

## 生物发酵全流程自动化解决方案

BIO-FERMENTATION FULL-PROCESS AUTOMATION SOLUTION



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发酵生产  
自动灭菌过程控制



物料连续  
灭菌过程控制



移种站  
全自动过程控制



发酵培养  
过程控制



发酵罐全自动  
清洗过程控制

通过配方搭建,实现发酵过程一键全自动控制。

One-click fully automatic control of the fermentation process via formula setup.

具备完善的电子签名、趋势报表、报警、审计追踪等功能,实现生产过程数据的可追溯性。

Through recipe configuration, achieve one-click, fully automated control of the fermentation process.

发酵车间轻量化生产过程管理系统,实现生产过程的电子化管理,形成完整而准确的电子批记录。

Through recipe configuration, achieve one-click, fully automated control of the fermentation process.

支持分阶段自适应报警管理:可根据灭菌、发酵、停车等不同工艺节点,自动开启/关闭报警功能、动态切换报警阈值,并在非生产状态下智能屏蔽无效报警,减少干扰的同时保障报警精准性。

Supports phase-adaptive alarm management: automatically enables/disables alarm triggers and dynamically adjusts thresholds based on process phases (sterilization, fermentation, shutdown). It intelligently suppresses invalid alarms during non-production states to minimize disruptions while ensuring alarm accuracy.



降低染菌率

Reduce bacterial infection rate



减少操作人员20%

Reduce the number of operators by 20%



提升生产效率

Improve production efficiency



蒸汽消耗降低50%以上

Reduce steam consumption by more than 50%



提高发酵水平

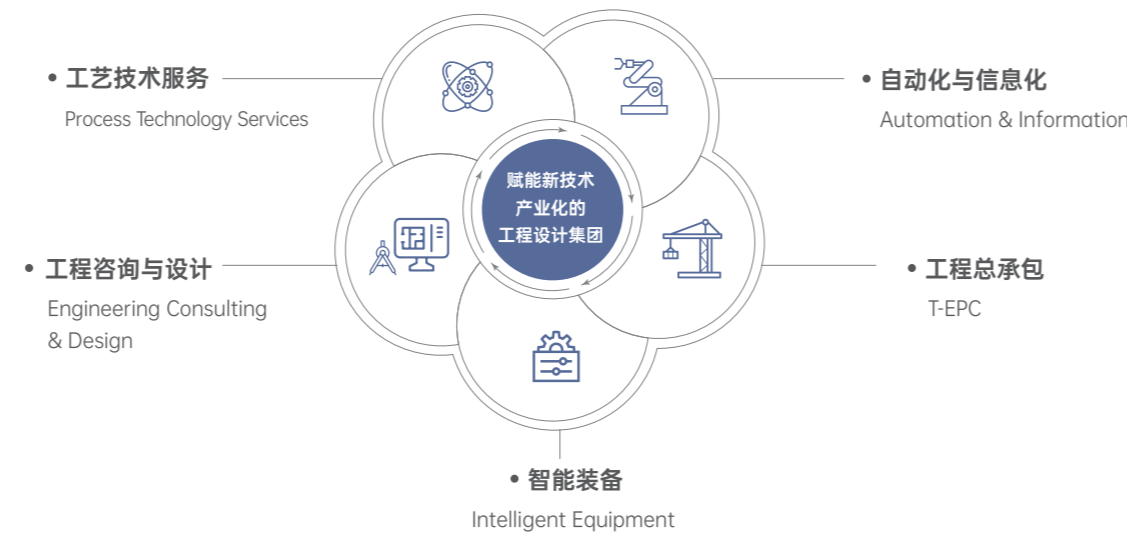
Improve fermentation level

TIAN'S 天俱时

天俱时集团 TIAN'S Group

天俱时集团是赋能新技术产业化的工程设计集团,以“天俱时模式”重新定义工程交付标准。我们以“Tech the Future”为品牌理念,提供集技术研发、工程咨询与设计、工程总承包、智能装备、自动化与信息化于一体的综合解决方案,精准助力客户实现从实验室到工厂(From Lab to Fab)的产业化飞跃。业务深度聚焦生物发酵、合成生物、生物医药、化学制药、精细化工、含氟精细化学品、电子化学品、电子特气、食品健康等前沿高科技领域。

TIAN'S Group is an engineering design group empowering industrialization of new technologies, redefining engineering delivery standards through its "TIAN'S Model". With the brand philosophy of "Tech the Future", we provide integrated solutions encompassing technology R&D, engineering consulting & design, EPC contracting, intelligent equipment, automation and digitalization, precisely assisting clients in achieving industrial leaps From Lab to Fab. Our business focuses on bio-fermentation, synthetic biology, bio-pharmaceuticals, chemical pharmaceuticals, cutting-edge high-tech sectors including fine chemicals, fluorine-containing fine chemicals, electronic chemicals, electronic specialty gases, and food health.



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SCAN QR CODE TO VIEW TIAN'S WECHAT ACCOUNT  
天俱时公众号

TJS-2601-CE500-20260228



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TIAN'S 天俱时

## 生物发酵 自动化与信息化 解决方案

BIO-FERMENTATION  
AUTOMATION & INFORMATION  
TECHNOLOGY SOLUTION

## 生物发酵自动化与信息化解决方案

BIO-FERMENTATION AUTOMATION & INFORMATION TECHNOLOGY SOLUTION

面对发酵工业产业升级、双碳目标与智能化转型需求,天俱时深耕行业KNOW-HOW,提供**生物发酵全流程自动化解决方案**。该解决方案集成高精度配料、连续灭菌、发酵罐灭菌(实消/空消)、无菌管路灭菌、菌株培养到系统清洗等关键环节,显著提升灭菌控制率、节能降耗、减少人工依赖、提升生产效率和发酵水平。同时,通过**发酵工厂数字化管理平台与轻量化T-MES生产管理系统**,实现生产全过程的实时监控,打通信息孤岛,为精益管理、科学决策与持续改进提供强大的数据支撑。该方案广泛应用于生物医药、生物材料、食品健康、医美、天然产物、农兽药等领域,助力客户实现数字化转型,构建可持续竞争优势。

To address the fermentation industry's drive for upgrading, the Dual Carbon goals, and intelligent transformation, TIAN'S leverages its deep industry KNOW-HOW to deliver a **full-process automation solution for bio-fermentation**. Integrating high-precision batching, continuous sterilization, fermenter sterilization (in-situ sterilization/empty sterilization), sterile pipeline sterilization, strain cultivation, and system cleaning, the solution significantly improves aseptic control, cuts energy consumption, reduces labor reliance, and enhances production efficiency and fermentation performance. Meanwhile, the **Fermentation Enterprises Digital Management Platform and Simplified T-MES Production Management System** enable real-time monitoring of the entire production process, break down information silos, and provide robust data support for lean management, scientific decision-making, and continuous improvement. Widely applied in biopharmaceuticals, biomaterials, food and health, medical aesthetics, natural products, and agro-veterinary pharmaceuticals, the solution empowers customers to achieve digital transformation and build sustainable competitive advantages.

### 生物发酵工厂自动化与信息化整体规划



## 全流程自动化发酵技术核心模块

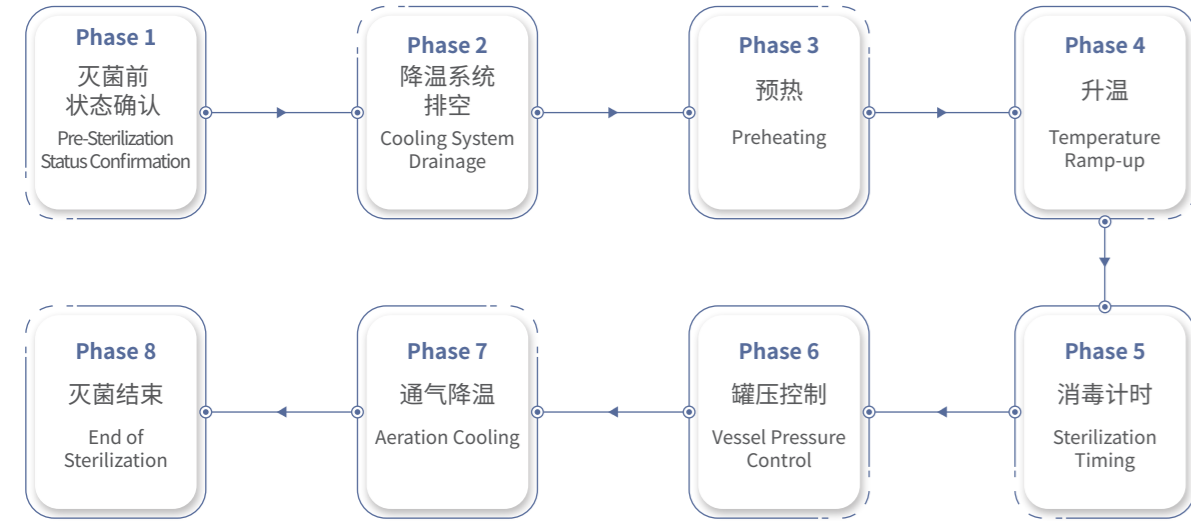
CORE MODULE OF FULL PROCESS AUTOMATION FERMENTATION TECHNOLOGY

### 发酵生产自动灭菌过程控制

Automatic Sterilization Process Control for Fermentation Production

根据发酵罐消毒工艺和路线设计,实现消毒过程的罐体排空、夹套排空、预热、升温、保压、计时、通气、降温等过程的自动化精准控制,保证无菌率、节约蒸汽消耗的同时减少人员操作,为微生物发酵生产提供可靠环境,实现节能减排。

Based on the fermentor disinfection process and route design, the system enables automatic and precise control of key processes including vessel emptying, jacket emptying, preheating, temperature ramp-up, pressure holding, timing, aeration, and cooling during sterilization. This ensures sterility, reduces steam consumption and manual intervention, provides a reliable environment for microbial fermentation, and achieves energy conservation and emission reduction.



### 物料连续灭菌过程控制

Material Continuous Sterilization Process Control

实际消毒时间长对培养基成份破坏较大,蒸汽用量大,天俱时基于阿伦尼乌斯公式和等效灭菌理论,应用智能瞬时连消技术将配制好的培养基向发酵罐等培养装置输送的同时进行加热、保温灭菌和冷却等操作过程,从而有效提高生产效率,节约能源。

Batch sterilization has a long duration, which causes significant degradation of medium components and high steam consumption. Based on the Arrhenius equation and equivalent sterilization theory, TIANS applies intelligent continuous flash sterilization technology to heat, hold-sterilize, and cool the prepared medium during its transfer to fermentors and other cultivation equipment, thereby effectively improving production efficiency and saving energy.

### 智能瞬时连消机 全国销量第一\*

Intelligent Instantaneous Sterilizing Equipment  
No.1 in sales volume in China



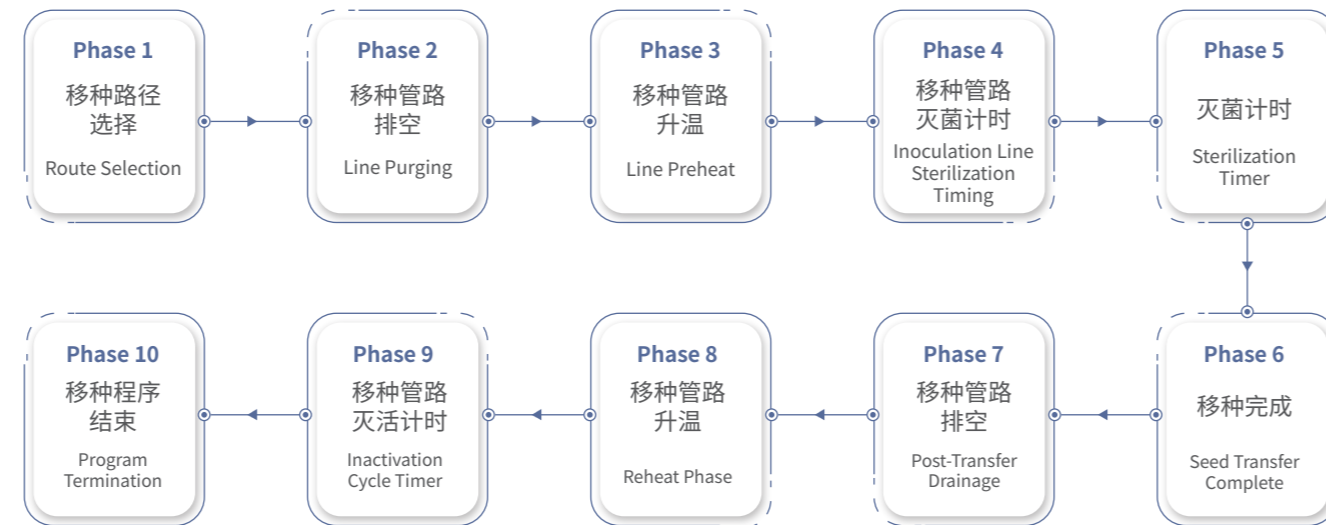
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### 移种站全自动过程控制

Fully Automatic Process Control of the Seeding Station

根据工艺设定,自动匹配移种路线,对移种管路进行自动排空、升温、保温消毒、降温、移种等操作,实现移种过程全自动控制。

Based on process specifications, the system automatically matches the seeding route and performs automatic operations on the inoculation pipeline, including line purging, preheating, hold-sterilization, cooling, and seeding, to achieve fully automatic control of the seeding process.



### 发酵培养过程控制

Process Control of Fermentation Culture

根据微生物生长特性,结合生产经验和专家数据库,建立控制模型,对发酵过程的补料、温度、pH、DO、进气流量、罐压、消泡实现培养过程精准控制,从而保证生产稳定,提高发酵单位,提升产品品质。

Based on the microbial growth characteristics, combined with production experience and expert database, a cultivation control model is established to achieve precise control of feeding, temperature, pH, DO, inlet air flow, tank pressure and defoaming of the fermentation process, so as to ensure stable production, improve fermentation units and improve product quality.

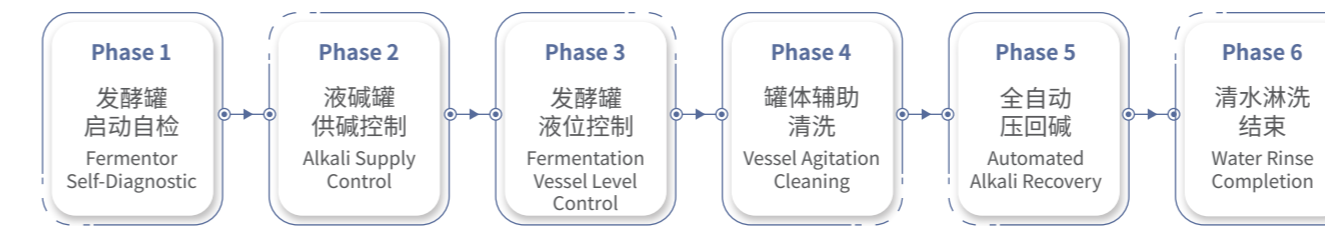


### 发酵罐全自动清洗过程控制

Fully Automated Fermentor CIP Process Control

发酵罐全自动碱洗流程以进碱量、液位为核心触发条件,联动阀门、泵体、温控系统自动完成进碱、搅拌辅助清洗、压碱及清水淋洗复位的闭环操作,全程无需人工干预。

The fully automated alkaline cleaning process for the fermentation vessel uses alkali dosing quantity and liquid level as core trigger conditions. It automatically coordinates valves, pumps, and the temperature control system to complete a closed-loop operation, including alkali feeding, agitation-assisted cleaning, alkali displacement, and a water rinse reset—all without manual intervention.

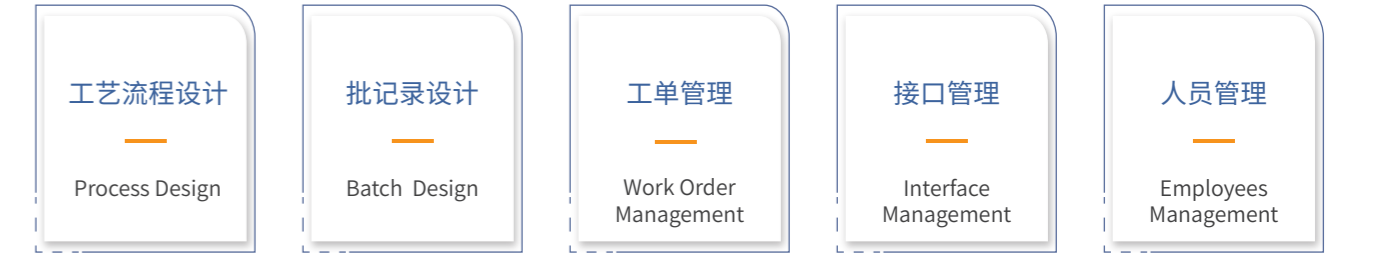


## 轻量化T-MES生产管理系统

SIMPLIFIED T-MES PRODUCTION MANAGEMENT SYSTEM

天俱时T-MES是一款“懂工艺”的轻量化智能制造执行系统,支持基于客户实际需求进行零代码、低成本定制。系统独具核心功能,操作便捷,信息传达高效,通过工单一键下发、实时数据监控、自动化流程和智能分析提供即时决策支持。系统拥有4项软件著作权,被认定为国内先进水平并荣获“河北省优秀软件产品”。

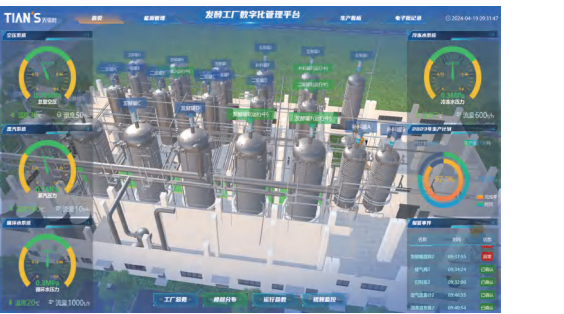
TIANS T-MES is a Simplified, process-knowledgeable intelligent manufacturing execution system that supports zero-code, low-cost customization based on customers' actual needs. Featuring unique core functionalities, the system is easy to operate and ensures efficient information transmission. It provides immediate decision support through one-click work order issuance, real-time data monitoring, automated workflows, and intelligent analysis. With four software copyrights, the system has been recognized as domestically advanced and has been honored as the "Hebei Provincial Excellent Software Product."



## 发酵工厂数字化管理平台

DIGITAL MANAGEMENT PLATFORM EMPOWERING FERMENTATION ENTERPRISES

天俱时发酵工厂数字化管理平台集成厂区生产管理、实时监测(含物料流向、批次号)、视频监控等功能,可对接能源管理、T-MES及DCS系统,采用数字孪生技术实时展示车间生产,显著提升企业的生产管理效率,助力发酵企业数字化转型。



【发酵工厂数字化管理平台】

The TIANS Fermentation Plant Digital Management Platform integrates plant production management, real-time monitoring (including material flow and batch numbers), and video surveillance. It can be connected with energy management, T-MES, and DCS systems, leveraging digital twin technology to visualize workshop production in real time. This significantly enhances production management efficiency and supports fermentation enterprises in their digital transformation.

