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- Batch Control Software Functions

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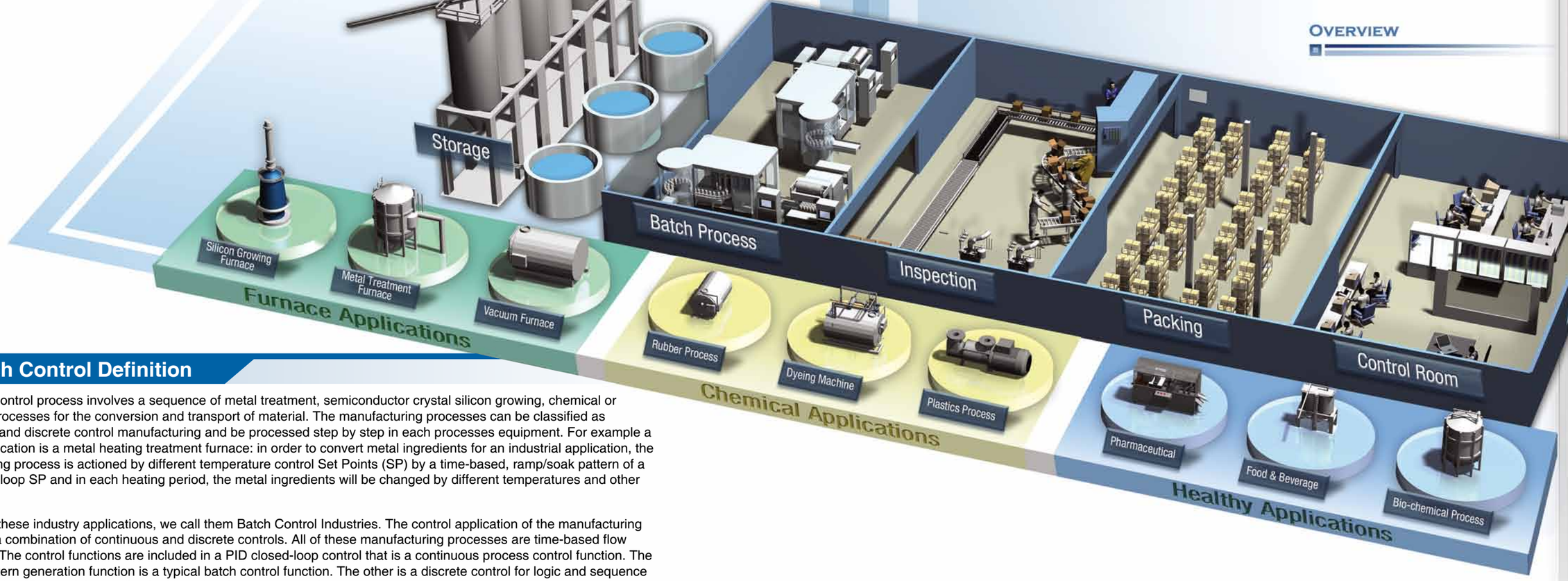
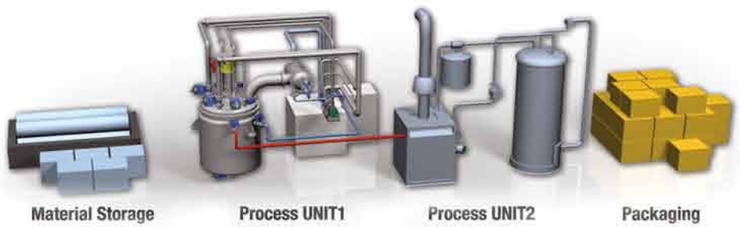


Batch Control Definition

The batch control process involves a sequence of metal treatment, semiconductor crystal silicon growing, chemical or biological processes for the conversion and transport of material. The manufacturing processes can be classified as continuous and discrete control manufacturing and be processed step by step in each processes equipment. For example a typical application is a metal heating treatment furnace: in order to convert metal ingredients for an industrial application, the metal heating process is actioned by different temperature control Set Points (SP) by a time-based, ramp/soak pattern of a PID control loop SP and in each heating period, the metal ingredients will be changed by different temperatures and other conditions.

To classify these industry applications, we call them Batch Control Industries. The control application of the manufacturing process is a combination of continuous and discrete controls. All of these manufacturing processes are time-based flow processes. The control functions are included in a PID closed-loop control that is a continuous process control function. The PID SP pattern generation function is a typical batch control function. The other is a discrete control for logic and sequence control function. Some of the applications need recipe controls and report management.



Batch Control Applications Highlight

The typical batch types are: single path, multiple path, and network path. Here we highlight batch applications as a basic type of physical structure.

A single-path structure is a group of units through which a batch passes sequentially (see chart below). A single-path structure could be a single unit, such as a furnace, reactor, or several units in sequence. The below markets are currently using Advantech's batch control solution service:

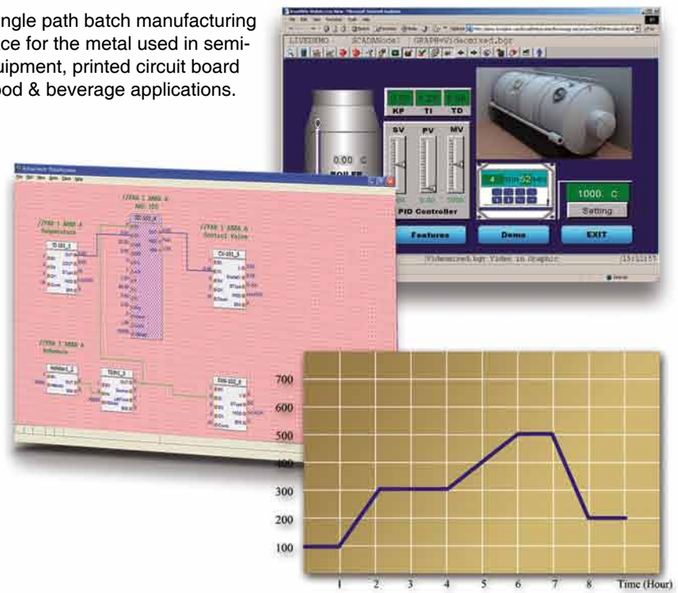
Target Applications Furnace

Furnace Applications	Chemical Applications	Healthy Applications
Silicon Growing Furnace	Rubber Process	Pharmaceutical
Metal Heat Treatment Furnace	Dyeing Machine	Food & Beverage
Vacuum Furnace	Plastics Process	Bio-chemical Process
Printed Circuit Board Press	Glue Process	

Batch Control Function Highlight

Typical Process/Production Line Diagram

Advantech's batch control system focuses on a single path batch manufacturing process equipment e.g. a heating treatment furnace for the metal used in semi-conductors. Plastic and rubber manufacturing equipment, printed circuit board (PCB) manufacturing equipment or reactors for food & beverage applications. Main application functions focus on:



Process Control Functions

- Auto-tuning PID Function
- Temperature Control
- Air/Fluid Ratio Function
- Ramp/Soak Control

Motion Control

- Position & Speed

Recipe Management

- Process Parameter Configuration

Batch Report

- Daily, Weekly, Monthly, Yearly

Furnace Application

Semiconductor Crystal Silicon Growing & Diffusion Furnace

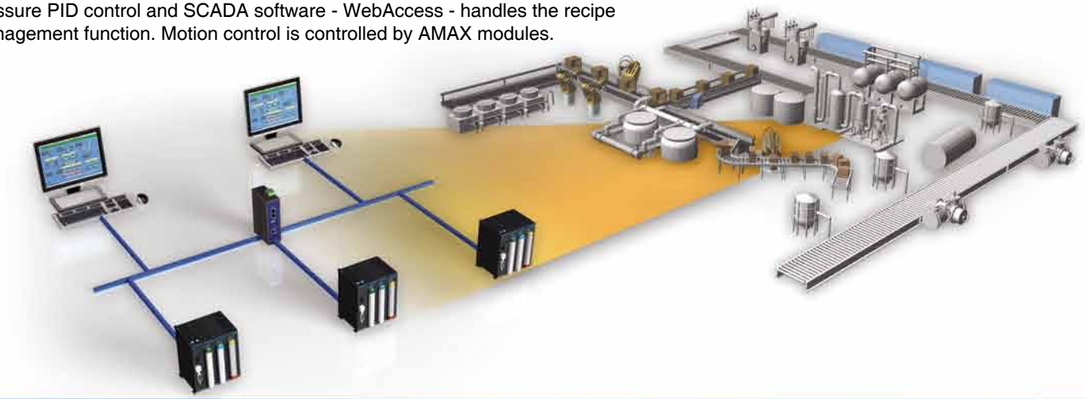
Crystal silicon growing & cell diffusion furnaces are part of the semi-conductor material processing technologies. To make high quality, precision controlled silicon, it needs a high precision temperature PID control with time-based SP (Set Point) pattern generation. It is not only has ramp/soak control, but also has a guaranteed soak (G.Soak) function and time event control to control the silicon growing process and diffusing efficiency.

The APAX-5000 provides a professional SFC language programming environment and powerful batch control function block, ramp/soak, event handling, guarantee soak function to control the silicon growing & diffusing process. For growing speed control, the APAX-5000 also provides the AMAX motion control module with PLCOpen function block to combine batch, process & motion control in one platform.

Healthy Application

Food & Beverage

A typical batch application for the Food and Beverage market includes mixing, boiling, sterilization, filling, inspection and packaging. The control function covers recipe control and management, process tank, motion control, sequence control and SCADA supervisory functions with daily, weekly, monthly and yearly tracking function reports. For the batch control functions, the APAX-5000 handles the batch process control, temperature, flow, level and pressure PID control and SCADA software - WebAccess - handles the recipe management function. Motion control is controlled by AMAX modules.



System Introduction

Advantech offer a complete solution for various batch applications, including control system softlogic control software, communication medium, HMI platform, SCADA software, etc. The control system and the HMI/SCADA platform can communicate using the standard Modbus protocol by built-in serial and Ethernet interfaces.

Advantech Batch Control System - PAC

Advantech PAC solutions, APAX series, are designed for industrial process automation applications and combine the openness and flexibility of PCs with the reliability of PLCs. It is an advanced closed-loop logic controller with modular design. APAX controllers offer various storage (e.g. CF card) and communication interfaces for data logging and networking.

The APAX series allows users to deploy the I/O modules in many expansion combinations, like direct stack or remote expansion. All APAX I/O modules comply with high noise immunity and excellent reliability. The user-friendly design also includes slice I/O, high density I/O with LEDs, and clamp type terminal blocks to ensure wiring quality.

Key Features

Guaranteed Real-time Performance

APAX I/O local bus ensures deterministic control. Contributed by the dedicated Digital Signal Processor (DSP) which handles I/O data process without controller's CPU resource, the I/O scan rate can be maintained within 1ms, regardless of the number of I/O points. Programmers can concentrate on their application program development, and the APAX system can perform real- time I/O access automatically.

Flexible Expansion Architecture

Through expansion ports on backplanes and standard Ethernet cables, a remote expansion with local-bus speed can be built, and the distance can be up to 100m. A standard ethernet switch can be used between two backplanes, so line, tree or star topologies can be built for I/O expansion - all with fast local-bus speed. When fiber optic ports are available, the distance can be longer.

Hot-Swappable I/O

APAX backplanes carry communication and power to I/O modules. With a special design, the I/O modules can be hot-swapped when the system is powered-on and running. Engineers can easily change modules without shutting down the system thereby saving system management costs.

Fail Safe Value

System reliability is critical for batch control applications. APAX output modules feature fail safe value settings, meaning when modules lose communication to the controller, all output channel values will be set as the pre-defined value. This can eliminate risks owing to system communication issues.

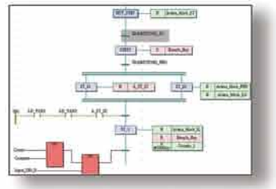
Soft Logic Control Software

The Advantech PAC solution delivers a softlogic programming environment compliant with the IEC 61131-3 standard, enabling users to leverage PLC-world typical programming interface. But they can also benefit from a portability of all platforms, reducing learning costs. A lot of function blocks necessary for batch applications are built within the development tool. An easy-to-use user interface is provided to perform related configuration.

Key Features

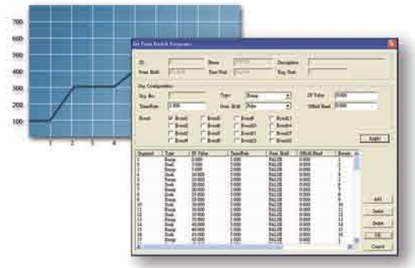
Sequential Function Chart (SFC)

Advantech softlogic software delivers a sequential function chart development environment, which makes it intuitive for programmer to build their applications. Programmers don't need to worry that the programming architecture won't match the real application flow chart.



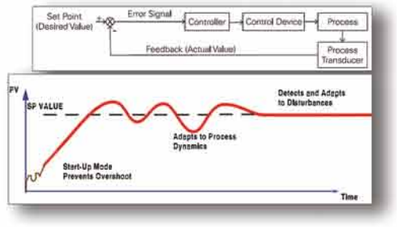
Ramp/Soak Configuration and Function Blocks

APAX controller can use its I/O to control related parameters following a pre-defined pattern (profile). Users can leverage a built-in user interface to create user profiles. For segments within one profile, users can configure ramp/soak type, time, rate, and hold band. The softlogic software will automatically control the parameter following the ramp/soak curve, and manage related events with specific function blocks.



Auto-Tuning PID Function Blocks

The PID function blocks provide auto-tuning functionality. This function block automatically finds the optimized P, I, and D parameters. The recommended number of PID function blocks is 32 loops, depending on customer's process application. For flow and pressure control applications, we recommended up to 16 PID loops.



WebOP-2000 Series	High Performance PAC Controllers	Compact PAC Controllers	Remote I/O Solutions	Browser-based HMI/SCADA Software
Industrial Operator Panel • Touch Panel Operation • Support RS-232/485 and Ethernet	• Integrate Process, Sequential and Motion Control • 32 PID Loops with Auto-Tuning Functionality • Supports Distributed Control Functionality • 50 Ramp/Soak Profile Available • Compliant with IEC-61131-3 Softlogic Standard	• Process and Sequence Control • 32 PID Loops with Auto-Tuning Functionality • 50 Ramp/Soak Profile Available • Compliant with IEC-61131-3 Softlogic Standard	• Supports Modbus/TCP Protocol • Up to 100 Mbps Communication Speed • Daisy-Chain Connectivity • Supports Fail Save Value Functionality	• WebAccess • Supports Receipe Management • Auto-tuning PID Configuration Interface • Ramp/Soak Configuration • Historical Trend Analysis

Model Name	WebOP-2104V
CPU	RISC 32 bits, 200 MHz
Flash Memory	16 M
Operating System	HMI RTOS, WebOP Designer 2.0
Display – Size	10.4" SVGA
Display – Max. Resolution	800 x 600
Display – Luminance (cd/m2)	300
Front USB Access	Yes
Power Supply Voltage	24 VDC ±10%
Power Consumption	25 W
Dimension W x H x D (mm)	232.5 x 175.8 x 42.9 mm (9.15" x 6.92" x 1.69")
Net Weight	1.0 kg
Operating Temperature	0 ~ 50° C (32 ~ 122° F)
Ingress Protection	Front panel: NEMA4, IP65

Model Name	TPC- 1570H
CPU	Intel Pentium 1.4 GHz Celeron M 1 Ghz
Memory	1 GB DDR SDRAM
Display – Size	15" XGA
Display – Max. Resolution	1024 x 768
Display – Max. Colors	262 K
Display – Luminance (cd/m2)	350
Power Input Voltage	18 ~ 32 VDC
Dimensions W x D x H (mm)	383 x 307 x 64.5 mm (15.08" x 12.09" x 2.54")
Weight (Net)	5 kg (11.02 lbs)
Operating Temperature	0 ~ 50° C (32 ~ 122° F)
Ingress Protection (Front Panel)	NEMA4/IP65

Model Name	APAX-5040	APAX-5046
Description	24-ch DI Module	24-ch DO Module
Rated Voltage	24 VDC	24 VDC
Type	Sink or Source Load	Sink
Over Voltage Protection	Yes	-
Fail Safe Value	-	Yes

Model Name	APAX-5017	APAX-5028
Description	12-ch AI Module	8-ch AO Module
Resolution	16-bit	14-bit
Voltage Input / Output	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V	±2.5 V, ±5 V, ±10 V, 0 ~ 2.5 V, 0 ~ 5 V, 0 ~ 10 V
Current Input / Output	±20 mA, 0 ~ 20 mA, 4 ~ 20 mA	0 ~ 20 mA, 4 ~ 20 mA
Fail Safe Value	-	Yes

Model Name	APAX-5520	APAX-5620
Description	PAC with XScale PXA270 CPU	PAC with XScale PXA270 CPU and CAN
Storage	CF slot	CF slot
LAN Ports	1	2
Serial Ports	1 x RS-485	2 x RS-485
CANopen interface	-	2
Certifications	CE, FCC class A, RoHS	