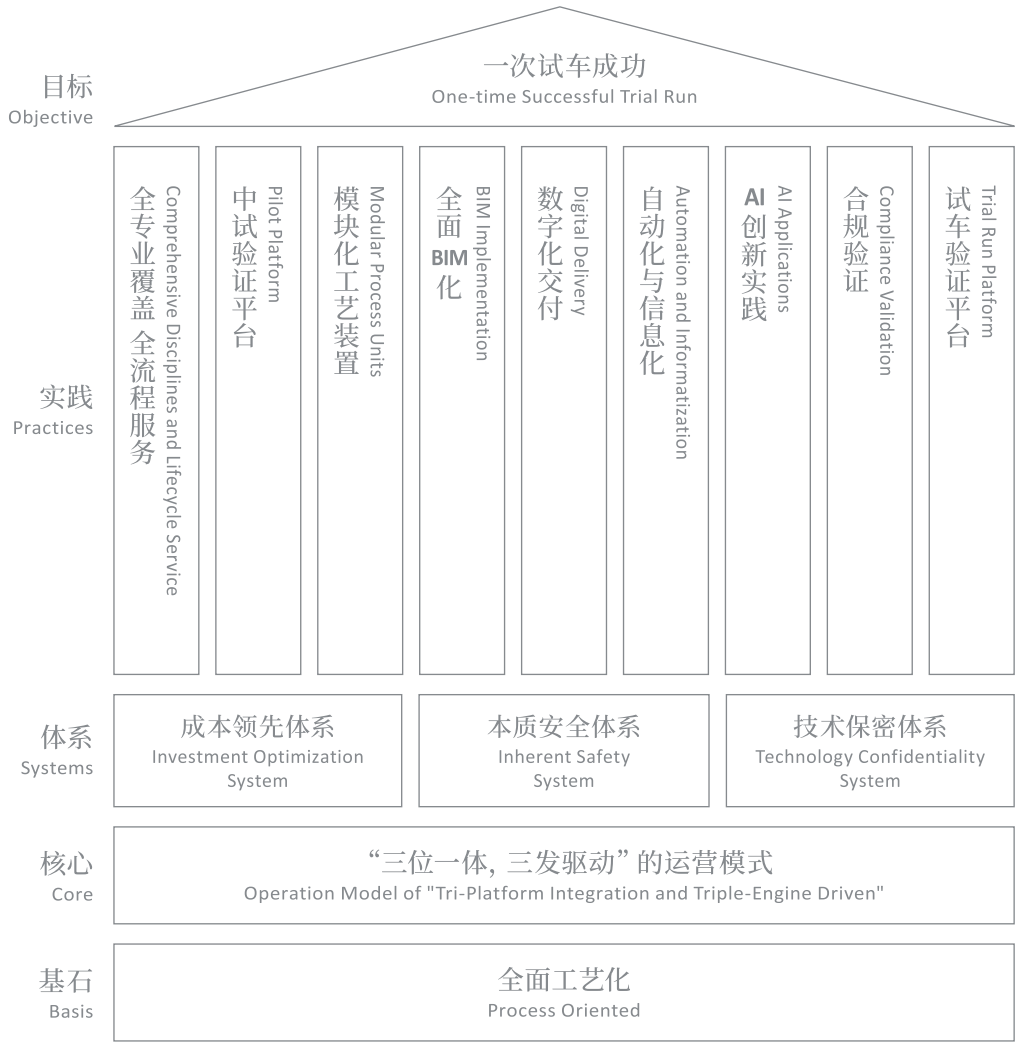
天俱时模式

赋能新技术产业化的创新实践

TIANS Model Innovative Practices

TIAN'S


目标
Objective
一次试车成功
One-time Successful Trial Run
实践
Practices
全专业覆盖 全流程服务
Comprehensive Disciplines and Lifecycle Service
中试验证平台
Pilot Platform
模块化工艺装置
Modular Process Units
全面BIM化
BIM Implementation
数字化交付
Digital Delivery
自动化与信息化
Automation and Informatization
AI创新实践
AI Applications
合规验证
Compliance Validation
试车验证平台
Trial Run Platform
体系
Systems
成本领先体系
Investment Optimization System
本质安全体系
Inherent Safety System
技术保密体系
Technology Confidentiality System
核心
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“三位一体, 三发驱动”的运营模式
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天俱时模式

当今世界，科技革新与产业重构交汇激荡，精细化工、合成生物、生物医药等行业领域新技术层出不穷，为产业升级注入澎湃动能。然而，从实验室成果迈向产业化的征途，常因技术复杂性、成本压力、安全风险与市场不确定性而步履维艰。传统工程服务模式囿于局部优化，难以满足全流程、多维度的产业化需求。时代呼唤一种贯通“从实验室到工厂”（From Lab to Fab）全链条的创新工程范式，以更高效率与灵活性驱动新技术产业化。天俱时集团，作为以工艺技术为核心、矢志创造价值的工程设计引领者，正以其独创的“天俱时模式”，重塑工程科技服务的边界与未来图景。

“天俱时模式”是一种驱动新技术产业化的工程科技新范式，以全面工艺化的技术生态为组织基石，依托技术平台、事业部平台与项目指挥平台“三位一体，三发驱动”的协同运营，整合覆盖全专业、全流程的一站式服务能力，最终实现“一次试车成功”的价值承诺，推动项目高效落地。

天俱时模式始终以市场为界面，以需求为锚点，为客户构建系统化、合规可行、快速落地的产业化解决方案，依托成本领先、本质安全、全过程保密等特色体系为客户创造核心价值，通过模块化工艺装置、数字化交付等九项能力推动新技术实现从小试、中试到规模化生产的高效转化，为客户交付从工艺验证到一次试车成功的价值工程，驱动产业高端化、绿色化、数字化和智能化可持续发展。

全面工艺化

新技术产业化面临工艺包不完善、规模化放大难，复合型人才不足，以及经济性、可靠性、合规性与可维护性等多重挑战。**天俱时率先提出并深入践行“全面工艺化”理念，始终以工艺为核心，构建贯通人才、技术与服务的全链条工艺技术体系，系统化解产业化进程中的各类不确定性，为客户提供确定、可靠、高效的项目落地保障。**

1 全面工艺化的人才体系

天俱时系统实施《核心领域工艺人才专项引进计划》《青年博士团计划》《采购体系工艺化发展计划》《工艺骨干渗透率考评专项计划》《工艺骨干持证奖励及项目指挥长任职资格管理计划》等一系列专项举措，推动工艺能力向设计、采购、自动化、施工等全专业渗透，已实现各专业人才全面工艺化，打造出一支深度融合技术与管理、兼具工艺开发、创新与产业化能力的核心团队。**截至 2025 年底，集团拥有 12 位博士及科学家，60 位行业咨询与规划专家，416 位工艺技术、工程设计及生产管理技术骨干。**

此外，天俱时科技委员会与清华大学、华东理工大学、北京化工大学、中国科学院过程工程研究所、大连化学物理研究所等知名院校

及科研机构形成稳固的战略合作。截至 2025 年底，拥有 50 余位精细化工、合成生物、医药、智能制造等行业产学研专家。

2 全生命周期工艺技术服务

依托“多核驱动，万马奔腾”的工艺发展理念，我们系统整合跨领域顶尖专业力量，构建起层次清晰、协同高效的技术支撑体系，为客户提供全生命周期高标准、全方位的工艺技术服务，确保每一环节的工艺决策精准匹配最终生产需求与商业目标。

项目规划阶段，专家团队深度参与项目前期调研，提供产品市场分析、竞争力分析、成本分析、产能分析等可行性分析报告。

工艺包优化阶段，针对实验室工艺进行优化，开展物料衡算、关键设备选型与工艺包论证，打造高质量、可落地的工艺技术包。

中试验证阶段，进行工艺放大研究与设备验证、路线调整，整合相关验证资源，为产业化转型提供可靠的数据支撑。

产业化阶段，贯穿设计、采购、施工以及试生产调试支持与工艺验证（4Q）全过程。

3 精深的工艺优化与工程转化能力

在精细化工、合成生物、生物医药等高技术领域，天俱时依托众多拥有深厚生产一线经验的工程师团队，以及作为专业工程技术公司的系统集成与落地能力，围绕全流程自动化、连续化、智能化、绿色化、

本质安全与成本控制等核心目标，以“工艺先行、系统优化”为原则开展技术工作。

生产经验赋能工艺转化：来自生产一线的工程师，能将实验室阶段的定性成果，通过基于实际运行洞察的工艺路线比选与流程系统性重构，精准转化为可规模化实施的工业控制逻辑、安全联锁与标准化操作规程（SOP）。我们深知生产痛点，确保工艺方案具备可操作性和稳定性。

工程能力驱动工艺落地：以工程技术公司的全局视角和专业能力，确保工艺理念贯穿始终。经验丰富的跨专业团队（工艺、设备、自控等）紧密协作，不仅关注关键工艺参数（CPP）的严格管控，更将工艺逻辑深度融入项目全生命周期。

“三位一体，三发驱动”的运营模式

为系统性破解工程建设领域营销、设计与执行相互割裂，以及由此导致的效率低下与客户体验不佳等瓶颈，天俱时首创并践行技术平台、事业部平台、项目指挥平台“三位一体，三发驱动”的运营模式。该模式旨在打破传统线性流程，推动三大平台从串联协作转向并联交互，构建一个以客户价值为核心、自动成核、动态协同的有机生命体，实现对市场需求的快速响应与高质量交付。

1 有机生命体：三位一体，三发驱动

(1) 技术平台——创新与技术的引擎

聚焦工艺技术与设计，以前沿的工艺技术和卓越的设计创意，为项目交付设定高品质标准，为客户提供兼具先进性与高度可实施性的技术方案。

整合工艺技术中心、总工程师办公室、首席设计师办公室、首席安全官办公室、首席工程师办公室、设计中心、青岛设计中心、中试验证平台、环保技术中心、BIM 中心、数字化中心、验证中心、大数据中心、试车验证平台、技术创新研究院等 15 个技术中心，共同构建支撑项目全周期运作的核心能力基座。

(2) 事业部平台——客户需求与价值链接的枢纽

始终以市场和客户为中心，锚定行业与项目核心痛点，通过前瞻性分析与深度挖掘客户需求，反向驱动技术创新与优化设计，最终为客户交付定制化解决方案。

通过由精细化工事业部、发酵工程事业部、医药健康与合成生物事业部、生物医药事业部、自动化与信息化事业部、食品健康事业部、营销事业部、国际事业部、天津中心、上海中心、胡志明中心等 11 个业务单元，纵深化聚焦精细化工、含氟精细化学品、电子化学品、合成生物、生物医药等高科技产业领域，业务遍及全球 30 余个国家和地区，已成功交付超过 3500 个精品项目。

(3) 项目指挥平台——项目交付与履约的基石

基于项目需求而设立的实体组织，精准锚定营销需求与设计标准，保障项目高效、高质量交付，致力于一次试车成功。

截至 2025 年底，已有 45 个项目指挥部成功运行，实现了技术、供应链、人才等核心资源的精准配置与高效协同。

2 创新运营：有机融合，流程再造

“三位一体，三发驱动”的运营模式不仅是一次组织升级，更是对行业生产关系的深刻重塑。其核心实践主要体现在以下两个方面：

(1) 以客户为中心的项目指挥部体系

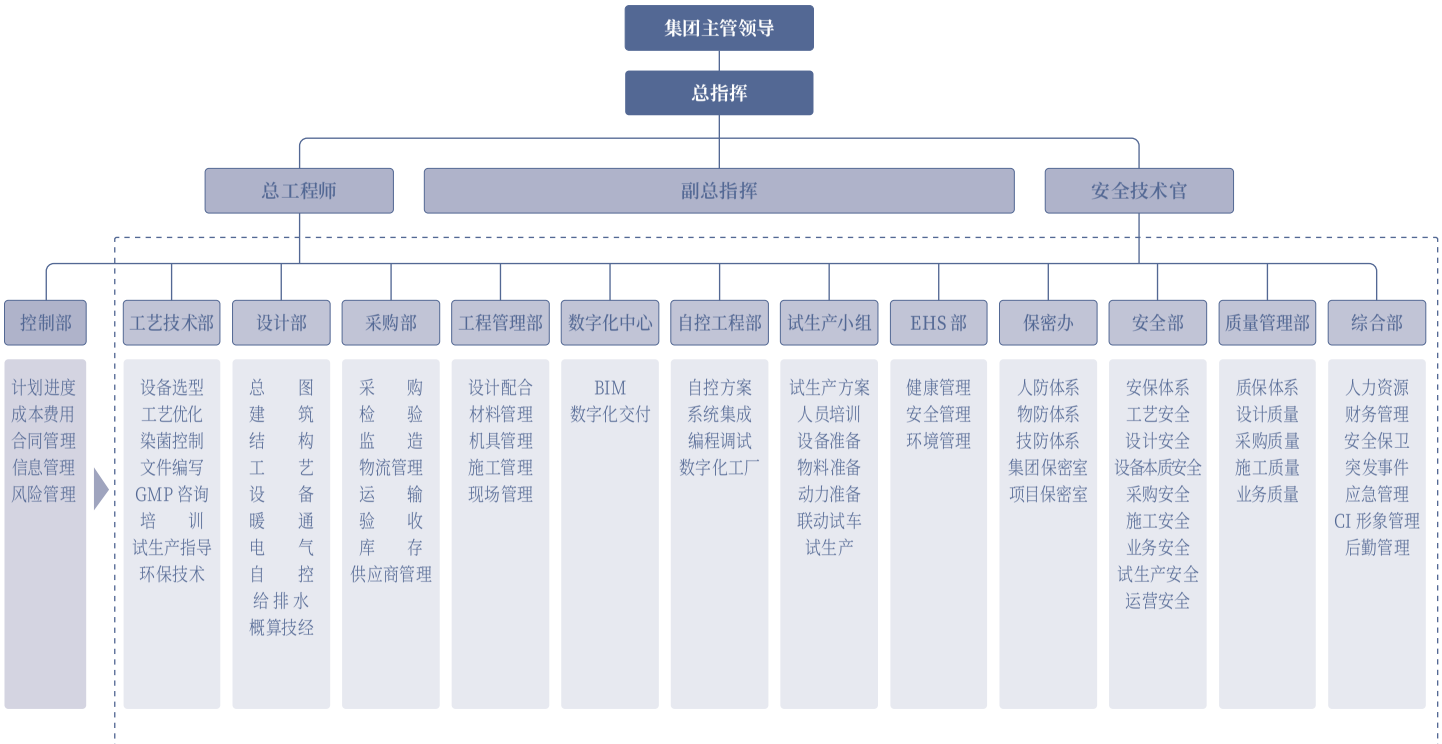
天俱时特色项目指挥部体系以客户需求为中心进行资源配置，确保“客户需要什么人，指挥部就配置什么人”。其特点包括：

指挥团队专业化：由工艺、设计专家担任项目总指挥，配备工艺背景的总工程师，保障一次试车成功。

职能对接无缝化：设置设计、采购、施工副总指挥，确保关键环节高效协同。

安全管理前置化：设立拥有“一票否决权”的安全技术官，将本质安全管控前移至设计阶段。

商业信息保密化：通过专设保密室与严格保密制度，确保客户商业秘密安全。


集团主管领导
总指挥
总工程师
副总指挥
安全技术官
控制部
工艺技术部
设计部
采购部
工程管理部
数字化中心
自控工程部
试生产小组
EHS 部
保密办
安全部
质量管理部
综合部
计划进度
成本费用
合同管理
信息管理
风险管理
设备选型
工艺优化
染菌控制
文件编写
GMP 咨询
培　　训
试生产指导
环保技术
总　　图
建　　筑
结　　构
工　　艺
设　　备
暖　　通
电　　气
自　　控
给 排 水
概算技经
采　　购
检　　验
监　　造
物流管理
运　　输
验　　收
库　　存
供应商管理
设计配合
材料管理
机具管理
施工管理
现场管理
BIM
数字化交付
自控方案
系统集成
编程调试
数字化工厂
试生产方案
人员培训
设备准备
物料准备
动力准备
联动试车
试生产
健康管理
安全管理
环境管理
人防体系
物防体系
技防体系
集团保密室
项目保密室
安保体系
工艺安全
设计安全
设备本质安全
采购安全
施工安全
业务安全
试生产安全
运营安全
质保体系
设计质量
采购质量
施工质量
业务质量
人力资源
财务管理
安全保卫
突发事件
应急管理
CI 形象管理
后勤管理

项目指挥部体系

(2) 以四次协调会议为核心的 EPC 管理流程

在“三位一体，三发驱动”的运营模式指导下，天俱时迭代形成了以四次协调会议为核心抓手的 EPC 管理流程。该流程系统性地串联起项目各关键阶段，通过阶段性决策与评审，确保工程全过程受控、执行有力，最终实现高品质交付。

四次协调会议：

四次会议	关键工作	参加人员
方案或初步设计文件审核暨第一次工艺、设计、采购、施工协调会	1. 评估工艺技术路线、设备及材料可行性； 2. 识别潜在工艺瓶颈、合规风险（如环保、安全标准）； 3. 多方案比选（如流程优化、模块化设计、自动化水平、关键技术选型）。	首席设计师办公室 首席安全官办公室 首席工程师办公室 工艺技术中心 设计中心 BIM 中心 采控中心 验证中心 自动化与信息化事业部 项目指挥部相关成员
详细或施工图设计文件审核暨第二次工艺、设计、采购、施工协调会	1. 从可生产性、可操作性、可维护性、可施工性、安全性审核、P&ID 及设备规格书； 2. 与设备、电气、自动化专业对接，确保工艺需求落地； 3. 三维模型审查。	
采购沟通会 暨第三次工艺、设计、采购、施工协调会	1. 讨论关键设备选型、供应商技术审核、监造与验收，确保设备符合工艺要求； 2. 确定工程执行工作计划、设备及材料采购计划。	
项目施工组织策划会 暨第四次工艺、设计、采购、施工讨论会	1. 讨论确定施工进度计划，包含工艺、设计、采购人员现场服务时间； 2. 确定《施工进度保障方案》； 3. 确定试车小组等组织核心成员，明确施工组织问题。	

特色体系

成本领先体系

新技术产业化过程中，产品能否以具有竞争力的价格切入市场，是衡量其经济可行性的核心指标。真正的成本优势根植于对生产工艺的透彻理解与对项目全生命周期的系统管控。为此，我们推动了一场以成本能力为核心的深刻变革，致力于实现**“比同行更懂成本控制，比传统更省项目投资”**的确定性目标。

1 源头创新：用工艺智慧优化全生命周期成本

成本控制必须始于设计之前，源于工艺之智。天俱时组建了深谙生产运营的专家团队，秉承“以生产定设计”的先进理念，从未来工厂的效益原点，反向审视和深化设计。

同时，我们推行全生命周期成本管控，在可行性研究阶段即开展多方案技术与经济比选，锁定最优投资路径。在设计阶段，通过厂区集约化布局、工艺流程再造、智能化升级与设备精准选型等，从源头固化成本、提升效率。

布局优化：通过整厂或车间级的系统性布局优化，可平均缩短物料

流转距离 20% ～ 30%，从而显著削减内部物流成本。

效率提升：通过工艺流程优化与自动化升级双轮驱动，帮助客户实现生产效率提升 15% 以上，综合用工成本锐减 25% ～ 40%，将效率直接转化为盈利与市场竞争力。

能耗管控：依托深厚的公用工程优化底蕴，通过对公用工程系统实施精准优化，实现运行能耗降低 15% ～ 20%，将核心成本项转化为长期运维利润来源。

设备智库：凭借千余项目沉淀的设备选型数据库，根据项目产能及技术需求，精准匹配兼具最佳经济性与性能适配度的仪表设备，确保投资价值最大化。

2 过程革命：以全流程协同优势实现系统化降本

传统工程模式中，设计、采购、施工环节割裂，图纸不具备落地性、施工反复变更图纸等是成本超支的主要根源。天俱时凭借全流程协同优势，突破传统建设成本思维，通过技术赋能与系统集成，实现工厂投产后数十年的运营、能耗与维护成本最优化。

设计引领，源头植入成本基因：设计之初便前置考量设备选型适配性、施工可行性与长期运维需求，以“可采购、可施工、可运营”为导向规划设计，从根本上规避后续变更与浪费。

采购协同，动态支撑施工节奏：通过“需求集成化采购”策略，系统性规划设计项目采控方案。同时，将关键设备、材料的交付节点与施工进度动态绑定，减少现场待料与仓储成本。

施工反馈，实现精益闭环管理：通过广泛应用 BIM 与模块化预制，从源头减少返工；并通过“设计－施工实时反馈机制”，打通设计与施工的壁垒，形成“设计引领工程，工程优化设计”的协同闭环，实现持续的降本增效。

通过以上三个环节信息实时共享、作业交叉管理、决策动态联动，天俱时系统化消解了传统工程中因环节割裂导致的效率损耗与资源浪费，实现全流程、多要素的成本优化与价值提升：

- 通过标准化与模块化设计，平均降低采购成本 10% ～ 15%。
- 试生产与施工团队提前介入设计，减少后期变更 30% 以上。
- 采购团队前置赋能设计选型，有效降低设备投资 20% 以上。
- BIM 与模块化技术应用有效缩短工期 20% ～ 25%，降低人工成本 30% ～ 40%。

3 数字引擎：数据驱动下的成本精准管控

经验之上，更需科学。天俱时构建了持续迭代的成本管控数字系统，基于对大量工程实践的系统研究，生成了《项目造价参考手册》等标准化工具，将技术经验转化为项目预判力与成本确定性。能够为新建项目提供从投资估算到施工落地的全过程数据支撑，帮助客户在技术先进性与经济合理性间，找到最佳平衡点。

4 实践见证：从成本节约到价值创造

(1) 模块化工艺装置驱动直接降本

依托自主研发与集成能力，模块化工艺装置能为客户创造可量化的成本优势：

- **自动配料系统及装备：**自动化水平提升 50% 以上，物料自动称重准确率稳定，节约称重配料工人 80%。
- **与工艺深度结合的分离、洗涤模块：**将固液分离、洗涤过滤、萃取分相和低温真空干燥等模块，根据工艺要求合并，连续操作，统一控制，减少工序转移和设备占用空间，人工投入降低 80%。
- **新型 TCU 控制系统：**较传统方案节约成本 30% 以上，控温精度符合国际认证。
- **熔融结晶等先进装置：**节省占地与投资，提升产品纯度，实现成本与品质的双重优化。

(2) 环保与生产融合的“成本转化”

环保不是纯成本项，而是可创造收益的价值环节。天俱时通过物料回收、高级氧化、膜技术集成等实现高价值物料回收和废水近零排放与资源化，将环保压力转化为循环经济收益。

通过锰、溴等高价值元素回收，乙腈、苯酚、异丙醇等物料回收，每年产生的经济效益可 100% 抵消全部处理成本，个别项目可产生一定的利润。

对于高盐高浓化工制药废水，通过高级氧化、膜技术集成和浓缩结晶技术应用，外排母液量少于 2%，水回用率可达到 95% 以上，全系统工艺的运行成本可降低 30% 以上。

(3) 集成优化与全流程管控，杜绝隐性成本

在某高端原料药项目中，通过深度工艺优化，帮助客户在实现产能提升 20% 的同时，整体投资比预算降低 18%。

在某关键精细化学品项目中，通过全流程再造，使客户运营成本降低 32%，投资回收期缩短 40%。

本质安全体系

安全不是单纯的成本，而是新技术产业化过程中的核心投资与竞争力来源。**天俱时突破传统被动式安全观，将安全视为可设计、可交付的核心工程属性，构建了以“风险预控、源头治理、全程管控”为核心的全过程本质安全管理体系。**依托“数据 + 专家”双螺旋决策机制，实现双向验证与增强，将防控措施深度前置至工艺与设计源头，严密覆盖研发、设计、施工、试车、运营的全生命周期，并通过标准化、合规化交付，确保每一环节可追溯、可管控。

我们深信，最高级的安全是让风险无从发生。因此，这套体系不仅确保合规，更为客户铸就可靠、具备持久竞争力的工程价值，系统化地将安全转化为项目的长期优势。

1 安全是可设计、可交付的“产品”

天俱时将安全视为一种必须从源头植入的工程属性，遵循以下三重原则：

- **前瞻性原则：**风险管控始于工艺概念阶段。
- **一体化原则：**安全是工艺、设计、采购、施工与运营等全专业共同的纲领。
- **资产化原则：**安全投入转化为可量化的长期资产，如更少的非计划停产、更高的资产利用率与企业声誉。

2 “数据 + 专家”双螺旋决策机制

安全决策不能依赖模糊的经验或孤立的直觉。为此，我们建立了“数据量化洞察”与“专家系统经验”深度融合的决策机制：数据揭示风险，专家解读成因与对策。二者协同作用，实现对风险的精准预判与根除。

(1) 数据端：基于风险场景模拟的工程安全优化实践

运用反应安全风险评估、DNV Phast 风险量化分析爆炸模拟、AspenPlus 流程动态模拟等工具，在虚拟世界中预演千种风险场景。例如在某新能源项目中，通过反应安全风险评估数据与模拟计算精确预测失控反应压力峰值，针对性优化并制定了更具科学性的安全方案，将控制温度降低 10%，将安全泄放面积放大 20%。

(2) 专家端：专家智库协同千项数据，筑牢安全防线

为每个项目配置工艺、仪表、设备、安全专家组成的“智库”，依托千余个项目沉淀的风险数据库与案例库，精准识别数据未覆盖的“暗礁”，输出高质量安全方案。

3 源头根治，将安全基因植入设计根基

我们坚持“最高效的安全始于设计”，将本质安全审查作为项目不可逾越的强制网关。

工艺包安全设计：在工艺包(PDP)阶段即应用工艺危害分析(PHA)，从反应路径与物料本质上剔除不可接受风险。

本质安全设计导则：持续迭代的《本质安全设计导则》收录上千条

源自事故教训与最佳实践的条款，为设计提供“安全清单”，例如强制规定毒性气体泄漏区域须设置密闭采样器。

全流程 HAZOP 护航：在关键设计节点（30%、60%、90% 模型）强制开展深度 HAZOP 分析，实现多专业对设计方案的“压力测试”。在某大型精细化工项目中，通过 HAZOP 提前识别并消除 47 处潜在设备误操作与连锁逻辑冲突。

4 全流程纵深管控

天俱时建立了以首席安全官办公室为战略引领、渗透至各平台、各环节的安全工程师为执行核心的纵深管理体系。该体系根据项目需要，灵活配置安全小组，小组成员深度融入项目全流程并动态管控：

- **研发阶段：**严控核心风险，将本质安全理念贯穿整个过程。
- **设计阶段：**全过程实时参与，提出本质更安全设计意见。
- **采购环节：**严审设备安全性能与合规认证。
- **施工阶段：**驻场动态监督，对高危作业制定专项管控方案。
- **试车阶段：**核验安全措施，编制专项方案并全程督导。

5 可审计的资产：交付清晰的安全“资产负债表”

我们交付的不仅是一个安全的工厂，更是一套完整可追溯的安全资产档案。通过全员安全责任制与数字化文件管理体系，确保从安全条件论证、风险分级管控清单到每一次隐患排查记录，所有行为可追溯、所有责任可归位。

这份“安全日志”是项目全生命周期的可信数字资产：对监管机构，是合规的明证；对客户，是未来运营、扩建与并购中无可替代的核心资产数据。

本质安全体系旨在将安全从“隐性成本”转化为贯穿工厂全生命周期的“显性资产”，最终交付一个让客户安心专注于生产与市场、无后顾之忧的确定性未来。

技术保密体系

作为创新者的命脉，商业机密必须得到全流程闭环守护。天俱时始终将技术保密视为客户信赖与合作的基石，在产业化阶段严守技术保密底线，构建了项目全周期“静态管控”与“动态管控”相结合的双重保障体系。**该体系关注制度、硬件、软件等静态设施和设计、采购、施工中的文件流转、归档、销毁等动态流程，对客户核心技术与知识产权实施全流程闭环守护，确保创新成果在产业化过程中技术保密，文件全程受控。**

1 “制度－物理－数字”的三维立体防线

(1) 制度：全场景覆盖

天俱时建立了《保密工作管理制度》《设计保密室使用管理制度》《保密工作管理十条》《保密室管理十条》《保密项目工程设计管理流程图》《保密承诺书》等 10 余项保密制度与标准化流程，覆盖核心文件存在泄密风险的全场景。

(2) 物理：高标准建设 + 闭环管控

我们高标准建设了 10 余间独立保密室，并规定保密项目现场必须建立保密办公室。这些区域采用双层门禁、无死角视频记录、通讯设备管理柜、密码文件柜等设施，并实行“双人双控、出入留痕”的管控模式。

(3) 数字：数字加密，全程跟踪

相关电脑均部署加密系统，对所有接收、创建文件进行加密。保密

室内设置内部网络，与外网物理隔离。任何文件的访问、复制或打印均自动添加操作人员专属的数字水印，实现操作全程可追溯。

2 保密深度嵌入全流程

保密并非独立环节，而是深度嵌入 EPC 管理流程的动态管控机制：

(1) 启动期：共定规则

与客户联合成立保密小组，共同识别核心保密点与风险，输出专属的《项目保密白皮书》。

(2) 执行期：动态管控

人员隔离：根据“最小必需”原则，实施细胞级访问权限控制。工艺、设备、控制系统等核心信息被分解存储，工程师仅能访问其负责模块的必需信息。

流程隔离：核心设计会议在保密室进行，所有草稿即产即销；数据传输通过物理隔离网络进行，禁止任何形式的未授权导出。

行为审计：涉密区域实行“白名单”制，进出记录与监控影像自动归档，形成不可篡改的行为证据链。

在某新型电池材料产业化项目中，我们将工艺流程分解为多个模块，不同团队的工程师仅能访问与其工作直接相关的部分数据，并通过物理隔离网络加密沙箱环境进行设计协同，从流程上杜绝了非授权聚合信息的可能。

(3) 收尾期：清零审计

项目结束时，执行严格的“数据清零程序”。所有涉密电子数据经

多重验证后，执行不可恢复的物理擦除；纸质文件在双人监督下使用粉碎 - 熔浆两级销毁；同时最终向客户提交双方签署的《保密闭环审计报告》，实现安全管理的精益闭环。

3 标准之上的创新实践

天俱时技术保密体系因多项前瞻性实践而更具韧性：

(1) 对于极高敏感度的项目，我们曾应客户要求，建立包含非真实技术参数的平行项目环境，用于监测和预警任何异常刺探行为，此方法成功帮助客户识别并规避了潜在的商业风险。

(2) 可信存证，区块链固证。所有对核心文件的访问与操作日志均实时同步至区块链存证平台，生成司法认可的电子证据，为潜在争议提供铁证。

(3) 保密不止于协议签署，更是全员共识。我们通过定期的情景化培训与案例教学，以及员工保密信用档案与激励机制，将保密意识深植于文化基因。

截至 2025 年底，已有超过 30 个涉及核心工艺与尖端技术的项目在保密室顺利完成，且始终保持客户技术“零泄漏”的完美记录，连续多年客户满意度 100%。

创新实践

全专业覆盖、全流程服务

精细化工、生物医药、电子化学品等领域的项目建设，正面临着技术集成度高、工期压力大、跨地域协同复杂等多重挑战。传统的设计院或施工企业已难以完全满足客户对技术前瞻性、工程整体性与交付确定性的综合需求。天俱时以“全专业覆盖、全流程服务”，实现项目所需的全部技术和执行能力的“内部化”和“一体化”整合，能够为客户构建一条从技术到产业的平滑、可靠、高效的交付路径。

1 全专业覆盖：横向整合，消除技术孤岛

天俱时构建了一套覆盖新技术产业化全链条的专业体系，不仅解决了“谁来做”的问题，更通过横向深度融合，彻底打破专业壁垒，确保技术方案在各专业能够完整、精确、快速地落地。

我们实现了从工艺研发、工程咨询与设计、过程安全、技经概算，到洁净、自控、环保、调试、验证、装备制造，乃至 BIM、数字化交付等领域的全专业覆盖。每一专业均拥有顶尖专家与扎实能力，依托内

部一体化协作机制，实现高效的跨专业协同，从而将分散的优势转化为高度集成的项目保障。

所有专业团队均为公司内部有机组成，在统一的管理体系与项目平台下工作，执行同一套数据标准，从而消除信息孤岛，实现知识无损传递与协同创新。

2 全流程服务：纵向贯通，负责到底

天俱时对项目全生命周期负总责，提供从概念到运营的“端到端”服务，而非只参与部分环节，确保客户最终获得的是能够持续创造价值的完整工厂，而非一堆图纸和分段工程。

从前端工艺包开发、工艺优化、中试验证与可行性研究开始；贯穿概念设计到施工图的全套工程设计，并融合专业化采购策略；负责施工建设、安装调试，严格执行质量与安全规范；最终完成系统开车、性能考核与稳定交付，并提供数字化运维支持，确保工厂持续高效运行。

3 核心价值：1+1>2 的系统性优势

“全专业覆盖”与“全流程服务”结合产生了决定性的优势：

传统分散模式	天俱时模式
多界面，难协同： 客户需要管理众多供应商界面，沟通成本高，责任不清。	**一个责任主体：** 天俱时作为唯一接口，承担全部责任，客户管理简单高效。
技术易脱节： 研发、设计、施工、运营各方目标不一致，技术意图层层衰减。	**技术一贯到底：** 技术团队全程参与，确保从实验室到生产的精准转化。
局部最优，整体失控： 各方追求自身环节成本最低，易导致整体预算和进度失控。	**全局最优：** 从项目全生命周期总成本出发进行决策，实现投资价值最大化。
风险转移： 出现问题容易互相推诿，客户成为最终风险承担者。	**风险内化：** 天俱时内部协调解决所有专业间问题，向客户交付确定性。

中试验证平台

从实验室的烧瓶到工厂的产线，高达 80% 的实验室成果因无法解决工艺放大、成本失控与可靠性验证等问题而夭折。天俱时中试验证平台，不仅提供从克级到吨级的全流程验证服务，更致力于将脆弱的实验室“样品”，转化为具备规模化生产基因的工业化产品，系统性破解了科技成果从技术可行到商业成功的“最后一公里”。

1 平台能力与数据基石

硬件基础：拥有连续流、高温高压、精馏提纯、生物发酵、结晶分离等 10 余类专业中试线，可满足 -80℃至 300℃、真空至 10MPa 的广泛工艺条件。

数据资产：基于 50 余个已完成的中试项目数据，我们构建了工艺放大系数数据库、设备选型经验库、物料安全数据库，为每一个新项目提供智能化的初始方案推荐与风险预警。

交付成果：不仅提供验证报告，更输出可直接用于基础设计的“中试数据包”和具备高度可复制性的“模块化工艺流程包”，实现从验证到设计的无缝对接。

2 全流程工程验证：六大维度，闭环赋能

天俱时构建了覆盖“工艺—设备—成本—可靠性—安全—人才”六

大维度的工程验证闭环体系，直击产业化核心痛点：

工艺放大与参数固化：依托 10 余套模块化中试装置与在线分析仪器（如 PAT 过程分析技术），精准模拟工业化条件，将实验室的“单点最佳参数”拓展为可稳定复制的“工艺操作窗口”，成功完成从毫克 / 升级到百公斤 / 批次级的工艺放大案例超过 50 项。

关键设备与材料验证：建立供应链验证数据库，对超过 300 家关键设备供应商及特殊材料进行性能测试与匹配性评估，提前锁定最优供应商，避免量产阶段的设备“水土不服”。

成本精准核算与优化：通过中试数据，建立精确的“物料平衡与能耗模型”，核算出的生产成本与最终量产误差率可控制在 ±5%，为投资决策与产品定价提供铁的数据支撑。

可靠性与寿命测试：模拟极端工况与长期运行，进行≥1000小时的连续稳定性测试与加速老化试验，确保产品性能与催化剂、关键部件寿命满足商业化要求，将量产后的故障率降低70%以上。

安全与环保合规预审：同步开展反应安全风险评估、首次工艺论证、三废处理工艺验证，确保工艺路线本质安全、环保合规，扫清项目审批与生产许可的重大障碍。

人才培养与文件输出：在验证过程中，为客户培育核心工艺工程师与操作员累计超 500 人次，并交付包含完整操作参数的标准化工艺包（PDP）及初步操作规程（SOP），实现“技术移交”与“人才移交”双落地。

3 产学研用协同生态

天俱时中试验证平台创新构建了分布式、网络化的中试基地联盟，通过设备共享与专家协同，形成“产学研用”深度融合的协同创新机制：高校科研团队提供前沿技术与人才支撑，中试平台承担工程化开发与验证，龙头企业参与需求导入与标准制定，下游企业则进行产品测试与应用反馈，形成闭环创新生态。

4 核心价值：提供确定性，加速产业化进程

通过系统性的中试，我们帮助客户将产业化成功率提升至行业领先水平，并将产品上市时间平均缩短 6-12 个月，让客户得以在技术窗口期内抢占市场制高点。

模块化工艺装置

在传统工程模式下，工厂建设如同一次次“从零开始的手工雕塑”，周期漫长、质量波动、成本失控。天俱时以“产品化思维”重塑工程建设，凭借对核心工艺的深刻解构与智能化技术的深度融合，我们成功将复杂的工厂系统，拆解并预制成一系列标准化、智能化的工艺模块。秉承“工艺模块化→模块产品化→产品智能化”的发展逻辑，致力于为客户构建柔性、高效、面向未来的生产体系。

1 核心产品矩阵：从单一模块到成套工艺系统

天俱时的模块化产品，并非设备的简单拼装，而是将核心工艺、安全逻辑与控制逻辑智能化封装的自主知识产权产品。基于自有模块化系统和项目需求，能够帮助客户构建一套标准化、模块化的工程方案，在保证首个项目高效落地的同时，为项目二次开发或同类项目建设提供可快速复制、迭代的标准化模块。

截至 2025 年底，我们已在 MVR 蒸发结晶、电子特气、连续流加氢、高危粉体输送等 8 大核心工艺板块，成功交付超过 50 套高标准撬装装置，项目一次验收合格率 100%。为精细化工、合成生物等多个领域客户创造了实质性价值：

- **建设周期：**通过模块化设计与安装，现场工期缩短 40% ～ 60%。
- **综合成本：**通过设计持续优化与批量预制，综合成本降低 15% ～ 25%。

- **质量与安全：**在受控工厂环境下制造，将焊接等关键工序的一次合格率提升至 99.8%，极大保障了本质安全。

我们正从单一单元向“多单元耦合的成套工艺模块”（如集成反应、分离、纯化的连续化生产模块）进阶，并全面嵌入预测性维护算法与数字孪生体，使模块具备“自感知、自优化”能力。

2 智能瞬时连消系统：一个品类，定义一个行业

天俱时智能瞬时连消系统是天俱时“工艺装备化、装备智能化”能力的极致体现，我们不仅制造装备，更定义标准。

基于《无过热水罐连续灭菌工艺》《连消成套设备自动化控制管理系统》等 21 项核心专利与自建的先进实验室，该系统实现了“一键灭菌”，无菌率稳定在 100%，蒸气能耗较传统系统降低 70% 以上，平均 10 个月收回设备投资成本，更以连续“零故障”的运行纪录（最长单体设备无故障运行时间超过 5 万小时），重新定义了可靠性标杆。

天俱时智能瞬时连消系统市场占有率超过 90%，位列中国第一，并荣获“国内领先水平”权威认证。

3 模块化工艺装置的核心价值

- **快速响应市场：**将新产线建设周期从“年”压缩至“月”，助力客户抢占市场窗口。

- **技术无缝升级**：当工艺革新时，可对特定模块进行单独更换或升级，而非淘汰整条产线，保护初始投资。
- **绿色与可持续**：模块可拆卸、易迁移，实现资产的全生命周期价值最大化。

全面 BIM 化

天俱时基于百余个复杂工程的深度实践，已超越基础建模，构建起完整的数字协同生态，推动 BIM 价值实现三级跃升：从服务设计的“有模型”、驱动施工的“用模型”，最终成为赋能客户长期运维的“活模型”。我们以行业最高标准为准则，将 BIM 作为贯穿工程全生命周期的核心数据基座，为项目高质量落地奠定坚实基础。

1 三级跃升：BIM 价值贯穿项目全周期

通过行业前沿实践与创新，我们以三级应用体系系统化释放 BIM 价值，全面赋能项目建设全生命周期。

Ⅰ级：设计优化，决策前移

天俱时 BIM 团队致力于在设计阶段通过高精度协同模型解决潜在问题。借助自动化碰撞检测、工艺模拟与空间优化，将关键决策大幅前移，平均可减少 20% 以上的现场变更，从源头保障工程品质、控制成本与工期。

Ⅱ级：施工管控，精益管理

通过 BIM 与进度（4D）、成本（5D）的深度联动，将静态模型转化为驱动现场精益管理的动态引擎。对施工方案进行虚拟推演与优化，可精准指导预制加工与现场作业，将整体施工效率与精度提升 15% 以上，显著降低返工与浪费。

Ⅲ级：交付运维，资产增值

我们将 BIM 技术贯穿于规划至运维的全阶段，将核心关键的工程数据转化为可继承、可分析、可持续增值的“活”资产，为资产的长期高效、安全与低碳运营提供核心数据支撑。

2 全面 BIM 化的三大核心能力

通过构建三大核心能力，实现 BIM 技术从孤立工具到核心引擎的蝶变。

(1) 前瞻的标准与协同体系

天俱时 BIM 创新实践深度契合中国前沿 BIM 应用标准。截至 2025 年底，通过《工厂模块化数据快速出图》等十余项课题研究，已在 50 余个应用场景中全面应用 BIM 技术，覆盖从智能审图到智慧运维的全链条。基于云的跨专业协同平台，确保各参与方在统一数据环境下工作，从机制上保障“一模到底”。

(2) 专业的复合型人才团队

我们组建了覆盖工艺、设计、采购、自控的全专业复合型 BIM 团队。**团队不仅精通 BIM 技术，更能围绕客户的工艺需求进行定制化开发，通过一体化设计与实时冲突处理，实现协同效率提升 30%、管线问题减少 40%，为项目高效落地提供坚实支撑。**

(3) 深度的数据融合与应用

天俱时 BIM 团队超越几何模型，通过多阶段数据整合：在设计阶段，植入设备参数、工艺逻辑等结构化信息；在施工阶段，关联进度、成本、质量数据，最终交付一个与实体工厂完全镜像、富含工程关键数据的“数字孪生体”。

- **运维提效：**基于孪生体的模拟与诊断，将巡检与故障处置效率提升 20% ～ 40%。
- **成本节约：**通过预防性维护与能耗优化，节约全生命周期运营成本 5% ～ 15%。

数字化交付

在交付实体工厂的同时，为给客户交付可追溯、可模拟、可运营的数字孪生资产，天俱时构建起覆盖设计、采购、施工到运营的一体化数据链，以高精度三维模型为直观载体，以结构化数据为核心，对实体工厂静态映射，支撑其未来安全、高效、智能化运营。

通过《天俱时数字化交付工程》专项计划，天俱时系统构建了以下五大核心能力：

1 数据结构化：让数据“活”起来

我们以工厂设备、管线等为核心，对设计、采购、施工、试生产全过程产生的静态信息进行清洗、关联与结构化处理。交付的不仅是三维模型与图纸，更是整合了智能 P&ID、对象属性、关联清单、供应商文档、施工文档的可视、可查、可溯的数据资产，为后续智能运维奠定坚实基础。

2 高精度建模与数据联动

天俱时数字化工程师能够熟练运用 SP3D 等国际主流平台进行全专业三维协同设计。各专业在同一模型空间并行作业，数据实时联动，通过实时碰撞检测功能，建立了“设计—检查—修改”的快速迭代机制。经实践验证，平均可减少约 30% 的现场设计变更与返工，显著节约项目成本与工期。

3 高效能团队 + 高效率组织

针对每一个数字化交付项目，专门组建以数字化交付经理为核心，融合设计、采购、数据、IT 等多专业的协同团队。从项目启动、策略制定到验收交付，全过程依托数字化平台高效流转，使项目准时交付率提升至 94% 以上，并成功减少 10% ～ 20% 因信息误差与返工导致的成本浪费。

4 全周期质量管控：交付可信赖的数字资产

天俱时数字化交付团队始终将数据的准确性、一致性、完整性和合规性作为核心准则。**通过实施严格的模型测试与数据校验流程，我们确保数字模型与设计图纸、实体工厂、设备清单等完全吻合，从而交付能够真实映射实体工厂的高质量数字孪生体。**

实践表明，严格的质量管控使设计协同中的信息冲突减少 90% 以上，极大提升了决策效率；同时，可为工厂投产后的预测性维护、智能巡检等高级应用，节省超过 60% 的数据准备时间与成本。

5 赋能未来智慧运营：交付只是起点

数字化交付的最终价值在于赋能运营。天俱时正在并将持续推动：

(1) 深化数据资产管理与应用：在现有材料库的基础上，构建企业级的“标准设备数据库”和“典型设计模块库”。探索将数字化交付的静态数据与工厂运维期的实时数据（如 DCS 数据）进行关联，为实现

预测性维护、智能巡检等高级应用准备数据基础。

(2) 构建统一交付平台：目标是整合智能软件以及文档管理、进度管理等多源数据，构建一个面向客户的、统一的数字化交付门户。该平台不仅提供可交互的三维模型浏览，还能实现基于位号或区域的数据快速检索、关联文档查看、施工模拟与培训等功能，真正交付一个“可生长、可运营”的数字工厂核心。

截至 2025 年底，我们已成功为巨化、渤化等国内领先的精细化工企业实施数字化交付。

自动化与信息化

在精细化工、合成生物、生物医药等控制逻辑复杂、高监管风险的行业，传统数字化转型往往面临资金投入大、解决方案落地性低、试错成本高的挑战。依托千余个流程工业过程自动化与信息化工程项目经验，天俱时形成了多个深植工艺、与生产场景紧密结合的解决方案，系统化破解了效率、合规与成本之间的核心矛盾。

1 工艺技术引领的全流程自动化

天俱时组建了涵盖工艺、仪表、自控系统、设备及验证的跨领域专家团队，核心成员拥有丰富的行业经验。基于对行业生产场景的深度理解，我们首创菜单式四级自动化服务，确保方案既先进又可落地：

I 级：模块化快速部署

通过对化学合成、生物发酵、生物医药等近百个典型工艺场景的控制逻辑进行标准化封装，形成了经典核心控制模型库，客户根据自身工艺需求可自主、灵活地搭建和掌控生产配方，可高效组合与集成优化，使方案设计及优化调整效率提升 80%以上，控制方案稳定性提升超过 20%。

II级：工艺—自动化一体化协同

推行正向一体化设计，工艺与自控专家从源头协同，将控制要点、安全联锁等需求直接融入三维设计与自动化方案，确保工艺意图无损传递至控制系统，更帮助客户实现产品合格率、收率平均提升 10%-25%，关键工艺参数波动幅度平均降低约 40%。

Ⅲ级：合规验证加速

提供经大量项目验证的模板化验证文件体系（URS/DQ/IQ/OQ）及电子批记录解决方案，平均缩短验证周期 30% 以上，助力系统快速合规达标。

Ⅳ级：持续运营赋能

项目投产后，提供基于数据分析的年度运营服务包，涵盖性能优化与预防性维护，助力客户实现生产效能的持续提升。

2 轻量化生产管理系统

为规避数字化转型“投入大、周期长”的陷阱，我们以“轻量化、模块化、易部署”为理念，推出灵活高效、低成本的生产管理系统。

核心产品轻量化生产管理执行系统（T-MES），以“流程可拖拽、合规即插即用”为设计原则，显著降低应用门槛：

拖拽式极速建模：系统内置近百种通用业务组件，工艺人员通过拖拽业务组件即可配置生产流程，系统同步生成电子 SOP，将建模部署周期从数周缩短至小时级。

开箱即用的合规性：电子签名、审计追踪等要求封装为标准组件，可减少约 80% 的验证文档工作量，确保合规高效落地。

融合 AI 的生产智能中枢：集成开源 AI 模型与企业知识库，实现数据、规则与知识的融合，为异常预警与工艺优化提供智能决策支持。

截至 2025 年底，天俱时 T-MES 已在华生元、颐海等化学合成、生物发酵、食品饮料行业 10 余个工程项目中成功实施，帮助客户实现：

- 生产效率提升 20% ～ 30%。
- 质量问题追溯时间从数天缩短至 10 — 40 分钟。
- 管理决策效率提升 50%以上。

3 三维可视化平台

基于 Unreal Engine 5 引擎打造的高逼真数字孪生底座，深度融合优化后 BIM 模型（精细化还原建筑结构、管线排布、设备布局等全要素），通过专属数据中转站实时采集、解析多系统数据，以沉浸式三维交互画面呈现全域运行状态，实现“一屏统管”的智能化运营新模式，已成功应用于百济神州、齐鲁安替制药、华生元等国内领先的生物医药企业。

4 从稳定生产到智能运营的价值闭环

天俱时自动化与信息化团队，始终以工艺知识为根，以客户价值为导向。通过“全流程自动化”筑牢稳定、高效、合规的物理生产基石，再通过“轻量化生产管理系统”构建灵活、智能的数字管理空间。两者协同，为生产企业搭建面向未来、可持续优化与创新的数字化平台，奠定可靠、敏捷的智能工厂基石。

AI 创新应用

在人工智能（AI）技术爆发式增长的时代，天俱时敏锐捕捉到技术变革的脉搏，不仅仅满足于数字化的连接，更致力于智能化的生成与决策。天俱时将 AI 技术深度融入工程设计、工艺决策及商业运营的各个环节，通过“AI+ 工程”的深度耦合，不仅大幅提升了交付效率，更实现了从“经验驱动”向“数据驱动”的决策模式跃迁，重新定义了工程服务的生产力标准。

1 AIGC 驱动智能设计：从“构想”到“看见”

天俱时率先引入生成式人工智能（AIGC）技术，打破了传统工程设计的时空限制，为客户提供极具视觉冲击力与决策参考价值的可视化设计方案。

(1) 建筑外立面效果图极速生成：依托自建的工业建筑风格大模型，设计师仅需输入基础参数与风格关键词，AI 即可在分钟级时间内生成数十种不同风格的高质量建筑外立面效果图。这不仅将设计周期缩短了 90% 以上，更让客户在项目初期就能多维度比选视觉方案，实现“所想即所见”。

(2) 工厂总图布局规划智能推演：基于天俱时 3500+ 项目实践，AI 助手能够根据地块参数、工艺流程逻辑及物流动线要求，快速生成多版工厂总图布局规划方案。通过 AI 算法对土地利用率、物流成本及能耗效率的模拟评估，辅助客户快速锁定最优布局，确保每一寸土地

都发挥最大效能。

2 工艺智脑：海量数据积淀助力精准决策

“工艺为核”是天俱时的基因，AI 则是激活这一基因、驱动未来发展的强大引擎。通过对过往千余个项目的工艺数据进行深度梳理与结构化处理，天俱时构建了行业领先的“工艺智脑”。

(1) 工艺数据积累与知识图谱：天俱时将 400 余位工艺技术骨干的经验智慧与海量工程数据（涵盖物料平衡、能耗数据、设备选型参数等）转化为数字资产，训练出专属于精细化工、合成生物、生物医药等高科技领域的垂类模型。

(2) 辅助快速决策：在项目可行性研究与概念设计阶段，借助 AI 并依托历史数据快速预测关键工艺参数与投资估算，为技术路线比选提供可量化的数据支撑，辅助客户科学决策、提升项目可落地性。

3 基于行业深度洞察的定制化解决方案

天俱时创新性地整合并创建技术营销方案数据库，旨在将海量的宏观信息转化为能够直接指导客户决策和行动的精准洞察。它不仅仅是一个信息库，更是一个集成了AI 分析能力的智能解决方案平台。该平台通过整合分析国家级与省市级的产业政策及地方标准、行业白皮书、权威技术报告以及产业链上下游前沿解决方案，以及天俱时近 30 年的项目实践与卓越经验，能够基于客户需求精准匹配政策红利、有

效规避合规风险，并高效匹配经过验证的先进技术与供应链资源，为客户提供兼具前瞻视野与高度可执行性的整体规划方案。

通过将前沿 AI 技术与天俱时深厚的工艺积淀、EPC 全链条服务以及行业深度洞察的深度耦合，我们正在构建一个“虚拟指引现实、数据驱动决策”的工程新范式。

合规验证

国内外的 GMP 以及相关组织的标准、指南对 GMP 合规性和验证的要求日益严格，通过系统性思考与长期实践，天俱时汇聚了经验丰富的专业验证团队，能够为客户提供从厂房设施、净化空调（HVAC）、洁净管道到计算机化系统等关键系统的确认与验证，致力于帮助细胞与基因治疗、抗体、疫苗、多肽等前沿领域客户，从容应对先进制造、无菌工艺与数据完整性等复杂合规挑战。

针对新建车间，我们秉持项目建设全生命周期服务理念，采用特色的“同步确认”执行模式，确保从用户需求提出、设计、建设到调试验证的每一步，精准契合 GMP 法规与客户需求，为项目顺利落地提供坚实保障。

1 全生命周期验证，将合规融入项目基因

天俱时验证团队打破传统“事后补验证”的被动模式，将验证工作深度前置并融入项目建设的每一个阶段。遵循 ICH Q10、ISPE C&Q2 等国际先进理念，我们的验证服务深度嵌入以下三个阶段：

(1) 设计阶段：前瞻介入，定义质量

验证团队从项目源头即介入，从合规性与客户需求双重视角，参与并审核关键质量属性（CQA）与关键工艺参数（CPP）的定义、评估关键控制要素（CA/CDE），确保设计输出即具备可验证性，为后续合规奠定坚实基础，从而降低因设计缺陷导致的后期变更成本约 40%。

(2) GEP 阶段：质量引导，规范执行

在良好工程实践（GEP）阶段，验证团队以 GMP 结果为导向，对关键质量控制点提出明确的质量要求，用验证思维规范工程施工与设备安装，确保“做的”即“合规所需的”，从而平均减少现场施工返工与整改达 50% 以上，缩短后续系统调试与验证时间约 30%，并大大降低了工程不符合预期而导致的合规偏离风险。

(3) 交付与使用阶段：专业测试，确保移交

在系统交付前，验证团队以专业能力执行规范的调试与确认测试（如 SAT/IQ/OQ），确保每套系统、每台设备都能稳定、合规地移交客户，并支持后续 PQ 的顺利开展，为生产连续性与工艺可靠性提供坚实保障。

2 同步确认，实现效率与合规的统一

坚决执行“同步确认”，是天俱时验证团队实现全生命周期合规管理的核心。通过将确认活动深度嵌入项目建设的每一个环节，实时输出合规文件，从而平均缩短项目周期 15% ～ 20%，显著为客户节约时间与审计成本。

“同步确认”四维模型：

项目阶段	核心活动	交付成果
用户需求（URS）	沟通与审核 URS 条款的适用性、合规性。	确保需求文件本身符合验证要求，避免后续偏差。
设计与采购	审核设计文件、图纸；参与关键设备选型与 FAT(工厂验收测试)。	从源头把控设计与设备质量，将问题消灭在制造厂内。
施工与安装	对关键质量要素进行即时检查；搜集归档设备资料与关键记录。	确保建造过程受控，文件实时归档，为确认报告提供证据链。
调试与确认	主导风险评估、DQ、SAT、IQ/OQ 等活动，确保流程科学、逻辑严谨。	输出完整、合规的验证文件包，保障系统顺利移交与合规放行。

试车验证平台

试车作为 EPC 项目的“最后一公里”，直接关系到项目的最终交付成果与客户投资回报。依托 3500+ 项目实践与千余次技术复盘，通过构建体系化试车验证平台与推动标准化流程再造，天俱时实现了项目交付在方法论与执行层面的双重突破，显著提升了一次试车成功率和项目投产效率。

1 全专业集成的试车验证技术体系

围绕试车阶段的共性痛点与关键环节，我们打造了跨专业协同的试车验证平台。该平台汇聚工艺、设备、仪表、电气、安全、质量等全链条专家，形成以首席工程师为核心的试车验证团队，截至 2025 年底，已汇聚 50 余位具备深厚工艺与生产实践经验的专家。

天俱时构建了一套独立于具体工艺的通用验证体系。该体系以标准化程序与数据为驱动，推动试车从“依赖经验判断”向“确保系统性能”的根本性转变。即便面对未知的“工艺黑箱”，也能客观验证和评估技术是否达标。

在某大型抗生素项目中，通过试车验证平台前置介入，提前识别并解决设计隐患 23 项，推动试车周期缩短 30%，助力客户提前 42 天实现达标达产。

2 全流程服务、多方位赋能

天俱时将试车验证团队与标准化流程深度嵌入项目全生命周期，

系统保障“一次试车成功”与“长期稳定运行”。

工艺优化与前端设计：在工艺包审查与 HAZOP 分析阶段即参与评估，依托实际运行数据提出工艺安全性与控制逻辑优化建议。通过《强制节点评审制度》，将试车意见作为 30%、60% 设计模型审查的强制关闭项，从源头杜绝设计缺陷。

详细设计阶段：运用标准化清单系统审查 P&ID、设备布置图等，确保设计与实际操作、维护需求一致。通过《文件签署权制度》，实现关键图纸须经试车团队会签，将运维要求固化于施工图，减少后期变更。

采购与施工阶段：在技术协议中明确操作培训、专用工具等要求，依托《标准化技术规格书》将试车与运维条款纳入招标约束。施工中通过《预调试标准化程序》监督安装与调试，确保实体建设符合设计意图。

试车执行与交付：试车前编制《试运行执行计划》与应急预案，试车中依托《试车操作手册》与专家团队全程协同，实现快速响应与平稳推进。

在某维生素 B12 项目中，实现系统联动试车一次成功，从机械竣工到稳定生产仅用 62 天，比行业平均周期缩短 40%。

3 三段式系统化验证，确保可靠交付

天俱时贯彻“由单机到系统、由空载到负载”的递进原则，通过“单机试车－联动试车－带料试车”三段式验证，逐级确认设备性能、系统协同与工艺达标。依托标准化流程与专家全程管控，保障项目实现“一次试车成功、长期稳定运行”的核心目标，为客户交付真正具备生产准备就绪状态的工程成果。

一次试车成功

在工程领域，“一次试车成功”不仅是一句承诺，更是对技术体系、组织能力与交付成果的整体考验。天俱时率先在行业内将这一标准系统化落地，并在诸多重大工程中持续验证。我们以全流程可控、全专业协同、全周期赋能的模式，从根本上消除客户对投产周期与运行效果的不确定性，重新定义工程交付标准，推动行业从传统“完工交付”向以结果为导向的“高效投产”跃迁。

截至 2025 年底，天俱时已在百余个项目中承诺并实现一次试车成功，涵盖生物医药、精细化工、新材料等多个领域，形成可复制、可验证的交付范式，推动工程行业向结果负责、以价值为导向的模式转型。

项目案例

卓越从非一蹴而就，而是在时间的淬炼中持续迭代、历久弥新。截至 2025 年底，天俱时已在 3500 余个项目中直面挑战、创造价值，完成了从行业参与者到关键挑战者，再到前沿引领者的跨越。这一历程，正是对“承典励新、笃行致远”的生动践行——我们扎根于传承，着眼于创新，致力于实践，志向于高远。

正是在这样的发展脉络中，每一个项目都是这一理念的凝练与见证：

行业	序号	项目案例（部分）
精细化工	1	浙江巨圣氟化学有限公司含氟聚合物项目
	2	浙江巨圣氟化学有限公司全氟醚橡胶项目
	3	浙江巨圣氟化学有限公司可熔氟树脂项目
	4	甘肃巨化新材料有限公司高性能硅氟新材料一体化项目
	5	甘肃巨翔氟塑科技有限公司 5000 吨 / 年聚四氟乙烯系列产品深加工项目
	6	天津市长芦化工新材料有限公司含氟有机新材料产业化项目
	7	中节能万润股份有限公司万润工业园项目
	8	中节能万润（蓬莱）新材料有限公司电子信息材料项目
	9	湖北宜化新能源有限公司新能源电池添加剂项目

行业	序号	项目案例（部分）
精细化工	10	浙江研一新能源科技有限公司锂电池水性粘结剂项目
	11	四川研一新材料有限责任公司特种水性粘结剂项目
	12	深圳市研一新材料有限责任公司锂电池功能性助剂和材料生产性项目
	13	汉高乐泰 (中国) 有限公司绿色高端胶粘剂产业化基地项目
	14	山东衡兴新材料科技有限公司丙酸钙项目
	15	中船（邯郸）派瑞特种气体股份有限公司高纯电子特气项目
	16	尚赛（黄冈）新材料有限公司新型光电有机半导体材料产业化项目
	17	锂宸（江山）新材料有限责任公司硅碳项目
	18	星辰新能（哈密）科技有限公司 全钒液流电池高活性电解液制造基地项目
	19	景德镇富祥生命科技有限公司 碳酸亚乙烯酯（VC）& 电解液添加剂项目
	20	河南平煤神马电子新材料有限公司全钒液流储能装备新型介质项目
	21	山东科翰硅源新材料有限公司电子级硅化学品项目
	22	建滔（衡阳）实业有限公司年产 1 万吨含氯电子级特气项目
	23	天津中科拓新科技有限公司 100 吨电子级装置项目
	24	山东金诺新材料科技有限公司电子级有机硼酸酯项目
	25	晶储膜材料（阳泉）有限公司阳泉准固态隔膜项目
	26	江西德思化学有限公司电子化学品项目
合成生物	27	伊犁川宁生物技术有限公司发酵原料药、高端原料药项目
	28	伊犁疆宁生物技术有限公司绿色循环经济产业园项目
	29	秦皇岛华恒生物工程有限公司小品种氨基酸项目
	30	巴彦淖尔华恒生物科技有限公司小品种氨基酸项目
	31	安徽华恒生物科技股份有限公司 人工智能驱动生物制造研发及中试示范基地项目

行业	序号	项目案例（部分）
合成生物	32	内蒙古伊品生物科技有限公司内蒙基地生物公司味精项目
	33	可克达拉金海生物科技有限公司 60 万吨玉米深加工项目
	34	味丹国际（越南）股份有限公司氨基酸项目
	35	内蒙古光大联丰生物科技有限公司 新建生物基新材料及医药中间体建设项目
	36	内蒙古溢多利生物科技有限公司生物酶制剂项目
	37	赤峰制药股份有限公司红山基地项目
	38	山西锦波生物医药股份有限公司 III 型人源胶原蛋白工业化项目
	39	聚维元创（连云港）生物科技有限公司 新建 5 万吨 / 年秸秆基生物合成产业化项目
	40	阜丰集团晟泰生物科技有限公司哈萨克斯坦生物产业园项目
	41	凯赛生物金乡、乌苏、太原基地发酵连消项目
	42	广东肇庆星湖生物科技股份有限公司多功能发酵中试平台项目
	43	武汉远大弘元股份有限公司氨基酸产业建设项目
	44	安琪酵母股份有限公司酶制剂项目
	45	华熙生物科技股份有限公司生命健康产业园项目
	46	万华化学（四川）有限公司发酵项目
	47	黑龙江伊恒生物科技有限公司年产万吨级关键技术新型酶制剂项目
	48	福祈制药（泰兴）有限公司新建生产基地项目
	49	亨通（内蒙古）生物科技有限公司小品种氨基酸产业基地项目
	50	南京同凯兆业生物技术有限责任公司核苷酸高效生物合成 技术研究及产业化项目
	51	常德经济技术开发区开发建设局合成生物制造中试转化基地项目
	52	河南牧元安粮合成生物技术有限公司 3 万吨 / 年合成生物产品项目
	53	内蒙古中牧生物药业有限公司大环内酯类创新驱动产业链提升示范项目

行业	序号	项目案例（部分）
合成生物	54	新疆沂利泓生物新材料科技有限公司 50 万吨 / 年农副产品深加工及综合利用项目
	55	亿懿兴华生物科技有限公司原料药与制剂一体化项目
	56	沈阳博泰生物制药有限公司甾体类激素项目
	57	山东金诺药业有限公司合成生物学创制基地项目
生物医药	58	广州百济神州生物制药有限公司南园区 ADC&DS4 车间项目
	59	百济神州（上海）医药研发有限公司上海创新中心项目
	60	高校生物医药技术转移转化中心（广州）有限公司项目
	61	正大天晴药业集团股份有限公司高端综合制剂车间项目
	62	绿叶嘉奥制药石家庄有限公司 CNS 重组及药物研发生产基地项目
	63	复星安特金（成都）生物制药有限公司创新疫苗总部及产业化基地项目
	64	深圳市海普瑞药业集团股份有限公司坪山工厂新建制剂线项目
	65	上海君实生物工程有限公司临港基地中试车间新建项目
	66	湖北远大永晟药业有限公司制剂工厂建设项目
	67	广州诺诚健华医药科技有限公司抗癌药生产基地建设项目
	68	施慧达药业集团（吉林）有限公司生物药中试车间项目
	69	苏州聚微生物科技有限公司 4500 万剂 / 年人用疫苗项目
	70	杭州多禧生物科技有限公司抗体偶联药物（ADC）项目
	71	江苏万高药业股份有限公司常乐二期综合制剂车间项目
	72	杭州复因生物科技有限公司基因治疗药物项目
	73	上海联合赛尔生物工程有限公司霍乱疫苗项目
	74	北京昭衍生物技术有限公司抗体偶联药物技术平台建设项目
	75	深圳迈瑞生物医疗电子股份有限公司龙华基地试剂车间项目
	76	佰诺创睿（温州）生物科技有限公司 细胞生长因子和蛋白制剂国家研究中心项目

行业	序号	项目案例（部分）
生物医药	77	和元智造（上海）基因技术有限公司精准医疗产业基地建设项目
	78	上海上药康希诺生物制药有限公司疫苗生产基地改造项目
	79	甘李药业山东有限公司临沂生产基地一期项目
	80	广东华生元基因工程发展有限公司重组人表皮生长因子喷剂、滴眼剂搬迁项目
化学制药	81	齐鲁制药有限公司乐陵医药产业园项目
	82	齐鲁制药（内蒙古）有限公司呼伦贝尔分公司绿色生物农兽药扶贫产业项目
	83	联邦制药（内蒙古）有限公司抗生素中间体项目第一至五期工程
	84	内蒙古联邦动保药品有限公司青霉素钠无菌原料药项目
	85	山东鲁抗医药股份有限公司循环人用合成原料药技术升级项目
	86	珠海联邦制药股份有限公司高栏港生产基地项目
	87	成都微芯药业有限公司原创新药制造基地项目
	88	黄冈人福药业有限责任公司高端新型特色原料药产业化生产基地项目
	89	江苏诺泰澳赛诺生物制药股份有限公司多肽原料药车间建设项目
	90	福建基诺厚普生物科技有限公司原料药中试及制剂产业化基地、多肽产业园项目
	91	四川多瑞药业有限公司高端多肽生物药产业基地项目
	92	海正药业（杭州）有限公司富阳基地项目
	93	天科（荆州）制药有限公司绿色制药产业基地项目
	94	康龙化成（绍兴）药业有限公司 CDMO 原料药项目
	95	贝达药业（嵊州）有限公司创新药产业化基地项目
	96	华东医药（西安）博华制药有限公司制药分公司原料药新基地建设项目
	97	内蒙古康普药业有限公司原研药仿制产业化项目
	98	河南康达制药有限公司二期高端无菌原料药及非无菌原料药建设项目

行业	序号	项目案例（部分）
化学制药	99	重庆天地药业有限责任公司乌杨医药产业园建设项目
	100	湖北一科制药有限公司原料药、液体剂、吸入溶液剂、注射剂生产车间项目
	101	山东汇海医药化工有限公司培南类高端医药中间体项目
	102	焦作丽珠合成制药有限公司厂房新建项目
食品健康	103	颐海（成都）食品有限公司火锅底料工艺总包项目
	104	颐海（漯河）食品有限公司火锅蘸料生产线总包项目
	105	颐海（马鞍山）食品有限公司二期工厂火锅底料工艺总包项目
	106	颐海食品（泰国）有限公司一期火锅底料工艺总包项目
	107	颐海（霸州）食品有限公司植物基牛油项目
	108	衡水以岭药业有限公司中药提取项目
	109	四川济生堂药业有限公司中成药扩建提取、浓缩总包项目
	110	湖南白象食品有限公司调味品项目
	111	天津现代创新中药科技有限公司现代中药制造业创新中心项目
	112	颐中（青岛）实业有限公司香精香料生产线项目
	113	佛山市麦点食品有限公司调味品工艺总包项目
	114	湖北宏中药业股份有限公司抗肿瘤制剂及植物提取加工总包项目
	115	广西五和博澳药业有限公司中药智能化生产线建设项目
	116	保定味群食品科技股份有限公司调味料技改项目
	117	宜昌人福药业有限责任公司远安口服三车间糖浆配料系统项目
	118	卫龙美味全球控股有限公司乐味工厂新红油总包项目
	119	四川宽味食品有限公司底料油水回收处理系统项目
	120	厦门烟草工业有限责任公司购置提取设备及配套实施项目

结语

纵观工程科技的发展史，每一次范式的跃迁，都是对产业阵痛的深切回应。当传统的局部优化已无法承载当今科技革新的巨浪，“天俱时模式”应势而生。它不仅是天俱时对自身的突破，更是工程行业向更高维度进化的必然产物。

“天俱时模式”将工程服务的边界从简单的“空间建造”推向了深层的“价值创造”。它以工艺技术为灵魂，将实验室的奇思妙想转化为工厂里的澎湃动能，让“从实验室到工厂”的跨越不再是充满变数的险途，而是科学逻辑下的精准着陆。

抛出问题，探求新解；架构通途，成就蝶变。天俱时模式将秉持这一行业进化的先进范式，以创新驱动重塑，以交付铸就刻度，在赋能产业向上、向绿、向智的征程中，为全球新技术产业化注入确定性的力量。

TIANS Model

In the contemporary global context, technological innovation and industrial restructuring are converging with dynamic force. Emerging technologies in fields such as fine chemicals, synthetic biology, and biopharmaceuticals are constantly progressing, providing strong impetus for industrial upgrading. Nevertheless, the transition from laboratory achievements to industrialization often encounters challenges owing to technical complexity, cost pressures, safety risks, and market uncertainties. Traditional engineering service models, confined to partial optimization, fall short of multi-dimensional and end-to-end demands of industrialization. The era demands an innovative engineering paradigm that encompasses the entire "From Lab to Fab" chain, driving the industrialization of new technologies more efficiently and flexibly. As a pioneer in engineering design dedicated to creating value by focusing on process technology, TIANS Group is redefining the boundaries and future prospects of engineering technology services with its distinctive "TIANS Model".

The "TIANS Model" is an innovative engineering paradigm for empowering the industrialization of new technologies.

Based on a process-oriented ecosystem as its organizational basis, it operates through the synergistic cooperation of the operation model of "Tri-platform Integration and Triple-engine Driven", which integrates the technology platform, business unit platform, and project command platform. This integrated approach offers one-stop services encompassing all specialties and processes, ultimately fulfilling the value commitment of "one-time successful trial run" to guarantee the efficient implementation of the project.

Market-facing and demand-driven, TIANS Model provides systematic, compliant, and rapidly implementable industrial solutions for clients. Relying on distinctive systems such as investment optimization, inherent safety, and technology confidentiality, it creates core value for clients. Through nine capabilities including modular process units and digital delivery, it facilitates the efficient transition of new technologies from lab, pilot to large-scale production. The TIANS Model delivers value engineering services from process validation to one-time successful trial run, driving the sustainable development of industries towards high-end, green, digital, and intelligent.

Process Oriented

The industrialization of new technologies confronts multiple challenges, including incomplete process packages, difficulties in scaling up, shortages of interdisciplinary talents, and issues related to cost-effectiveness, reliability, compliance, and maintainability.

TIANS has pioneered and actively implemented the "process-oriented" philosophy, consistently placing process as the core. By establishing a full-chain process through a technological system that integrates talent, technology, and services, the company systematically tackles various uncertainties in industrialization, offering clients reliable, efficient, and guaranteed project implementation.

1 A Talent System Built on Process Orientation

TIANS has implemented a series of strategic initiatives to facilitated process capability across every discipline, from design and procurement to automation and construction, including *the Core Disciplines Process Talent Recruitment Program, the Young Doctoral Fellows Program, the Procurement System Process Development Initiative, the Process Core Penetration Rate Evaluation Program, and the Process Core Certification*

Incentive & Project Commander Qualification Management Program. These measures have facilitated the integration of process capabilities across all disciplines, from design and procurement to automation and construction, achieving comprehensive process-oriented talent development. This effort has cultivated a core team that deeply integrates technology and management, with expertise in process development, innovation, and industrialization. **By the end of 2025, the group boasted 12 Ph.D holders and scientists, 60 industry consulting and planning experts, and 416 technical backbone personnel specializing in process technology, engineering design, and production management.**

In addition, the TIANS Science & Technology Committee has established strong strategic partnerships with renowned institutions such as Tsinghua University, East China University of Science and Technology, Beijing University of Chemical Technology, Institute of Process Engineering of Chinese Academy of Sciences, and Dalian Institute of Chemical Physics. By the end of 2025, the committee encompassed over 50 industry-academia-research experts in domains such as fine chemicals, synthetic biology, pharmaceuticals, and intelligent manufacturing.

2 Full Lifecycle Process Technology Services

Guided by the principle of "multi-core drive", we systematically integrate top-level cross-disciplinary expertise to construct a well

-structured and highly collaborative technical support framework. This allows us to offer end-to-end, high-standard process technical services throughout the entire lifecycle, ensuring that every decision is precisely in line with production requirements and business goals.

Project Planning Stage: The expert team conducts in-depth preliminary research and provides feasibility analysis reports that encompass product market analysis, competitive analysis, cost analysis, and capacity analysis.

Process Package Optimization Stage: We optimize laboratory processes through material balance calculations, key equipment selection, and process package validation, ultimately delivering a high-quality and executable technology packages.

Pilot-scale Test Stage: We conduct process scale-up studies and equipment validation, optimize production routes, and integrate relevant validation resources to provide reliable data support for industrial transformation.

Industrialization Phase: Technology service encompasses the entire process, including design, procurement, construction,trial run, commissioning, and process validation (4Q).

3 Advanced Process Optimization and Engineering Transformation Capability

In high-tech fields such as fine chemicals, synthetic biology, and

bio-pharmaceuticals, TIANS leverages two interlocking capabilities. One is a deep bench of engineers with extensive front-line production experience. The other is the integration and implementation capabilities. Guided by the principle of "process-oriented, systematic optimization", we focus relentlessly on core objectives: end-to-end automation, continuous processing, intelligent operations, green chemistry, inherent safety, and investment control.

Production Insight Informing Process Scale-up: Engineers with frontline production experience can precisely translate qualitative findings from laboratory stages into scalable industrial control logic, safety interlocks, and Standard Operating Procedures (SOPs) through process route comparisons and systematic process re-engineering based on operational insights. They have a profound understanding of production pain points to ensure that process solutions are both operable and stable.

Engineering Capability Driving Process Implementation: Leveraging the holistic perspective and professional expertise of an engineering technology company, we ensure the process service throughout the entire lifecycle. Seasoned cross-disciplinary teams (comprising process, equipment, automation, etc.) collaborate seamlessly. Their focus extends beyond the stringent control of Critical Process Parameters (CPPs) to the deep embedding of process logic into every phase of the entire project lifecycle.

Operation Model of "Tri-Platform Integration and Triple-Engine Driven"

To systematically tackle the fragmentation between marketing, design, and execution in construction projects, which results in inefficiency and a poor client experience, TIANS pioneered and practiced an operational model that integrates three platforms: the technology platform, the business division platform, and the project command platform, that is "Tri-Platform Integration and Triple-Engine Driven" model. This model disrupts traditional linear workflows, converting the interaction among the three platforms from sequential collaboration to parallel interaction. It constructs an organic ecosystem centered around client value, capable of self-organizing and dynamic collaboration, achieving rapid response to market demands and high-quality delivery.

1 Organic Ecosystem:Tri-Platform Integration and Triple-Engine Driven

1.1. Technology Platform——The Engine of Innovation and Technology

We specialize in process technology and design, leveraging cutting-edge techniques and exceptional creative design to set high-quality standards

for project delivery. We provide clients with technical solutions that integrate advanced innovation and strong implementability.

TIANS constructs a core competetency foundation to support the project lifecycle by integrating 15 technical centers, including the Process Technology Center, the General Engineer Office, the Chief Designer Office, the Chief Safety Officer Office, the Chief Engineer Office, the Design Center, the Qingdao Design Center, the Pilot Platform, the Environmental Technology Center, the BIM Center, the Digital Deliver Center, the Validation Center, the Big Data Center, the Commissioning Platform, and the Technology Innovation Research Institute.

1.2. The Business Division Platform——The Hub of Client Needs and Value

Remaining steadfastly market-and client-centric, this platform identifies core industry and project pain points. Through forward-looking analysis and deep mining of client requirements, it drives reverse innovation in technology and optimization of design, ultimately delivering customized, turnkey solutions.

Through 11 business units, namely the Fine Chemical Division, the Fermentation Engineering Division, the Pharmaceutical Health & Synthetic Biology Division, the Bio-pharmaceutical Division, the Automation & Informatization Division, the Food Health Division, the Sales Division, the International Division, the Tianjin Center, the Shanghai Center, and the Ho Chi Minh City Center, TIANS has intensified

its focus on high-tech industries such as fine chemicals, fluorine -containing fine chemicals, electronic chemicals, synthetic biology, and bio-pharmaceuticals. Our business covers more than 30 countries and regions globally, with more than 3,500 benchmark projects successfully completed.

1.3. Project Command Platform——The Cornerstone of Project Delivery and Performance

Established as physical entities in response to specific project requirements, these commands precisely anchor both the client demands and design standards, ensuring efficient, high-quality delivery with the unwavering goal of one-time successful trial run.

By the end of 2025, 45 project command centers have been successfully put into operation, realizing precise allocation and efficient coordination of core resources such as technology, supply chains, and talents.

2 Innovative Operation: Organic Integration and Process Re-engineering

The operation model of "Tri-Platform Integration and Triple-Engine Driven" not only represents an organizational upgrade but also a profound reshaping of industrial production relations. Its core practices are mainly reflected in the following two aspects:

2.1. The Client-centric Project Command System

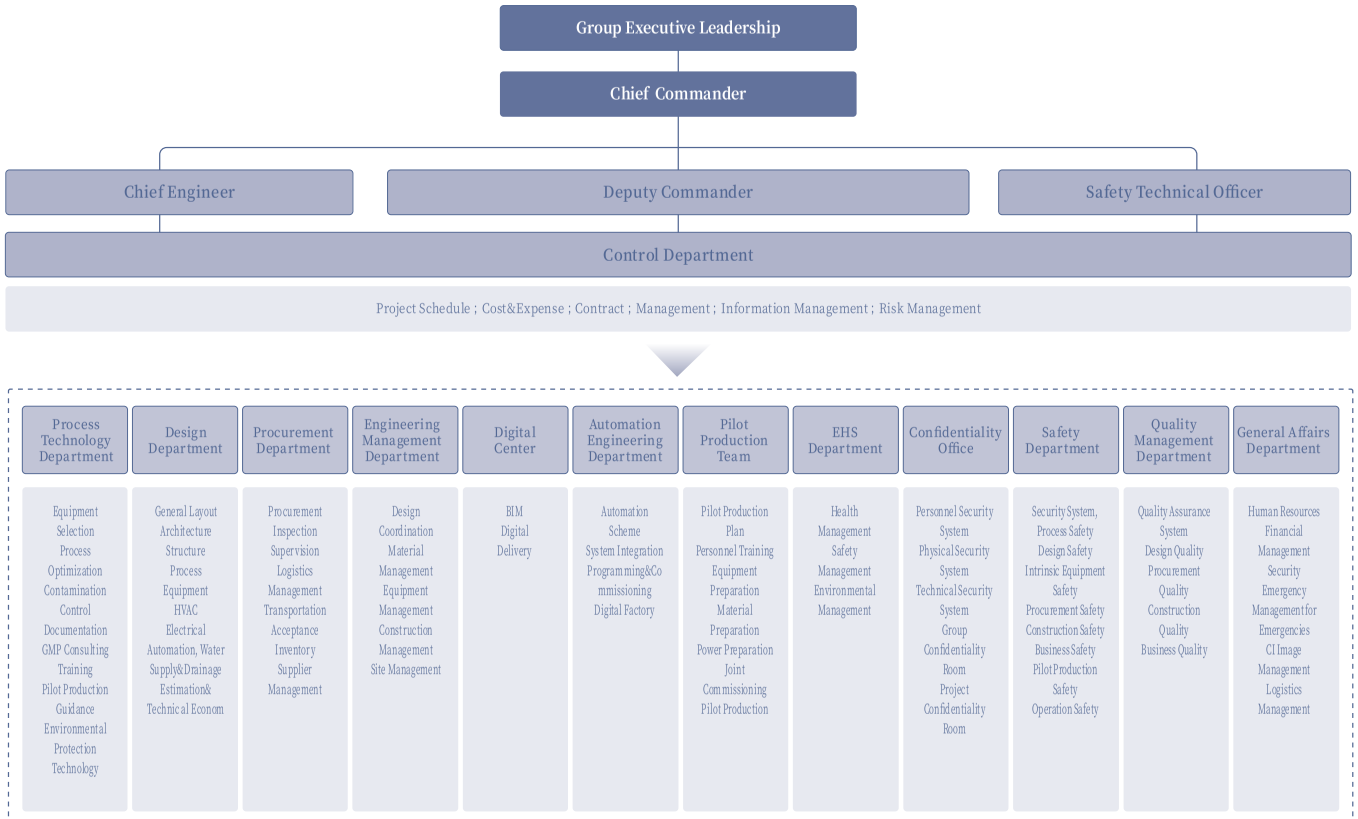
The TIANS project command system allocates resources according to client needs, ensuring that "the command center assigns personnel in line with client requirements". Its key features include:

Professional Command Team: The project commander is typically a process or design expert, supported by a process-proficient chief engineer to ensure one-time successful trial run.

Seamless Functional Integration: Structured with deputy commanders for design, procurement, and construction to guarantee efficient coordination among key processes.

Forwarding Safety Management: Designating a safety technical officer with veto power to implement inherent safety control during the design phase.

Business Information Confidentiality: By means of dedicated security offices and strict confidentiality protocols, we guarantee the security of clients' trade secrets.



Project Command System

2.2. The EPC Management Process Centered on Four Coordination Meetings

Guided by the operation model of "Tri-Platform Integration and Triple-Engine Driven" , TIANS has iteratively developed an EPC management process centered on four coordination meetings. This process systematically connects all key stages of the project, ensuring ful-process control and effective implementation through phased decision-making and reviews, ultimately attaining high-quality delivery.

Four Coordination Meetings

Four Meetings	Key Contents	Participants
Review of Scheme or Preliminary Design Documents (First Coordination Meeting of Process, Design, Procurement and Construction)	1. Evaluate the Feasibility of Process Rechnology Routes, Equipment, and Materials; 2. Identify Potential Process Bottlenecks and Compliance Risks (e.g., environmental/safety /standards); 3. Compare Options (e.g., process Optimization, Modular Design, Automation Level, Key Tech Selection).	· Chief Designer Office · Chief Safety Officer Office · Chief Engineer Office · Process Technology Center · Design Center · BIM Center · Procurement Control Center · Validation Center · Auto & Info Engineering Division · Members of the Project Command Team
Review of Detailed or Construction Drawing Design Documents (Second Coordination Meeting of Process, Design, Procurement and Construction)	1. Review Producibility, Operability, Maintainability, Construction Feasibility, Safety Audits, P&Id, and Equipment Specs; 2. Coordinate with Equipment, Electrical, and Automation Specialists to Implement Process Requirements; 3. 3d Model Review.	
Procurement Communication Meeting (Third Coordination Meeting of Process, Design, Procurement and Construction)	1. Discuss Key Equipment Selection, Supplier Technical Review, and Acceptance to Meet Process Requirements; 2. Determine Project Execution Plan and Equipment/Material Procurement Plan.	
Project Construction Organization Planning Meeting (Fourth Coordination Meeting of Process, Design, Procurement and Construction)	1. Discuss And Finalize Construction Schedule, Including On-Site Service Time for Process, Design and Procurement Personnel; 2. Finalize the Construction Schedule Assurance Plan; 3. Confirm Core Team Members (E.g., Commissioning Team) and Clarify Construction Organization.	

Distinctive Systems

Investment Optimization System

In the industrialization of new technologies, a product's capacity to enter the market at a competitive price serves as the key indicator for evaluating its economic viability. Investment advantage derives from a comprehensive understanding of production process and systematic management throughout the entire project lifecycle. Therefore, we have engineered a profound transformation centered on investment competitiveness, aiming to achieve the definitive objective of "controlling investment cost better than competitors and saving project investments more effectively than traditional methods".

1 Source Innovation: Optimizing the Lifecycle Investment with Process Intelligence

Investment cost control must commence before design, originating from process intelligence. TIANS has assembled an expert team with profound expertise in production operations. Adhering to the advanced concept

of "design guided by production", we conduct a reverse review and in-depth design optimization starting from the benefit origin of the Future Factory.

Meanwhile, full lifecycle investment control is implemented. During the feasibility study phase, multi-scheme technical and economic comparisons are carried out to lock in the optimal investment path. In the design phase, we embed cost discipline at the source through intensive plant layout, process optimization, intelligent upgrades, and precision equipment selection.

Layout Optimization:Through systematic plant-wide or workshop-level layout optimization, we reduce material handling distances by an average of 20% to 30%, significantly reducing internal logistics investment cost.

Efficiency Enhancement: Driven by two factors, namely process optimization and automation upgrades,we help clients increase production efficiency by over 15% while reducing labor investment by 25% to 40%,translate efficiency directly into profits and market competitiveness.

Energy Efficiency Management: Leveraging in-depth expertise in utility design and construction, 15% to 20% energy savings are achieved through precision optimization, transforming core investment cost items into sustainable long-term operational profits.

Equipment Intelligence Bank: Drawing on a database of equipment

selections from over a thousand projects, we precisely match instruments and equipment to project capacity and technical requirements, ensuring optimal economic and performance fit for maximum investment value.

2 Process Revolution: Achieving Systematic Investment Reduction via Lifecycle Synergy

In traditional engineering models, the fragmentation of the design, procurement, and construction phases, along with non-implementation -ready drawings and frequent design revisions during construction, are the primary factors leading to investment cost overruns. Leveraging lifecycle collaborative advantages, TIANS has transcended conventional cost-centric approaches, through technological empowerment and system integration, we achieve optimal management of operational, energy consumption, and maintenance costs for decades after factory commissioning.

Design-driven Approach with Embedded Investment Considerations: From the very beginning, the design process prioritizes equipment compatibility, construction feasibility, and long -term operational needs, adhering to the "procurable, constructible, operable" philosophy to fundamentally avoid subsequent changes and resource waste.

Procurement Synced, Dynamically Supporting Construction:

By implementing the "demand-integrated procurement" strategy, we systematically plan project sourcing. Delivery schedules for critical equipment and materials are dynamically linked to construction progress, minimizing on-site material shortages and warehousing.

Construction Feedback Enabling Lean Closed-loop Management: Through the extensive application of Building Information Modeling (BIM) and modular prefabrication, rework is reduced at the source. The "real-time design-construction feedback mechanism" eliminates the barriers between design and construction, establishing a collaborative closed loop where "design guides engineering, and engineering optimizes design", thereby achieving continuous cost reduction and efficiency improvement.

Through real-time information sharing, cross-functional management, and dynamic decision-making coordination across these three links, TIANS systematically resolves efficiency losses and resource waste caused by fragmentation in traditional engineering, achieving lifecycle, multi-dimensional investments optimization and value enhancement.

- Standardized and modular design reduces procurement costs by an average of 10% to 15%.
- The early involvement of the trial production and construction teams in the design phase reduces post-project changes by over 30%.
- The proactive empowerment of the procurement team in early-

stage design reduces equipment investments by more than 20%.

- The application of BIM and modular technologies shortens project schedules by 20%–25% and reduces labor costs by 30%–40%.

3 Digital Engine: Data-driven Precision Investment Control

Beyond relying on experience, scientific approaches are of utmost importance. TIANS has developed a continuously iterative digital investment control system. Based on systematic research into extensive engineering practices, we have created standardized tools including the *Project Investment Cost Reference Manual*, transforming technical expertise into project forecasting capabilities and investment certainty. This provides end-to-end data support for new projects spanning from investment estimation to construction implementation, assisting clients in achieving the optimal balance between technological advancement and economic rationality.

4 Proven Practice: From Investment Savings to Value Creation

4.1. Modular Process Units Facilitates Direct Investment Reduction

Possessing independent R&D and integration capabilities, our modular process units deliver quantifiable investment advantages:

- Automated Batching Systems: Automation levels increased by

over 50%, weighing accuracy remains consistently high, and batching labor is reduced by 80%.

- Integrated of Separation and Washing Modules in Line with Process: By integrating solid-liquid separation, washing and filtration, extraction and phase separation, and low-temperature vacuum drying modules into a single, continuously operated, unified control module, reduces material transfers and equipment footprint,cutting labor input by 80%.
- Next-generation TCU Control System: Achieves cost savings of over 30% compared to traditional solutions, with temperature control precision meeting international certification standards.
- Advanced Melt Crystallization Units: Reduce footprint and investment, improve product purity, and achieve dual optimization of investment cost and quality.

4.2. Cost Transformation Through Integrated EHS Solutions

Environmental protection is not simply a cost factor, rather, it can be a value-generating link. TIANS employs technologies such as material recycling, advanced oxidation, and membrane technology integration to achieve high-value material recovery and near-zero wastewater discharge with resource recovery, turning environmental pressure into circular economy gains.

By recovering high-value elements like manganese and bromine, as well as materials such as acetonitrile, phenol, and isopropanol, the

annual economic benefits can fully cover all treatment , with some projects even yielding a profit.

For high-salt and high-concentration chemical and pharmaceutical wastewater, the application of advanced oxidation, membrane integration, concentration and crystallization technology can discharge the mother liquor amount to less than 2%, achieve a water reuse rate of over 95%, and lower the overall system operating costs by more than 30%.

4.3. Integrated Optimization and Lifecycle Process Control to Eliminate Hidden Costs

In a high-end Active Pharmaceutical Ingredient (API) project, production capacity is increased by 20% through in-depth process optimization, while the overall investment is reduced by 18% compared to the budget.

In a key fine chemicals project, the full-process re-engineering reduced client's operating costs by 32% and shortened the investment payback period by 40%.

Inherent Safety System

Safety is not merely about cost, but it serves as the cornerstone of investment and competitiveness in new-technology industrialization. **TIANS has redefined traditional passive safety by regarding it as a core engineering attribute that can be designed and implemented. We have established a comprehensive inherent safety management system centered on "risk pre-control, source governance, and full lifecycle management".** Guided by a dual-helix decision-making mechanism that integrates "data + expertise", we achieve bidirectional verifiocation and enhancement. Prevention measures are deeply embedded at the sources of process and design, and rigorously implemented across the full lifecycle: R&D, design, procurement, construction, trial production, and operations. Through standardized, compliance-driven delivery, we ensure every link in the chain is traceable and controllable.

It is firmly believed that the highest level of safety lies in eliminating the possibility of risk occurrence. Therefore, this system not only ensures compliance but also establishes reliable and sustainably competitive engineering value for clients, systematically converting safety into long - term project advantages.

1 Safety is a Design-able and Deliverable Product

TIANS views safety as an engineering attribute that must be integrated from the source, adhering to the following three principles:

- **Proactive Principle:** Risk management begins at the process design stage.
- **Integration Principle:** Safety serves as the common guiding principle for all disciplines, encompassing process, design, procurement, construction, and operation.
- **Assetization Principle:** Safety investments are transformed into quantifiable long-term assets, including fewer unplanned shutdowns, higher asset utilization, and improved corporate reputation.

2 "Data + Expert" Dual-Helix Decision-Making Mechanism

Safety decision-making does not rely on vague experience or isolated intuition. Therefore, we establish a decision-making framework that deeply integrates "data-driven quantitative insight" with "expert systemic knowledge". Data uncovers risks, while experts analyze causes and formulate countermeasures. This synergy enables precise risk prediction and elimination.

2.1. Data-driven: Engineering Safety Optimization Practice Based on Risk Scenario Simulation

By utilizing tools such as reaction safety risk assessment, DNV Phast

for quantitative risk analysis and explosion simulation, and AspenPlus for dynamic process simulation, thousands of risk scenarios are simulated in virtual environments. For example, in a new energy project, precise prediction of uncontrolled reaction pressure peaks was realized through reaction safety risk assessment data and simulation calculations. This allowed us to optimize the safety scheme scientifically, reducing the control temperature by 10% and increasing the relief area by 20%.

2.2. Expert-driven: Fortifying Defenses with Collective Intelligence

Each project is supported by a "think tank" of process, instrumentation, equipment, and safety experts. Leveraging a risk database and case library accumulated from over one thousand projects, they identify hidden "reefs" not revealed by data alone and deliver high-integrity safety solutions.

3 Source Control: Embedding Safety Genes into Design Fundamentals

TIANS adheres to the principle that "the most effective safety starts with design". Inherent safety reviews serve as a mandatory and non-negotiable gateway in project execution.

Process Package Safety: Process Hazard Analysis (PHA) is applied at the Process Design Package (PDP) stage to eliminate unacceptable risks at the level of reaction pathways and material properties.

Inherent Safety Design Guidelines: The continuously updated

Inherent Safety Design Guidelines codify more than one thousand clauses derived from accident investigations and industry best practices, providing designers with a definitive safety checklist. For example, the guidelines mandate closed-loop samplers in toxic gas leak zones.

End-to-end HAZOP Assurance: Mandatory in-depth HAZOP analysis is conducted at critical design milestones (30%, 60%, 90% model reviews), subjecting the design to multi-disciplinary "stress tests". In a large-scale fine chemical project, HAZOP identifies and eliminates 47 potential points of equipment misoperation and interlock logic conflicts at an early stage.

4 Lifecycle Layered Control

TIANS has established a layered safety management system, strategically led by the office of the Chief Safety Officer and implemented by safety engineers embedded across all platforms and project phases. Safety teams are flexibly configured based on project needs, deeply integrated into the entire process, and maintain dynamic control:

R&D Phase: Rigorous control of core risks, with inherent safety philosophy applied throughout.

Design Phase: Lifecycle real-time participation, providing inherent safety design recommendations.

Procurement Phase: Strict review of equipment safety performance

and compliance certifications.

Construction Phase: On-site dynamic supervision, with specialized control plans developed for high-risk activities.

Trial Production: Verify safety measures, compile specialized plans, and offer lifecycle supervision.

5 Audit-able Assets: Deliver a Clear Safety "Balance Sheet"

We not only deliver a secure facility but also a comprehensive and traceable safety asset profile. Through a comprehensive safety accountability system and a digital document management framework, we ensure that all actions, ranging from the justifications of safety conditions and risk classification control lists to each hazard investigation record, are traceable, and all responsibilities are clearly defined.

This "safety log" serves as a reliable digital asset throughout the project's lifecycle. It provides regulators with clear evidence of compliance and offers clients irreplaceable core asset data for future operations, expansions, and mergers and acquisitions.

TIANS inherent safety system transforms safety from an "implicit cost" into a "visible asset" throughout the plant's lifecycle, ultimately creating a predictable future where customers can focus on production and market operations with confidence.

Technology Confidentiality System

As the lifeblood of innovation, trade secrets must be protected through a closed-loop process. TIANS consistently regards technology confidentiality serves as the cornerstone of client trust and collaboration. During the industrialization process, we strictly adheres to technology confidentiality standards, establishing a dual-safeguard system that integrates "static control" and "dynamic control" across the entire project lifecycle.

This system addresses both the static infrastructure——policies, physical facilities, and digital security——and the dynamic workflows of document handling, archiving, and destruction during design, procurement, and construction. The result is a closed-loop safeguard for client core technologies and intellectual property, ensuring technology confidentiality and complete document control throughout the industrialization.

1 Three-dimensional Defense: Institutional, Physical, and Digital

1.1. Institutional: Full-scenario Coverage

TIANS has formulated over 10 confidentiality policies and standardized workflows, including the *Confidentiality Management System, Design Confidentiality Room Usage System, Ten Confidentiality Management*

Rules, Ten Confidentiality Room Management Rules, Confidential Project Engineering Design Flowchart, and Confidentiality Commitment Letter. These measures comprehensively cover all scenarios with risks of core document leaks.

1.2. Physical: High-standard Infrastructure + Closed-loop Control

TIANS maintains more than 10 independent high-specification confidentiality rooms. A dedicated on-site confidentiality office is mandatorily established for classified projects. These areas are equipped with dual-layer access control, comprehensive video surveillance, secure communication storage lockers, and encrypted file cabinets. Access operations follow the "dual-person, dual-control, traceable entry-exit" protocol.

1.3. Digital: Encryption and Lifecycle Traceability

All workstations deploy automatic encryption systems for all generated and received files. Confidentiality rooms use internal networks physically isolated from external networks. All file access, copying, and printing activities carry a unique digital watermark linked to the operator, ensuring full operational traceability.

2 Deeply Embedded Confidentiality Throughout the Entire Process

Confidentiality is not an isolated component but rather a dynamic control mechanism deeply embedded in the EPC management process.

2.1.Initiation Phase: Co-creating the Rules

Collaborate with client to establish a confidentiality team, jointly identify critical confidentiality points and risks, and produce a customized *Project Confidentiality White Paper*.

2.2.Execution Phase: Dynamic Control

Personnel Isolation: Implement cell-level access control based on the "minimum necessary" principle. Core information such as processes, equipment, and control systems is decomposed and stored, enabling engineers to access only the essential information of their assigned modules.

Process Isolation: Core design reviews are conducted in confidentiality rooms. All drafts are shredded immediately on site. Data transmission takes place over physically isolated networks, and any unauthorized form of data export is prohibited.

Behavioral Auditing: Confidential areas operate under a strict access "whitelist". Entry and exit records as well as surveillance footage are archived automatically, forming an immutable evidence chain.

In a new battery material industrialization project, the process was divided into multiple modules. Engineering teams from different disciplines could only access data directly relevant to their work and design collaboration is conducted through physically isolated, network-encrypted sandbox environments. This measure effectively prevented unauthorized information aggregation.

2.3. Closing Phase: Zero Audit

Upon project completion, a rigorous "data sanitization protocol" is implemented. All classified electronic data undergoes multi-layer verification before irreversible physical erasure. Paper documents are pulped and destroyed under dual supervision. A jointly signed *Confidentiality Audit Report* is submitted to the client as the final deliverable, achieving a streamlined closed-loop security control.

3 Innovation Practices Beyond the Standard

The TIANS technology confidentiality system is more robust due to several forward-looking practices:

3.1. For exceptionally sensitive projects, at client request, parallel project environments with simulated technical parameters have been established to monitor and alert against any suspicious probing activities. This approach has successfully assisted client in identifying and mitigating potential business risks.

3.2. Blockchain-based evidence anchoring. All access and operation logs of core documents are synchronized in real-time to the blockchain evidence storage platform, generating judicially recognized electronic evidence to offer irrefutable proof for potential disputes.

3.3. Confidentiality is not solely about signing agreements, but a cultural imperative. Through regular scenario-based training,

case studies, employee confidentiality credit records, and incentive mechanisms, confidentiality awareness is deeply ingrained in TIANS culture.

By the end of 2025, over 30 projects involving core processes and cutting-edge technologies had been successfully delivered in confidentiality rooms, maintaining an impeccable "zero-leakage" record and achieving 100% client satisfaction for consecutive years.

Innovative Practices

Comprehensive Disciplines and Lifecycle Service

The construction projects in fields of fine chemicals, biopharmaceuticals, and electronic chemicals are facing multiple challenges, including high technical integration, tight schedules, and complex cross-regional coordination. Traditional design institutes or construction firms can no longer fully meet clients' comprehensive requirements for technological foresight, holistic engineering solutions, and guaranteed delivery. TIANS addresses these requirements through its approach of "comprehensive disciplines and lifecycle service", facilitating the internalization and integration of all necessary technical and operational capabilities. This establishes a seamless, reliable, and efficient delivery channel from technology to industrial application for clients.

1 Comprehensive Disciplines: Horizontal Integration To Eliminate Technical Silos

TIANS has developed a comprehensive professional framework that encompasses the entire industrialization chain of emerging technologies.

This system not only resolves the issue of "who will execute it", but also, through in-depth horizontal integration, completely breaks down professional barriers, guaranteeing that technical solutions can be fully, precisely, and promptly implemented across all disciplines.

We offer full coverage of all disciplines encompassing process R&D, engineering consultancy and design, process safety, technical-economic estimation, cleanroom systems, automation, environmental protection, commissioning, validation, equipment manufacturing, and even BIM and digital delivery. Each discipline is staffed with top-level experts and equipped with robust capabilities. Through our integrated internal collaboration mechanism, we achieve efficient cross-disciplinary synergy, converting fragmented strengths into a highly integrated project support system.

All professional teams are organically integrated within the company, operating under a unified management system and project platform. They conform to the same data standards, eradicating information silos and facilitating seamless knowledge transfer and collaborative innovation.

2 Lifecycle Service: Vertically Integrated and Take Full Responsibility

TIANS takes full responsibility for the entire lifecycle of the project,

offering "end-to-end" services from the conceptual stage to the operational phase, rather than merely participating in partial phases. This guarantees that clients ultimately obtain a fully integrated facility capable of sustained value creation, rather than just a set of blueprints and fragmented projects.

The project commences with front-end process package development, process optimization, pilot-scale test, and feasibility studies. It encompasses the entire engineering design process from conceptual design to construction drawings, integrating specialized procurement strategies. The team supervises construction, installation, and commissioning while strictly adhering to quality and safety standards. The final deliverables include system startup, performance evaluation, and stable handover, supplemented with digital operation and maintenance support to ensure the continuous and efficient operation of the facility.

3 Core Value: The Synergistic Advantage of 1+1>2

The combination of "comprehensive disciplines" and "lifecycle service" provides a decisive advantage:

Traditional Subcontracting Model	TIANS Model
Multiple Interfaces, Difficult Coordination: Client manages many supplier interfaces, leading to high communication costs and unclear responsibilities.	A Single Responsible Entity: TIANS acts as the sole interface, assumes full responsibility, enabling simple and efficient client management.
Technology Easily Disconnected: R&D, design, construction, and operation have inconsistent objectives, diluting technical intent.	Technology Fully Integrated: Technical team participates throughout, ensuring precise translation from lab to fab.
Local Optimization, Overall Loss of Control: Parties pursue minimum cost in their own segments, easily leading to overall budget and schedule overruns.	Global Optimization: Decision-making based on total lifecycle cost, maximizing investment value.
Risk Transfer: Problems lead to mutual blame, with the client as the ultimate risk bearer.	Risk Internalization: TIANS resolves all inter-disciplinary issues internally, delivering certainty to the client.

Pilot Platform

From laboratory flasks to facility production lines, up to 80% of laboratory achievements fail to be scaled up due to challenges such as process scaling and cost overruns. The TIANS Pilot Platform not only offers end-to-end validation services from micro-scale, but also transforms fragile laboratory samples into industrial-grade products with scalable production capabilities. This platform systematically bridges the "last mile" gap between technological feasibility and commercial success.

1 Platform Capabilities and Data Foundation

Hardware Infrastructure: It is equipped with more than 10 types of specialized pilot-scale production lines, including continuous flow, high-temperature/high-pressure systems, distillation purification, biological fermentation, and crystallization separation. These are capable of meeting a wide range of process conditions, from-80 ° C to 300 ° C and from vacuum to 10 MPa.

Data Assets: By leveraging data from over 50 completed pilot projects, a process scale-up coefficient database, an equipment selection expertise library, and a material safety database have been developed. These provide intelligent initial solution recommendations and risk alerts for every new project.

Delivery Outcomes: In addition to providing validation reports, a "pilot-data package" directly applicable to foundational design and a "modular process package" with high replicability are delivered, enabling a seamless transition from validation to design.

2 End-to-end Engineering Validation: Six Dimensions for Closed-loop Empowerment

TIANS has developed an engineering validation closed-loop system covering six dimensions: process, equipment, cost, reliability, safety, and talent, which addresses the core pain points of industrialization.

Process Scale-up and Parameter Solidification: By leveraging more than 10 modular pilot-scale units and online analytical instruments (such as PAT process analysis technology), the system accurately simulates industrial conditions. It expands the laboratory's "single-point optimal parameters" into a "process operation window" that can be stably replicated. This method has successfully completed over 50 process scale-up cases, spanning from milligrams per liter to hundreds of kilograms per batch.

Verification of Critical Equipment and Materials: A supply chain validation database is established to conduct performance testing and compatibility evaluation for more than 300 key equipment suppliers and special materials. Optimal suppliers are pre-identified to avoid equipment incompatibility during mass production.

Cost Precision Accounting and Optimization: Leveraging pilot-scale data, an accurate "material balance and energy consumption model" is established, facilitating production cost calculation with the error rate in final mass production controlled within ±5%. This offers robust data support for investment decisions and product pricing.

Reliability and Life Testing: Through simulating extreme conditions and conducting long-term operations, continuous stability tests and accelerated aging tests with a duration of ⩾1000 hours are carried out to ensure that the product performance and the service life of catalysts and critical components meet commercial requirements. Meanwhile, post-production failure rates are reduced by more than 70%.

Safety and Environmental Compliance Pre-review: Concurrent reaction safety risk assessments, initial process validations, and three-waste treatment process validation are conducted to ensure that the process route is inherently safe and environmentally compliant, thereby removing major obstacles to project approval and production licensing.

Talent Training and Documentation Output: During the validation process, more than 500 core process engineers and operators are trained for clients, and standardized process packages (PDP) with complete operational parameters and Standard Operating Procedures(SOP) are delivered, realizing the dual implementation of "technical transfer" and "talent transfer".

3 Industry-Academia-Research Application Collaborative Ecosystem

The TIANS Pilot Platform has pioneered a distributed, networked alliance of pilot bases. Through equipment sharing and expert collaboration, a synergistic innovation mechanism that deeply integrates industry, academia, research, and application is established. University research teams provide cutting-edge technology and talent support; the pilot platform undertakes engineering development and validation. Leading enterprises participate in demand analysis and standard formulation, while downstream companies conduct product testing and offer application feedback, thus establishing a closed-loop innovation ecosystem.

4 Core Value: Providing Certainty and Accelerating Industrialization

Through systematic pilot testing, we help clients achieve industry-leading industrialization success rates. Meanwhile, we reduce the average time-to-market by 6-12 months, enabling them to gain market leadership during the critical technology window.

Modular Process Units

In traditional engineering models, facility construction is similar to "manual sculpting from scratch", a process marked by long timelines, inconsistent quality, and cost overruns. TIANS revolutionizes construction by adopting product-oriented thinking, conducting in-depth analysis of core processes, and seamlessly integrating intelligent technologies. We successfully break down complex facility systems into standardized, intelligent process modules. Guided by the development logic of "process modularization→ module productization→product intelligentization", we are committed to building flexible, efficient, and future-proof production systems for clients.

1 Core Product Matrix: From Single Module to Integrated Process System

TIANS' modular units are not merely assembled devices but proprietary intellectual property that encapsulates core processes, safety logic, and control logic in an intelligent manner. By leveraging its proprietary modular system and in line with specific requirements, TIANS enables clients to develop standardized and modular engineering solutions. This approach ensures the efficient implementation of initial projects. Meanwhile, it provides standardized modules that can be rapidly replicated and iterated for secondary development or similar projects.

By the end of 2025, we had successfully delivered over 50 high-standard portable units across eight core process sectors, specifically MVR evaporation crystallization, electronic specialty gases, continuous flow hydrogenation, and hazardous powder handling. All projects achieved a 100% one-time acceptance pass rate. These deliverables have created tangible value for clients in various fields such as fine chemicals and synthetic biology.

- Construction Timeline: Modular design and installation reduce on-site duration by 40% to 60%.
- Total Cost: Through continuous design optimization and mass prefabrication, the total cost is decreased by 15% to 25%.
- Quality and Safety: Manufactured in a controlled factory environment, the one-pass qualification rate for critical processes such as welding has been raised to 99.8%, ensuring intrinsic safety.

TIANS is transitioning from single-unit systems to integrated process modules with multi-unit coupling (e.g., Continuous production modules for integrated reaction, separation, and purification). These modules are fully integrated with predictive maintenance algorithms and digital twins to enable self-perception and self-optimization capabilities.

2 TIANS Intelligent Instantaneous Continuous Sterilizing System: Defining an Industry through a Distinct Category

The TIANS Intelligent Instantaneous Continuous Sterilizing System demonstrates the company's proficiency in "process equipment and equipment intelligence". It is not just about equipment manufacturing; it is about establishing industry standards.

Relying on 21 core patents and combined with its self-built advanced laboratory, based on *Continuous Sterilization Process Without Superheated Water Tank* and the *Automated Control Management System for Continuous Sterilization Equipment*, this system achieves "one-touch sterilization" with a stable 100% sterility rate. Compared with traditional systems, it reduces steam energy consumption by over 70% and recoups equipment investment costs within an average of 10 months. Moreover, it has redefined the reliability benchmark with a continuous "zero-failure" operation record (the longest single-unit equipment failure -free operation time exceeds 50,000 hours).

TIANS Intelligent Instantaneous Continuous Sterilizing System holds a market share of over 90%, ranking first in China, and has been awarded the authoritative "domestic leading" Level certification.

3 Core Value of Modular Process Equipment

- **Rapid Market Response:** It reduces the construction duration of new production lines from years to months, enabling customers to

capitalize on market opportunities.

- **Seamless Technological Upgrades:** When process innovations occur, specific modules can be independently replaced or upgraded without scrapping entire production lines, thus safeguarding investments.
- **Green and Sustainable:** The modular design enables easy disassembly and relocation, thereby maximizing the asset value over the entire lifecycle.

BIM Implementation

Through extensive application in over 100 complex projects, TIANS has progressed beyond basic modeling to establish a comprehensive digital collaboration ecosystem. It has achieved a triple leap in BIM value realization: from utilizing models to support design, driving construction with models, and ultimately evolving into "living models" to support clients' long-term operations. Guided by industry-leading standards, BIM is positioned as the core data foundation spanning the entire project life cycle, laying a solid foundation for high-quality project execution.

1 Triple Leap: BIM Value Across the Entire Project Life-cycle

Through industry leading practices and innovations, the value of BIM is systematically unlocked via a three-level application framework, empowering projects throughout the entire lifecycle.

Level I: Design Optimization, Forward-Decision-Making in the BIM Process

The TIANS BIM team is proficient in resolving design-phase challenges via high-precision collaborative models. By executing automated collision detection, process simulation, and spatial optimization, crucial decisions can be made at an earlier stage, resulting in an average reduction of on-site changes by more than 20%. This

approach guarantees engineering quality, cost control, and schedule management from the very beginning.

Level II: Construction Control and Lean Management

Through the in-depth integration of Building Information Modeling (BIM) with 4D (schedule) and 5D (cost), the static model is transformed into a dynamic engine that drives on-site lean management. The virtual simulation and optimization of construction plan precisely guides prefabrication and on-site operations, enhancing the overall construction efficiency and accuracy by over 15% and significantly reducing rework and waste.

Level III: Delivery, Operation, Asset Appreciation

We apply BIM technology throughout the entire lifecycle, from planning to operation and maintenance, converting core engineering data into "living" assets that are inheritable, analyzable, and capable of sustainable value-addition. This provides essential data support for long-term, efficient, safe, and low-carbon asset operations.

2 Three Core Competencies of BIM Implementation

By developing three core competencies, BIM technology achieves a transformative leap from a standalone tool to a core engine.

2.1. Forward-looking Standards and Collaborative Framework

TIANS' BIM innovative practices are highly consistent with Chinese

advanced BIM application standards. By the end of 2025, through more than ten research topics such as *Rapid Drawing of Factory Modular Data*, BIM technology has been comprehensively applied in over 50 application scenarios, covering the entire chain from intelligent drawing review to smart operation and maintenance. The cloud-based cross-disciplinary collaboration platform ensures that all participants operate within a unified data environment, which guarantees "one model throughout" from a systematic perspective.

2.2. A Professional Team of Versatile Talents

We have established a multi-disciplinary, composite BIM team that spans across process, design, procurement, and automation. This team not only has a good command of BIM technology but also offers customized solutions based on clients' process requirements. Through integrated design and real-time conflict resolution, a 30% increase in collaborative efficiency and a 40% reduction in pipeline conflict are realized, providing strong support for the efficient execution of projects.

2.3. Deep Data Fusion and Applications

The TIANS BIM team goes beyond geometric models through multi-stage data integration. During the design phase, structured information such as equipment parameters and process logic is incorporated; during the construction phase, schedule, cost, and quality data are linked. Ultimately, a "digital twin" that comprehensively reflects the physical

facility and is rich in critical engineering data is delivered.

- Operational Efficiency: Twin-based simulation and diagnostics improve inspection and fault resolution rates by 20% to 40%.
- Cost Savings: Preventive maintenance and energy efficiency optimization can reduce life-cycle operating costs by 5% to 15%.

Digital Delivery

To deliver traceable, simulatable, and operable digital twin assets to clients together with physical facility, TIANS has established an integrated data chain covering design, procurement, construction, and operation. Utilizing high-precision 3D models as visual carriers and structured data as the core, it establishes a static mapping of physical facility to support their future safe, efficient, and intelligent operations.

Through the *TIANS Digital Delivery Project*, the TIANS system has developed five core capabilities:

1 Data Structuring: Enabling Data to be "Active"

Centering on facility equipment and pipelines, selection, correlation, and structuring of static information generated throughout the design, procurement, construction, and trial-production processes are conducted. The deliverables include not only 3D models and drawings but also a comprehensive data asset that integrates intelligent P&ID, object attributes, correlation lists, supplier documents, and construction documentation, making it visual, searchable, and traceable. This provides a solid foundation for subsequent intelligent operation and maintenance.

2 High-Precision Modeling and Data Link

TIANS Digital engineers are proficient in utilizing mainstream international platforms such as SP3D for comprehensive 3D collaborative design across all disciplines. Teams from different specialties conduct real-time synchronous work within a unified model space, with data synchronized in real time. The real-time collision detection feature establishes a rapid "design-check-modify" iteration mechanism. Proven in practice, this approach reduces on-site design changes and rework by an average of approximately 30%, significantly reducing project costs and time.

3 High-Performance Team + High-Efficiency Organization

For each digital delivery project, a dedicated collaborative team is established, which is led by a Digital Delivery Manager and integrates professional knowledge from the design, procurement, data, and IT sectors. The entire process, from project initiation and strategy formulation to acceptance and delivery, is streamlined through a digital platform. As a result, the on-time project delivery rate exceeds 94%, and the cost waste caused by information errors and rework is successfully reduced by 10% to 20%.

4 Full-Cycle Quality Control: Delivering Trustworthy Digital Assets

TIANS Digital Delivery Team consistently adheres to data accuracy, consistency, completeness, and compliance as core principles. **Through strict model testing and data verification processes, it is ensured that digital models are precisely aligned with design drawings, physical facilities, equipment lists, etc. This approach leads to the delivery of high-quality digital twins that accurately mirror real - world facility operations.**

Practice demonstrates that strict quality control reduces information conflicts in design collaboration by over 90%, notably enhancing decision -making efficiency. Meanwhile, it saves more than 60% of the data preparation time and costs for advanced applications such as predictive maintenance and intelligent inspection after facility commissioning.

5 Empower Future Smart Operations: Delivery is Just the Beginning

The ultimate value of digital transformation lies in empowering operations. TIANS is actively promoting and will continue to advance this initiative:

5.1. Enhance Data Asset Management and Utilization: Based on the existing material database, establish enterprise-level "Standard Equipment Databases" and "Typical Design Module Libraries". Explore the integration of digitally delivered static data with real-time operational

data (e.g., DCS data) during facility maintenance phases, laying the foundation for advanced applications such as predictive maintenance and intelligent inspections.

5.2. Establish a Unified Delivery Platform: The objective is to integrate intelligent software with multi-source data from document management and progress tracking, creating a customer-oriented, unified digital delivery platform. It not only enables interactive 3D model browsing but also supports rapid data retrieval by tag number or region, linked document access, construction simulation, and training functions, ultimately delivering a "scalable and operational" digital facility core.

By the end of 2025, digital transformation solutions were successfully delivered for leading domestic fine chemical companies including Juhua Group and Tianjin Bohai chemical industry group.

Automation and Informatization

In industries with complex control logic and high regulatory risks, such as fine chemicals, synthetic biology, and biopharmaceuticals, traditional digital transformation often faces challenges such as substantial capital investment, low implementability of solutions, and high costs of trial and errors. By leveraging over a thousand process automation and informatization projects in the industrial sector, TIANS has developed multiple process-integrated solutions that are closely aligned with production scenarios, systematically resolving the core conflict among efficiency, compliance, and cost.

1 Process Technology Leading Full-Process Automation

TIANS has established a cross-disciplinary expert team encompassing process engineering, instrumentation, automation systems, equipment, and validation. The core members of this team possess extensive industry experience. By capitalizing on in-depth understandings of industrial production scenarios, we introduced a menu-style four-level automation service to guarantee that the solutions are both advanced and implementable:

Level I: Modular Rapid Deployment

By standardizing the control logic for nearly 100 typical process

scenarios, such as chemical synthesis, biotechnology fermentation, and biomedical applications, a core control model library has been developed. This allows customers to independently and flexibly design and manage production recipes in accordance with their specific process requirements. The system promotes efficient integration and optimization, attaining over 80% efficiency improvement in solution design and adjustment, and enhancing the stability of control schemes by more than 20%.

Level II: Integrated Process-Automation Synergy

Through forward integration design, process and automation experts collaborate at the origin to directly incorporate requirements such as control points and safety interlocks into 3D design and automation solutions. This guarantees that the process intent is accurately transmitted to the control system, assisting customers in achieving an average 10-25% increase in product qualification/yield rates and reducing fluctuations in key process parameters by approximately 40%.

Level III: Compliance Validation Acceleration

A template-based validation document system (URS/DQ/IQ/OQ) and electronic batch record solutions are provided. These solutions, validated by extensive project experience, reduce validation cycles by over 30% on average, facilitating systems to achieve compliance in a timely manner.

Level IV: Continuous Operations Empowerment

After the project is launched, Data-Annual service packages are

offered, which encompass performance optimization and preventive maintenance, enabling clients to attain sustained enhancements in production efficiency.

2 Light Production Management System

To circumvent the challenges of digital transformation, namely high costs and protracted cycles, a flexible, efficient, and cost-effective production management system was developed based on the principles of light design, modularity, and ease of deployment.

The core product, Light Manufacturing Execution System (T-MES), is characterized by drag-and-drop processes and plug-and-play compliance, significantly reducing the application threshold.

Drag-and-Drop Ultra-Fast Modeling: The system incorporates nearly 100 pre-built universal business components. Process engineers can configure production workflows by simply dragging these components, and the system automatically generates electronic SOPs. This innovation shortens the modeling and deployment cycle from weeks to hours.

Out-of-the-Box Compliance: Standardized components such as electronic signatures and audit trails reduce validation documentation by 80%, ensuring efficient and compliant implementation.

AI-powered Production Intelligence Hub: By integrating open-

source AI models with enterprise knowledge bases, it combines data, rules, and expertise to provide intelligent decision support for anomaly alerts and process optimization.

By the end of 2025, TIANS T-MES had been successfully implemented in over 10 engineering projects across chemical synthesis, biotechnology fermentation and the food & beverage industries, including Huashengyuan and Yihai, it assists clients in achieving the following:

- A 20%-30% increase in production efficiency
- The ability to trace quality issues within 10-40 minutes, which was previously taking days.
- An over 50% improvement in management decision-making efficiency.

3 3D Visualization Platform

The high-fidelity digital twin platform, developed utilizing Unreal Engine 5, integrates and optimizes BIM models (with comprehensive reconstruction of architectural structures, pipeline layouts, equipment placements, etc.). Through a dedicated data relay station, it collects and analyzes multi-system data in real-time, presenting the overall operational status via immersive 3D interactive interfaces. This enables a new intelligent operation model of "one-screen centralized management", which has been

successfully applied in leading domestic biopharmaceutical enterprises such as BeiGene, Qilu Ante Pharmaceutical, and Huashengyuan.

4 Value Loop from Stable Production to Intelligent Operation

The TIANS Automation and Informatization Team is based on process expertise and customer value. By implementing "full-process automation", it establishes a stable, efficient, and compliant physical production foundation, while the "light production management system" creates a flexible and intelligent digital management environment. This synergy constructs a future-oriented, sustainable, optimized and innovative digital platform for manufacturing enterprises, laying a reliable and agile foundation for smart factories.

AI Applications

In the era of the explosive growth of artificial intelligence (AI) technology, TIANS has astutely capture the pulse of technological transformation. Beyond simple digital connectivity, TIANS is committed to intelligent generation and decision-making. By deeply integrating AI into all aspects of engineering design, process decision-making, and business operations, TIANS has achieved a profound synergy between "AI+engineering". This integration has not only notably enhanced delivery efficiency but also achieved a paradigm shift from "experience -driven" to "data-driven" decision-making, redefining the productivity standards in engineering services.

1 AIGC-driven Intelligent Design: From "Conception" to "Visualization"

TIANS takes the lead in adopting generative artificial intelligence (AIGC) technology, overcoming the temporal and spatial limitations of traditional engineering design. This innovation provides visually appealing and decision-supporting design solutions for clients.

1.1. Instantaneous Facade Rendering: Powered by our proprietary industrial architecture style model, designers only need to input basic parameters and style keywords, and the AI can generate dozens of high-quality facade renderings in diverse styles within minutes. This

innovation not only shortens the design cycle by over 90%, but also allows clients to compare visual solutions from multiple perspectives during the early stage of the project, realizing the vision of "what you think is what you see".

1.2. Site Layout Planning Based on Intelligent Deduction: Drawing upon TIANS experience from over 3,500 projects, our AI assistant formulates multiple site layout plans according to site parameters, process flow logic, and logistics requirements. By means of AI algorithms that simulate land utilization, logistics costs, and energy efficiency, it assists clients in promptly identifying optimal layouts to optimize land usage.

2 Process Intelligence Brain: Massive Data Accumulation Enables Precise Decision-Making

"Process-centricity" constitutes the core characteristic of TIANS, and AI functions as a potent engine to activate this core and propel future development. Through in-depth analysis and structured processing of process data from over a thousand previous projects, TIANS has established an industry-leading "Process Intelligence Brain".

2.1.Process Data Accumulation and Knowledge Graph: TIANS has digitized the expertise of over 400 process technology specialists and extensive engineering data (including material balance, energy consumption data, equipment selection parameters, etc.) into digital

assets, and trained specialized vertical models for high-tech fields such as fine chemical engineering, synthetic biology, and biopharmaceuticals.

2.2.Assist in Decision-Making Acceleration: During the project feasibility study and conceptual design stages, AI utilizes historical data to rapidly predict crucial process parameters and investment estimates, offering quantifiable data support for the comparison and selection of technical routes. This enables clients to make well-informed decisions and improves the project's implementability.

3 Customized Solutions Based on Industry Insights

TIANS innovatively integrates and constructs a technical marketing solution database, converting extensive macro-level information into precise insights that directly guide customer decisions and actions. It is not merely an information repository but an intelligent solution platform driven by AI analytics. By synthesizing national and provincial industrial policies, local standards, industry white papers, authoritative technical reports, cutting-edge solutions across the supply chain, and TIANS' 30-year project expertise, the platform provides tailored policy benefits, reduces compliance risks, and effectively matches proven technologies with supply chain resources. This generates comprehensive planning solutions that combine forward-looking vision with high-level implementability.

By seamlessly integrating state-of-the-art AI technology with TIANS' profound process accumulation, lifecycle EPC services, and industry-specific insights, we are leading a new engineering paradigm where "virtual guides reality, data drives decision-making".

Compliance Validation

The requirements for GMP compliance and validation in both domestic and international GMP standards and guidelines, as well as those from related organizations, are becoming increasingly strict. Through systematic thinking and long-term practice, TIANS has established an experienced professional validation team that can offer clients qualification and validation services for critical systems, including facilities, HVAC (Heating, Ventilation, and Air Conditioning), clean piping, and computerized systems. We are dedicated to assisting clients in cutting-edge fields such as cell and gene therapy, antibodies, vaccines, and peptides to confidently tackle complex compliance challenges related to advanced manufacturing, aseptic processes, and data integrity.

For new workshops, we uphold the philosophy of full-life-cycle service of project construction, adopting a distinctive "synchronous confirmation" execution model. This ensures that every step, ranging from user requirement proposal, design, construction to commissioning and validation, precisely conforms to GMP regulations and client requirements, providing solid guarantees for the smooth implementation of the project.

1 Full Life-cycle Validation, Integrating Compliance into the Project DNA
The TIANS Validation Team has broken the traditional passive model

of "post-event supplementary validation" and deeply integrated validation work into every phase of project construction. Adhering to international advanced concepts such as ICH Q10 and ISPE C&Q2, the validation services are thoroughly incorporated into the following three stages:

1.1. Design Phase: Proactive Intervention, Defining Quality

The validation team participates from the project's initiation, participating in and reviewing the definition and evaluation of Critical Quality Attributes (CQAs) and Critical Process Parameters (CPPs) from both compliance and customer needs perspectives, as well as the identification of Critical Control Elements (CCEs/CDEs). This ensures that the design output is verifiable from the beginning, laying a solid foundation for subsequent compliance and thereby reducing the cost of late-stage changes caused by design defects by approximately 40%.

1.2. GEP Phase: Quality-Oriented, Standardized Implementation

During the Good Engineering Practice (GEP) phase, the validation team adopts a GMP outcome-driven approach by establishing clear quality requirements for critical control points. Through validation-oriented methodologies, we standardize construction and equipment installation to ensure that all work complies with regulatory standards. This methodology achieves a reduction of over 50% in on-site rework and corrective actions, shortens system commissioning and validation timelines by approximately 30%, and significantly reduces the risks of compliance deviation caused by project non-compliance.

1.3.Delivery and Usage Phase: Professional Testing to Ensure Handover

Prior to system delivery, the validation team conducts standardized commissioning and qualification tests (e.g., SAT/IQ/OQ) with professional proficiency. This ensures that all systems and equipment are transferred to customers in a stable and compliant state, while supporting subsequent performance qualification (PQ) to ensure production continuity and process reliability.

2 Synchronous Qualification for Efficiency and Compliance

The strict implementation of "synchronous qualification" serves as the foundation for the full lifecycle compliance management of the TIANS validation team. By integrating verification activities into every phase of project construction and generating compliance documents in real-time, we shorten the average project cycle by 15%-20%, substantially saving clients' time and audit costs.

"synchronous qualification" 4D model:

Project Phase	Core Activities	Deliverables
User Requirements (URS)	Communicate and review the applicability and compliance of URS clauses.	Ensure requirement documents meet validation standards to avoid subsequent deviations.
Design & Procurement	Review design documents and drawings; participate in key equipment selection and FAT.	Control design and equipment quality from the source, eliminating issues at the manufacturing plant.
Construction & Installation	Conduct real-time inspections of key quality elements; collect and file equipment data and critical records.	Ensure construction process control and real-time document archiving, providing an evidence chain for confirmation reports.
Commissioning & Qualification	Lead risk assessments, DQ, SAT, IQ/OQ, etc., to ensure scientific and logically rigorous processes.	Deliver a complete and compliant validation package, ensuring smooth system handover and regulatory release.

Trial Run Platform

As the "final stage" of EPC projects, trial run directly determines both the project's deliverables and the client's return on investment. Drawing on over 3,500 project implementations and more than 1,000 technical reviews, TIANS has made dual breakthroughs in methodology and execution. It has accomplished this by establishing a systematic trial run platform and standardizing process re-engineering, which has notably increased the rate of one-time successful trial run and improved project production efficiency.

1 A Fully Integrated Professional Trial Run Technology System

To tackle common pain points and crucial phases during the trial run phase, a cross-disciplines collaborative trial run verification platform has been established. This platform assembles experts from the entire chain, including process engineering, equipment, instrumentation and electrical systems, safety, and quality, forming a trial run team led by the chief engineer. By the end of 2025, the platform had assembled over 50 experts with extensive practical experience in process engineering and production.

TIANS has developed a universal validation system that is independent of specific manufacturing processes. This system is

driven by standardized procedures and data, facilitating a fundamental transformation of trial runs from being "reliant on empirical judgment" to "guaranteeing system performance". Even when faced with unknown "process black boxes", it allows for the objective qualification and assessment of whether the technology meets the required standards.

In a large-scale antibiotic project, pre-intervention via the trial-run verification platform identified and resolved 23 design risks in advance. This resulted in a 30% reduction in the trial-run cycle and enabled the client to achieve compliance and production targets 42 days ahead of schedule.

2 Lifecycle Service and Multidimensional Empowerment

TIANS integrates its test validation team and standardized processes throughout the project lifecycle, ensuring both "one-time successful trial run" and "long-term stable operation".

Process Optimization and Front-end Design: Participate in the evaluation during the process package review and HAZOP analysis phases, presenting recommendations for process safety and control logic optimization based on actual operational data. Through the *Compulsory Milestone Review System*, trial run feedback is incorporated as a mandatory closure criterion for the 30% and 60% design model reviews, eliminating design defects at the source.

Detailed Design Phase:A standardized checklist system is used to review P&IDs, equipment layout drawings, etc., ensuring that the design aligns with the actual operational and maintenance requirements. The *Document Sign-off Authority System* stipulates that critical drawings must be co-signed by the trial run verification team, integrating O&M requirements into construction drawings to minimize future modifications.

Procurement and Construction Phase: The technical agreement shall clearly define requirements for operational training and specialized tools, incorporating commissioning and operation & maintenance (O&M) clauses into the bidding framework according to the *Standardized Technical Specification*. During construction, the Standardized *Pre-Commissioning Procedure* is used to supervise installation and commissioning, ensuring that the physical construction conforms to the design intent.

Trial Run Execution and Delivery: Prior to the trial run, the *Trial Run Operation Execution Plan* and emergency response plan are formulated. During the trial run, the *Trial Run Operation Manual* and the expert team collaborate throughout to ensure a rapid response and smooth progress.

In a vitamin B12 project, it achieved one-time successful trial run, achieving stable production within only 62 days after mechanical completion, which is 40% shorter than the industry average cycle.

3 Three-stage Systematic Validation Ensures Reliable Delivery

TIANS implements the progressive principle of "transitioning from standalone to system integration and from no-load to operation". Through a three-phase validation process, namely single -machine trial run, coordinated trial run, and material-load trial run, it gradually verifies equipment performance, system synergy, and process compliance. Supported by standardized procedures and expert supervision throughout, the project attains its core objective of "one-time successful trial run and long-term stable operation", delivering engineering deliverables that is production-ready.

One-time Successful Trial Run

In engineering industry, "one-time successful trial run" goes beyond mere pledges; it represents a comprehensive assessment of technical systems, organizational capabilities, and delivery execution. TIANS was the first to systematically implement this standard across the industry and continuously validates it through major projects. Through a model characterized by end-to-end process control, cross-disciplinary integration, and lifecycle empowerment, we fundamentally eliminate clients' uncertainties regarding production timelines and operational outcomes. In doing so, we have redefined the benchmark for engineering delivery——propelling the industry from traditional "completion-based handover" to results-driven "efficient production launch".

By the end of 2025, TIANS had successfully completed one-time successful trial run in over 100 projects, spanning multiple industries such as biopharmaceutical, fine chemicals, and new materials. This has evolved into a repeatable, verifiable delivery paradigm——one that is actively reshaping the engineering industry toward accountability for result-oriented and a value-driven model of success.

Reference Projects

Excellence is never an overnight achievement but is forged through continuous iteration and refined over time. By the end of 2025, TIANS had confronted challenges and delivered values in over 3,500 projects, evolving from an industry participant to a key challenger and ultimately a trailblazer. This journey vividly embodies the philosophy of "inheriting legacy, inspiring innovation, pursuing practice, and aspiring to greatness" ——rooted in heritage, focused on innovation, dedicated to practice, and driven by aspirations.

Within this developmental framework, each project embodies and testifies to this philosophy.

Industry	No.	Reference Projects (Partial)
Fine Chemicals	1	Zhejiang Jusheng Fluorine Chemical Co., Ltd. Fluoropolymer Project
	2	Zhejiang Jusheng Fluorine Chemical Co., Ltd. Perfluoroether Rubber Project
	3	Zhejiang Jusheng Fluorine Chemical Co., Ltd Molten Fluorine Resin Project
	4	Gansu Juhua New Material Co., Ltd. High Performance Silicon Fluorine New Material Integrated Project

Industry	No.	Reference Projects (Partial)
Fine Chemicals	5	Gansu Juxiang Fluoroplast Technology Co., Ltd. 5000 tons/year polytetrafluoroethylene series products deep processing project
	6	Tianjin Changlu Chemical New Material Co.,Ltd Fluorine Organic New Material Industrialization Project
	7	CECEP Valiant Corporation Limited Industrial Park Project
	8	CECEP Valiant (Penglai) New Materials Co., Ltd. Electronic Information Materials Project
	9	Hubei Yihua New Energy Co., Ltd. New Energy Battery Additive Project
	10	Zhejiang Yanyi New Energy Technology Co., Ltd. Lithium Battery Water-based Binder Project
	11	Sichuan Yanyi New Material Co., Ltd. Special Water-based Binder Project
	12	Shenzhen Yanyi New Materials Co., Ltd. Lithium Battery Functional Additives and Materials Production Project
	13	Henkel Loctite (China) Co., Ltd. Green High-end Adhesive Industrialization Base Project
	14	Shandong Hengxing New Material Technology Co., Ltd. Calcium Propionate Project
	15	SPIC High-Purity Electronic Special Gas Project
	16	Shangsai (Huanggang) New Material Co., Ltd. New Photoelectric Organic Semiconductor Materials Industrialization Project
	17	Lithium Chen (Jiangshan) New Materials Co., Ltd. Silicon Carbon Project
	18	Star New Energy (Hami) Technology Co., Ltd. Project for the Manufacturing Base of High-Accitivity Electrolyte for Vanadium Redox Flow Battery

Industry	No.	Reference Projects (Partial)
Fine Chemicals	19	Jingdezhen Fushine Life Technology Co., Ltd. Vinylene Carbonate (VC) & Electrolyte Additives Project
	20	Henan Pingmei Shenma Electronic New Material Co., Ltd. Vanadium Liquid Flow Energy Storage Equipment New Medium Project
	21	Shandong Kehan Silicon Source New Materials Co., Ltd. Electronic-grade Silicon Chemicals Project
	22	Kingboard (Hengyang) Industrial Co., Ltd. Annual Production of 10,000 Tons of Chlorine-Containing Electronic-Grade Specialty Gases Project
	23	Tianjin DisTheAll Technology Co., Ltd. 100-ton Electronic-Grade Equipment project
	24	Shandong Ginno New Material Technology Co., Ltd. Electronic-grade Organic Borate Ester Project
	25	Jingchu Membrane Material (Yangquan) Co., Ltd. Yangquan Quasi-solid State Membrane Project
	26	Jiangxi Desi Chemical Co., Ltd. Electronic Chemicals Project
Synthetic Biology	27	Ili Chuanning Biotechnology Co., Ltd. Fermentation Active Pharmaceutical Ingredients and High-end Active Pharmaceutical Ingredients Project
	28	Yili Jiangning Biotechnology Co., Ltd. Green Circular Economy Industrial Park Project
	29	Qinhuangdao AHB Bioengineering Co., Ltd. Small Amino Acid Project
	30	Baiyannur AHB Biotechnology Co., Ltd. Small Amino Acid Project
	31	Anhui AHB Biotechnology Co., Ltd. AI-driven Biomanufacturing R&D and Pilot Demonstration Base Project

Industry	No.	Reference Projects (Partial)
Synthetic Biology	32	Inner Mongolia EPPEN Biotechnology Co., Ltd. Monosodium Glutamate Project
	33	Kekedala Jinhai Biotechnology Co., Ltd. 600,000-ton Corn Deep Processing Project
	34	Vedan International (Vietnam) Co., Ltd. Amino Acid Project
	35	Inner Mongolia Guangda Lianfeng Biotechnology Co., Ltd. New Construction of Bio-based New Materials and Pharmaceutical Intermediates Project
	36	Inner Mongolia VTR Biotechnology Co., Ltd. Bio-enzyme Preparation Project
	37	Chifeng Pharmaceutical Co., Ltd. Hongshan Base Project
	38	Shanxi Jinbo Biomedical Co., Ltd. Industrialization Project of Type III Human Collagen
	39	Polyway (Lianyungang) Biotechnology Co., Ltd. New 50,000 tons/year Straw-based Biosynthesis Industrialization Project
	40	Shengtai Biotechnology Co., Ltd. of Fufeng Group Kazakhstan Biotechnology Industrial Park Project
	41	Cathay Biotech's Fermentation Continuous Sterilization Projects at its Jinxiang, Wusu, and Taiyuan bases
	42	Zhaoqing Star Lake Biotechnology Co., Ltd. Multi-functional Fermentation Pilot Platform Project
	43	Wuhan Grand Hoyo Co., Ltd. Amino Acid Industry Construction Project
	44	Angel Yeast Co., Ltd. Enzyme Preparation Project
	45	Bloomage Biotechnology Co., Ltd. Life Health Industrial Park Project

Industry	No.	Reference Projects (Partial)
Synthetic Biology	46	Wanhua Chemical (Sichuan) Co., Ltd. Fermentation Project
	47	Heilongjiang Yiheng Biotechnology Co., Ltd.Annual Production of 10,000-ton Key Technology New Enzyme Preparation Project
	48	Fortune Pharmaceutical (Taixing) Co., Ltd. New Production Base Project
	49	Hengtong (Inner Mongolia) Biotechnology Co., Ltd. Small Variety Amino Acid Industrial Base Project
	50	Nanjing Biotogether Biotechnology Co., Ltd. Research and Industrialization Project on High-Efficiency Nucleotide Biosynthesis Technology
	51	Changde Economic and Technological Development Zone Development and Construction Bureau Synthetic Biology Manufacturing Pilot Transformation Base Project
	52	Henan Muyuan Anliang Synthetic Biotechnology Co., Ltd. 30,000 tons/year Synthetic Biological Products Project
	53	Inner Mongolia Zhongmu Biological Pharmaceutical Co., Ltd. Demonstration Project of Innovation-driven Industrial Chain Upgrade of Macrolide
	54	Xinjiang Yilihong Bio New Material Technology Co., Ltd. 500,000 tons/year Agricultural By-products Deep Processing and Comprehensive Utilization Project
	55	Yi Yi Xing Hua Biotechnology Co., Ltd. Integrated Project of Active Pharmaceutical Ingredients and Formulations
	56	Shenyang Botai Biopharmaceutical Co., Ltd. Steroid Hormone Project
	57	Shandong Jinnuo Pharmaceutical Co., Ltd. Synthetic Biology Innovation Base Project

Industry	No.	Reference Projects (Partial)
Biopharmaceutical	58	Guangzhou Beone Biopharmaceutical Co., Ltd. ADC&DS4 Workshop Project, Nanyuan Park
	59	Beone (Shanghai) Pharmaceutical R&D Co., Ltd. Shanghai Innovation Center Project
	60	Biomedical Technology Transfer and Transformation Center (Guangzhou) Co., Ltd. Project
	61	Chiatai Tianqing Pharmaceutical Group Co., Ltd. High-end Comprehensive Preparation Workshop Project
	62	Lvye Jia'ao Pharmaceutical Shijiazhuang Co., Ltd. CNS Recombinant and Drug R&D Production Base Project
	63	Fosun Antigen (Chengdu) Biopharmaceutical Co., Ltd. Innovative Vaccine Headquarters and Industrialization Base Project
	64	Shenzhen Hepalink Pharmaceutical Group Co., Ltd. New Preparation Line Project at Pingshan Factory
	65	Shanghai Topalliance Bioscience Engineering Co., Ltd. New Pilot Plant Construction Project at Lingang Base
	66	Hubei Grandpharma Yongsheng Pharmaceutical Co., Ltd. Preparation Factory Construction Project
	67	Guangzhou Innocare Pharmaceutical Technology Co., Ltd. Construction Project of Anti-Cancer Drug Production Base
	68	Shihuida Pharmaceutical Group (Jilin) Co., Ltd. Pilot Production Facility for Biologics Project
	69	Suzhou Juwei Biotechnology Co., Ltd. 45 Million Doses/year Human Vaccine Project
	70	Hangzhou DAC Biotechnology Co., Ltd. Antibody-Drug Conjugate (ADC) Project
	71	Jiangsu Vanguard Pharmaceutical Co., Ltd. Changle Phase II Comprehensive Preparation Workshop Project

Industry	No.	Reference Projects (Partial)
Biopharmaceutical	72	Hangzhou Fuyin Biotechnology Co., Ltd. Gene Therapy Drug Project
	73	Shanghai United Cell Biotechnology Co., Ltd. Cholera Vaccine Project
	74	Beijing Joinn Biologics Co., Ltd. Antibody-Drug Conjugate Technology Platform Construction Project
	75	Shenzhen Mindray Bio-Medical Electronics Co., Ltd. Longhua Base Reagent Workshop Project
	76	TransReco (Wenzhou) Biotechnology Co., Ltd.National Engineering Research Center Project for Cell Growth Factor Drugs and Protein Preparations
	77	OBiO Manufacturing (Shanghai) Gene Technology Co., Ltd. Precision Medicine Industrial Base Construction Project
	78	Shanghai Pharmaceutical CanSino Biologics Co., Ltd. Vaccine Production Base Renovation Project
	79	Gan & Lee Pharmaceutical Shandong Co., Ltd. Phase I Project of Linyi Production Base
	80	Guangdong Watsin Genetech Co., Ltd. Relocation Project of Recombinant Human Epidermal Growth Factor Spray and Eye Drops
Chemical Pharmaceuticals	81	Qilu Pharmaceutical Co., Ltd. Laoling Pharmaceutical Industrial Park Project
	82	Qilu Pharmaceutical (Inner Mongolia) Co., Ltd. Hulunbuir Branch Green Bio-agrochemical Poverty Alleviation Industry Project
	83	United Laboratories (Inner Mongolia) Co., Ltd. Antibiotic Intermediate Project Phase I to V
	84	Inner Mongolia United Laboratories Animal Protection Drug Co., Ltd. Penicillin Sodium Sterile Active Pharmaceutical Ingredient Project

Industry	No.	Reference Projects (Partial)
Chemical Pharmaceuticals	85	Shandong Lukang Pharmaceutical Co., Ltd. Circular Human Synthetic Active Pharmaceutical Ingredient Technology Upgrade Project
	86	Zhuhai United Laboratories Co., Ltd. Gaolan Port Production Base Project
	87	Chengdu Microchip Pharmaceutical Co., Ltd. Original Innovative Drug Manufacturing Base Project
	88	Huanggang Humanwell Pharmaceutical Co., Ltd. Industrialization Production Base Project of High-end New and Special Active Pharmaceutical Ingredients
	89	Jiangsu Sinopep Aosainuo Biopharmaceutical Co., Ltd. Construction Project of Peptide Active Pharmaceutical Ingredient Workshop
	90	Fujian Genohope Biotech Co., Ltd. API Pilot Production and Pharmaceutical Industrialization Base Project & Peptide Industrial Park Project
	91	Sichuan Duorui Pharmaceutical Co., Ltd. High-end Peptide Biopharmaceutical Industry Base Project
	92	Hisun Pharmaceutical (Hangzhou) Co., Ltd. Fuyang Base Project
	93	Tianke (Jingzhou) Pharmaceutical Co., Ltd. Green Pharmaceutical Industry Base Project
	94	Pharmaron (Shaoxing) Pharmaceutical Co., Ltd. CDMO Active Pharmaceutical Ingredient Project
	95	Betta Pharmaceutical (Shengzhou) Co., Ltd. Innovative Drug Industrialization Base Project
	96	Huadong Medicine (Xi'an) Bodyguard Pharmaceutical Co., Ltd. Construction Project of New Base for Active Pharmaceutical Ingredients at the Pharmaceutical Division

Industry	No.	Reference Projects (Partial)
Chemical Pharmaceuticals	97	Inner Mongolia Kangpu Pharmaceutical Co., Ltd. Industrialization Project of Generic Drug Reproduction for Original Drug
	98	Henan Kangda Pharmaceutical Co., Ltd. Phase II High-end Sterile and Non-sterile Active Pharmaceutical Ingredient Construction Project
	99	Chongqing TianDi Pharmaceutical Co., Ltd. Wuyang Pharmaceutical Industrial Park Construction Project
	100	Hubei Yike Pharmaceutical Co., Ltd. Raw Material Drug, Liquid Preparation, Inhalation Solution, and Injection Production Workshop Project
	101	Shandong Huihai Pharmaceutical Chemical Co., Ltd. Peinan Class High-end Pharmaceutical Intermediate Project
	102	Jiaozuo Livzon Synthetic Pharmaceutical Co., Ltd. Factory Building Construction Project
Food Health	103	Yihai (Chengdu) Food Co., Ltd. Hotpot Condiment Processing Turnkey Project
	104	Yihai (Luohe) Food Co., Ltd. Hotpot Dip Sauce Production Line Turnkey Project
	105	Yihai (Ma'anshan) Food Co., Ltd. Phase II Factory Hotpot Condiment Processing Turnkey Project
	106	Yihai Food (Thailand) Co., Ltd. Phase I Hotpot Condiment Processing Turnkey Project
	107	Yihai (Bazhou) Food Co., Ltd. Plant-based Butter Project
	108	Hengshui Yiling Pharmaceutical Co., Ltd. Traditional Chinese Medicine Extraction Project
	109	Sichuan Jishengtang Pharmaceutical Co., Ltd. Expansion Extraction and Concentration Turnkey Project for Traditional Chinese Medicine
	110	Hunan Baixiang Food Co., Ltd. Seasoning Products Project

Industry	No.	Reference Projects (Partial)
Food Health	111	Tianjin Modern Innovation Traditional Chinese Medicine Science and Technology Co., Ltd. Innovation Center Project for Modern Traditional Chinese Medicine Manufacturing
	112	Etsong (Qingdao) Industrial Co., Ltd. Flavoring and Fragrance Production Line Project
	113	Foshan Mai Dian Food Co., Ltd. Turnkey Project for Flavoring and Seasoning Process
	114	Hubei Honch Pharmaceutical Co., Ltd. Anti-tumor Preparation and Plant Extraction Processing Turnkey Project
	115	Guangxi WeHand Pharmaceutical Co., Ltd. Construction Project for Intelligent Traditional Chinese Medicine Production Line
	116	Baoding Waychein Food Technology Co., Ltd. Process Improvement Project for Seasoning Materials
	117	Yichang Huamanwell Pharmaceutical Co., Ltd. Yuan'an Oral No.Third Workshop Syrup Ingredient System Project
	118	Weilong Delicious Global Holdings Co., Ltd. New Red Oil Turnkey Project
	119	Sichuan Conwee Food Co.Ltd. Base Oil and Water Recovery and Treatment System Project
	120	Xiamen Tobacco Industrial Co., Ltd. Purchase of Extraction Equipment and Supporting Implementation Project

Conclusion

Throughout the history of engineering technology, each paradigm shift has represented a profound response to the evolving challenges faced by the industry. When traditional localized optimization approaches proved inadequate in the face of accelerating technological innovation, the "TIANS Model" emerged as a natural and timely solution. It signifies not only TIANS breakthrough but also the inevitable progression of the engineering sector toward higher-dimensional development.

The "TIANS Model" elevates engineering services from conventional "spatial construction" to strategic "value creation". Centered on process technology, it transforms laboratory-based innovations into scalable, operational realities within industrial settings. By doing so, it ensures that the transition "From Lab to Fab" is no longer a high-risk endeavor marked by uncertainty, but a systematic and scientifically guided process of precise implementation.

By posing critical questions to uncover innovative solutions and establishing structured pathways to enable transformative growth, the TIANS Model will continue to embody this advanced paradigm of industrial evolution. It drives technological innovation with purpose and delivers measurable outcomes that set new industry benchmarks. In empowering industries to advance toward higher value-added, environmentally sustainable, and intelligent manufacturing practices, the model consistently contributes predictable and impactful momentum to the global industrialization of emerging technologies.

技驭未来

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