制造能力
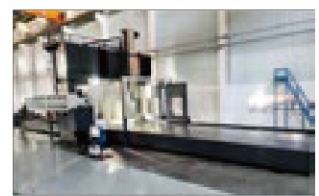### Manufacturing Capabilities

尼古拉斯五面铣龙门加工中心
Nicholas Five-Face Gantry CNC Center

美国哈斯 ST40 卧式数控车床
American Haas ST40 Horizontal CNC Lathe

日本新潟卧式加工中心
Japan Niigata Horizontal CNC Center

台湾亚威五面体龙门加工中心
Taiwan AWEA Pentahedron Gantry Machining Center

大型定制抛丸设备
Large custom shot blasting equipment

大型回火时效炉
Large tempering and aging furnace

检测能力
Detection Capabilities

美国雷顿三坐标检测仪
American Leader Three-Coordinate Measuring Machine

英国雷尼绍激光干涉仪
UK Renishaw Laser Interferometer

英国雷尼绍精密转台
UK Renishaw Precision Rotary Table

英国雷尼绍球杆仪
UK Renishaw Ballbar

瑞典 Easylaser 激光校准仪
Swedish Easylaser Laser Alignment Instrument

英国雷尼绍 RTCP 标定仪
British Renishaw RTCP calibrate

CLAM™增材制造应用场景
CLAM™ Additive Manufacturing Application Scenarios

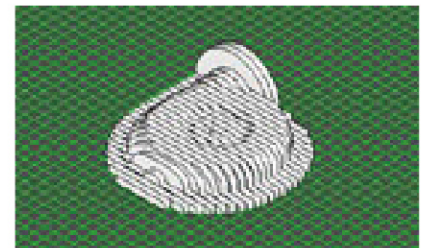通过不同的产品组合，将您的创意高效率、低成本地转化为CLAM™工艺产品，为创新提速。
Through different product combinations, we can efficiently and cost-effectively transform your ideas into CLAM™ process products to accelerate innovation.
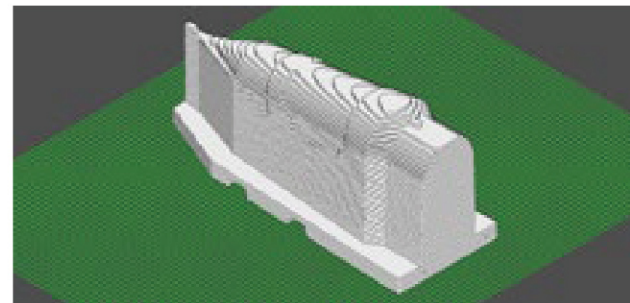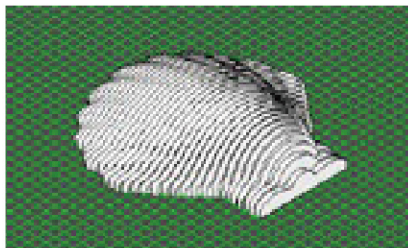

航空铺贴工装
Aviation paving tooling

航空裁切胎具
Aviation cutting jig

铸造模具
Casting mold

吸塑模具
Blister mold

吸塑模具
Blister mold

晨灿机械
CHENcan machine

晨灿机械
CHENcan machine

CLAM™贝壳增材
智能制造系统

利用无法传统3D打印的材料获得增材制造优势
构建大型、近净形状的增材零件

CLAM™ Shell Additive
Intelligent manufacturing system

Gain the benefits of additive manufacturing with materials that cannot be printed using traditional 3D printing
Build large, near-net-shape additive parts

企业简介
Company Profile

山东研发生产基地
Shandong R&D and Production Base

江苏研发生产基地
Jiangsu R&D and Production Base

晨灿机械创立于 1998 年，是行业领先的 CNC 数控加工解决方案服务商，以创新的产品和及时的服务助力全球企业降本增效，改善工作环境。26 年来，我们一直秉承诚信、重品质的服务宗旨，已为全球 70 多个国家和地区的 12000 余家企业提供高性价比的数控产品与服务。

晨灿机械总部座落于素有"九达天衢、神京门户"的山东省德州市，使用面积 60000 多平方米，拥有各类专业技术人才和高级技工 200 余人，研发人员占比超过 10%，自主研发生产多款软件、关键零部件。公司现有山东齐河、江苏泗洪两大产基地。各产研基地均通过 ISO9001 质量管理体系认证、CE 认证，配有高端的生产设备和检测仪器，结构件全部厂内自主加工，质量稳定、交期可控。

晨灿机械致力探索与创新，愿意与学术界、产业界一起共同探索数控加工技术的前沿，推动创新升级、不断为行业创造价值。

我们近十年已累计投入研发费用超过一亿元。截至 2023 年底，已申请发明及实用新型专利 130 余项，多款产品获 2017、2019、2022 年度《首台（套）技术装备和关键核心部件》认定，同时，被机械工业协会鉴定为国内的领先水平，入选江苏省《重点推广应用的新技术新产品目录》，获得高新技术企业认定、科技型中小企业认定、专精特新中小企业认定等 10 余项荣誉。

晨灿机械坚定不移地与全球产业和生态伙伴一起，深度参与不同行业的合作，促进跨领域、跨技术和跨手段的交流和协作，携手推进数控加工技术的快速发展。

Founded in 1998, Chencan Machinery is an industry-leading CNC machining solution service provider, helping global companies reduce costs, increase efficiency and improve the working environment with innovative products and timely services. For 26 years, we have been adhering to the service tenet of integrity and quality, and have provided cost-effective CNC products and services to more than 12,000 companies in more than 70 countries and regions around the world.

Chencan Machinery is headquartered in Dezhou City, Shandong Province, and enjoys the reputation of "convenient road transportation and a hub for many roads. The location is extremely important and superior". The usable area is more than 60,000 square meters, with more than 200 professional and technical personnel and senior technicians, and R&D personnel account for more than 10%. They independently develop and produce a variety of software and key components. The company currently has two major production and research bases in Qihe, Shandong and Sihong, Jiangsu. All production and research bases have passed ISO9001 quality management system certification and CE certification, and are equipped with high-end production equipment and testing instruments. All structural parts are independently processed in the factory, with stable quality and controllable delivery time.

Chencan Machinery attaches great importance to exploration and innovation, and is willing to work with academia and industry to explore the frontiers of CNC machining technology, promote innovation and upgrading, and continuously create value for the industry. We have invested more than 100 million yuan in research and development in the past decade. As of the end of 2023, more than 130 invention and utility model patents have been applied for, and many products have been recognized as the "First Set of Technical Equipment and Key Core Components" in 2017, 2019, and 2022. At the same time, it has been identified as a domestic leading level by the Machinery Industry Association and selected into the Jiangsu Province's "Catalogue of New Technologies and New Products for Key Promotion and Application", and has won more than 10 honors including high-tech enterprise certification, science and technology-based small and medium-sized enterprise certification, and specialized and new small and medium-sized enterprise certification.

Chencan Machinery develops and produces various types of five-axis linkage CNC gantry machining centers, composite plate sawing and milling machining centers, three-dimensional five-axis laser cutting machines, eight-axis welding robots, industrial-grade large-scale 3D additive and subtractive integrated machines and other high-end CNC equipment, which are widely used in aerospace, wind power generation, rail transportation, new energy vehicles, shipbuilding, medical equipment, casting molds and other fields.

Chencan Machinery is unwaveringly working with global industry and ecological partners to deeply participate in cooperation in different industries, promote cross-domain, cross-technical and cross-means exchanges and collaborations, and work together to promote the rapid development of CNC machining technology.

什么是CLAM™贝壳增材
What is CLAM™ Shell Additive

晨灿机械CLAM™贝壳增材背后的核心理念是，使无法打印的材料利用先进的技术以简单、低成本方法获得增材制造的优势。

与传统的LSFDM技术的增材打印相同的是，零件分别制造、彼此堆叠、形成成形以外壳。不同的是CLAM™贝壳增材技术的制造过程并不是并非打印这些层，而是使用专业的先进技术将材料进行切片并组装而成。通过晨灿机械CLAM™贝壳增材智能制造系统，实现了对大型工件进行切片增材的高效制造。

The core concept behind Chencan Machinery's CLAM™ shell additive is to enable unprintable materials to gain the advantages of additive manufacturing in a simple, low-cost way using advanced technology.
Similar to traditional LSFDM technology additive printing, parts are manufactured in layers, stacked on top of each other, and form a hollow shell. The difference is that the manufacturing process of CLAM™ shell additive technology is not to extrude and print these layers, but to slice and assemble the materials using professional advanced technology. Through Chencan Machinery's CLAM™ shell additive intelligent manufacturing system, efficient manufacturing of sliced additives for large workpieces is achieved.

CLAM™贝壳增材技术特点
Features of CLAM™ Shell Additive Technology

全新的增材方式
A new way to add materials

当我们说"增材制造"时，人们通常会想到 3D 打印，但实际上，增材制造通过添加材料而不是减去材料来制造零件。CLAM™贝壳增材是一种计对大型零件实现此目的的全新方法。

When we say "additive manufacturing" people often think of 3D printing, but additive manufacturing actually creates parts by adding material rather than subtracting it, CLAM™ Shell Additive is a new way to do this for large parts.

超强的通用性
Super versatility

CLAM™贝壳增材可以简单地加工或切割出材料层并将它们添加到彼此的顶部。它适用于任何可切割或机加工的材料。

CLAM™ Shell Additive can simply machine or cut out layers of material and add them on top of each other. It works with any material that can be cut or machined.

颠覆传统
Subverting tradition

与几乎所有3D打印技术相同的は，在不计成本的前提下，虽然通过传统工艺也可以使用相同材料与方式来制造大型工件、工装和模具。
创建 CNC 数料程序来加工数百个单独的层段，而且这些层段必须全部精确地结合在一起以制造单个零件，这实际上是一项难且の编程任务，使用传统编程方式不可能会缓实现。
编程成本将超过任何可能节省的成本。
而CLAM™贝壳增材智能制造系统则帮助用户把这一部分成本抹抹去了。

As with almost all 3D printing technologies, large workpieces, tooling, and molds can be manufactured using the same materials and methods through traditional processes, regardless of cost.
Creating a CNC nesting program to process hundreds of individual layers that must all mesh together precisely to make a single part is actually a difficult programming task that is not reasonably possible using traditional programming methods.
The programming costs will exceed any possible cost savings.
The CLAM™ Shell Additive Intelligent Manufacturing System helps users completely eliminate this part of the cost.

更快的创新速度
Faster innovation

整个CLAM™贝壳增材制造过程（切割和组装）对比热塑性增材打印机生产相同的近沙形状零件至多花费相同时间，对于某些材料，速度可以更快，有时甚至快很多。

The entire CLAM™ AM process (cutting and assembly) takes at most the same time to produce the same near-net-shape part using a thermoplastic AM printer. For some materials, it can be faster, sometimes much faster.

更低的创新成本
Lower innovation costs

CLAM™贝壳增材以几乎令人难以置信的低成本制造大型工业零件、工具和模具。
CLAM™ Shell Additive makes large industrial parts, tools and molds at an almost unbelievable low cost.

智能制造
Smart Manufacturing

不需要用户输入CNC数料程序，晨灿机械CLAM™贝壳增材智能制造系统通过智能技术，在本质上知道如何制造CLAM™贝壳增材层段零件。
只需要简单三步，用户就可以使用晨灿机械CLAM™贝壳增材工艺制造出想要的大型工件、工装和模具。
第一步：导入描述外形的 CAD 文件，不需要详细细节，只需要基本形状即可。
第二步：定义加工余量、壳体厚度、使用板材信息，以及如何分割层段零件。
第三步：等待系统生产层段零件，拾料并按指示拼接成为最终CLAM™贝壳增材工艺的零件。

There is no need for users to input CNC nesting programs. Chencan Machinery's CLAM™ shell additive intelligent manufacturing system uses intelligent technology to essentially know how to manufacture CLAM™ shell additive layer segment parts. In just three simple steps, users can use Chencan Machinery's CLAM™ shell additive process to manufacture the desired large workpieces, tooling and molds.
Step 1: Import a CAD file that describes the shape. No detailed details are required, only the basic shape is needed.
Step 2: Define the machining allowance, shell thickness, plate information, and how to split the layer segment parts.
Step 3: Wait for the system to produce the layer segment parts, pick up the materials and splice them as instructed to become the final CLAM™ shell additive process parts.

CLAM™贝壳增材工艺优势
CLAM™ Shell Additive Process Advantages

★ 使用该工艺生产的零件有着惊人的低成本优势。
★ 实现该工艺的增材制造设备的采购与使用成本很低。
★ 大型零件可以由任何可加工的材料制成，包括有色金属。
★ 与制造大型工业零件的其他非增材方法相比，它的速度更快。
★ 可处理诸特的产品，例如高填充热固性复合材料。
★ 对零件几何形状的限制很小。
★ 通过该工艺所制作的工装支持带有复杂的内部冷却管路。
★ 对可生产的零件尺寸没有实际限制。

★ Parts produced using this process are incredibly low-cost.
★ The AM equipment that enables this process is inexpensive to purchase and operate.
★ Large parts can be made from any machinable material, including nonferrous metals.
★ It is faster than other non-additive methods for making large industrial parts.
★ Unique products such as highly filled thermoset composites can be processed.
★ Few restrictions on part geometry.
★ Tooling produced using this process supports complex internal cooling lines.
★ There is no practical limit to the size of parts that can be produced.
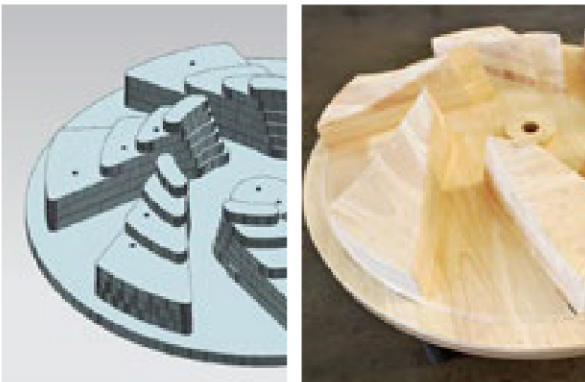
如何使用CLAM™贝壳增材智造系统
## How to use the CLAM™ additive manufacturing system

只需要简单三步，就可以使用CLAM™贝壳增材工艺制造出想要的大型工件、工装和模具。
In just three simple steps, you can use the CLAM™ shell additive process to manufacture the large workpieces, tools and molds you want.

Step 1 加载模型 / Loading the model

• 支持STEP格式1的模型导入。
• 支持选择模型底面2的功能。
  1：所有主流设计软件均支持将设计导出为STEP格式。
  2：可矫正设计软件的模型坐标系与CLAM™贝壳增材智造系统的坐标系。

• Supports import of models in STEP format 1.
• Supports the function of selecting the bottom surface of the model 2.
  1: All mainstream design software supports exporting designs to STEP format.
  2: Can correct the model coordinate system of the design software and the coordinate system of the CLAM™ shell additive manufacturing system.
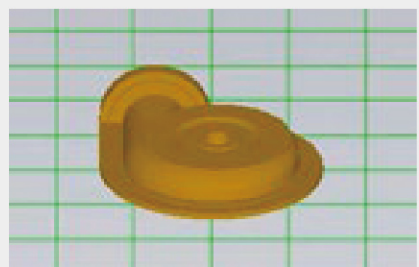
01 点击应用上方动作栏 按钮打开文件加载弹出。
Click the button on the upper action bar of Apply to open the file loading pop-up window.

02 选择您要处理的文件，点击打开按钮，将模型加载到系统内。
Select the file you want to process, click the Open button, and load the model into the system.

03 如果加载的模型旋转方向与实际加工方向不同，可选中正确模型底面后，通过应用上方动作栏 按钮(快捷键：F)重新设置模型底面。
If the rotation direction of the loaded model is different from the actual processing direction, you can select the correct model bottom surface and reset the model bottom surface by clicking the button on the upper action bar of Apply (shortcut key: F).
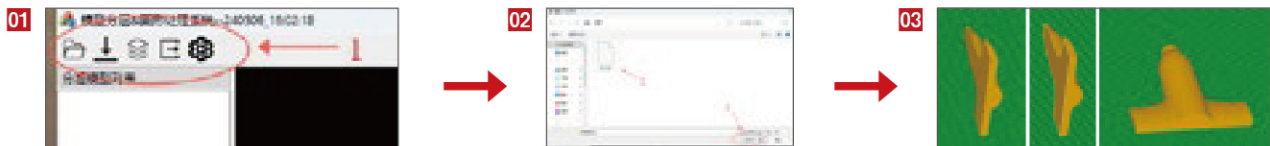
Step 2 层块分割 / Layer block segmentation

根据所要制造产品的特性选择合适的层厚、壳体壁厚、最小加工余量等参数将模型分割。
根据实际情况将每层进一步切分为层块。

According to the characteristics of the product to be manufactured, select appropriate layer thickness, shell wall thickness, minimum processing allowance and other parameters to divide the model into layers.
According to the actual situation, each layer is further divided into layer blocks.
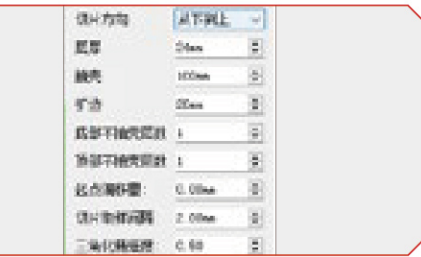
01 点击应用上方动作栏 按钮打开切片配置弹窗。
Click the button in the action bar above the application to open the slicing configuration pop-up window.

02 配置完成后，点击 确定 按钮开始模型切片。
After configuring the parameters, click the button 确定 to start model slicing.

03 软件左侧显示分层列表，可以对每层轮廓进行查看，并选中需要进一步分割层块的层。
The layer list is displayed on the left side of the software. You can view the outline of each layer and select the layer that needs to be further divided into layers.

3.1 可在分层列表点击右键，对选中层的厚度进行调整。该调整不会影响其他层的厚度。
You can right-click in the layer list to adjust the thickness of the selected layer. This adjustment will not affect the thickness of other layers.

04 在分层列表左键点击选中需要切块的层，3D预览界面将展现所选中层的模型，2D操作界面可以对选中层进行进一步处理。
In the layer list, left-click to select the layer to be sliced. The 3D preview interface will show the model of the selected layer, and the 2D operation interface can further process the selected layer.

### Step 3 拾料拼装 / Picking up materials and assembling

CLAM™贝壳增材智造系统可自动将所有层块以优先套料早期拼接层的策略进行生产。
系统将自动导出始料指导图、拼接指导图来引导装配工人的操作。
系统支持贴标、油墨喷码、激光蚀刻等多种标记方式简化始料操作。
系统支持生成定位销安装孔、拼接关节等多种定位方式简化拼接操作。

CLAM™ Shell Additive Manufacturing System can automatically produce all layers with the strategy of prioritizing the early splicing layer.
The system will automatically export the material picking guide map and splicing guide map to guide the assembly workers' operation.
The system supports labeling, inkjet coding, laser etching and other marking methods to simplify the material picking operation.
The system supports the generation of positioning pin installation holes, splicing joints and other positioning methods to simplify the splicing operation.
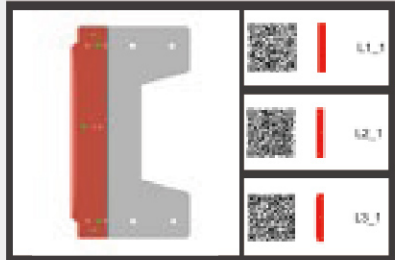
CLAM™增材智造生产组合
CLAM™ Additive Manufacturing Production Portfolio

CLAM™预处理软件
CLAM™ Preprocessing Software
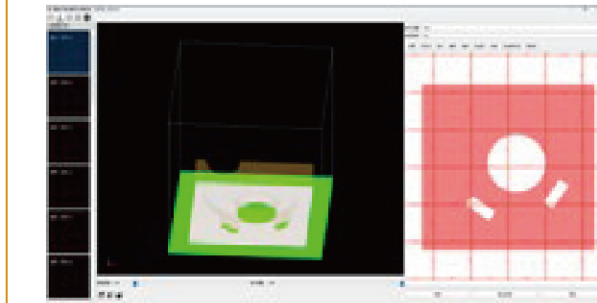
CLAM™贝壳增材预处理软件可以通过简单的操作，让您完全舍弃传统很注中繁杂的编程过程，使大尺寸工件、工装和模具的低成本快速制造成为可能。

CLAM™ Shell Additive Pre-processing Software allows you to completely abandon the complicated programming process in traditional practices through simple operations, making low-cost and rapid manufacturing of large-sized workpieces, tooling and molds possible.

其他辅助装备
Other Auxiliary Equipment

更多自动打标、打磨、喷涂、拾料、拼装等装备正在完善中……

More automatic marking, grinding, spraying, picking, assembly and other equipment are being improved……

大型数控加工中心
Large CNC Machining Center

将通过CLAM™贝壳增材工艺制造的工件高效高精的修整、完成最终产品的加工。

The workpieces manufactured by the CLAM™ shell additive process are efficiently and accurately trimmed to complete the processing of the final product.

晨灿机械CLAM™贝壳增材智能裁床
CLAM™ Shell Additive Intelligent Cutting Machine

• CLAM™贝壳增材智能裁床可实现与晨灿机械CLAM™贝壳增材预处理软件的无缝智能交互。
• 专为CLAM™贝壳增材智造工艺而设计。
• 机器知道如何从简单的CAD模型制作CLAM™贝壳增材零件。
• 自动创建加工每一层坯所需的CNC数料程序。
• 自动打印每个层块的位置信息，告诉您它在该层上的位置。
• 自动在每个零件上打印二维码，以便在需要时轻松重新加工零件。
• 自动在层块之间加工连接接头，以加强拼接的完整性。
• 自动钻定位销对准孔以提供精确的层与层对准信息。
• 自动在每个零件上打印销钉插入标记，以进一步简化组装。
• 自动错开每层�块头位置以获得更坚固的结构。
• 自动在两层或多层之间粘结连接孔并攻丝，以便金属工件可以用螺栓固定在一起。
• 自动加工工件内部加热或冷却流体的内部通道。
• 自动换刀装置最多可容纳12个刀具，满足不同的工艺需求。

• CLAM™ Shell Additive Intelligent Cutter can realize seamless intelligent interaction with Chencan Machinery CLAM™ Shell Additive Pre-processing Software.
• Designed for CLAM™ Shell Additive Intelligent Manufacturing Process.
• The machine knows how to make CLAM™ Shell Additive parts from simple CAD models.
• Automatically create the CNC nesting program required to process each layer block.
• Automatically print the position information of each layer block to tell you where it is on that layer.
• Automatically print a QR code on each part so that parts can be easily reprocessed when needed.
• Automatically process connecting joints between layer blocks to strengthen the integrity of the splicing.
• Automatically drill locating pin alignment holes to provide precise layer-to-layer alignment information.
• Automatically print pin insertion marks on each part to further simplify assembly.
• Automatically stagger the joint positions of each layer block for a stronger structure.
• Automatically drill and tap connecting holes between two or more layers so that metal workpieces can be bolted together.
• Automatically process internal channels for heating or cooling fluids inside the workpiece.
• The automatic tool changer can accommodate up to 12 tools to meet different process needs.