

数控径向锻造压机生产线
CNC Radial forging machine production line

青岛海德马克智能装备有限公司
Qingdao HDMECH Intelligent Equipment Co.,LTD.

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HDMECH
QINGDAO HDMECH INTELLIGENT EQUIPMENT CO.,LTD

精细化的产品 国际化的海德马克

www.hdmech.com

公司简介 Company Profile

青岛海德马克智能装备有限公司（“海德马克”或“公司”）原青岛华东工程机械有限公司，成立于1994年10月28日，注册资金6166万元，位于青岛市高新技术产业开发区春阳路北侧、思源路西侧，公司厂区占地面积13.9万平方米（208亩），总资产3.57亿，现有员工170余人。

海德马克，是一家从事智能化生产线、机器人、物联网技术研发、设计、制造、销售、服务于一体的国家高新技术企业。主要产品包括：冰箱（冷柜）智能化生产线、洗衣机智能化生产线、油烟机智能化生产线、热水器智能化生产线、工业机器人、智能无人高精密锻造操作装备、径锻机、智能数控碾环机、智能数控热处理装备等。

海德马克，先后服务于海尔、海信、美的、澳柯玛、TCL、GE、格力、倍科、一重、二重、上重、太重、沈重、大连华瑞、无锡叶片、马钢、宝钛以及德国罗特艾德等知名企业。

Qingdao HDMECH Intelligent Equipment Co. Ltd. (“HDMECH”) Qingdao Huadong Engineering Machinery Co. Ltd., founded in October 28, 1994, registered capital of 61.66 million yuan, is located in Qingdao high tech Industrial Development Zone, between the north of Chunyang Road, and the west of Siyuan Road, the company covers an area of 139 thousands square meters (208 acres), with total assets of 357 million and enrolled employees more than 170.

HDMECH, is a national high-tech enterprise engaged in the R&D, designing, manufacturing, sales of home appliance intelligent production line, robot, internet of things technology. The main products include: refrigerator (freezer) intelligent production line, wash machine intelligent production line, kitchen ventilator intelligent machine production line, heater intelligent production line, intelligent unmanned-operation high precision forging equipment, industrial robots, intelligent CNC ring rolling machine, radial forging machine, intelligent CNC heat treatment equipment etc..

HDMECH has been supplied production line for Arcelik, Haier, Hisense, Midea, AUCMA, GREE, TCL, GE, and CFHI, CNEG, TAYOR, TYHI, NHI, DHHI, WTB, MIS, BaoTi and Germany Rothe Erde and other famous enterprises.

国家高新技术企业
山东省企业技术中心
青岛市液力装备工程技术研究中心
多个创新研发项目列入国家、省市重点技术创新项
60t数控重载锻造操作机技术被列入2010年度国家火炬计划
1000kg全液压重载机器人项目列入国家扩大内需重点资金支持项目
智能无人高精密锻造操作装备（800KN）被评为2015年度山东省首台套技术装备
260t锻造操作机项目获得青岛市重点技术攻关项目
数控精密锻造基层技术研发，被列入青岛市关键技术攻关计划
“18MN径向锻造压机、径向锻造操作机”被认定为2014青岛市企业技术创新重点项目
冷柜全自动钣金铆接线开发被列入青岛市企业技术创新重点项目计划
对开门冰箱门壳自动化生产线的开发被列入青岛市企业技术创新重点项目计划
洗衣机全自动内筒成型线的开发被列入青岛市企业技术创新重点项目计划

National high-tech enterprise
Shandong Enterprise Technology Center
Qingdao hydraulic equipment Engineering Technology Research Center
A number of innovative R & D projects included in the national, provincial key technological innovation projects
60t CNC heavy duty forging manipulator technology was included in the 2010 National Torch Program
1000kg all hydraulic heavy duty robot project included in the national expansion of domestic demand key funding projects
Intelligent unmanned operation high precision forging equipment (800KN) was named the 2015 annual Shandong province first sets of technical equipment
The project of 260t forging machine has been awarded the key technical project of Qingdao
CNC precision forging technology research and development, has been included in the key technology projects in Qingdao
"18MN radial forging press, radial forging manipulator" was identified as the 2014 Qingdao enterprise technology innovation key projects
Refrigerator automatic sheet metal rivet line development was included in the key projects of Qingdao city enterprise technology innovation plan
The development of the automatic door shell production line of the French door refrigerator was included in the key project of Qingdao enterprise technology innovation
The development of full automatic washing machine drum forming line of was included in the key project of enterprise technology innovation in Qingdao

技术专利 Technology Patents

装料取料伺服仿真机械手发明专利
生产线传输对中机构及其方法发明专利
金属板料滚边装置及其方法发明专利
机械手及其夹持方法发明专利
钣金件复合加工模具及其方法发明专利
装出料机及其控制方法发明专利
机械手控制系统及控制方法发明专利
自动对中装置、对中方法及带有此装置的仿真手柄发
冰箱隐形门折弯模具及其折弯方法发明专利
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Patent of loading and reclaiming servo simulation manipulator
Patent of production line transmission centering mechanism and method
Patent of sheet metal rolling device and method
Patent of manipulator and its clamping method
Patent of sheet metal part composite machining die method
Patent of charging and discharging machine and its control method
Patent of Robot control system and its control method
Patent of automatic centering device, centering method, and simulation handle with this device
Patent of refrigerator invisible door bending die and its bending method

荣获100多项国家发明专利及实用新型专利 Won more than 100 national invention patents and utility model



合作与交流 Cooperation and Exchange



公司一直与上海交通大学、燕山大学、中国海洋大学、济南铸锻所、中国重型机械研究院、马钢设计院等高校及科研院所保持着长期战略合作关系，通过与高校和科研院所的交流与合作提高技术创新能力。

HDMECH has maintained long term strategic relationship with Shanghai Jiao Tong University, Yanshan University, Ocean University of China, Ji'nan JFMMRI, Chinese Heavy Machinery Research Institute, Maanshan Institute and other universities and research institutes, and to improve the technological innovation capability through the exchange and cooperation with universities and research institutes

数控径向锻造压机生产线

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概述 General

径向锻造机（全称“卧式径向精密锻造机”），是替代气锤、快锻机等开坯和锻造粗加工成型机械的更新换代产品，以其独特的四（二）锤头锻造原理，在锻造材质内外部质量、成材率、尺寸精度、自动化程度、经济性和对环境保护及对操纵者卫生安全等方面有明显的优势。
我公司依靠多年来设计大型液压快锻设备的实际经验和技術优势，广泛消化吸收国外先进技术，创新设计、优化工艺、高效生产，于2012年自主开发研制的径向锻机HDX/I系列，满足客户需求。

Radial forging machine (the full name of "horizontal radial precision forging machine") is the air hammer forging machine and Quick forging machine replacement products. with its unique four (two) in the forging hammer forging principle, material internal and external quality, yield, size precision, automation, the economic and environmental protection and health and safety of operators has obvious advantages.

Our company rely on years of design of large Quick forging machine practical experience and technical advantages, widely absorbing foreign advanced technologies and innovative design, process optimization, efficient production. In 2012 the independent development of the radial forging machine HDX/I series, to meet customer needs.

适用范围 Suitable scope

适用材料 Suitable materials include

碳钢、不锈钢、合金结构钢、工具钢、高速钢、非磁性钢、铝合金、钛合金和高温合金等。
Carbon steels、Stainless steels、Structural steels、Tool steels、High-speed steels、Non-magnetic steel、Nickel-based alloys、Titanium alloys、Superalloys and other special alloys

锻件形状：可锻造的产品包括
Listed below are some of the possible forging long products



一体化解决方案

1.完美的接口匹配

海德马克提供的设备从机械组件、液压系统、电气系统直到自动化控制，因此用户能得到相互间完美协调匹配的工艺技术，从而保证用户的设备从一开始就能高效率的进行生产运行。

HARMONISED INTERFACES

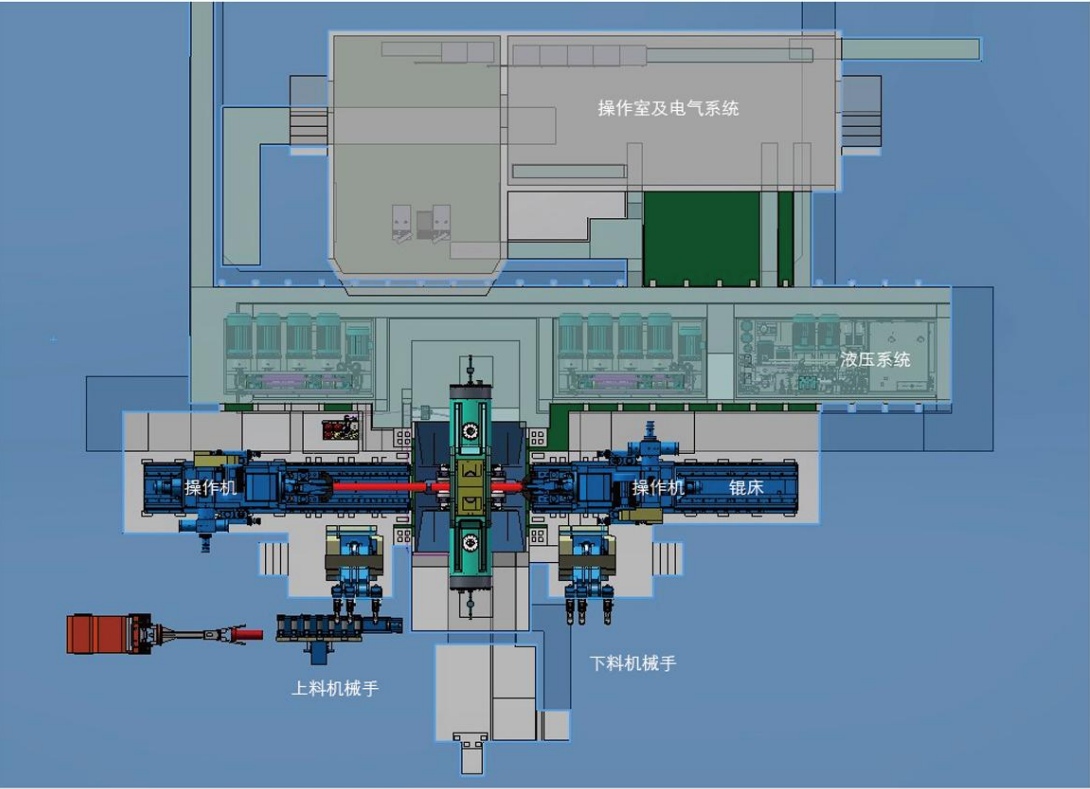
The HDMECH offers everything from the mechanical plant components through the hydraulics and electrics right up to the control and automation systems from a single source. Customers therefore receive perfectly harmonized technologies to ensure a highly productive forging line.

2.主要设备组成

- | | |
|----------------------------|--|
| ① HDJX径向锻造机（含对冲装置） | HDX/I radial forging machine（including Centering Device） |
| ② 两台操作机（含轨床、工件托辊装置） | Two manipulators（with guide bed and Block support） |
| ③ 操作机及电气系统、液压系统、润滑系统 | Hydraulics, electrical and lubrication system |
| ④ 辅助装置(上下料辊道、上下料机械手、废料小车等) | Other device |

A typical plant configuration comprises:

3.径向锻造机典型布局 Typical layout of radial forging unit



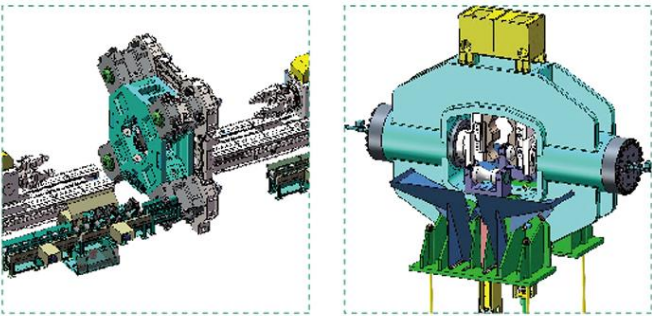
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径向锻造主机 Radial forging machine



设备名称：径向锻造组
Equipment name: Radial forging unit
设别型号：HDJX-060
可锻件最大尺寸
主机结构形式：ix 机械式，YY 液压式
海德马克
Type : HDJX-060
Maximum size of forging
Host structural style: X- Four
Hdmech

四锤头径向锻造主机 Radial forging machine (Four hammer)

型号 /Type	最大毛坯尺寸 (直径) mm Nominal start size	最小锻件尺寸 (直径) mm typical smallest forged size	锻造力 Mn Forging force in MN	锻造频次 (r/min) Strokes per minute	径向调节范围 Diameter setting range in mm	最大驱动功率 (kw) Forging power in kW
HDJX-300	Ø 300	Ø 50	5	< 340	200	1100
HDJX-420	Ø 420	Ø 60	7.5	< 340	290	1640
HDJX-450	Ø 450	Ø 80	10	< 260	300	2200
HDJX-600	Ø 600	Ø 100	13	< 240	360	2840
HDJX-700	Ø 700	Ø 120	18	< 240	400	4000
HDJX-1000	Ø 1000	Ø 130	22	< 200	800	4800

双锤头径向锻造主机 Radial forging machine(two hammer)

型号 /Type	最大毛坯尺寸 (直径) mm Nominal start size	最小锻件尺寸 (直径) mm typical smallest forged size	锻造力 Mn Forging force in MN	锻造频次 (r/min) Strokes per minute	径向调节范围 Diameter setting range in mm	最大驱动功率 (kw) Forging power in kW
HDJX-30	Ø 300	Ø 50	5	< 340	200	550
HDJX-42	Ø 420	Ø 50	7.5	< 340	290	820
HDJX-45	Ø 450	Ø 50	10	< 260	300	1100
HDJX-60	Ø 600	Ø 50	13	< 240	360	1420
HDJX-70	Ø 700	Ø 50	18	< 240	400	2000
HDJX-100	Ø 1000	Ø 50	22	< 200	800	2400

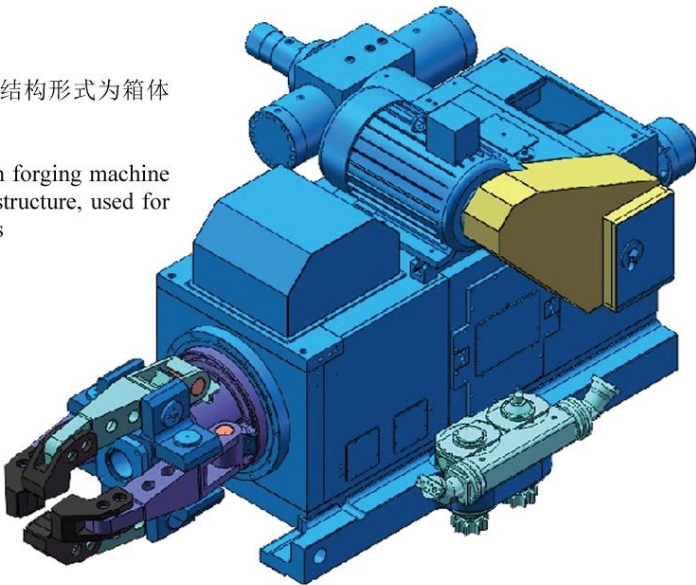
径向锻造操作机

操作机的夹持中心与数控精锻机中心始终保持同心. 结构形式为箱体结构, 用来夹持、导向、前进和旋转工件。

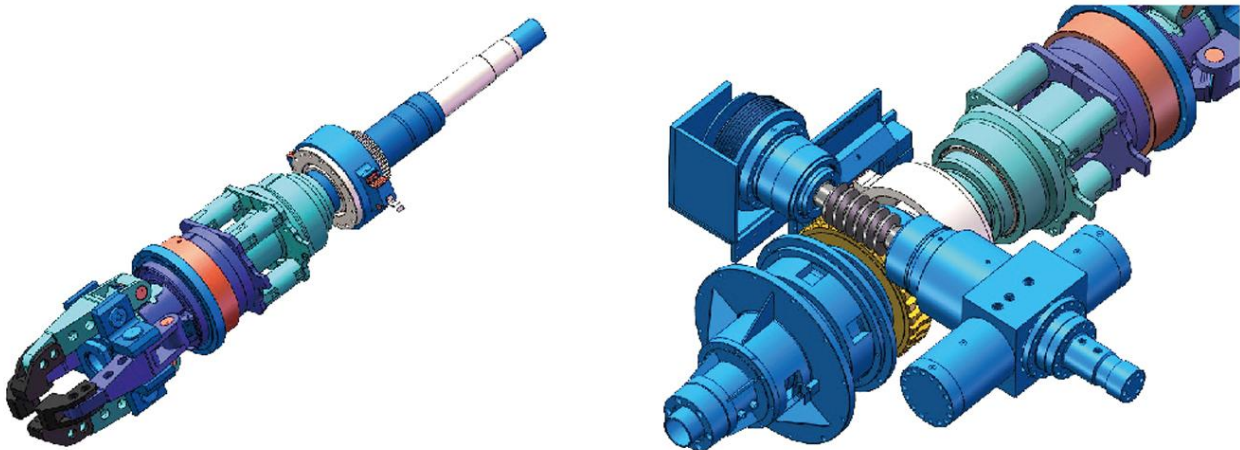
The manipulator clamping center and NC radial precision forging machine center always maintain concentric. The structure is box structure, used for clamping, guiding, advancing and rotating the work pieces

具有4个动作 With 4 actions

- ①夹钳夹紧 Tong opening/closing
- ②车体行走 Manipulator forward/return
- ③夹钳旋转 Rotate tongs
- ④夹钳伸缩 Tong out/retracted



操作机 Manipulators	0	35/105	60/180	80/240	100/300
最大承载力KN Max. load-carrying force in kN		35	60	80	100
最大加紧扭矩KNm Max. clamping torque in kNm		105	180	240	300



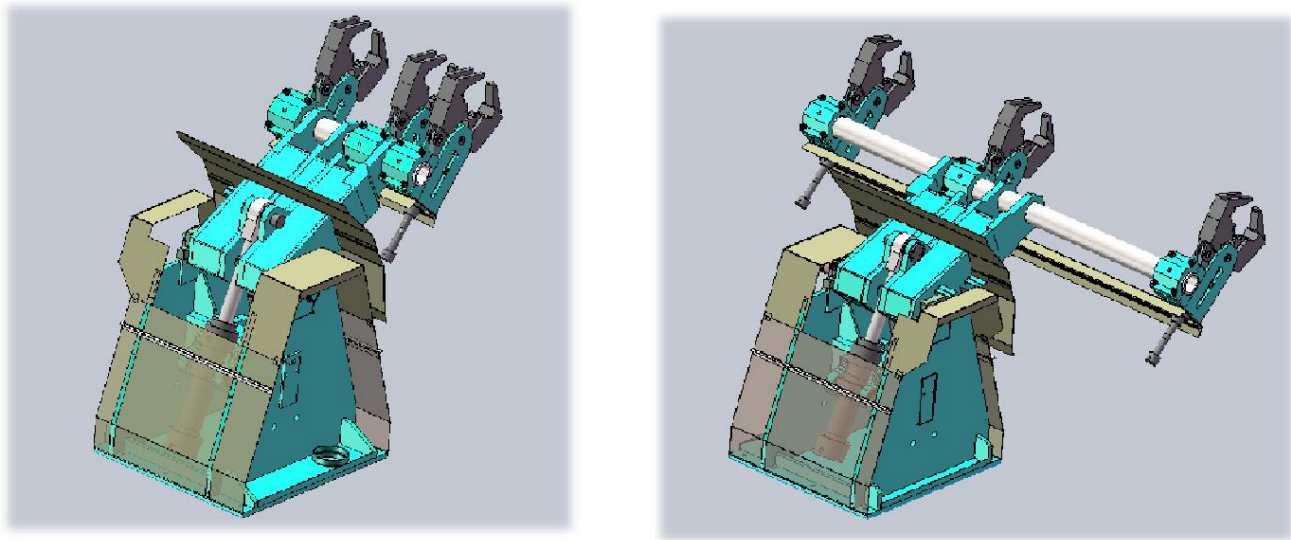
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上下料装置 Loading/unloading

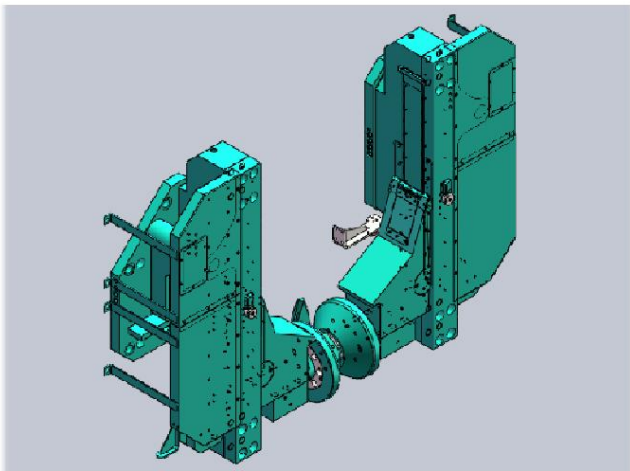


工件自动上下料装置包括上料装置及下料装置。
上料装置将锻造坯料从专用辊道台翻转到设备轴线上，工件由夹头“A”夹持。
锻造操作结束后，下料装置将工件从夹头“B”中卸下并将其存放到专用辊道台上。
工件的最大和最小重量和长度根据工艺数据而定。
对于超长工件的横向下料，工件可以穿过夹头“B”的空心轴用天车手动下料。

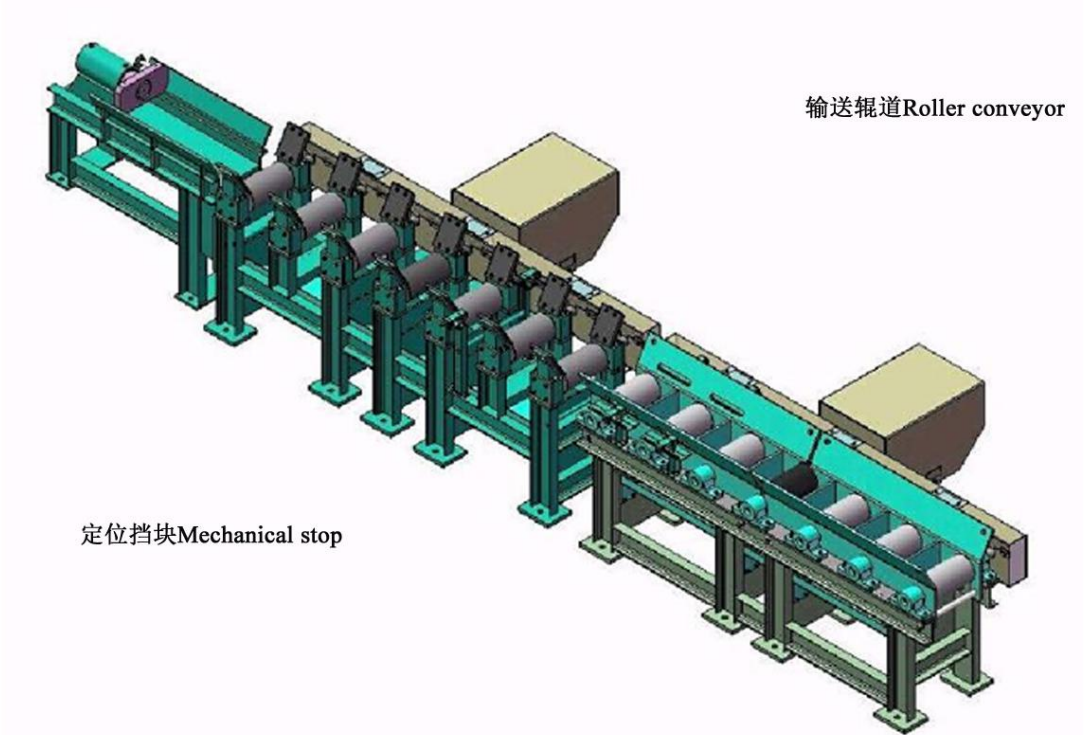
Automatic Loading/unloading equipment includes Loading equipment and unloading equipment.
The Loading equipment will load the work pieces from the Roller conveyor to the manipulator axis, the work piece is clamped by manipulator "A".
After the forging operation, unloading equipment will unload the work piece from manipulator "B" to unloading roller
Maximum and minimum weight and length of work piece is based on process data
For the long work piece material, the work piece can be manually feeding with the crane hollow shaft passes through the manipulator "B"

工件对中装置 Centering Device

在精锻机的两边，各安装一个工件对中装置，用以保证锻件轴心与数控快锻机中心同心，对于不同规格的工件，均可自动、可靠定心。
One centering device each is arranged on either side of the forging unit. The centering tongs are actuated hydraulically and serve to the guiding of the work piece in it's correct axis into the forging dies and to support the work piece when it leaves the forging dies.



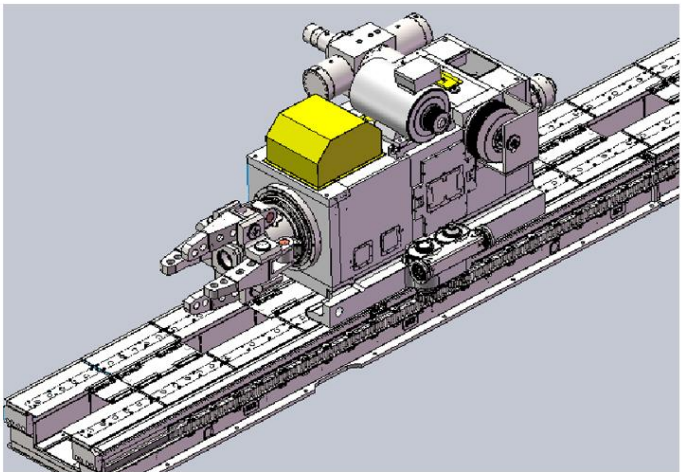
运输辊道 Roller conveyor



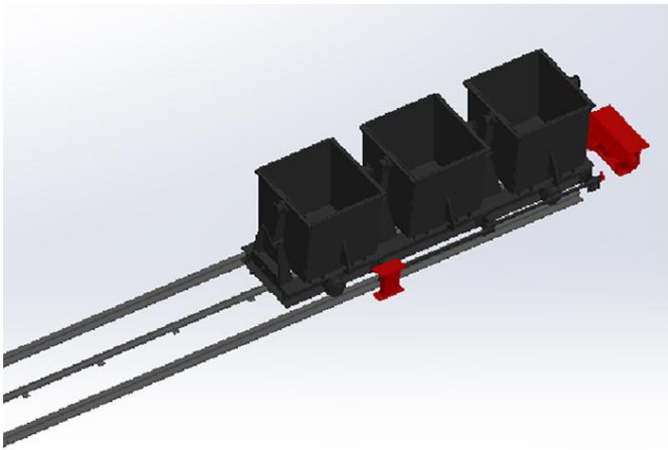
定位挡块 Mechanical stop

输送辊道 Roller conveyor

轨床 Guide Bed



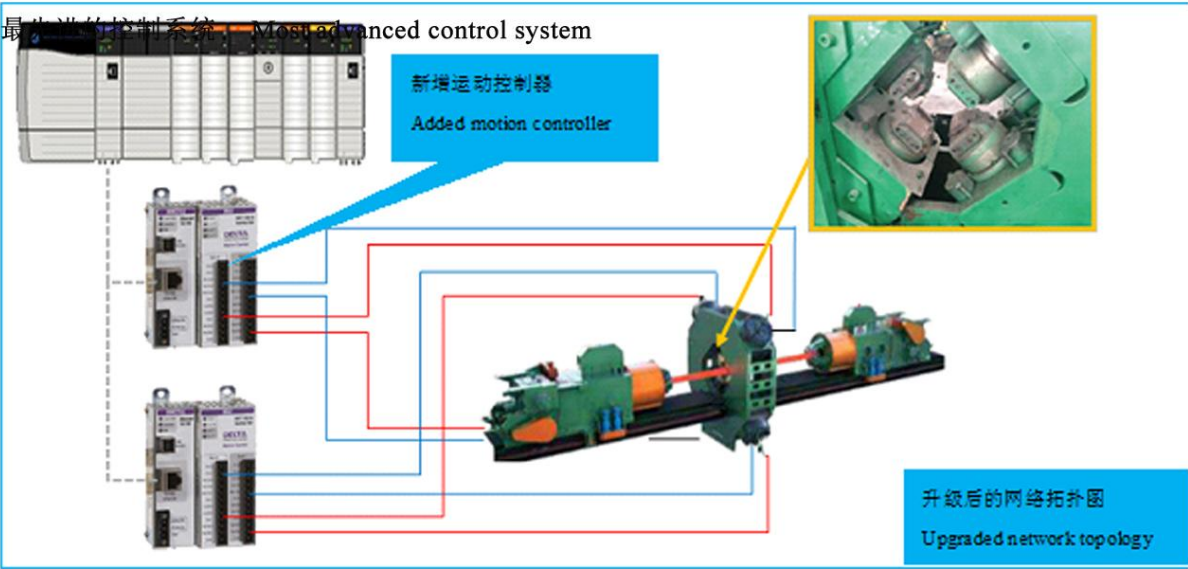
废料小车 Waste scrap trolley



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针对精锻机高频次（ ≥ 240 次/min）、高精度（ $\leq \pm 0.3\text{mm}$ ）下的各锤头同步、锤头与操作机同步、两操作机同步都需要对过程进行精确控制的要求，精锻机和操作机上面的各个轴向伺服液压驱动的控制，是由运动控制器实现的，并具有如下优点：

For precision forging machine high frequency (over 240 /min), high precision (less than 0.3mm) of the hammer under the hammer and machine operation synchronization, synchronization, two machine synchronization needs the precise control of the process requirements of various axial servo hydraulic forging machine and machine operation above drive control is realized by motion controller. And has the following advantages

- 1) 超强的运算速度 High computing speed
- 2) 先进的闭环控制算法 Advanced closed loop control algorithm

先进的闭环控制算法，包含高级微分量增益。在同样的液压系统下，可以达到最优的闭环控制精度。
Advanced closed loop control algorithm, including advanced differential component gain. Under the same hydraulic system, the optimal closed-loop control precision can be achieved

- 3) 先进的液压数学模型 Advanced hydraulic mathematical model

根据液压系统控制特点，引入多个液压系统参数到控制系统中，建立了先进的液压数学控制模型，实现了液压系统快、准、稳的定位需求。
According to the characteristics of hydraulic system control, a number of hydraulic system parameters are introduced into the control system, and an advanced hydraulic mathematical model is established

- 4) 内置针对液压运动控制的自动优化工具 Built in automatic optimization tool for hydraulic motion control

由于精确的数学模型建立，可以通过手动示教功能，较为准确的计算出液压伺服系统控制参数。
Because of the accurate mathematical model, the control parameters of the hydraulic servo system can be calculated accurately by manual teaching function

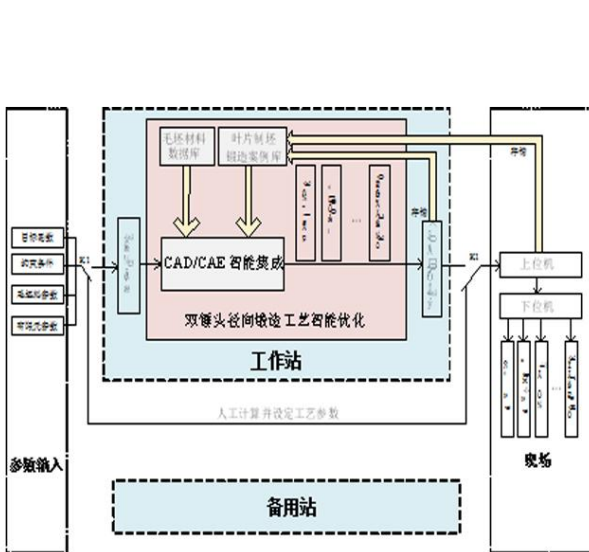
智能工艺软件 Intelligent technology software

该智能工艺软件包括毛坯材料数据库、制坯锻造实例库以及神经网络智能集成技术。
The Intelligent technology software includes blank material database, billet forging case database and neural network intelligent integration technology

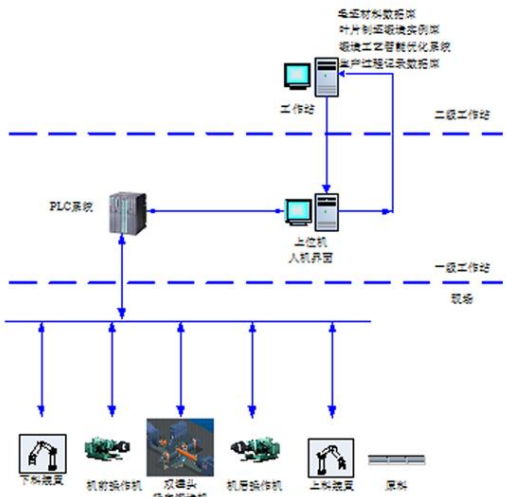
该智能工艺软件是以毛坯材料数据库、制坯锻造实例库为基础，应用神经网络、最优化控制、人工智能、软件科学、塑性力学、有限元模拟、计算机控制技术等多学科集成化的先进智能设计系统。
The Intelligent technology software is a blank material database, billet forging case base as the basis, advanced intelligent design system based on neural network, optimization control, artificial intelligence, software science, plastic mechanics, finite element simulation, computer control technology and other disciplines integration.

可以实现寻找最优的工艺生产参数（部分设置可以人工干预），进而提高径向锻造工艺及各种制坯件的质量和效率。
Can realize the production process to find the optimal parameters (Partial settings can be artificially intervened) and improve the radial forging process, and its blank quality and efficiency.

该软件的应用将极大提升智能制造水平。
The application of the software will greatly enhance the level of intelligent manufacturing.



径向锻造工艺智能优化系统组成图
Composition of intelligent optimization system for radial forging process



智能锻造工艺系统网络结构
Network structure of intelligent forging process system