its fleet of eight GE Additive Electron Beam Melting (EBM) machines, today, AK Medical’s 3D-printed medical devices are used by orthopedic surgeons across China, including at many of the country’s tertiary hospitals.

#### **Rethinking conventional manufacturing methods for implants**

Traditional orthopedic implants are fixed models manufactured in batches, involving a series of processes - from product design to mold design, mold manufacturing, blank die casting, processing, and post-processing - before the final products are delivered to end-users.

So, when it comes to the application process, conventionally manufactured implants rarely fit the specific needs of each patient given that bone morphology varies from person to person and the range of bone tissue eroded by each lesion is different.

In such circumstances, often, when a surgeon inserts an orthopedic implant, they may need to make an incision into the patient’s bone to adapt to the prosthesis if it doesn’t match well, which can lead to a loss of bone tissue.

Additionally, conventionally manufactured spinal implants need to be fixed into place at the front and rear of the abdomen during surgery, and an external fixation device is also needed post-surgery to maintain stability. As a result, some patients may need extended bed rest - typically three months - before the device is removed.

This traditional treatment path for spinal injuries can be marked by surgical complexity, a lengthy recovery time, and heightened pain for certain patients. And, over time, conventionally manufactured implants might be prone to deformation and loosening.

“Our aim is to serve both patients and medical experts,” said Mr. Li Zhijiang, chairman, chief executive officer and executive director at AK Medical. “With our advanced products, we strive to make the treatment of orthopedic conditions more efficient and easier, while bringing about better outcomes and quicker recovery times to our patients.”

### **A decade of experience generating possibilities for today and tomorrow**

Metal additive technology provides greater flexibility by using metal powder to construct orthopedic implants through layered manufacturing and layer-by-layer stacking, thus significantly streamlining the manufacturing process.

This process helps manufacturers reduce lead times and improve customer experience. In contrast with traditional implants, 3D printed orthopedic implants use the same metal materials, but unlike with conventional manufacturing, the trabecular structure is built directly into the part, leading to increased levels of integration between the implant and bone.

AK Medical has been using GE Additive’s powders and Arcam EBM machines for research, design, and manufacturing of three types of orthopedic implants for more than a decade. In that time, the company has adopted three Arcam models: from the first-generation model through to the current [Arcam EBM Q10plus](#) system.

The [EBM process](#) uses an electron beam to melt the metal powder layer by layer to generate high-precision, fully dense parts. This production method makes it particularly suitable for the small-batch production of complex orthopedic implants.

Producing parts in a vacuum environment, EBM provides high melting efficiency, allows for stacking, and reduces the need for post-heat treatment, resulting in considerably improved cost efficiency.

EBM technology provides the ability to save the cost of an acetabular cup on average by 38% when compared to other additive technologies. Orthopedic implants produced with EBM technology perform really well and offer porous structures that are similar to those of regular bone tissue, resulting in enhanced osseointegration.

“We have used EBM technology for more than a decade, so when we recently needed to invest in new machines, we naturally opted for the Q10plus,” said Mr. Li. “The Q10plus system provides a user-friendly interface, a higher precision of processing, and better-quality products. It helps us improve the cost efficiency of both standard production and small-scale customized production.”

As part of its customer support service, GE Additive engineers worked onsite at AK Medical's facility in Beijing, to oversee routine equipment management, the timely replacement of consumables and conduct preventive maintenance for reduced downtime.

Mr. Li noted, “GE Additive’s highly professional service team provides excellent technical support and process control, assuring us of high production efficiency and product quality. Some of the equipment we acquired back in 2009 is now more than ten years old and it is still running well. We trust GE, and that is why we choose them over and over again.”

### **Committed to making customized orthopedic surgery a reality**

One of the benefits of metal additive technology is the ability to customize orthopedic surgery and deal with a range of complex clinical cases that were difficult to solve in the past. In fact, many patients have regained their health with the aid of bespoke 3D-printed orthopedic products.

In 2016, Professor Liu Zhongjun, from the Department of Orthopedics, Peking University Third Hospital, admitted a patient, Mr. Yuan, who was suffering from a rare malignant chordoma.

The tumor had eroded five of his vertebrae, including three thoracic vertebrae and two lumbar vertebrae. In this case, the tumor could only be removed surgically, but healing the large-span bone defects would present a significant challenge when the lesion was removed.

Using EBM technology, Professor Liu worked with AK Medical to develop a customized artificial vertebral body comprising five vertebral pieces similar to the anatomical structure of the patient's body.

A 19-centimeter-long spinal support was created for the Mr. Yuan and Professor Liu also designed four pedicles on the artificial vertebral prosthesis, which were connected to the internal fixation structure, to be secured in the back of the spine.

This integrated front-to-back device greatly enhanced the stability of the patient’s spine. As a result, in an incredible outcome, Mr. Yuan was able to walk freely without wearing any braces just two months after the surgery.

Mr. Yuan was the first patient to benefit from the NMPA-certified metal 3D-printed artificial vertebral body, which was developed jointly by AK Medical and Peking University Third Hospital.

This metal 3D-printed orthopedic implant not only better meets the needs of the patient, it also provides a longer service life, resulting in reduced patient pain and medical costs.

### **Deploying Additive on an Industrial Scale**

Since 2009, when the first EBM machine was introduced at AK Medical, the company has established a large-scale 3D-printing footprint in China, including Beijing AKEC Medical Co., Ltd.; Changzhou Tianyan Medical Co., Ltd.; and, overseas with JRI Orthopaedics in the UK.

As it scales its additive business, AK Medical has made continuous improvements and is committed to developing innovative orthopedic applications. The company works closely with leading clinical and R&D experts to address and overcome various challenges; applying a closed loop approach to 3D-printing technology development - from exploration to standardization, registration and certification.

AK Medical has also taken part in the formulation of several local industry standards for 3D-printed medical devices and is committed to improving the relevant legislation and regulations relating to their use.

On January 1, 2020, "Regulations on the Supervision and Management of Customized Medical Devices (Tentative)," jointly published by the NMPA and the National Health Commission came into effect, ushering in a great opportunity for 3D printing in China's medical device industry.

Moving forward, AK Medical will focus primarily on 3D printing technology, while simultaneously focusing on developing its multiple business lines. These initiatives will consolidate its leadership position in China, while actively developing international markets.

The company plans to expand its focus into other orthopedic areas beyond bone joints, and leverage 3D printing to create products for more applications. In parallel, Mr. Li and his teams will continue to improve product quality and efficiency.

"We look to the future full of confidence," said Mr. Li. "Additive technology itself is tremendously advantageous in terms of cost, and personalized customization is increasingly becoming an industry trend. And when you begin think of it in combination with CT, nuclear MRI, software, the Internet, 5G and many other technologies, then additive is likely to unleash greater potential to boost the entire medical industry."

### **About GE Additive**

[GE Additive](#) – part of GE (NYSE: GE) is a world leader in additive design and manufacturing, a pioneering process that has the power and potential to transform businesses. Through our integrated offering of additive experts, advanced machines and quality materials, we empower our customers to build innovative new products. Products that solve manufacturing challenges, improve business outcomes and help change the world for the better. GE Additive includes additive machine providers Concept Laser and Arcam EBM; along with additive material provider AP&C.

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Examples of AK Medical implants manufactured on Arcam EBM machines.  
(Photo: AK Medical)



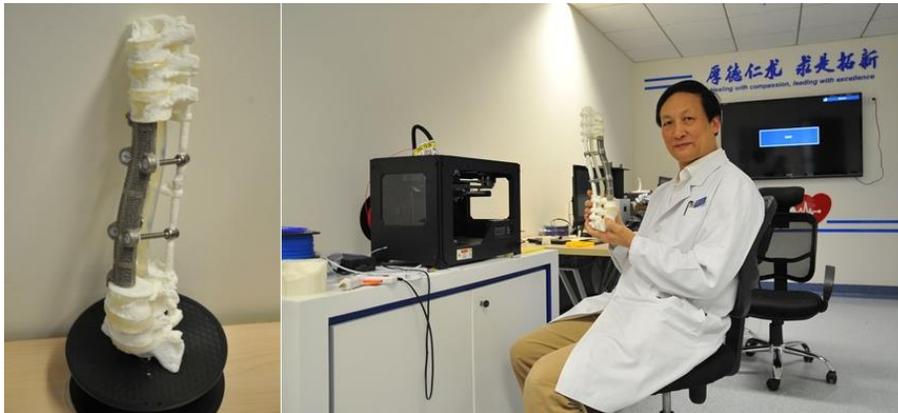
Mr. Li Zhijiang, chairman, chief executive officer and executive director at AK Medical.  
(Photo: AK Medical)



Arcam EBM Q10plus machines installed at AK Medical's Beijing facility.  
(Photo: AK Medical)



Operator using Arcam EBM equipment at AK Medical's Beijing Facility.  
(Photo: AK Medical)



Professor Lui pictured with implants manufactured for patient Mr. Yuan.  
(Photo: Peking University Third Hospital)

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