



因格(苏州)智能技术有限公司

SUZHOU ENGOAL INTELLIGENT TECHNOLOGIES CO., LTD.

地址:江苏省苏州市相城区康元路777号9号楼

邮编:215131

电话:0512 - 62997068

网址:www.engoal-tech.com

商务邮箱:bd@engoal-tech.com

招聘邮箱:hr@engoal-tech.com

Add: Building 9, No. 777, Kangyuan Road, Suzhou, Jiangsu Province, P.R. China

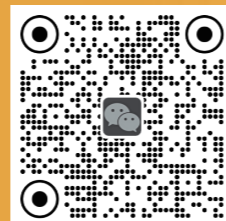
Zip code: 215131

Tel: 0512 - 62997068

Web: www.engoal-tech.com

Business mail:bd@engoal-tech.com

Recruitment mail:hr@engoal-tech.com

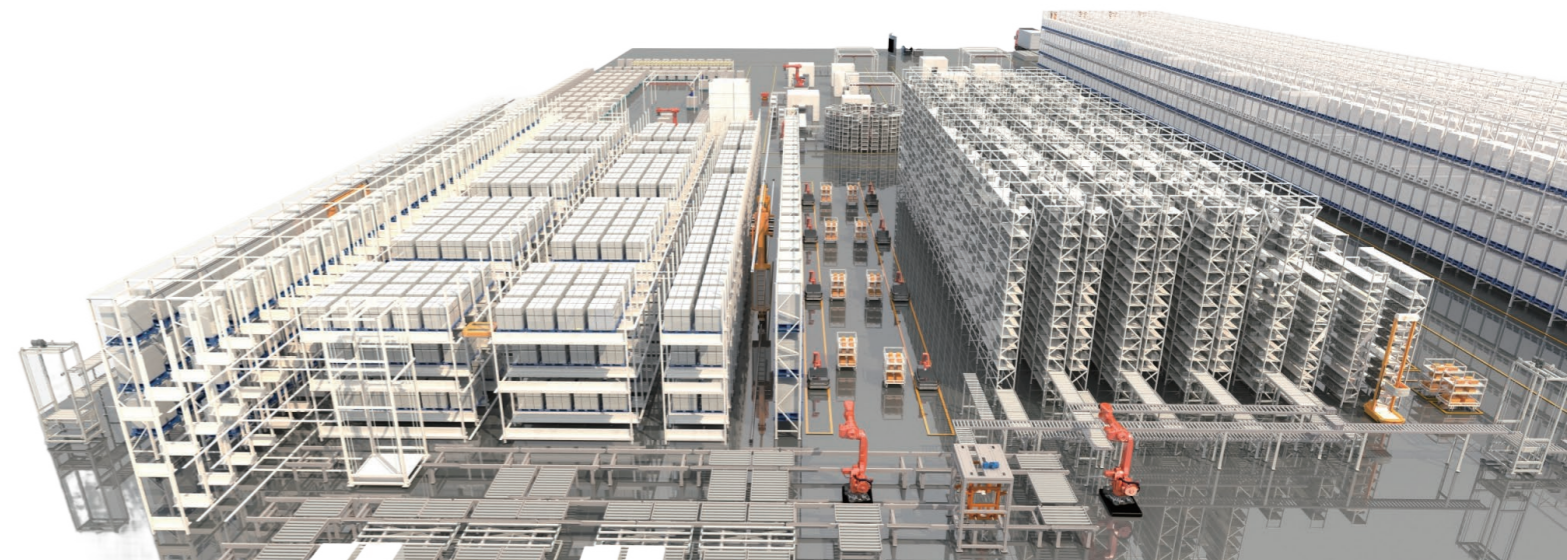


精益物料流驱动 智能制造

Lean Material Flow Drives
Smart Manufacturing

致力于在工业制造与物料流的
融合领域提供数智化解决方案

All-in-One Intelligent Intra-logistics
Solutions for Manufacturing Industry



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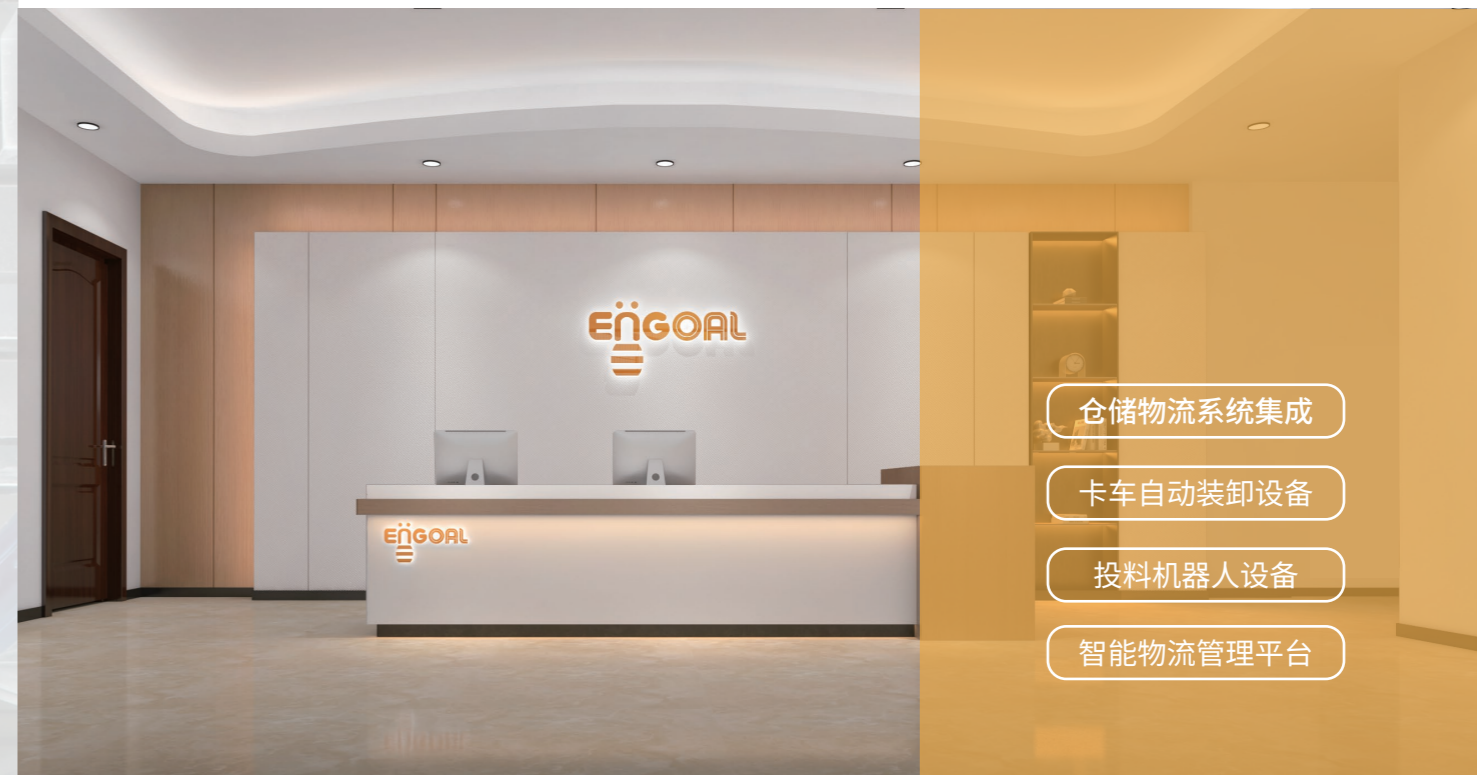
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企业文化 Company culture

目标

成为工业制造领域智能物流应用技术的领跑者

Objective: To be a global leading company in the warehousing and logistics field.

使命

以卡车自动装卸技术为仓储物流规划起点，解决与促进工业制造领域生产与物料流的无边界融合

Mission: With Automatic Truck Loading System as a starting point, to solve and promote the borderless integration of production and material flow in the industrial manufacturing field.

愿景

致力于精益物流技术的普遍应用

Vision: Committed to the general application of lean logistics technology.

文化

精进、专注，心到之处即责任

Culture: Be passionate and liable for all of our work.

仓储物流系统集成服务商

Global Intelligent Intralogistics Solution Provider

因格(苏州)智能技术有限公司(ENGOAL)是一家以**仓储物流自动化技术**为核心竞争力的创新型科技公司,致力于在工业制造领域,促进生产与物流的无边界融合,帮助客户打造从**物料自动卸货、自动存储、自动上线到成品自动出库装车**的闭环无人化物流场景。公司最早成立于2016年,总部位于苏州,在西南、西北、华北等区域均设有业务团队,拥有遍及汽车制造业、光伏制造、锂电池、军工制造、电线电缆、食品饮料等行业的全球化销售、运营和服务能力。

Suzhou Engoal Intelligent Technologies Co., Ltd. (ENGOAL in short), established in 2016, is an excellent supplier of intelligent intralogistics solutions. ENGOAL focuses on the application of intralogistics automation technology, and specializes in building closed-loop scenarios, including **unloading, storage, handling and outbound loading of finished products** in manufacturing industry. Headquartered in Suzhou, Jiangsu Province, ENGOAL provides smart intralogistics solutions within 6 main industries: automobile, PV, lithium-ion battery, military, wire manufacturing and FMCG.

智能物流应用技术的探索和实践过程

Milestones in the Development Process

2016

- 因格(北京)智能技术有限公司成立
- 连续签下13个亚马逊库房自动化改造项目
- Beijing Engoal Intelligent Technologies Co., Ltd was established.
- ENGOAL signed 13 warehouse automation renovation projects from Amazon.

2018

- 黑灯工厂标杆案例:上汽变速器工厂TS11项目
- Project breakthrough: TS11 Factory Automation Project of SAGW company.

2020

- 西安办事处成立
- ENGOAL-XI' an office was established.

2022

- 骊格联创海外事业部成立
- 广州、长沙、成都办事处成立
- Overseas business department of LEADGOAL was established.
- Guangzhou/Changsha/Chengdu offices were established.

2017

- 汽车行业破冰:一汽集团某底盘厂物流自动化集成设计与实施项目
- Ice-breaking in the automotive industry.

2019

- 因格(苏州)智能技术有限公司成立
- 获得元禾原点首轮融资
- Suzhou ENGOAL Intelligent Technologies Co., Ltd was established.
- Received the first round of financing from ORIZA SEED.

2021

- 合资公司成立:苏州骊格联创智能技术有限公司
- The joint venture company Suzhou Leadgoal Intelligent Technology Co., Ltd was established.

2023

- 合资公司成立:因塔科技(苏州)有限公司
- 苏州总部办公室新迁
- The joint venture company Suzhou Eta Technology Co., Ltd was established.
- Suzhou ENGOAL Office Relocation.



60%
研发及技术人员
R&D Team Ratio



100+
知识产权
Intellectual Properties



100+
项目落地案例
Project Cases



100%
交付保障
Guarantee of Delivery



行业先锋 屡获殊荣 | Qualifications and Honors

质量管理体系认证、职业健康安全管理体系认证、环境管理体系认证等资质;
江苏省高新技术企业、江苏省民营科技企业、苏州市领军人才等荣誉, 及众多行业创新奖项和客户满意奖项。



区域化布局: 服务全国, 辐射海外

Business Layout

2 家合资子公司

2 Joint Venture Subsidiaries

LEADGOAL

苏州骊格联创智能技术有限公司

- 为航空、海运等货运物流企业打造数字化、网络化、智能化的智慧仓储物流体系

Suzhou Leadgoal Intelligent Technology Co., Ltd.

LEADGOAL was established in 2021, and specialized in digitizing logistics business operation, with emphasis on aviation freight and other logistics business sectors.

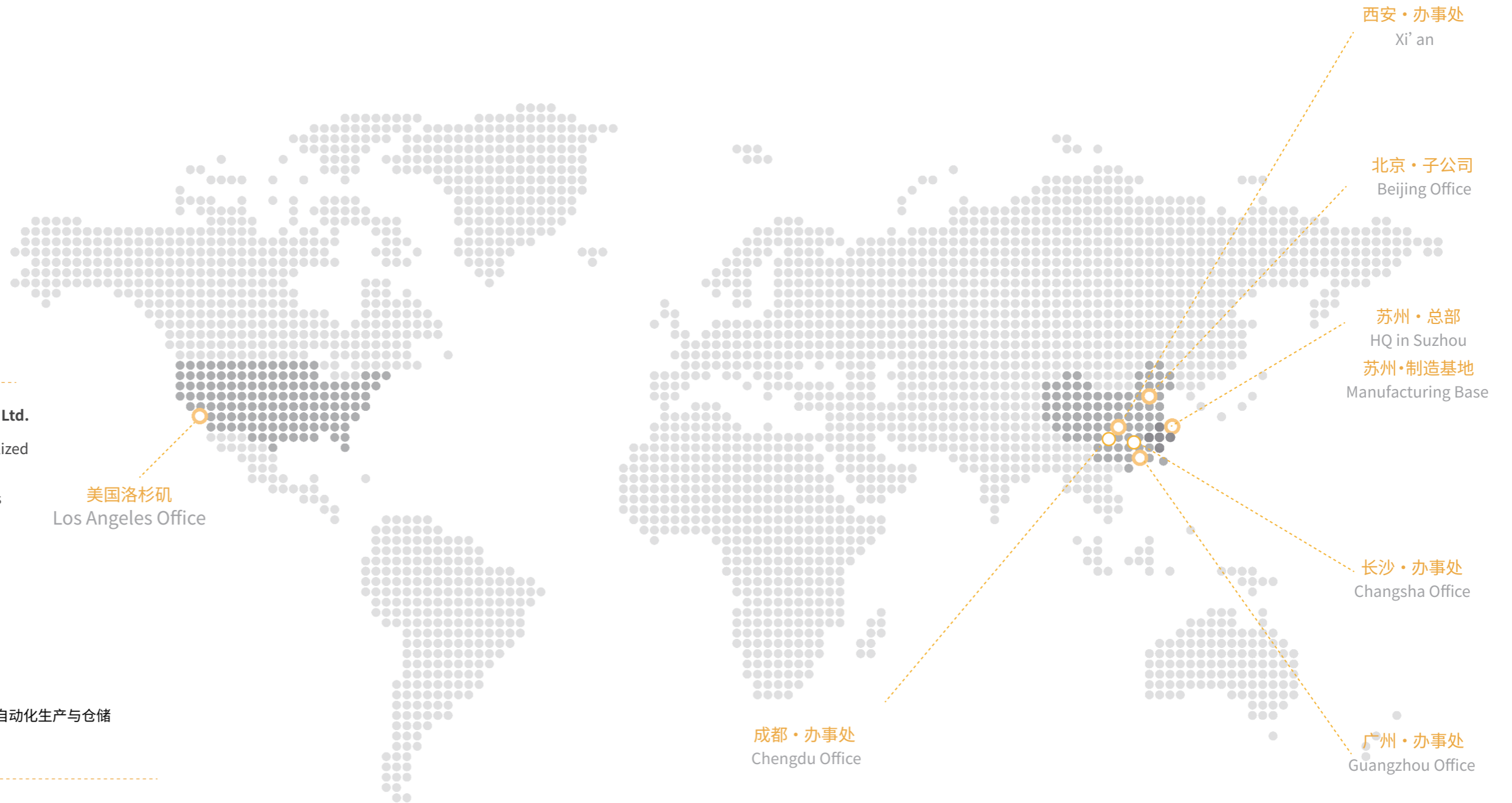


因塔科技(苏州)有限公司

- 为光伏制造企业提供“AI运维+信息化软件系统+自动化生产与仓储物流设备”一站式智能制造解决方案

Suzhou Eta Technology Co., Ltd.

Providing photovoltaic manufacturing enterprises with an all-in-one intelligent manufacturing solution that includes "AI-driven maintenance, software systems, and automated production, warehousing equipment."



6 个国内服务团队

6 Domestic service teams

1 个海外办事处

1 Overseas branch

1 个华东制造基地

1 Manufacture base



行业解决方案

Industry Solutions

01. 物料自动装卸解决方案

Solution of automatic loading and unloading

02. 汽车制造智能工厂生产物流无人化解决方案

Turnkey Intralogistics Solution For Automobile Manufacturing Industry

03. 光伏行业智能工厂与光伏组件智能工厂解决方案

Intelligent Manufacturing Solutions for the Photovoltaic Industry

04. 逆变器智能工厂生产物流无人化解决方案

Intralogistics Solution For Inverter Manufacturing Industry

05. 锂电池智能工厂循环包装及自动装卸解决方案

Cycle Packaging and Automatic Loading & Unloading Solution For LiB Manufacturing Industry

06. 绿岛园区智慧物流解决方案

Smart Logistics Solution For Green Industrial Park



物料自动装卸解决方案

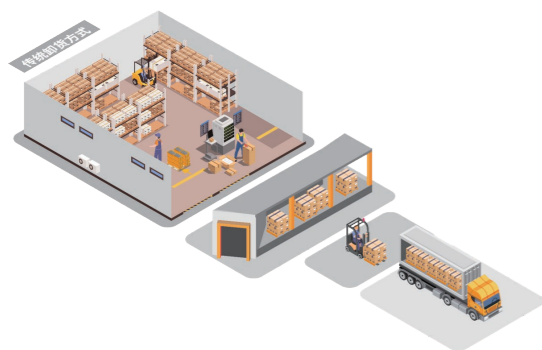
Solution of automatic loading and unloading

自动装卸:赋能智能制造再提速

自动装卸是一种利用自动化机械设备与软件进行货物装卸的方法。这些系统能够根据预定的工作程序自主执行装卸任务,并根据外部情况的变化自动适应工作方式。因格智能研发的自动装卸系统前端可对接无人驾驶商用车,后端对接工厂原材料立体库,从仓库到运输再到目的地的货物装卸和交付,实现端到端的物流自动化。

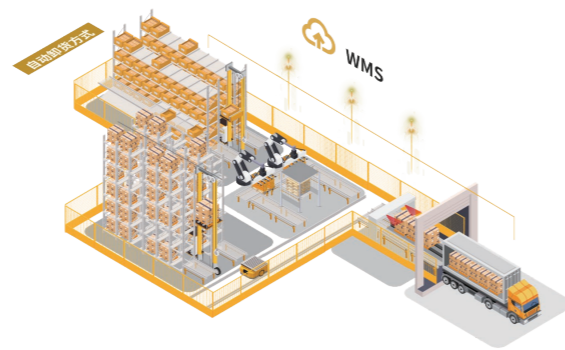
Automatic loading is a method of handling goods using automated mechanical equipment and software. These systems are capable of autonomously executing loading tasks based on predefined work procedures. Intelligent loading and unloading systems developed by ENGOAL significantly enhances loading efficiency, reduces manual intervention, and provides a comprehensive solution for modern logistics and transportation.

装卸货行业痛点



- 垛口占用率高
- 人工作业货损率高
- 人力使用成本高
- 搬运作业效率低
- 信息化流程断点

自动装卸方案特点



- 整车物料自动卸货入库
- 缩短作业时间
- 实现内部流程的有机协调
- 最快10天内部署,1个月上线,易改造,易升级

客户价值

85%+

人员成本优化
Optimization of labor cost

6 mins

最快装卸时间
The fast loading or unloading time

100%

道口利用率
The efficiency of truck dock

100%

减少叉车燃油排放
Reduction of forklifts
Less fuel consumption

卡车自动装卸系统:物流自动化的最后一块拼图

Automatic Truck Loading and Unloading System

因格智能自动化装卸方案可以良好适配立体库存储作业,着眼于“道口-库房”之间30米的无人化衔接和效益最优化,只需1人操作,效率提升52%,人力成本+装卸成本节约40万/年。

The system can perfectly work with the stereoscopic warehouse in solving the loading and unloading choke point, and reduce manual labor costs. It enables loading or unloading an entire truck in less than 6 minutes.

系统组成及架构 | System Structure



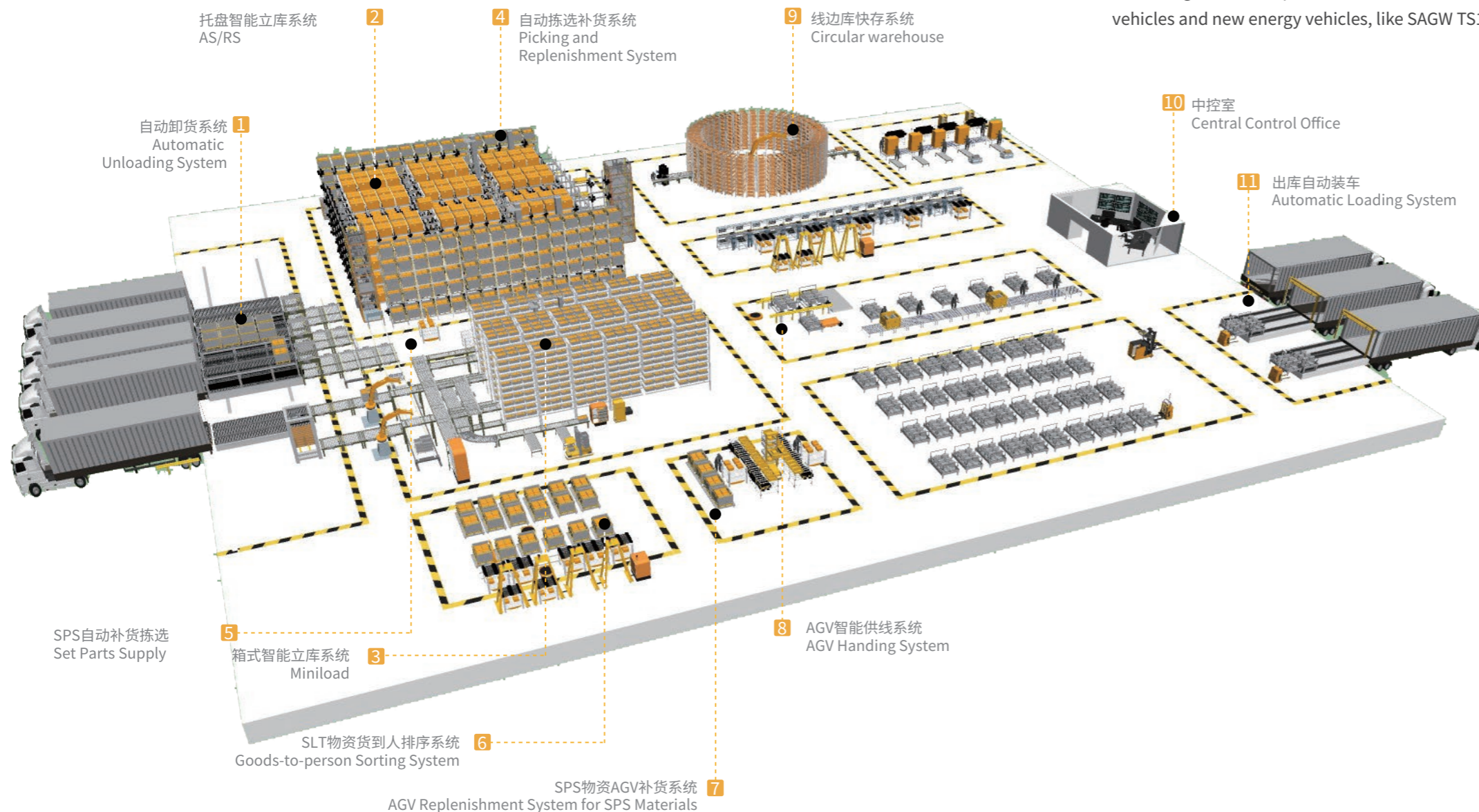
汽车制造智能工厂生产物流无人化解决方案

Turnkey Intralogistics Solution of Automobile Manufacturing Industry

汽车生产过程中存在协同难度大, 供应商库存管理复杂, JIT高精度生产要求以及MILK RUN的统筹等痛点。因格的方案规划与项目实施团队全部来自汽车制造相关产业, 因此公司拥有强大的自主研发能力、成熟的场景设计能力、丰富的项目集成经验。在汽车行业深耕多年, 为汽车主机厂及零部件企业提供定制化的解决方案, 打造智能、柔性、精益的制造和物流体系。目前已在传统汽车以及新能源汽车领域完成多个与行业龙头企业共同打造的智能制造生产物流标杆案例。

In the process of automobile manufacturing, there are many pain points such as supplier inventory management, JIT requirements and MILK RUN coordination. As the team members are all from automobile manufacturing industry, Engoal has a mature design ability and rich experience in logistics integration. After deeply ingrained in automobile manufacturing industry for many years, It can provide customized solutions for automobile OEMs and parts enterprises, and create intelligent, flexible and lean manufacturing and logistics systems.

So far, Engoal has completed a number of benchmark cases with many industry leading enterprises in the field of traditional vehicles and new energy vehicles, like SAGW TS11 project, Cummins Xi'an Phoenix project, etc.



智能物流设备 Application of Logistics Equipment Products

- 物料自动装卸系统 Automatic Truck Loading & Unloading System
- 托盘立体库 AS/RS
- 料箱立体库 Miniload
- 堆垛机 Stacker Crane
- SPS料车亮灯拣选 Set Parts Supply
- Milk Run物流车 U-fame Vehicle
- AGV Automated Guided Vehicle
- 环形仓 Circular Warehouse

智能软件管理系统 Intelligent Software System

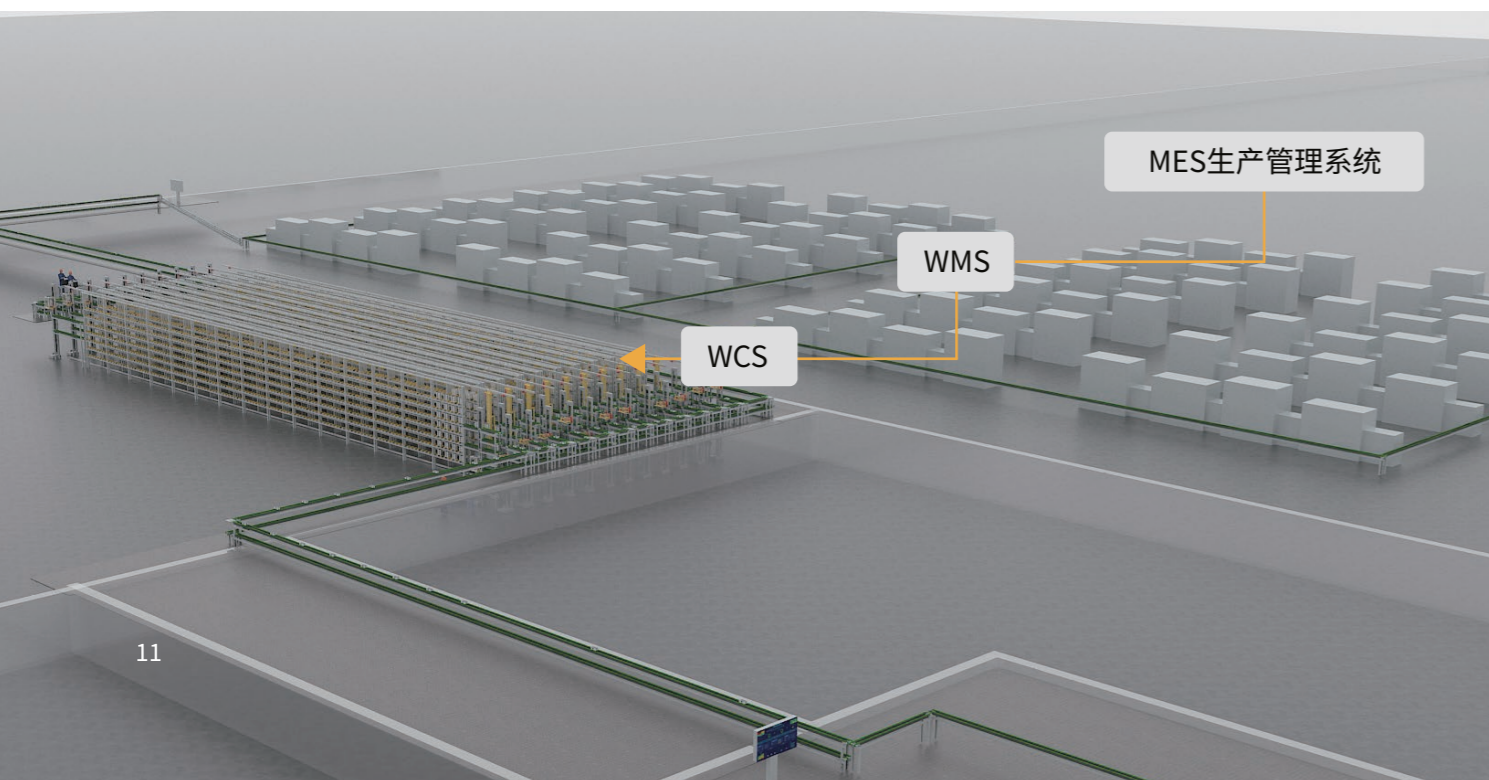
- 智能物流管理平台 Intelligent Logistics Management Platform
- 仓储管理系统 Warehouse Management System
- 仓储调度系统 Warehouse Control System
- AGV调度系统 AGV Control System

光伏行业智能工厂解决方案

Intelligent Manufacturing Solutions of the Photovoltaic Industry

A 光伏电池片缓存库场景

Auto-storage Solution For Photovoltaic Cells



光伏行业处于高速增长阶段，智能制造是光伏电池片企业发展的关键。因格智能打造的光伏电池片缓存库场景通过实施自动化存储，实现线边物流拉动生产的模式，从而达到降低库存成本、人力成本、管理成本等。为客户打造智能化水平较高的标杆性示范工厂；最终通过整厂物流自动化的手段帮助企业实现降本、增效、保交期的目的。

The PV industry is in a stage of rapid growth, and intelligent manufacturing is the cornerstone of sustainability for PV enterprises. The PV cells' warehouse created by ENGOAL implements automated storage, thereby reducing inventory costs, labor costs, management costs, and more. Ultimately, through the automation of logistics throughout the entire factory, ENGOAL helps enterprises achieve the goals of cost reduction, efficiency improvement, and guaranteed delivery time.

智能物流设备 Application of Logistics Equipment Products

- 轻型料箱堆垛机 Bin Stacker Crane
- 排序提升机 Sorting Elevator
- 拆码盒提升机 Carton Palletizing and De-palletizing Elevator
- 同步带输送线 Convey Line With Synchro Belt
- 移载机 Transfer
- 有轨穿梭车 Rail Guided Vehicle
- 读写设备 Read-write Device

智能软件管理系统 Intelligent Software System

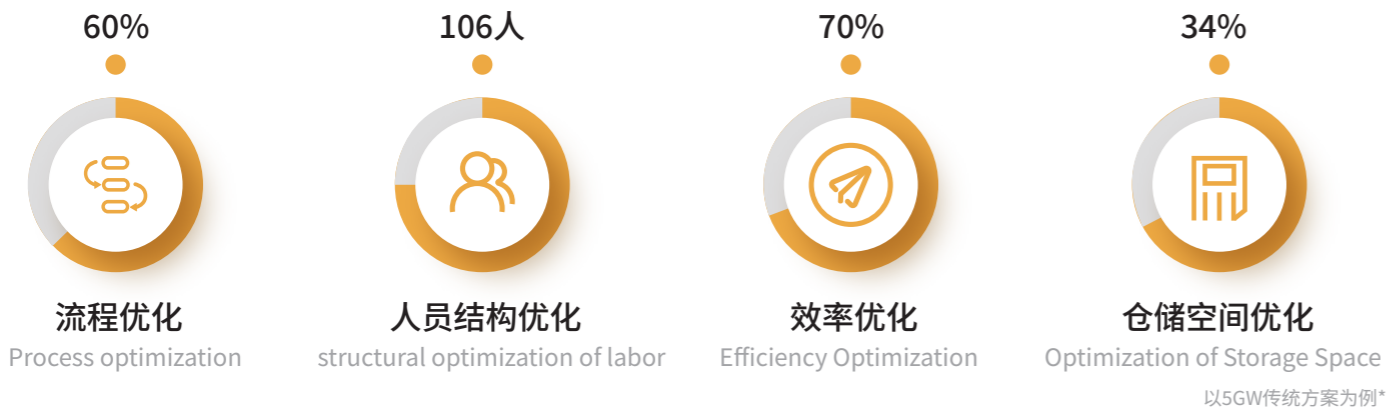
- 智能物流管理平台 Intelligent Logistics Management Platform
- 制造执行系统 Manufacturing Execution System
- 仓储管理系统 Warehouse Management System
- 仓储调度系统 Warehouse Control System
- 数字孪生系统 Digital Twin

光伏组件智能工厂生产物流无人化解决方案

Intralogistics Solution of PV Modules Manufacturing Industry

因格智能在光伏组件制造领域,可以提供自动化检测、自动化分档分拣和搬运、冷拉膜自动化包装、自动化存储及发运等解决方案,以数字化信息系统进行全流程物料信息管理,实现检测、包装、入库存储、发运的全自动化场景。

In the field of photovoltaic module manufacturing, ENGOAL provides automatic solution for the process of detection, picking & handling, packaging, storage and delivery. Making full use of the digital information system to manage the whole process of materials flow, and realize the automated logistics application scenarios.



智能物流设备 Application of Logistics Equipment Products

- 外观检测: 飞拍采集系统自动化检测
Detection: automated detection of flying camera acquisition system
- 分档分拣: 桁架分档&辊筒AGV
Sorting & Picking: gantry robot & backpack AGV with roller conveyor
- 包装: 冷拉膜技术
Packaging: stretch-hood technology
- 成品储存: 堆垛机立体库
Storage of finished goods: AR/AS
- 发运: 链板式自动装卸车
Loading: chain plate type of ATLS

智能软件管理系统 Intelligent Software System

- 智能物流管理平台 Intelligent Logistics Management Platform
- 制造执行系统 Manufacturing Execution System
- 仓储管理系统 Warehouse Management System
- 仓储调度系统 Warehouse Control System
- AGV调度系统 AGV Control System
- 电气控制系统 Programmable Logic Controller

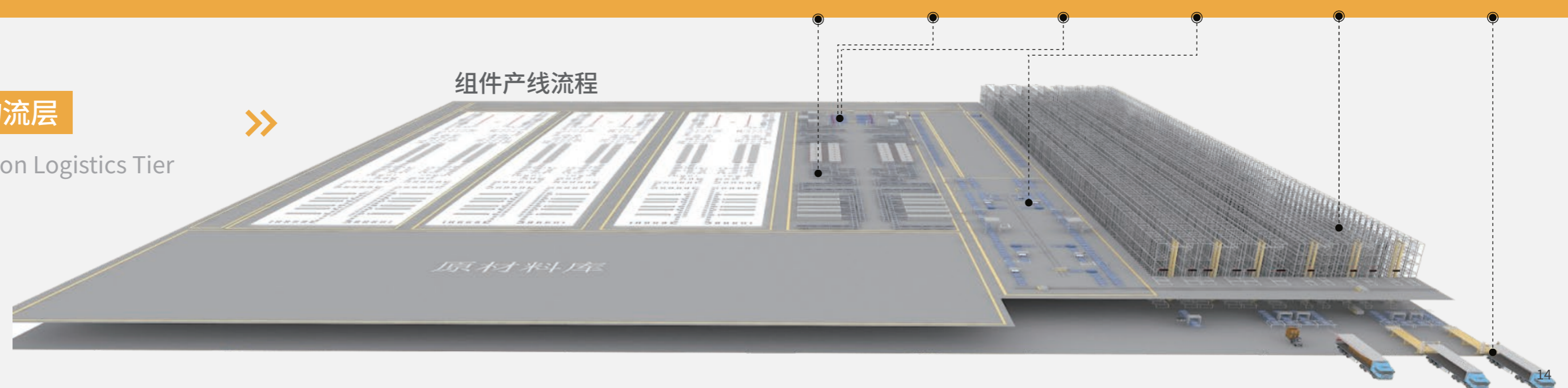
自动设备层

Automatic Equipment Tier



生产物流层

Production Logistics Tier



逆变器智能工厂生产物流无人化解决方案

Intralogistics Solution of Inverter Manufacturing Industry

在逆变器制造领域, 因格智能致力于帮助客户搭建数字化管理系统, 通过透明的供应链一体化平台, 按照订单、库存计划进行排产拉动和精细化管理, 构建敏捷供应链体系; 同时, 通过集成智能化、自动化物流设备, 有机融合产线与物料流, 实现物料的有序、及时供应。通过原材料大小件分区存储管理、自动化包装线、“货到人”分拣模式、线边物料AGV自动配送等生产物流环节优化, 让精益物流驱动智能制造成为企业品牌增长的利刃。

In the field of inverter manufacturing, Engoal is committed to help customers build digital management platform through the transparent supply chain integration, and achieve an orderly and timely supply of production materials according to the integration of intelligent and automatic logistics equipment. Lean logistics management will drive intelligent manufacturing and become a sword for the growth of enterprise brand.



全流程搬运无人化
Fully Automated Handling



人机配合, 拣选备料工位化
Man-machine Coordination



为每个物料规划物流路径
Materials' Paths Planning

智能物流设备 Application of Logistics Equipment Products

- 托盘四向车库 AS/RS with Four-way Shuttle
- 料箱AGV库 AS/RS with Box AGV
- AGV自动搬运 AGV Handling
- 高温老化库 High Temperature Aging Room
- 自动缠膜机 Wrapping Machine
- 电池五面封式堆垛机库 Finished Inverter AS/RS

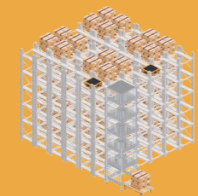
智能软件管理系统 Intelligent Software System

- 智能物流管理平台 Intelligent Logistics Management Platform
- 制造执行系统 Manufacturing Execution System
- 仓储管理系统 Warehouse Management System
- 仓储调度系统 Warehouse Control System
- AGV调度系统 AGV Control System

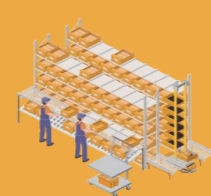
自动设备层



Automatic Equipment Tier



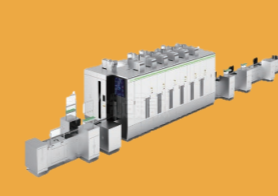
大件物料储存
GLT storage



小件物料储存
KLT storage



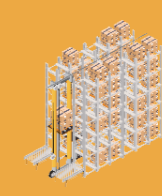
搬运
Handling



老化测试
Ageing test



缠膜
Wrapping film



成品储存
AS/RS

入库
Unloading

原材料库
Raw Materials AS/RS

预加工
Preprocessor

组装
Assembly

老化测试
Aging Test

包装
Packaging

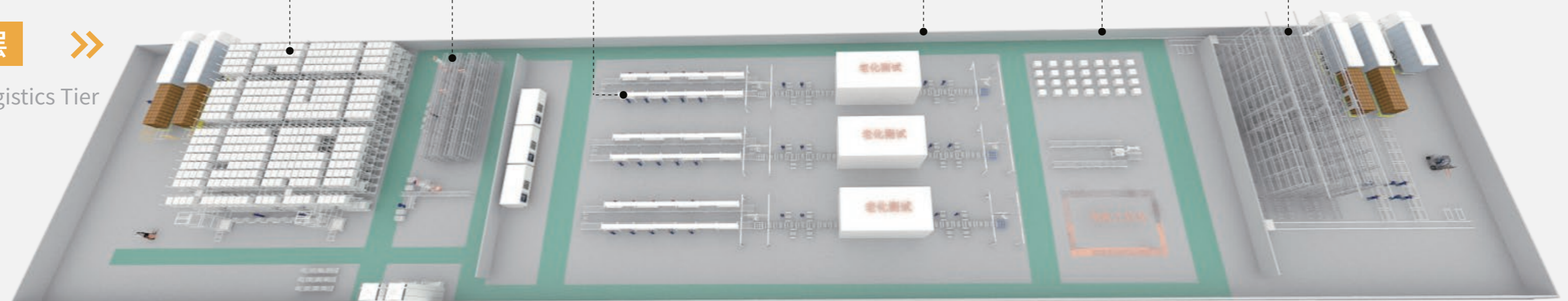
成品库
Finished Goods AS/RS

发运
Delivery

生产物流层



Production Logistics Tier



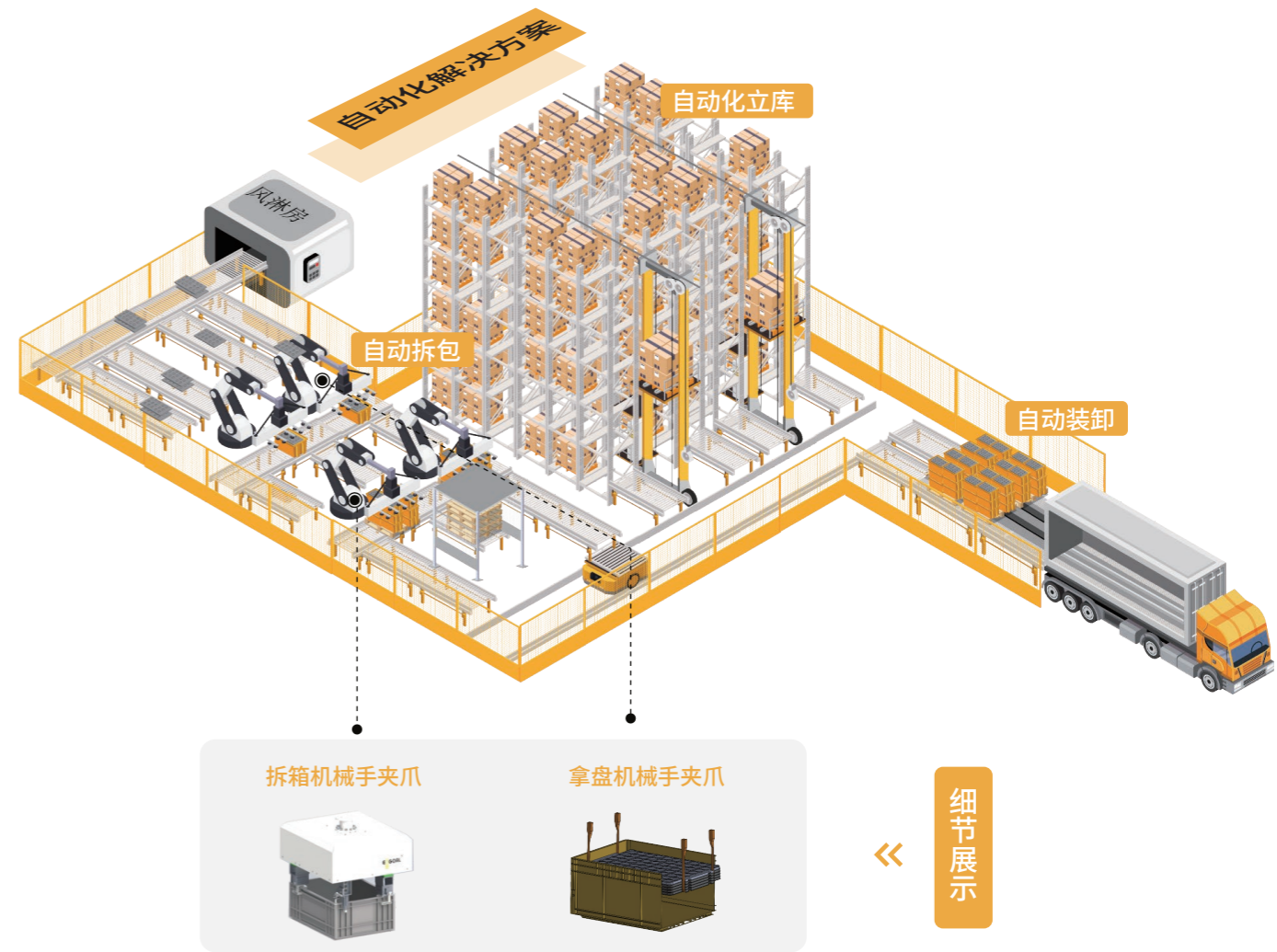
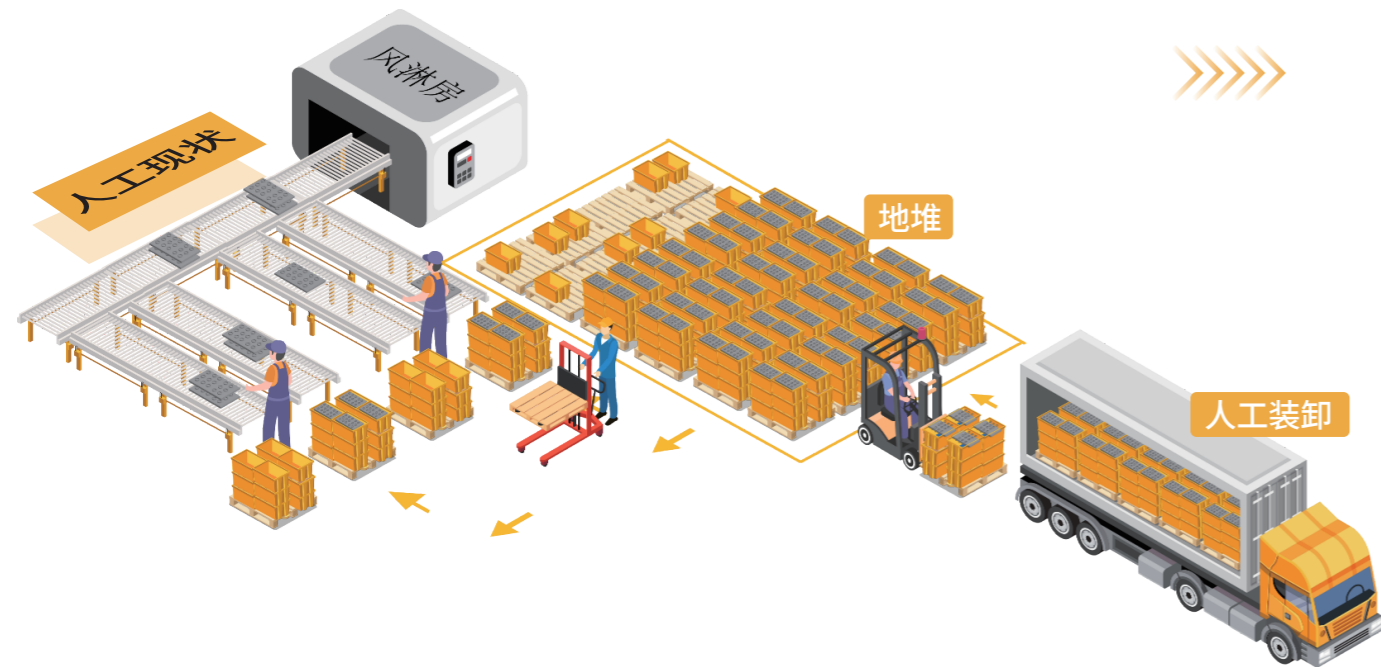
锂电池智能工厂循环包装及自动装卸解决方案

Cycle Packaging and Automatic Loading Solution For LiB Industry

锂电行业在全球碳中和的大背景下，其顺势而上的发展趋势是必然的。受整体行业水涨船高的影响，锂电池生产制造行业近年来也向整合化、整线化、自动化方向快速发展。制造端仓储物流智能转型成为行业整体走向。锂电池产品工艺流程繁杂，在大规模生产过程中，锂电池企业目前都已布局场内智能物流系统，各仓储物流企业形成了各自独特的整线物流系统。但是在对卡车车厢内的物料卸货和对电池包成品打包装车两个环节普遍还处于半自动化阶段。

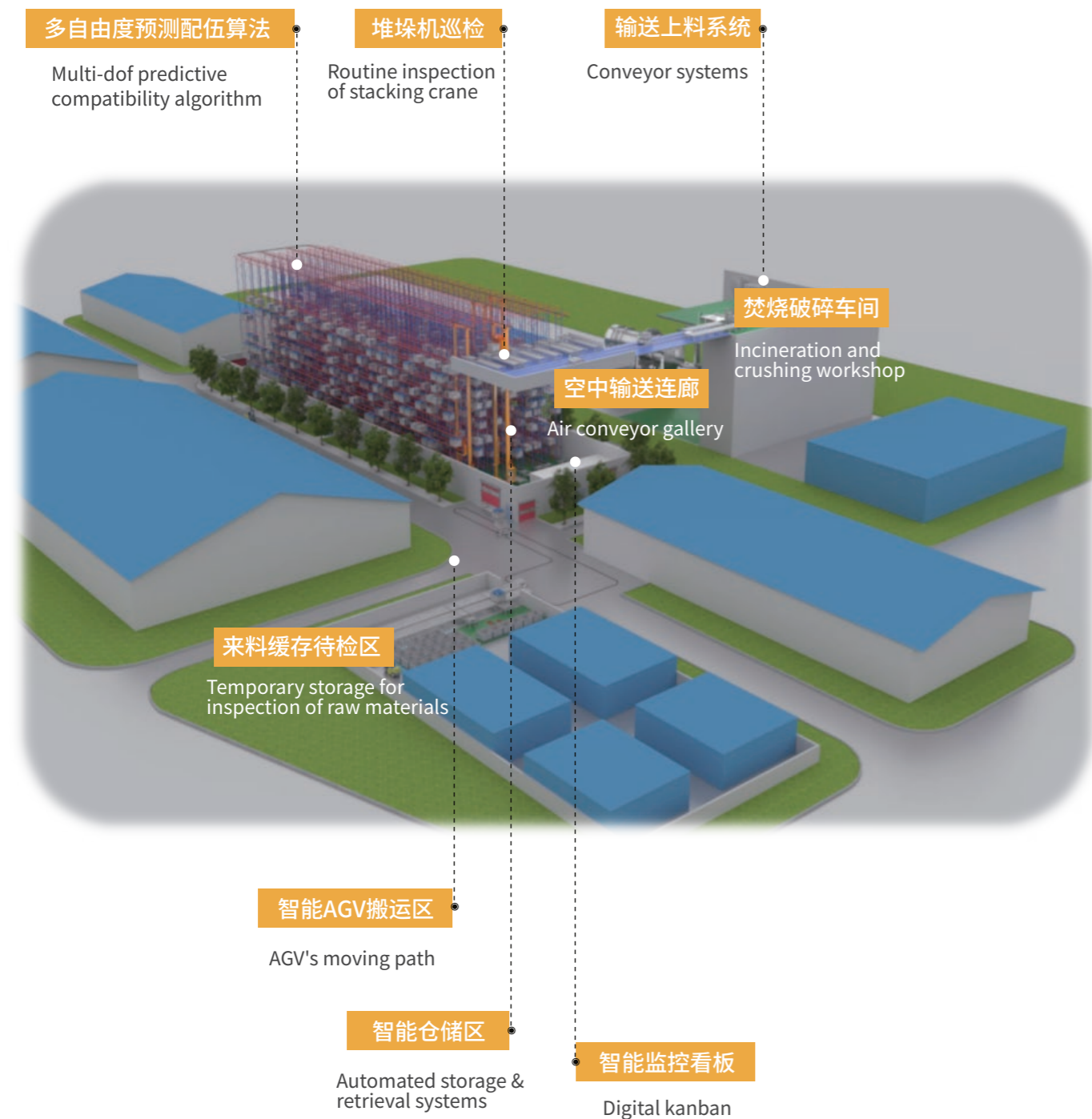
因格智能在企业原来的智能仓储系统模式下加增一套自动拆包系统与卡车自动装卸系统，解决仓储物流“第一站”和“最后一站”的装卸瓶颈，为锂电智能制造再提速。

The LIB manufacturing industry has been rapidly developing in the direction of integration and automation in recent years. Although the LIB enterprises have laid out the intelligent logistics system in the field, the two scenarios are still in the semi-automatic stage: raw materials' unloading process and the finished batteries' manual loading. Under the existing warehouse management system, ENGOAL adds the ATLS to solve the bottleneck of loading and unloading, and further speed up the development of LIB manufacturing.



绿岛园区智慧物流解决方案

Smart Logistics Solution For Green Industrial Park



核心产品和标准化场景

Core Products and Standardized Scenarios





数字化信息系统

Digital Information System

01. 信息架构平台

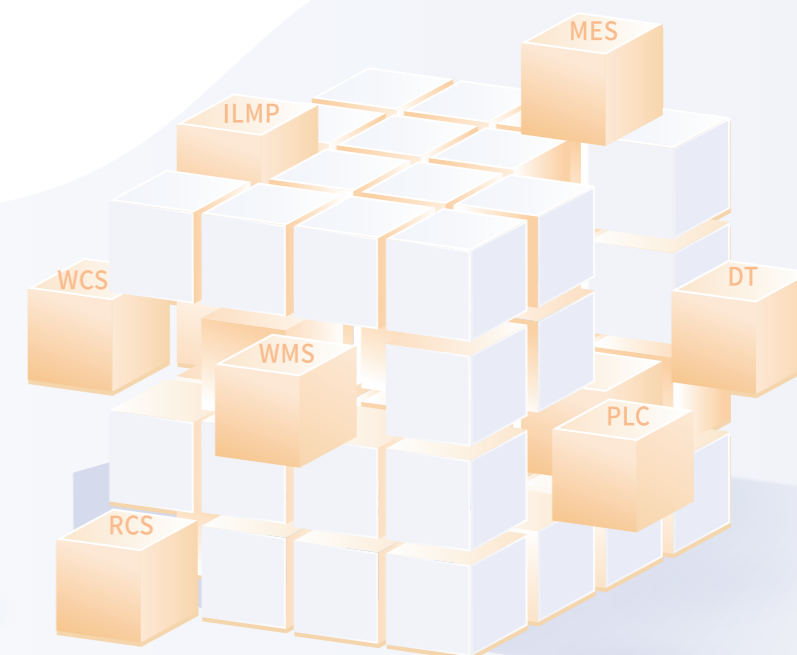
Information Architecture Platform

02. 物流管理平台

Logistics management platform

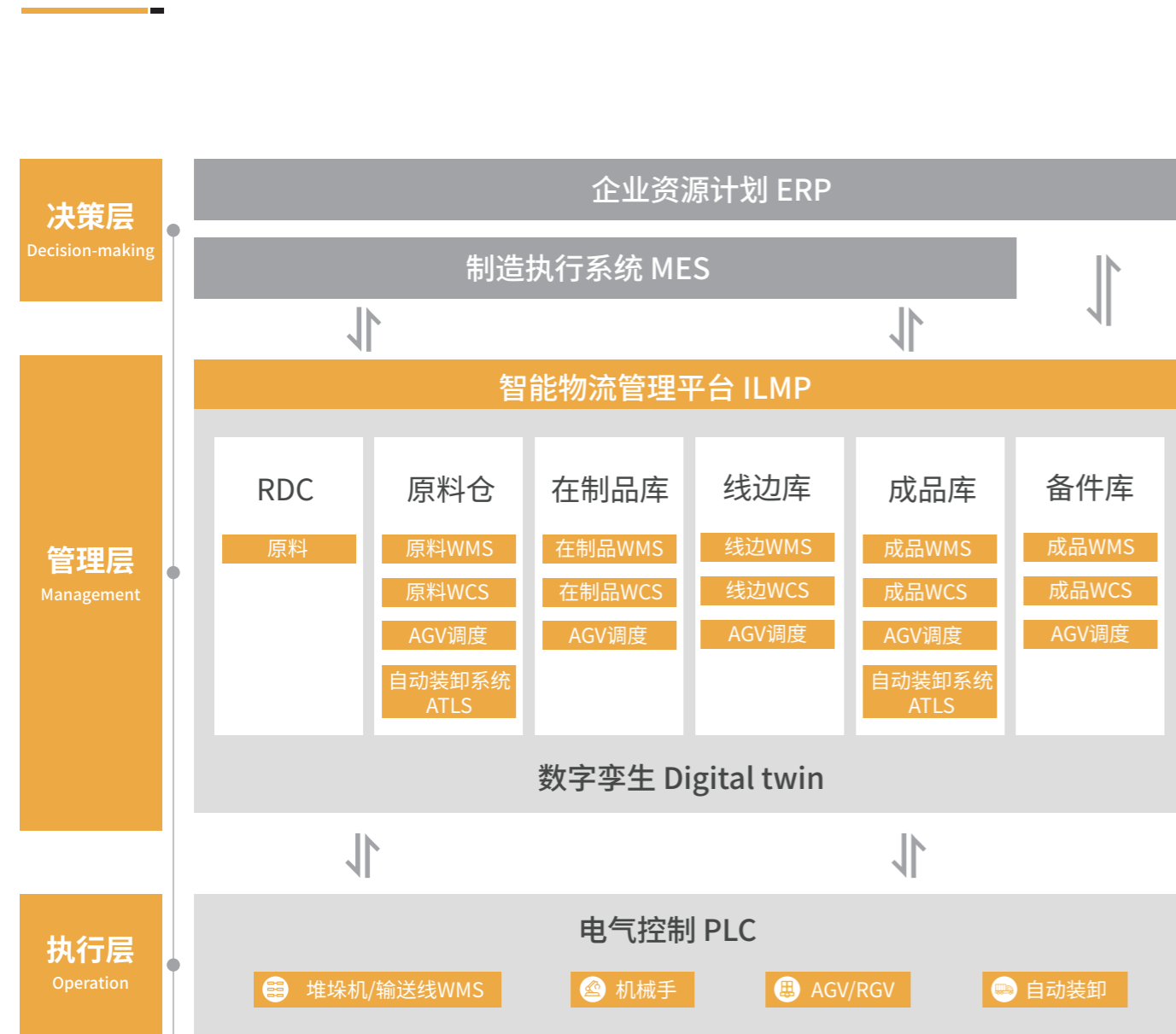
03. 物流软件系统

Logistics management platform



生产企业信息系统架构

The Architecture of Information System



生产企业物流信息系统功能架构

Functional Architecture of Logistics Information System



物流软件管理系统

Warehouse Software Management System



ILMP智能物流管理平台

实时互通 实现厂区数字化监管

因格智能化数字化系统方案实现了工厂信息化、数字化、智能化的管理监控新模式。

- 因格ILMP将LES系统、WMS系统、WCS系统及数字孪生系统的功能进行了整合优化，将重复模块进行了合并优化，并将系统功能分解到各个系统模块中，各模块之间即可独立使用，又可以组合使用。
- 此平台解决了原来多系统之间对接复杂、系统之间交互出错无法快速定位原因等问题，将平台的优势充分发挥。



Intelligent Logistics Management Platform (ILMP)

Be fully functional to realize the digital supervision of the factory

The ILMP system enables factories to realize the new mode of digital and intelligent management and monitoring.

- It uses advanced technologies to seamlessly integrate with LES, WMS, WCS and digital twin systems used in the industry. Meanwhile, ILMP also combines and optimizes the duplicate modules, and therefore each module can be used independently or in combination.
- More importantly, this platform giving full play to the advantages of the platform and solves the original problems such as the complex docking between multiple systems and the failure of the interaction between systems to quickly locate reasons.



信息追溯

实时跟踪物流信息
提高物流运营效率
Information tracing
and replenishment



监控管理

异常情况监控
避免物流运营延误和损失
Unusual conditions
tracking reporting



数据分析

分析物流运营成本
提高企业的盈利能力
Real-time and data
driven

智能仓储管理系统 (WMS)

Intelligent Warehouse Management System



WMS系统可以提高仓库操作的效率和准确性,优化库存管理和订单处理,减少错误和损失,提高仓库空间利用率,并提供数据分析和决策支持。这些优点有助于提升企业的运营效率、客户满意度和竞争力。

Warehouse Management System (WMS) can improve the efficiency and accuracy of warehouse operations, optimize inventory management and order processing, reduce errors and losses, enhance warehouse space utilization, and provide data analysis and decision support. These advantages contribute to enhancing the operational efficiency, customer satisfaction, and competitiveness of enterprises.

智能仓储控制系统 (WCS)

Intelligent Warehouse Control System



运行

Operation

- 监控设备状态:**WCS系统实时监控仓库内的物流设备,例如输送线、拣选机器人、堆垛机等。
The WCS system monitors the real-time status of logistics equipment in the warehouse, such as conveyors, picking robots, and stacker cranes.
- 接收任务指令:**WCS系统接收来自上层系统(如WMS系统)或其他调度系统的任务指令。
The WCS system receives task instructions from upper-level systems such as WMS system or other scheduling systems.
- 任务调度与分配:**根据任务指令和设备的可用性、状态等信息,WCS系统进行任务调度和分配。
Based on task instructions and information regarding the availability and status of equipment, the WCS system performs task scheduling and allocation.
- 设备控制与执行:**WCS系统通过与物流设备进行通信,发送控制指令以执行任务。
The WCS system communicates with logistics equipment and sends control commands to execute tasks.
- 监督任务执行:**WCS系统监督任务的执行过程,跟踪设备的位置和状态变化,并记录任务的执行情况。
WCS supervises the execution process of tasks, tracks the position and position changes of equipment, and records the progress of task execution.
- 数据交换与信息共享:**WCS系统通过与其他系统进行数据交换和信息共享,确保与仓库管理系统、供应链系统等无缝集成。
WCS xxxxxxxxxxexchanges data and shares information with other systems to ensure seamless integration with warehouse management systems, supply chain systems, and other related systems.



主营产品介绍

Product Center

01. 线边仓库

Line Side Warehouse

- 恒温恒湿砂芯库 Sand Core AS/RS
- 电池片成品缓存库 AS/RS of Finished Battery Cell
- 逆变器老化测试库 Aging Test Chamber

02. 自动装卸系统

Automatic Loading and Unloading System

- 滑链式自动装卸系统 Roller-chain System
- 叉轨式自动装卸系统 Fork-rail System
- 推板式自动装车系统 Push-plate Loading System
- 链板式自动装卸系统 Chain-plate System

03. 输送分拣

Conveying & Sorting

- 料箱堆垛机 Tote Stacker Crane
- 托盘堆垛机 Pallet Stacker Crane
- 拆叠盒轻型提升机 Collapsible Box Hoist
- 板链RGV Chain-plate RGV (Rail Guided Vehicle)

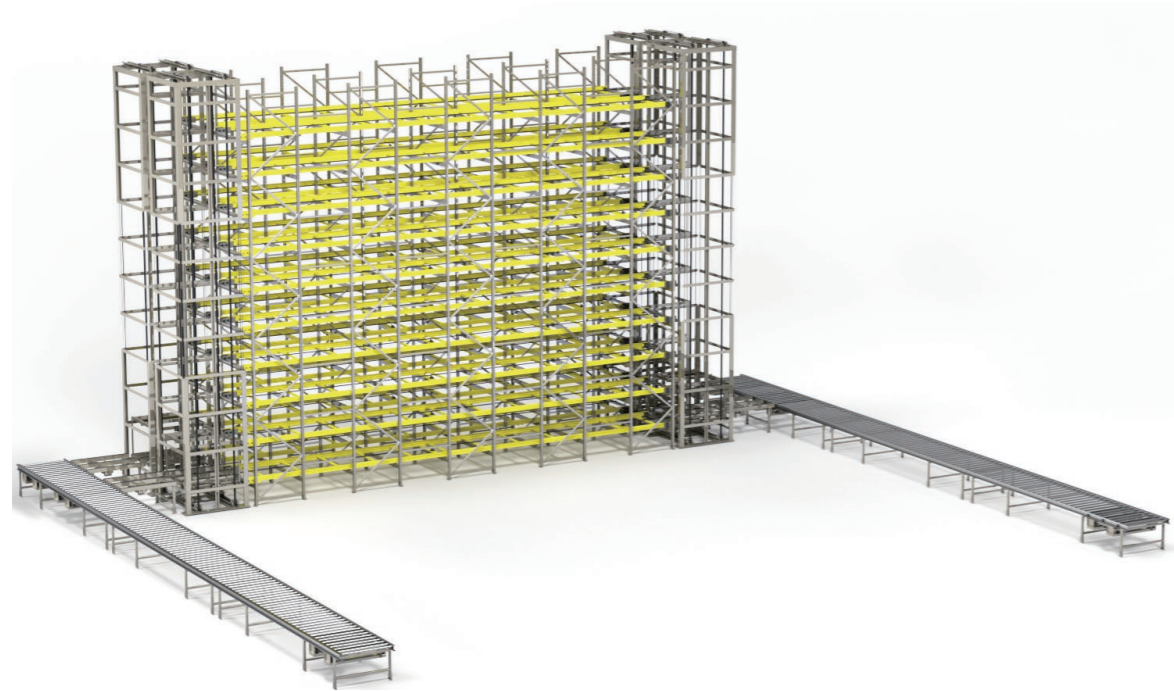
04. 机器人应用

Robotic Application

- 光磁仓 Intellectual Management Depository of CD
- 环形仓 Circular Warehouse
- 料箱拆码垛工作站 Automated Tote Palletizing and De-palletizing Workstation
- 纸箱拆码垛工作站 Automated Carton Palletizing and De-palletizing Workstation
- 线边投料机器人 Material Feeding Robot
- 桁架机械手 Gantry Robot

恒温恒湿砂芯库

Sand Core AS/RS with Constant Temperature and Humidity



恒温恒湿砂芯库是根据汽车缸体砂芯储存要求量身定制的。充分考虑生产节拍、储存环境、搬运劳动强度等因素，因格旨在砂芯制造车间，建设立体库存以及AGV配送系统，提高生产效率，减少人工作业率，通过实施自动化存储以及配送项目，实现拉动式线边物流生产模式。最终实现信息化、智能化、柔性化、少人化的目标，以物流自动化的手段真正为企业做到**降本、增效、保交期**的目的。

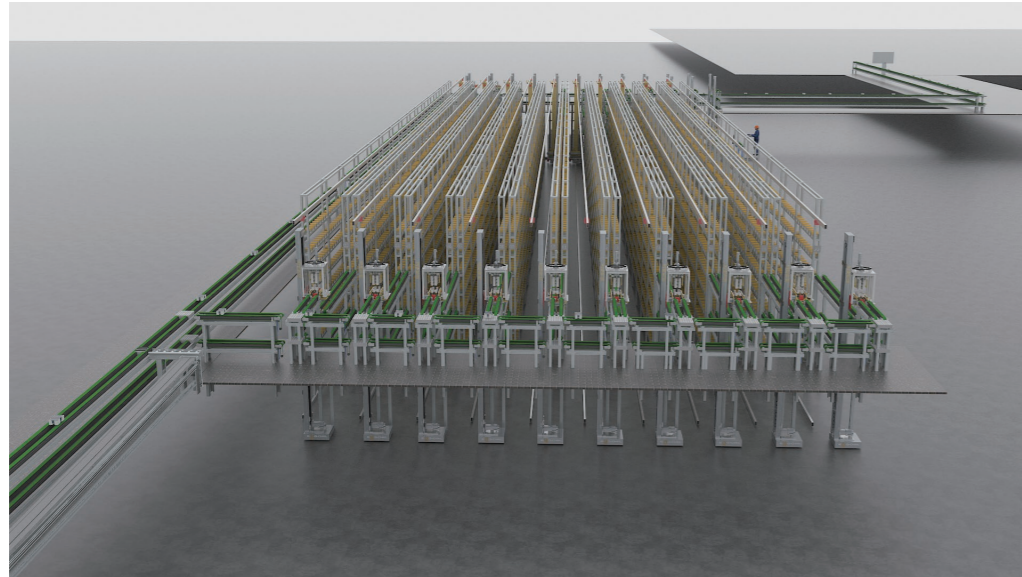
The temperature and humidity-controlled core sand storage is customized according to the storage requirements of automotive cylinder core sand. Taking into account factors such as production cycle, storage environment, and labor intensity, ENGOAL aims to construct a AS/RS and AGV delivery system in the core sand manufacturing workshop to improve production efficiency and reduce manual labor. By implementing automated storage and transport, the ultimate goal is to achieve informatization, intelligence, and ensuring delivery deadlines through logistics automation.

主要结构与参数 | Key Structure and Features

工作站/modules	部件名称/components	
出入库对接机构 Inbound and outbound docking mechanism	框架 Frame	碳钢 carbon steel
	提升行程 Lifting distance	1000 mm
	输送货物重量 Weight of the transported goods	100 kg
	输送速度 Conveying speed	16m/min
	辊筒 Roller drum	Φ75钢制镀锌辊筒 Φ75 steel galvanized roller drum
	辊筒间距 Spacing between the rollers	100mm
	输送驱动 Conveyor drive	电机 Electric motor
	提升驱动 Lift drive	电机 Electric motor
积放链缓存区域 Storage area for accumulation chains	供电方式 Power supply	380v 交流电/AC power
	链条 Chain	10 b
	倍速链输送机 High-speed chain conveyor	长度:26,570 mm 有效输送宽度:1,350 mm
	机架 machine frame	型材 profiled material
	输送货物重量 Weight of the transported goods	100kg
提升机 Elevator	输送速度 Conveying speed	12m/min
	输送驱动 Conveyor drive	Sew
	供电方式 Power supply	扁平电缆 Flat cable
	轴承 Bearing	Tr/哈轴
	规格 Parameters	长度/length:11,700 mm 有效输送宽度/effective conveying width:1,350 mm 辊筒间距/ Roller spaces:200 mm
出入库输送线 Inbound and outbound conveyor line	机架 Machine frame	碳钢折边 Carbon steel
	外装形式 External form	安全防护网 Security fence
	升降动力传输 Lifting power transmission	同步带 Timing belt
恒温恒湿系统 Onstant temperature and humidity system	水平输送方式 Horizontal conveying method	辊筒输送 Roller conveyor
	双链辊筒输送机 Double chain roller conveyor	长度/length:3,000 mm 有效输送宽度/effective conveying width:1,150 mm 辊筒间距/spacing between the rollers:200 mm
	双链辊筒输送机 Double chain roller conveyor	长度/length:3,500 mm 有效输送宽度/effective conveying width:1,150 mm 辊筒间距/spacing between the rollers:200 mm
	顶升移栽机 Lift transfer machine	有效输送宽度/effective conveying width:900 mm 输送面高度/conveyor height:650-700 mm
	Ahu空调箱 Air handling unit	滤网、盘管、电加热端、加湿段(加湿器)、风机段等 Filter mesh/coil/electric heater section/humidifier/ fan section, etc.
	管道系统 Pipeline system	热镀锌钢管、镀锌铁皮共板法兰风管、顶送侧回的送回风方式 Hot-dip galvanized steel water pipe/galvanized sheet metal flange duct/air delivery method by top supply and side return
	Ba控制系统 Building automation control system	西门子plc控制系统 Siemens PLC control system

电池片成品缓存库

AS/RS of Finished Battery Cell



电池片成品有外包装箱的情况下要求单独存放, 因格智能定制化电池片成品缓存库能帮助生产企业从传统人工装箱的方式升级为单箱物流, 实现物料在电池生产车间、电池片成品库和组件车间的自动转运。通过自动化缓存、排序、输送等系统降低人力成本, 快速相应生产节拍, 有利于传统光伏企业升级改造实现高效能的数字化工厂建设。

With the requirement for separate storage of finished battery cells that are packaged in individual boxes, the customized finished battery cell buffer/storage warehouse by ENGOAL aims to upgrade the traditional manual packing method to single-box logistics.

系统组成	System components
排序叠盒系统	Sorting and stacking system
出入库输送系统	Inbound and outbound conveyor system
电池片、空箱直流输送系统	Direct current conveyor system for battery cells and empty boxes
出库拆盒系统	Outbound box disassembling system
异常处理系统	Exception handling system

逆变器老化测试库

Aging Test Chamber



该设备适用于并网逆变器、储能变流器等全自动化组装、老化测试的生产应用, 其中包括各种测试设备、监测仪器和环境控制设备。在该老化测试库中, 逆变器可以在不同的温度、湿度、负荷和工作条件下进行长时间的运行, 以便评估其稳定性和寿命。这有助于制造商确保逆变器在实际应用中能够持续稳定地工作, 并且可以为产品质量提供可靠的保证。

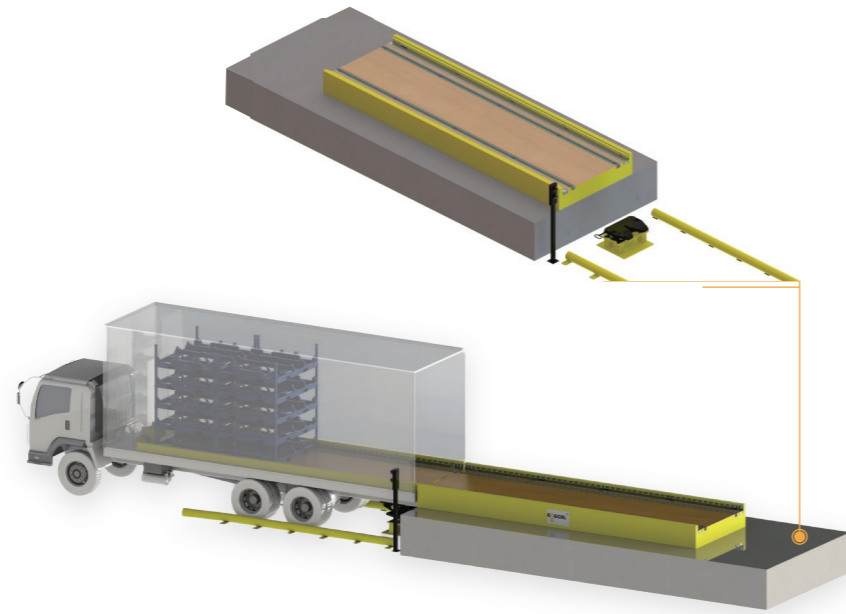
This equipment is suitable for the fully automated assembly and aging testing of grid-connected inverters, energy storage converters, and other similar products. It includes various testing devices, monitoring instruments, and environmental control equipment. In this facility, inverters can undergo long-term operation under different temperature, humidity, load, and operational conditions to assess their stability and lifespan. This helps manufacturers ensure that inverters can work continuously and reliably in practical applications, providing a dependable assurance for product quality.

滑链式自动装卸系统

Roller-chain System

主要特点 Key features

- 标准托盘
- 短途运输
- 车辆改造
- 可装可卸
- 双动力结构
- Standard palletized goods
- Short-haul transportation
- Modified vehicle
- Load & Unload
- Dual power conveying mechanism



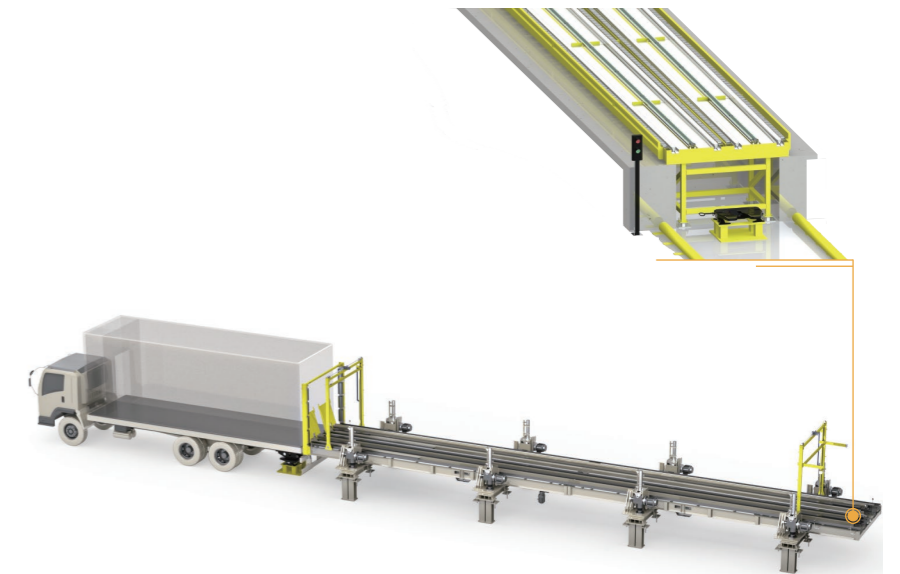
参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
厂内输送线体高度 Height	按需定制 Customization	厂内输送线体宽度 Width	按需定制 Customization
车内输送线体高度 Height of chain	80mm	车内驱动形式 Drive mode	前置驱动/下置驱动 Front drive/bottom drive
输送线体长度 Length	Max 16500mm	适用车厢长度 Length	Max 17500mm
单层载荷 Load capacity	Max 30t	输送速度 Speed	Max 12m/min
驱动电机总功率 Electric power	Max 6kw	噪音 Noise	≤70 Db
气源压力 Compressed air pressure	3-5 bar	安全阻挡器 Blocking mechanism	气动阻挡器 Pneumatic stopper
适用场景 Scenes	车辆改造 Vehicle modification	控制方式 Control	全自动控制 Fully automatic control

叉轨式自动装卸系统

Fork-rail System

主要特点 Key features

- 标准托盘
- 长&短途运输
- 车辆改造均可
- 可装可卸
- 单动力结构
- Standard palletized goods
- Long & short-haul transportation
- Non-modified/ modified vehicle
- Load & Unload
- Single power conveying mechanism



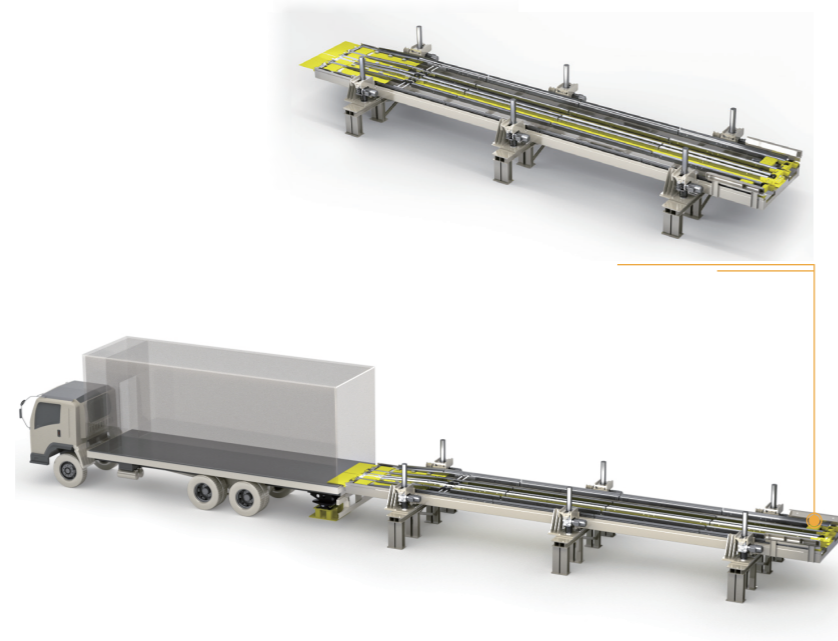
参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
厂内输送线体高度 Height of conveyor system	按需定制 Customization	厂内输送线体宽度 Width	按需定制 Customization
车厢离地高度 Height of truck carriage	80mm	车内驱动形式 Drive mode	无驱动 No drive
货叉长度 Length of fork-rail	Max 19000mm	适用车厢长度 Length	Max 17500mm
系统载荷 Load capacity	30t	对接输送速度 Speed	Max 12m/min
伸缩货叉系统载荷 Load capacity	1000kg/m	伸缩货叉行走速度 Speed	Max 18m/min
驱动电机总功率 Electric power	Max 12Kw	噪音 Noise	≤70 Db
气源压力 Compressed air pressure	3-5 bar	安全阻挡器 Blocking mechanism	气动阻挡器 Pneumatic stopper
适用场景 Scenes	车辆改造或不改造 Vehicle modification or non-modification	控制方式 Control	全自动控制 Fully automatic control

推板式自动装车系统

Push-plate Loading System

主要特点 Key features

- 对物料底盘无特殊要求
- 长途运输
- 车辆不改造
- 只装不卸
- 单动力结构
- Non-standard palletized goods
- Long-haul transportation
- Non-modified vehicle
- Load only
- Single power conveying mechanism



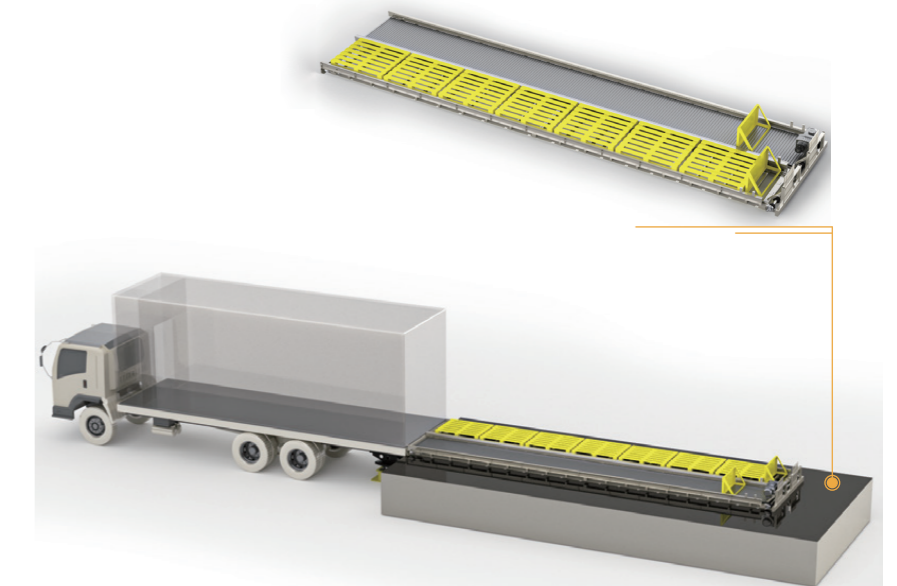
参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
车厢离地高度 Dimensions	13500-16500 mm	载荷 Load Capacity	Max 30t
输送速度 Speed	Max 18m/min	适用车型 Applicable models	标准20英尺、40英尺 Container truck of 20 feet and 40 feet
推半结构形式 Structure	滚轮+链条 Roller + Chain	升降位移 Up and Down displacement	0-500 mm
适用车厢长度 Length of truck carriage	Max 17500 mm	平移位移 Translation displacemen	±150 mm
车厢离地高度 Height of truck carriage	13500-16500 mm	噪音 Noise	≤60 dB
保护等级 Protection Levels	IP55	装卸时间 Loading and unloading time	Max 7min

链板式自动装卸系统

Chain-plate System

主要特点 Key features

- 对物料底盘无特殊要求
- 短途运输
- 车辆改造
- 可装可卸
- 单动力结构
- Non-standard palletized goods
- Short-haul transportation
- Modified vehicle
- Load & Unload
- Dual power conveying mechanism



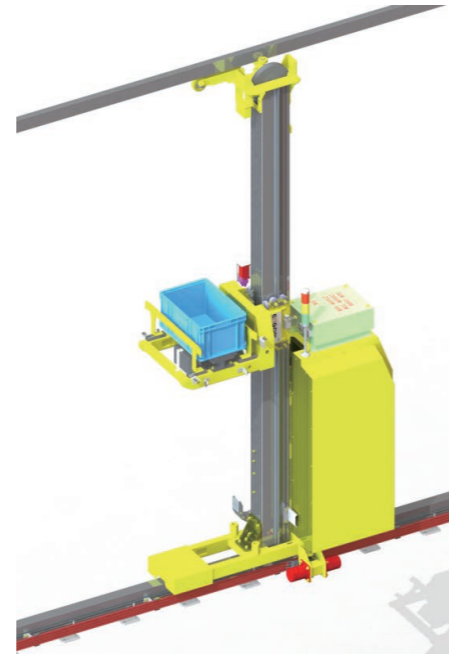
参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
外形尺寸 Dimensions	14000x2200x4300 mm	载荷 Load Capacity	Max 30t
输送速度 Speed	Max 18m/min	适用车型 Applicable models	标准20英尺、40英尺 Container truck of 20 feet and 40 feet
车辆定位形式 Location method	马鞍座+导向柱 Sensor coupling + guidepost	适用场景 Scenes	车辆改造 Modified vehicle
链板形式 Chain-plate form	铝合金耐磨槽条 Aluminum alloy groove strip	驱动电机总功率 Electric power	Max 5 kw
定位精度 Positioning Accuracy	±10mm	噪音 Noise	≤60 dB
保护等级 Protection Levels	IP55	装卸时间 Loading and unloading time	Max 7min

料箱堆垛机

Tote Stacker Crane

主要特点 Key features

- 适合料箱物料
- 成熟稳定的模块化设计
- 毫米级定位精度
- 机械及电气双重防护
- 平稳快速存取料箱
- Suitable for totes and cases
- Mature and stable modular design
- Millimeter level of positioning accuracy
- Double protection for machinery and electrical
- Stable and fast access to materials



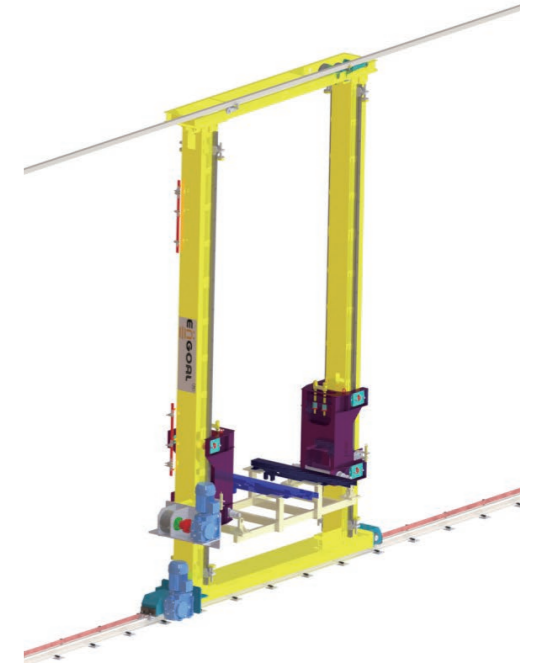
参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
高度 High	Max 6m	载荷 Load Capacity	Max 40kg
行走速度 Speed	Max 180m/min	行走加速度 Walking acceleration	1.2 m/s ²
定位精度 Positioning Accuracy	±5mm	噪音 Noise	≤75 dB
升降速度 Up and Down Speed	Max 30m/min	升降加速度 Up and Down acceleration	0.5 m/s ²
定位精度 Positioning Accuracy	±3mm	噪音 Noise	≤75 dB
货叉速度 Fork Speed	Max 60m/min	货叉伸缩加速度 Fork acceleration	0.5 m/s ²
定位精度 Positioning Accuracy	±3mm	噪音 Noise	≤75 dB

托盘堆垛机

Pallet Stacker Crane

主要特点 Key features

- 适合托盘物料
- 成熟稳定的模块化设计
- 毫米级定位精度
- 机械及电气双重防护
- 平稳快速存取料箱
- Suitable for pallets
- Mature and stable modular design
- Millimeter level of positioning accuracy
- Double protection for machinery and electrical
- Stable and fast access to materials



参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
高度 High	Max 8.5m	载荷 Load Capacity	Max 1500kg
行走速度 Speed	Max 120m/min	行走加速度 Walking acceleration	0.5 m/s ²
定位精度 Positioning Accuracy	±5mm	噪音 Noise	≤83 dB
升降速度 Up and Down Speed	Max 18m/min	升降加速度 Up and Down acceleration	0.5 m/s ²
定位精度 Positioning Accuracy	±3mm	噪音 Noise	≤83 dB
货叉速度 Fork Speed	Max 30m/min	货叉伸缩加速度 Fork acceleration	0.5 m/s ²
定位精度 Positioning Accuracy	±3mm	噪音 Noise	≤75 dB

拆叠盒轻型提升机

Collapsible Box Hoist

结构特点 Structural features

- 组合式机体框架
- 支腿
- 提升电机
- 输送电机
- 提升机框架
- 配重框架
- 导向装置
- 输送机
- Combined Body Frame
- Support Legs
- Lifting Motor
- Conveyor Motor
- Frame of Hoist Marchina
- Counterweight Frame
- Guide Device
- Conveyor



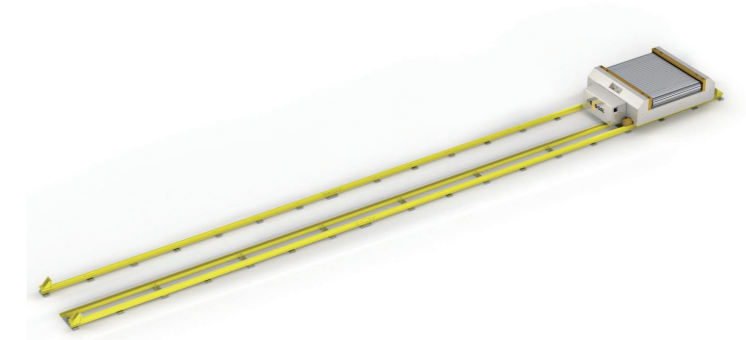
项目	参数	Items	Specifications
承载	15 kg	Maximum load capacity	15 kg
提升高度	5,000 mm	Maximum lifting height	5,000 mm
提升速度	80 m/min	Lifting speed	80 m/min
加速度	1m/s ²	Acceleration	1m/s ²
输送速度	40 m/min	Conveyor speed	40 m/min
效率	150 盒/小时 150 box/hour	Efficiency	150 盒/小时 150 box/hour
叠放层数	4 层 4 layers	Stacking layers	4 层 4 layers
供电方式	拖链供电 Cable drag chain	Power supply	拖链供电 Cable drag chain
噪音	≤75db	Noise	≤75db

板链RGV

Chain-plate RGV (Rail Guided Vehicle)

结构特点 Structural features

- 水平速度: $V_x=160\text{m/min}$; $a_x=0.33\text{m/s}^2$
- 输送速度: $V_z=18\text{m/min}$; $a_z=0.5\text{m/s}^2$
- Horizontal speed: $V_x = 160\text{m/min}$; $a_x = 0.33\text{m/s}^2$
- Vertical speed: $V_z = 18\text{m/min}$; $a_z = 0.5\text{m/s}^2$



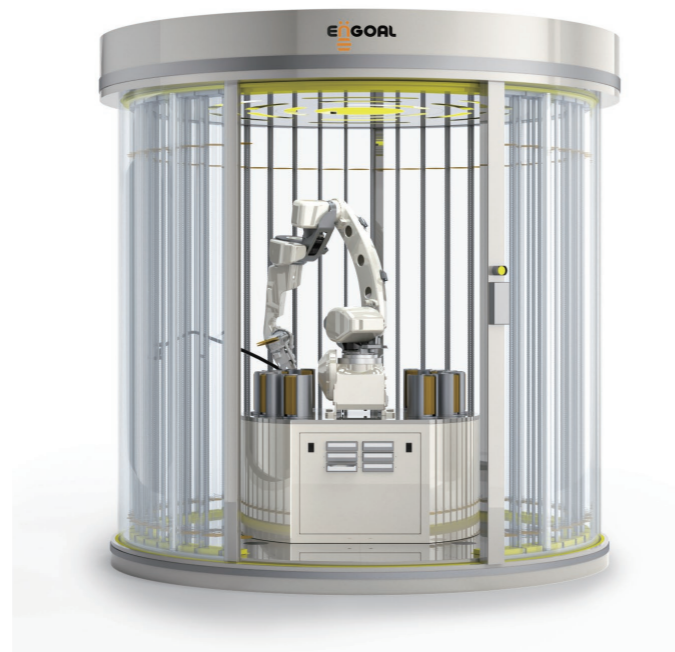
- 采用激光测试定位系统, 定位精度高;
- 结构紧凑, 复合国际一流标准;
- 模块化组合, 安装、维护方便;
- 广泛应用于汽车、烟草、医药、食品、电子、化工、轻工.
- It adopts laser positioning system for high positioning accuracy.
- Compact structure, in compliance with international standards.
- Modular design for easy installation and maintenance.
- Widely used in automotive, tobacco, pharmaceutical, food, electronics, chemical, and light industries.

光磁仓

Intellectual Management Depository of CD

主要特点 Key features

- 适用于光盘类小件存放
- 大容量数据信息存储
- 快速排序、出库
- 数据长期、安全存储保障
- Storage for optical disc
- Large storage capacity of data and information
- Quick sorting and outbound
- Long term and secure data storage guarantee



参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
外形尺寸 Dimensions	φ2580x2580	光盘规格 Disc Specifications	φ120-φ15--1.2
移动速度 Moving Speed	Max 1.5m/s	光盘存放数量 Storage quantity	8325张
加速度 Acceleration	Max 3m/s ²	夹爪驱动方式 Gripper Drive	电动 Electric drive
测距范围 Ranging range	200-400mm	夹爪行程 Gripper Stroke	10mm
定位精度 Positioning Accuracy	±0.1mm	噪音 Noise	≤45 dB

环形仓

Circular Warehouse



设备名称	机器人快存系统
作业场景	用于小件物料自动仓储
关键参数	满足3种规格周转箱自动仓储
储存量	保证2天生产线需求量
出库效率	满足生产线线边2小时的拉动

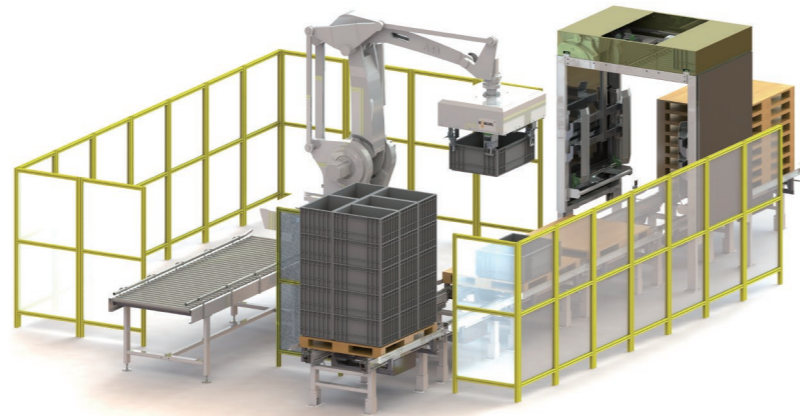
Device Name	Robot Fast Storage System
Operating Scenario	Designed for automatic storage of small items
Key Parameters	Accommodates three sizes of turnover boxes for automatic storage
Storage Capacity	Ensures a 2-day production line supply
Outbound Efficiency	Meets a 2-hour pull for the production line at the line-side

料箱拆码垛工作站

Automated Tote Palletizing and De-palletizing Workstation

特点

- 设备稳定性好
- 工作站部署时间短
- 兼容不同类型的料箱
- Good Equipment Stability
- Short Workstation Deployment Time
- Compatible with Different Types of Tote



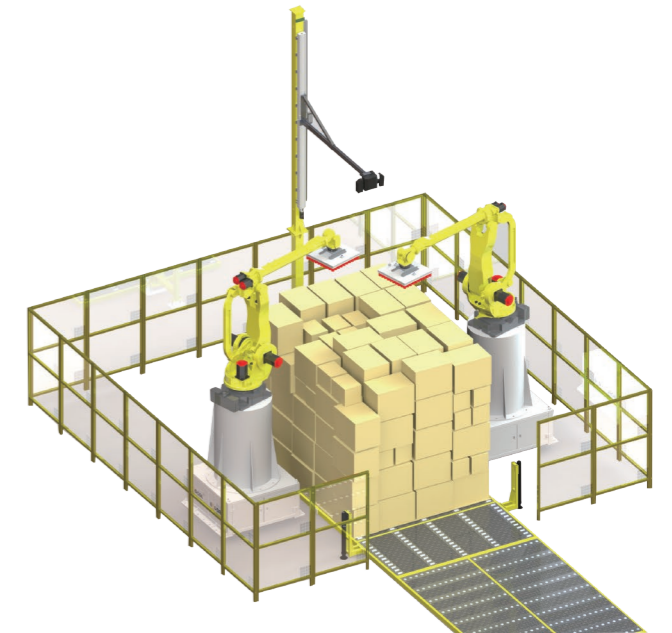
参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
外形尺寸 Overall dimensions	5000*5080*4500 mm	夹具最大负载 Maximum load	Max 50kg
节拍 Takt time	240箱/h	机械臂工作半径 Working radius of manipulator	2700mm
料箱尺寸 Container size	1045*1045*367	自由度 Degrees of freedom	6
夹具工作气压 Claw working pressure	0.5Mpa	定位精度 Positioning accuracy	±1mm
适用场景 Applicable scenario	工厂内料箱搬运及倾倒 Handling and dumping of totes in the factory		

纸箱拆码垛工作站

Automated Carton Palletizing and De-palletizing Workstation

特点

- 特制抓手轻松应对不同的抓取方式；
- 可兼容不同尺寸且不规则的各类货物；
- 操作简单，快速适配新产品。
- Specially designed grippers can easily handle different grasping methods;
- Compatible with various sizes and irregular goods;
- Easy to operate and quickly adapt to new products.

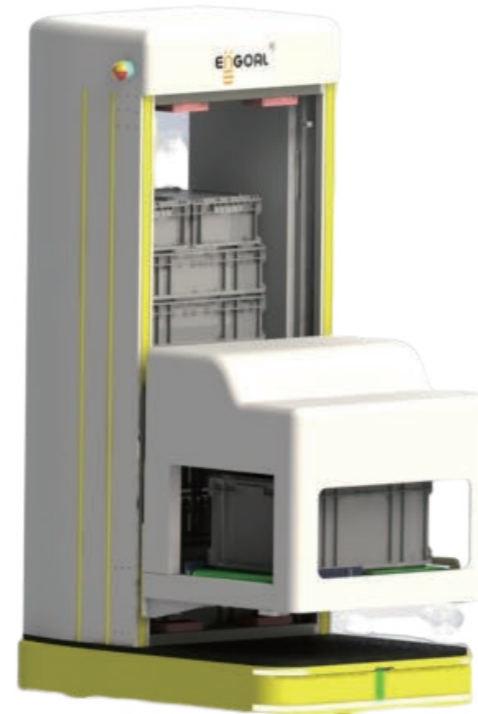


参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
外形尺寸 Overall dimensions	7000*7080*7200 mm	吸盘最大负载 Maximum load	Max 30kg
真空度 Vacuum degree	40Kpa	机械臂工作半径 Working radius of manipulator	2300mm
节拍 Takt time	600箱/h	自由度 Degrees of freedom	6
货物尺寸 Cargo size	3.2m*2.4m*3.2m	定位精度 Positioning accuracy	±1mm
适用场景 Applicable scenario	航空托盘拆垛 Destacking of air pallets	噪音 Noise	≤85 dB

线边投料机器人 Material Feeding Robot

特点

- 精度高±2mm
- 激光SLAM+反射板
- 一次构图, 无需多次更新
- 小尺寸更灵活
- Accuracy up to ± 2mm
- Laser SLAM+ Reflector
- Accurate Composition
- Smaller Size for Greater Flexibility

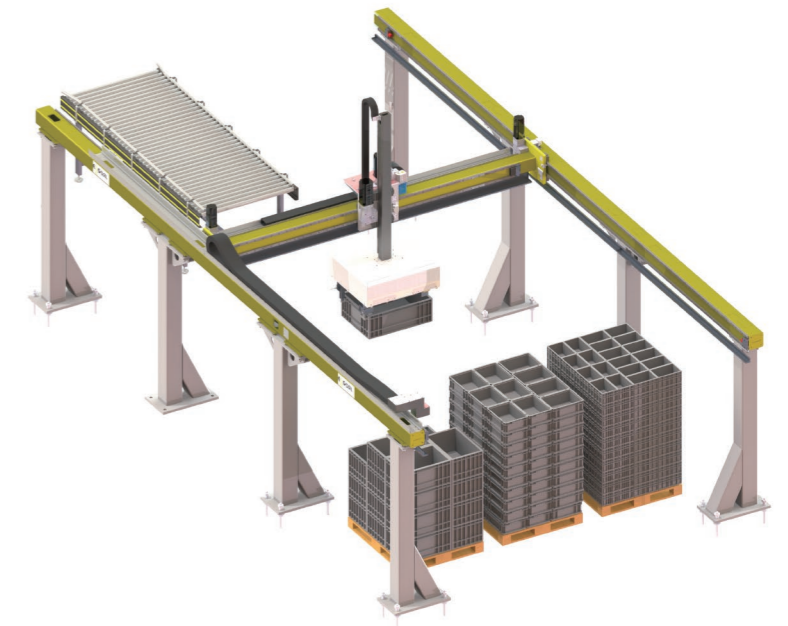


参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
外形尺寸 (L*W*H) Dimensions	1.25*0.88*2.1m	载荷 Load Capacity	Max 300kg
行走速度 Speed	Max 90m/min	升降速度 Up and Down Speed	Max 15m/min
搬运速度 Handling speed	Max 8.5m/min	自重 dead weight	580kg
存储料箱规格 (L*W*H) Storage bin specifications	60*40*28 (14.8) cm	最大存储量 Maximum storage	5 (9) 箱 5 (9) Boxes
存储料箱规格 (L*W*H) Storage bin specifications	40*30*28 (14.8) cm	最大存储量 Maximum storage	10 (18) 箱 10 (18) Boxes
导航方式 Navigation mode	二维码+惯性导航 QR navigation & Inertial navigation	旋转精度 Rotational accuracy	±0.5°
避障方式 Obstacle avoidance	雷达避障 Radar obstacle avoidance	续航时间 Battery life	4-6h
取放节拍 Pick and place beats	30s/箱	噪音 Noise	≤60 dB

桁架机械手 Gantry Robot

特点

- 占地面积小
- 造价成本低
- 承载能力极强
- 安装操作简单
- Small Floor Space
- Low Device Cost
- Extremely Strong Carrying Capacity
- Easy Installation and Operation



参数类别 Parameter	数值 Value	参数类别 Parameter	数值 Value
外形尺寸 Overall dimensions	4000*8000*6000mm (可定制/customizable)	夹爪最大负载 Maximum load	Max 30kg
X Y Z行程	3500/7000/3800mm (可定制/customizable)	X轴加速度 X-axis acceleration	0.5 m/s ²
X Y速度	2m/s	Y轴加速度 Y-axis acceleration	0.5 m/s ²
Z速度	1.5m/s	Z轴加速度 Z-axis acceleration	0.5 m/s ²
三轴定位精度 Three axis positioning accuracy	±0.1mm	适用场景 Applicable scenario	拆码垛 Palletizing and De-palletizing

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* 以上排名不分先后