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DIGITAL TECHNOLOGY DEPLOYMENT FOR BATCH PROCESS INDUSTRIES (TPC/SCGC/I-APC)

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TPC/SCGC Batch Process Focused
Improvement Leads

TPC Group's Company Profile

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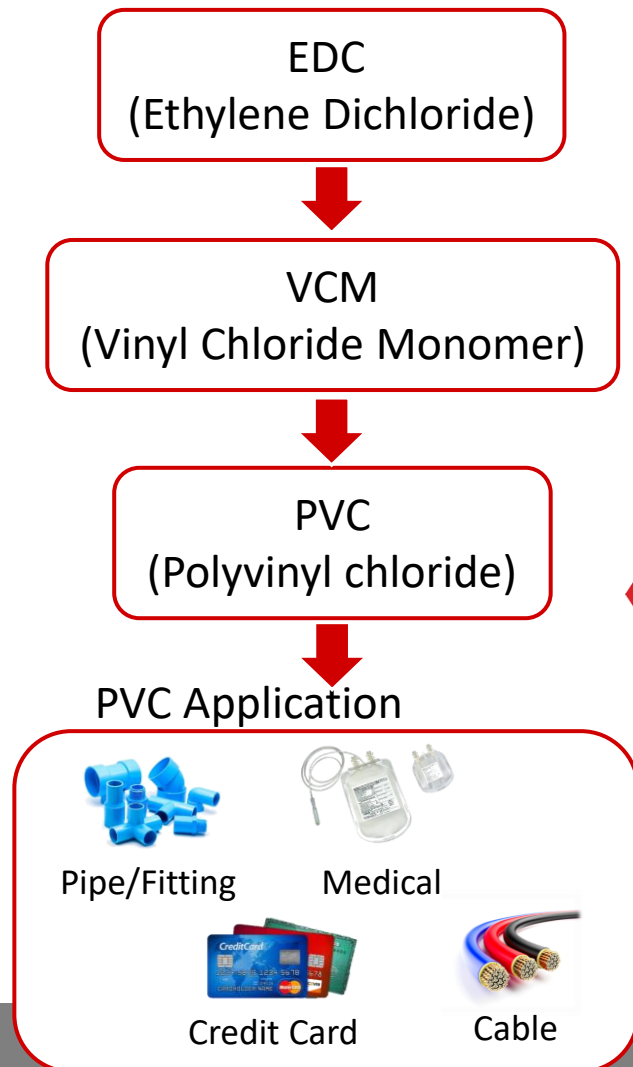


SCGC



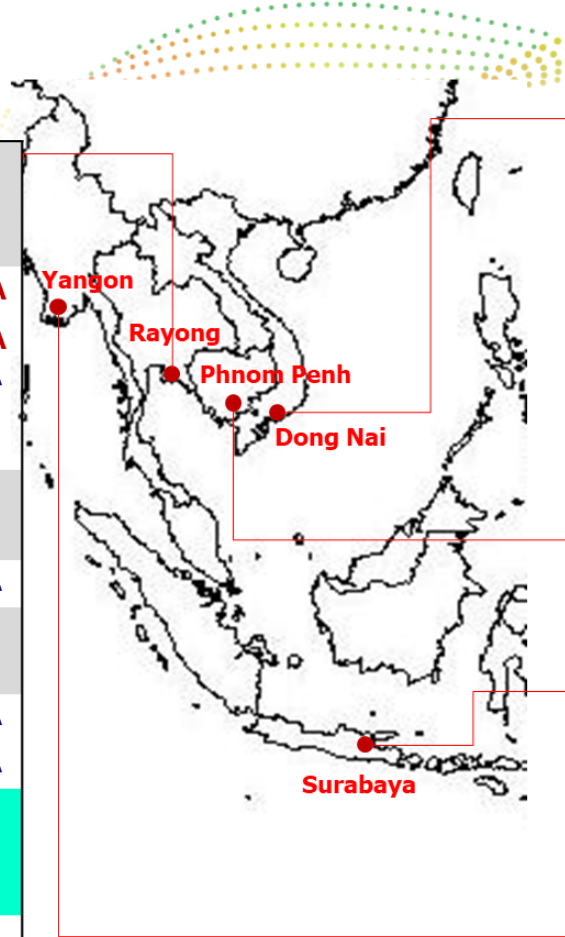
TPC THE ASEAN PVC LEADER

Vinyl Business Value Chain



Thailand

Thai Plastic and Chemicals Plc (TPC) (Registered Capital 875 MB)		
PVC Resin	530,000	TPA
VCM	590,000	TPA
Hydrochloric Acid (18%)	70,500	TPA
TPC Paste Resin Co., LTD (TPR) (Registered Capital 333 MB)		
PVC Paste Resin	36,000	TPA
Nawa Plastic Industries Co., Ltd (Register Capital 400 MB)		
PVC Pipe and Fitting	204,000	TPA
Profile	21,000	TPA
Riken (Thailand) Co., Ltd (35%) at Pathumthani (Register Capital 120 MB)		
PVC Compound Special Grade	82,000	TPA



Foreign country

Vietnam		
TPC VINA Plastic and Chemical Corp., Ltd. (Registered Capital 35 Mil.USD)		
PVC Resin	200,000	TPA
Viet-Thai Plastchem Co., Ltd. (Registered Capital 2.87 Mil.USD)		
PVC Compound	17,000	TPA
Chemtech Co., Ltd. (Register Capital 2.8 Mil.USD)		
XLPE	12,000	TPA
Binh Minh Plastics Joint Stock Company (Register Capital 819 Bil.VND)		
PVC Pipe and Fitting	150,000	TPA
Cambodia		
Nawa Plastic (Cambodia) Co., Ltd (Registered Capital 5 Mil.USD)		
PVC Pipe and Fittings	18,000	TPA
Indonesia		
PT. TPC Indo Plastic and Chemicals (Registered Capital 27.6 Mil.USD)		
PVC Resin	120,000	TPA
PT.Berjaya Nawaplastic Indonesia (Registered Capital 65 Bil.IDR)		
PVC Pipe and Fitting	21,000	TPA
Myanmar		
Grand Nawa Plastic Myanmar Co., Ltd (Register Capital 6.8 Mil.USD)		
PVC Pipe and Fitting	16,000	TPA

Innovation that's Real

- Adhere to Fairness
- Belief in the Value of the Individual
- Dedication to Excellence
- Concern for Social Responsibility

SCGC is committed to sustainable business with good corporate governance by integrating ESG to become a world-class leader. All of which are handled through creation of products and solutions for a better world, sustainable operations along the value chain, and development of solutions for society. The Company has continued to enhance quality of life and create value for stakeholders through the concept of

"Innovation that's Real"



Key Strategies

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Key Strategies for Moving toward the Chemicals Business for Sustainability

Fully Integrated Vinyl Player

- Strengthen profitability, with the intention to expand the business of PVC resins and PVC finished products
- Increase cost competitiveness and strengthen profitability across the value chain

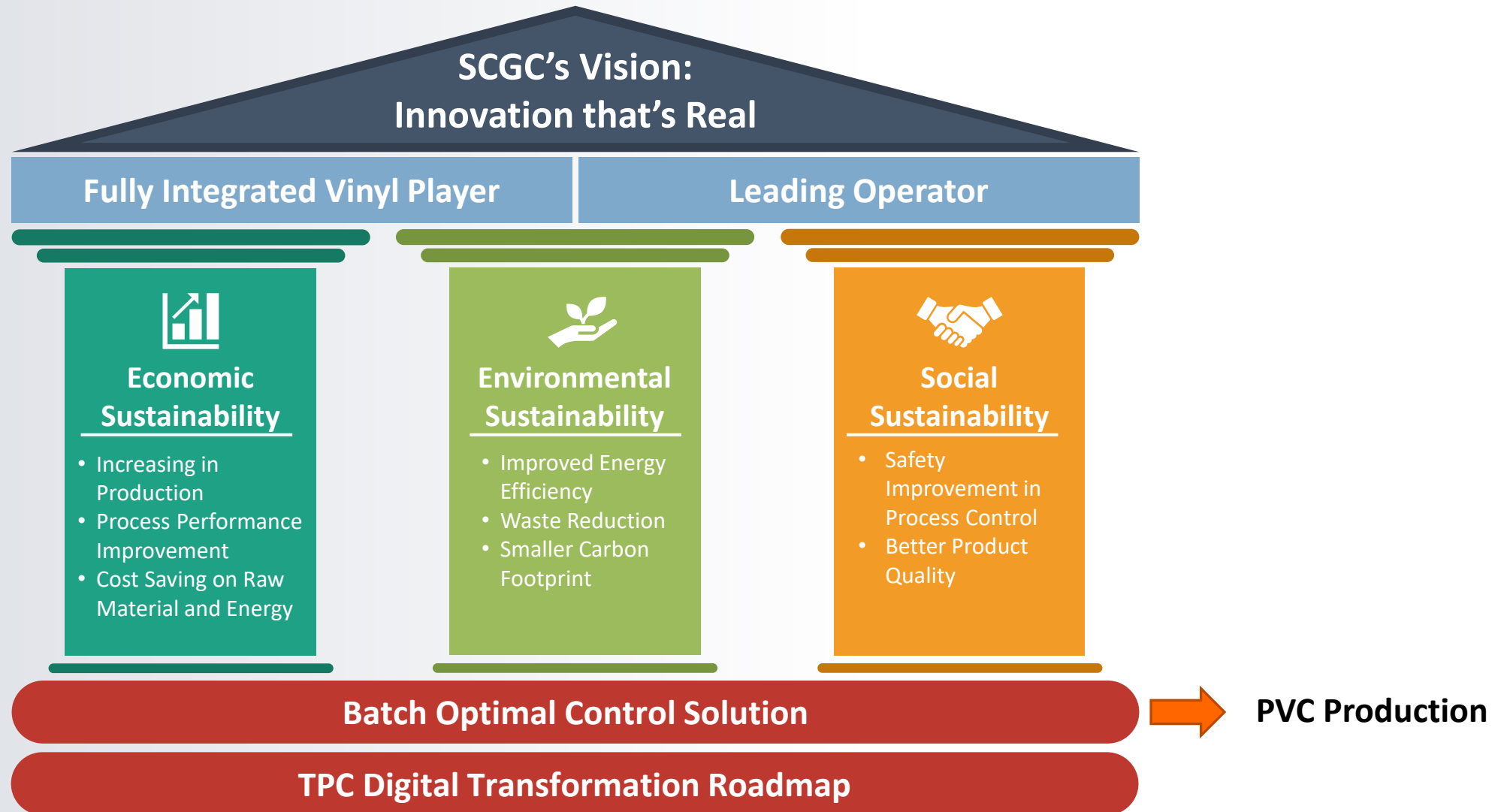
Leading Operator

- Strengthen leadership on OE By adopting digital technology and data analytics across the value chain



Sustainability

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Batch Optimal Control Solution

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Opportunity Statement

To unlock potential benefits of the chemical batch process in terms of production efficiency, product quality, resource optimization, safety, and scalability. An integration of Batch Optimal Control Solution, empowered by simplified digital technology, can drive sustainability initiatives, reduce environmental impact, and position company as leaders in sustainable practices within the industry.

TPC Roadmap To Industry 4.0

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ADVANCED REAL-TIME OPERATION APPS I

- Batch Optimal Control
- Multivariable Predictive Control (MPC)
- Integrated Process Sequencer Expert System

PREDICTIVE ANALYTICS

- Predictive Analytics AI/ML
- Asset Performance Mgt
- Yield Analytics
- Energy Mgt Analytics

GLOBAL PLANT OPTIMIZATION

- Self Optimization Plant
- Demand Management
- Production Scheduling
- Inventory / Distribution

OPERATION TECHNOLOGY II BIG DATA PLATFORM

- Plant Historian / Lab Information
- Planning Scheduling / Maintenance
- Operator Report / Data Integration
- Dashboard / ERP / SCM / WMS / CRM

OPERATION TECHNOLOGY I PROCESS AUTOMATION

- Distributed Control System (DCS)
- Programmable Logic Control (PLC)

ADVANCED REAL-TIME OPERATION APPS II

- Batch Recipe Optimization
- Advanced Multivariate Analytics
- Operator Mobility / Rounding
- Operation Mgt & Shift Handover System

Roadmap

TPC/SCGC Digital Transformation journey to meet industrial trend of a similar value chain petrochemical industries

Batch Optimal Control Solution - LPMS

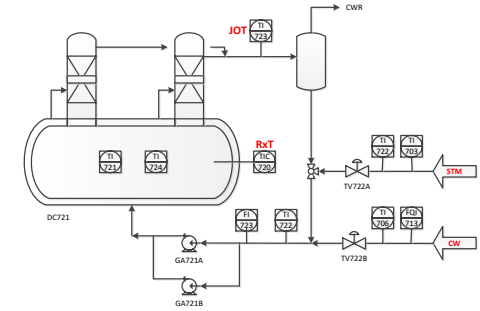
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LPMS (Loop Performance Management System)

Advanced Adaptive Control for Batch and Semi-Batch Process:

Calculate the optimal output based on the dynamic model between Manipulated and Control Variables

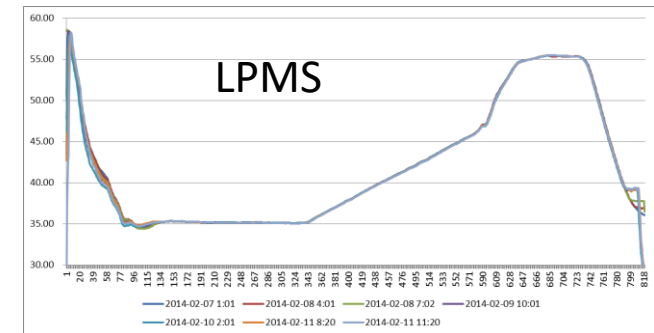
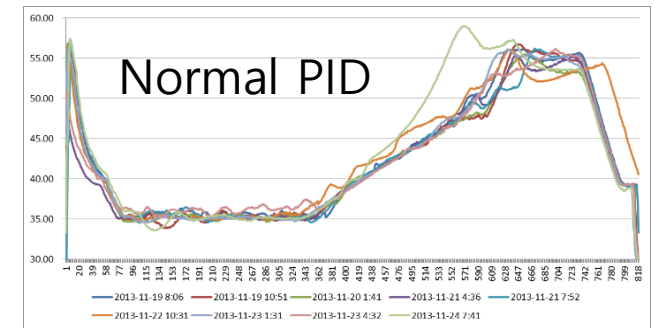


Major Features

- ✓ Predictive control with modeled Heat of Reaction
- ✓ Reactor temperature recipe is covered by control horizon
- ✓ Predictive control considering separate model for STM and CW

Key Benefits

- ✓ Higher process performance from better control precision
- ✓ Easy to create and modify the recipe of each grade
- ✓ More robust controller for many changes/conditions



Batch Optimal Control Solution - BCMS

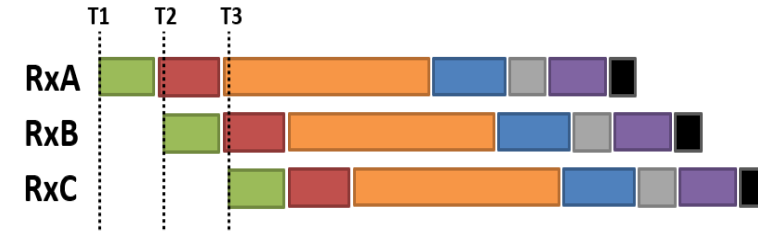
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BCMS (Batch Constraint Management System)

Batch Execution Time Management for Batch and Semi-batch Process:

Calculate and recommend the batch starting time of each reactor in order to minimize the idle time or gap between each batch starting point



Major Features

Key Benefits

Recommended batch starting time with minimized idle time or gap

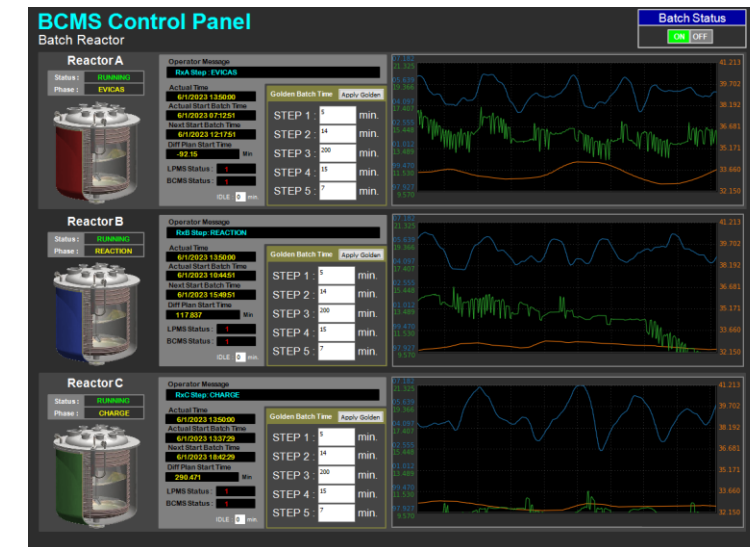
Process efficiency improvement from idle time minimization

Real-time batch starting time adjustment with reactor status verification

Higher production from better precision on batch starting time

Autopilot capability to fully automated batch starting point

Reduction of human error to start the batch with autopilot function



Batch Optimal Control Solution - BCMS

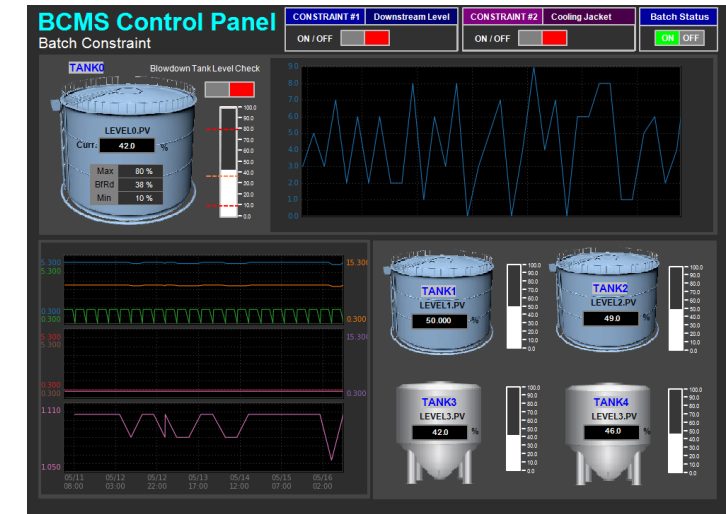
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BCMS (Batch Constraint Management System)

Process Constraint Management:

Calculate and recommend the batch starting time to avoid known process constraints to ensure the consistent of batch production time



Major Features

Key Benefits



Batch starting time adjustment with process constraint consideration



Enhanced process efficiency from removal of bottleneck



Capable of including multiple constraints to reflect actual time adjustment



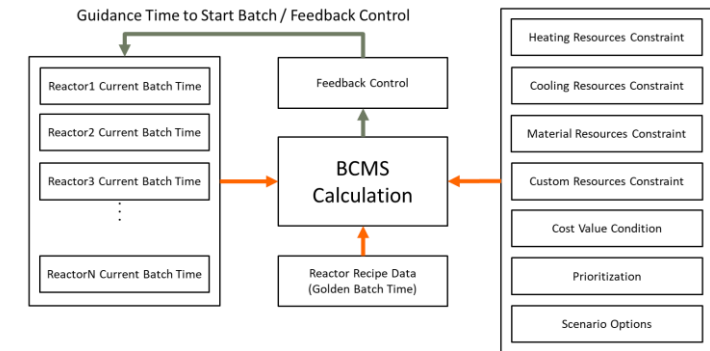
Increasing throughput via precise batch timing (no waiting or idle time)



Real-time batch starting time adjustment with reactor status verification



Improved resource utilization and allocation using BCMS calculation model



Batch Optimal Control Solution – Summary

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Batch Optimal Control Solutions



Reduce Batch Control Deviation

01

Decrease Batch Retention Time

02

Increase Batch Consistency

03



i-APC/TPC Long-Term Partner

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Why i-APC as TPC's Long-Term Partner

Ability to implement best-fit digital solution, maintain peak performance, and visualize key information to meet TPC Digital Transformation journey

Experience

i-APC is one of the most highly experienced Non-Linear Advanced Process Control (APC) consulting firms focusing specifically on Specialty Chemicals, Polymers, and Petrochemicals Process Industries.



Expertise

i-APC is having consultants located in all over the world including USA, China, Korea, SEA(Thailand) and the Middle East with approximately 100 combined man-years of experiences in advanced modeling in Polymers and Specialty Chemical business.



Quality Solution

i-APC systematically focus on delivering of high-quality pragmatic solutions with specific design to generate significant economic and operability improvements to customers' processes



Technology-Independent

i-APC is a technology-independent consulting firm to select best solution for successful deployment at TPC/SCGC in each stage of Digital Transformation roadmap



Best Practices

i-APC is a consulting firm with best practices from various software platforms, which can selectively choose the best solution to successfully deploy for batch production



Business Flexibility

With flexible implementation and supporting scheme, i-APC is able to plan and schedule all the works to meet TPC's business requirements worry-free

