



# Sequencia Partner Tools

20 Minute OpenBatch  
Review

# 20 Minute Review



- Suggested use
  - This is intended to show some of the basic functionality of OpenBatch and explain some of the concepts of batch automation
    - It lists the high points of the product
    - It shows some of the typical product screens
  - The first time through run through this slowly,
  - Run through this quickly for a review

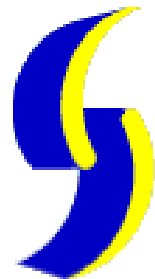
# Batch Automation Elements



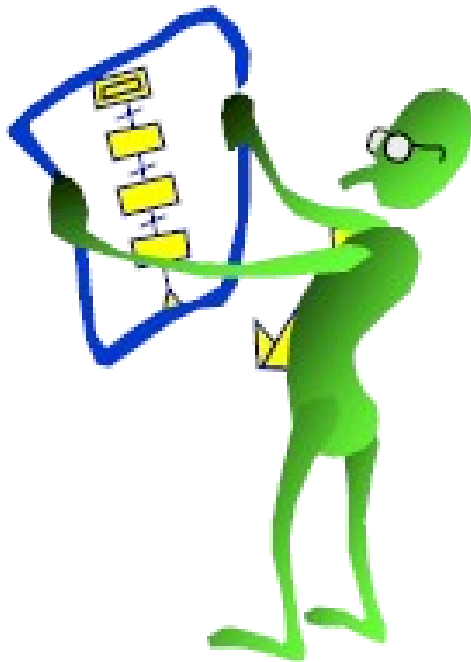
- There are three basic elements involved in batch automation
  - 1: Defining the basic processing capability of the equipment
  - 2: Defining recipes for products
  - 3: Making batches
- This is all based on the international standard for batch control systems  
ISA S88.01 (also known as IEC 61512-01)

# Batch Automation

Click here  
anytime to return  
to this screen



[Click here to go immediately to Defining Equipment Capability](#)



[Click here to go immediately to Recipe Definition](#)

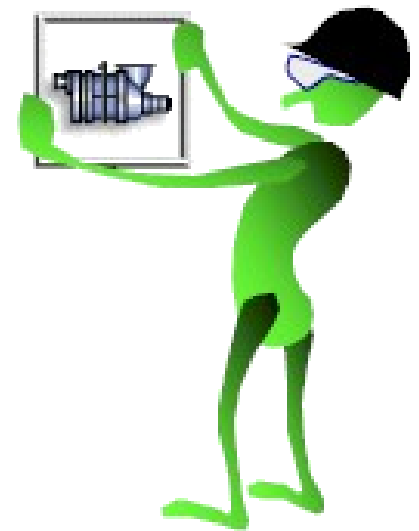


[Click here to go immediately to Batch Execution](#)

# Equipment Capability Definitions

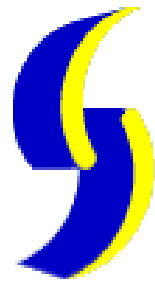


- The basic capability of the equipment must be defined
  - Capability that is usually product independent
  - Such as; heating, cooling, charging, mixing, transferring, ...
  - Associated to specific equipment
- Capability may be performed automatically or manually
- Defined using the Equipment Editor



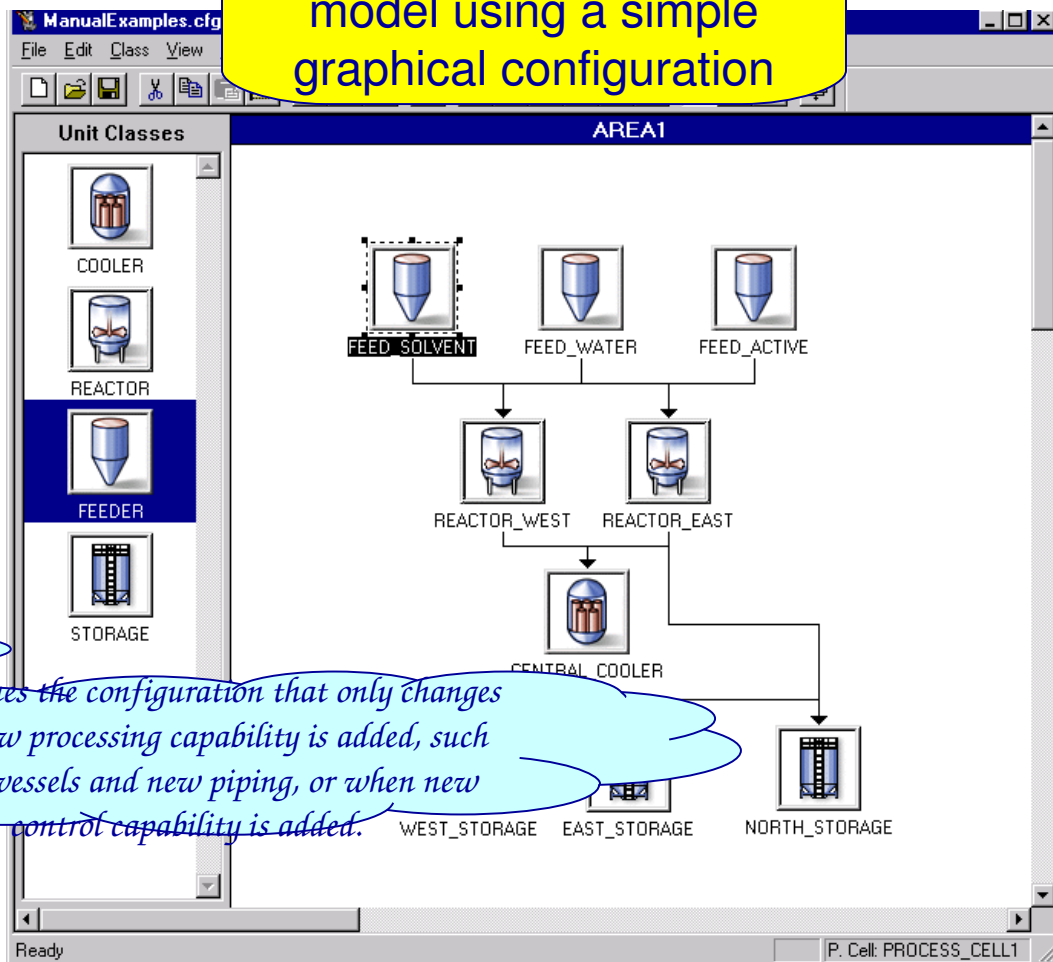
Equipment Definition

# Equipment Editor



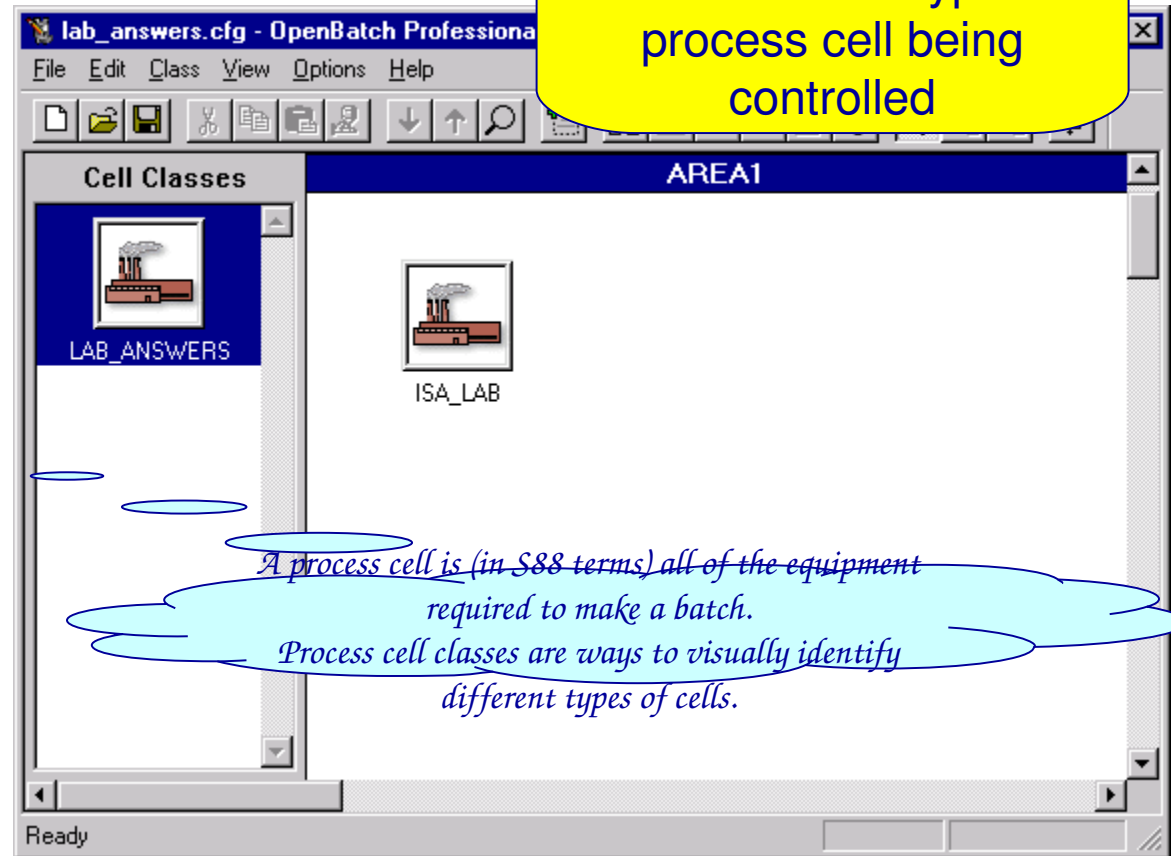
- The equipment editor is run, off-line, to define what the equipment is capable of doing
- You also use the equipment editor to define the mapping (addresses or names) to the PLC and DCS systems that implement the functions

Define the equipment model using a simple graphical configuration

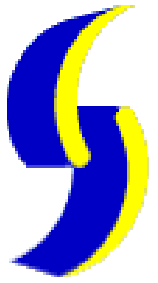


# Top Level - Process Cells

- Batches run to completion in a process cell
- This follows the S88.01 equipment hierarchy model
  - Process cells
  - Made up of units
  - Units contain equipment phases
- Each OpenBatch server can support multiple process cells

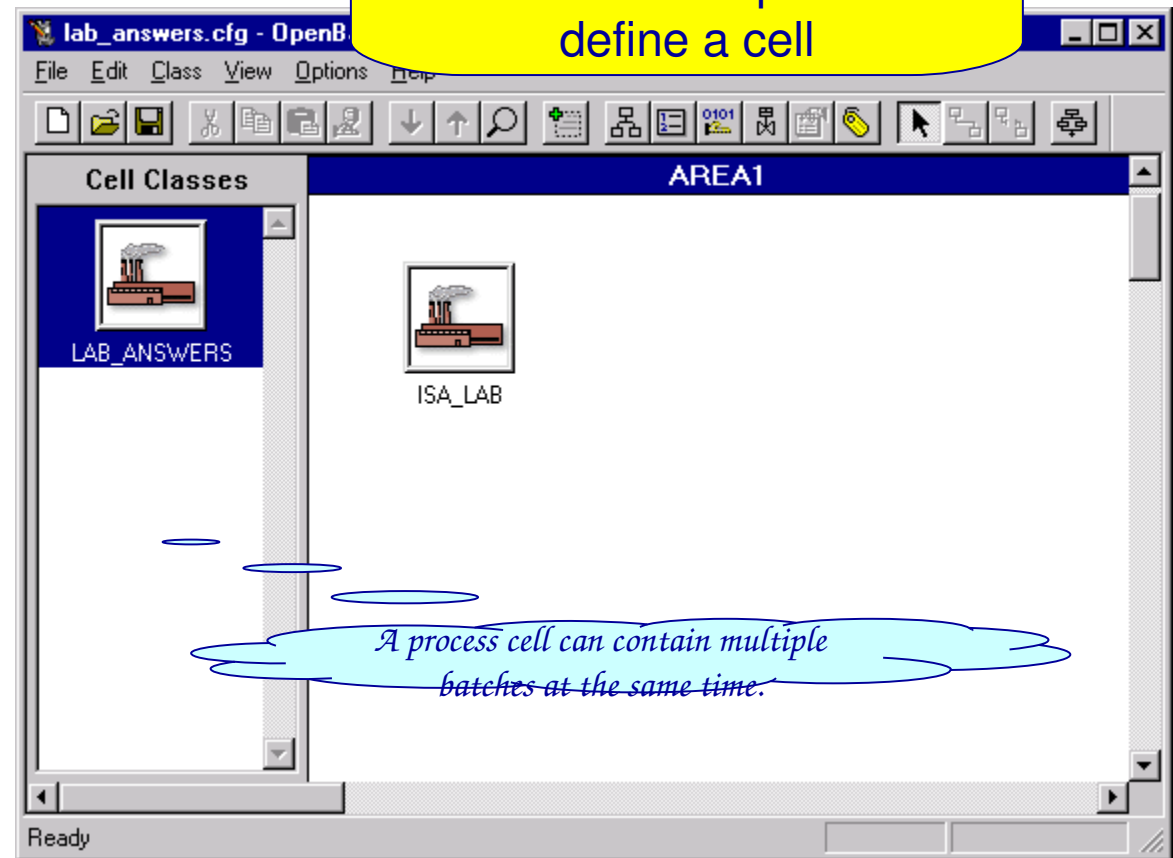


# Drag and Drop Configuration



Drag and drop a cell class into the workspace to define a cell

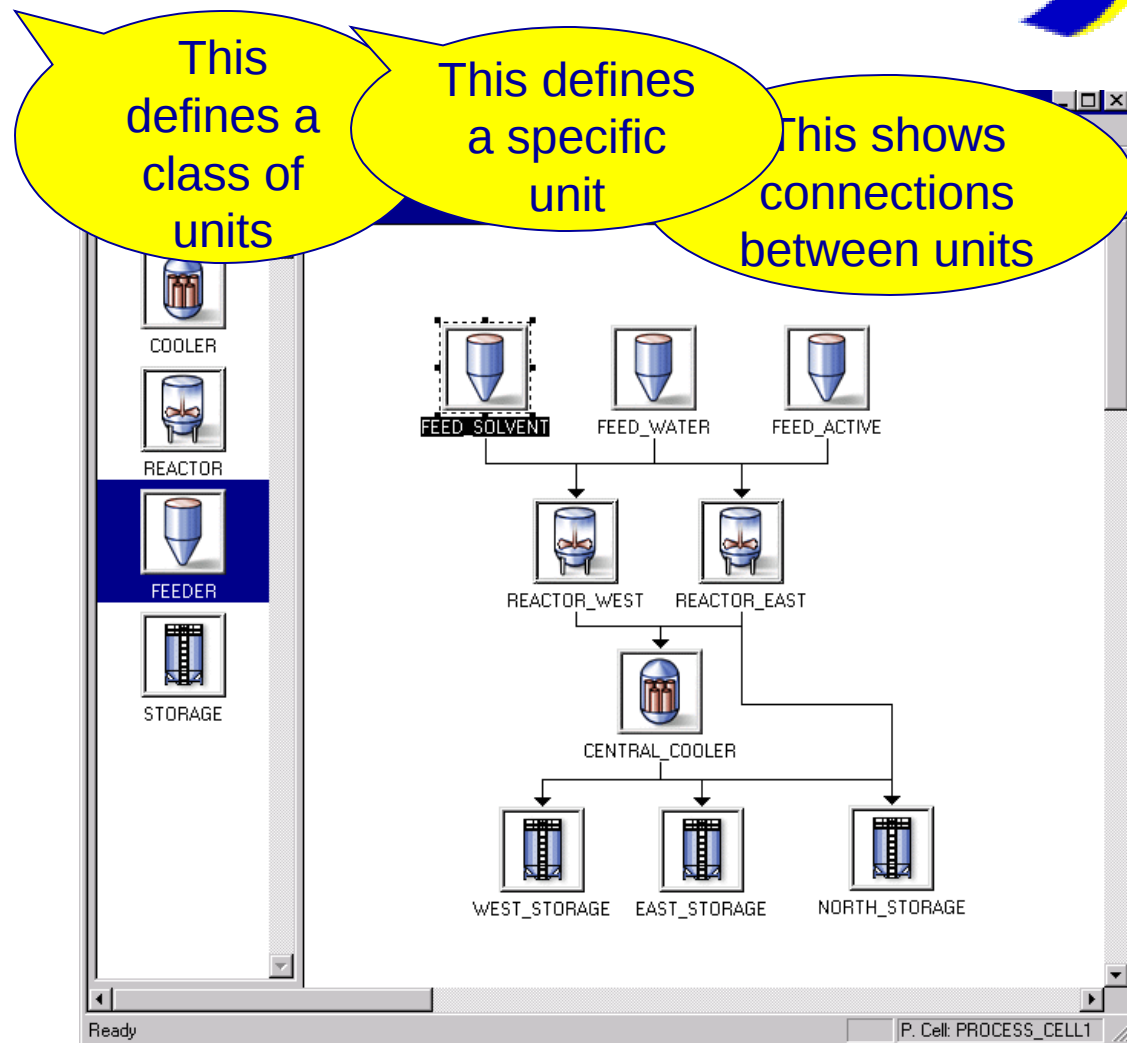
- Starting an equipment model is a simple process of creating a process cell class and then creating a specific cell
- Icons represent the process cells, units, and equipment phases



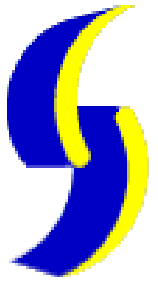
# Define Units and Flow Paths



- Create units the same way
- A unit operates on only one batch at time
- A unit performs major processing actions on a batch
- Define connections between units to show flow paths of materials



# Equipment Phase - Basic Equipment Capability



- Equipment phases define what the basic processing equipment is capable of doing
  - Such as heating, mixing, adding ingredients, transferring materials, ...
- Each phase is a minor processing action on the batch
- It does not matter if the function is performed manually or automatically

Define a phase and drop it onto the unit definition. This defines an equipment capability available in the unit.

ManualExamples  
File Edit Class  
Phases  
UNLOCK  
LIQUID\_ADD  
WAIT  
RECYCLE  
CHARGE\_WATER  
CHARGE\_SOLVENT  
CHARGE\_SOLVENT1 CHARGE\_WATER1  
LIQUID\_ADD2 ADD\_CONTROLLED2  
RAMP\_SOAK1 MIX1 RECYCLE2  
DUMP2  
Ready Unit: REACTOR\_WEST P. Cell: PROCESS\_CELL1

# Phase Parameters



- Phases may have parameters
- Parameters define information to be sent to the phase before it executes
- Examples are
  - temperature setpoints
  - materials to be added
  - amount to be added
  - mixing times
  - heating times
  - ...

lab\_answers.cfg - OpenBatch Professional Equipment Editor

File Edit Class View Options Help

Edit Phase: CHARGE\_A

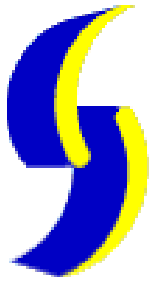
General Parameters Reports Messages

Name	ID	Type	High	Low	Default	Units	Scale	DL on Start
AMOUNT_TO_CHARGE	1	REAL	100	0	55	KILOS	<input checked="" type="checkbox"/>	<input type="checkbox"/>
WHAT_TO_ADD	2	ENUM			STRONG_ACID	MATERIAL_TYPE	<input type="checkbox"/>	<input type="checkbox"/>

Define the parameters sent to the phase from the recipe

Ready Unit: R501 P. Cell: ISA\_LAB

# Report Parameters



The reports are sent back by the controller logic, or entered by operators for manual phases

Name	ID	Type	Units/E.U.	UL on Terminal State	UL on TOC
ACTUAL_CHARGE	1	REAL	KILOS	<input type="checkbox"/>	<input type="checkbox"/>
TIME_TO_CHARGE	2	REAL	Seconds	<input type="checkbox"/>	<input type="checkbox"/>

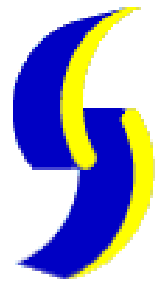
Define the parameters reported back to the recipe from the phase

Buttons: Add Report, Delete Report, OK, Cancel, Apply, Help

Status: Ready Unit: R501 P. Cell: ISA\_LAB

- Phases may report back values during or after their execution
- Such as
  - Actual amount added
  - Actual temperature
  - Actual pressure
- Report parameters may be manually entered by the operator or automatically collected by control equipment

# Equipment Interface



- The equipment editor is where you specify the interface to the control equipment for the phase
- The interface can be DDE or OPC to PLC or DCS systems
- The interface may be an annotated SOP document for manual operations using Procedure Manager

lab\_answers.cfg - OpenBatch Professional

File Edit Class View Options Help

Phases

Name CHARGE\_B\_3

Phase CHARGE\_B\_

CHARGE\_A

CHARGE\_B

CHARGE\_C

CHARGE\_D

AGITATE\_3

MUOVE\_TO\_STORAGE

Equipment Module Tags

COMMAND	Name	CHARGE_B_3_OC
FAILURE	Type	INTEGER
OWNER	Command Register. Set by Batch Server. Used to command the phase to a new state. (START, STOP, etc.)	
PAUSE		
PAUSED		
REQUEST		
SINGLE_STEP		
STATUS		
STEP_INDEX		

Arbitration

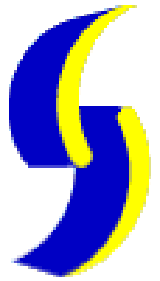
Equipment ID 15

Max Owners 1

Equipment Needed:

Unit: R501 | P. Cell: ISA\_LAB

# Manual or Automated Functions

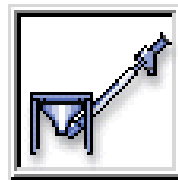


- Equipment phases may be executed in control equipment, such as DCS or PLC systems
- Equipment phases may be executed manually, where instructions are presented to operators using Sequencia's Procedure Manager



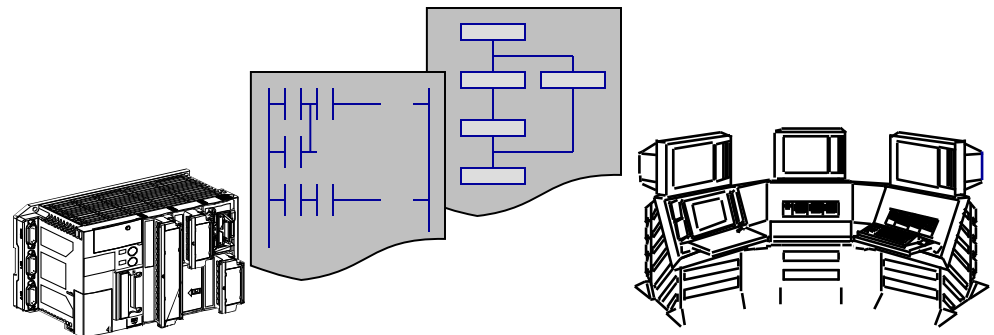
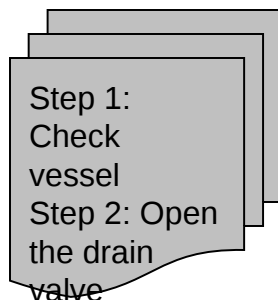
Manual Phase

Identify document that specifies how to accomplish the function

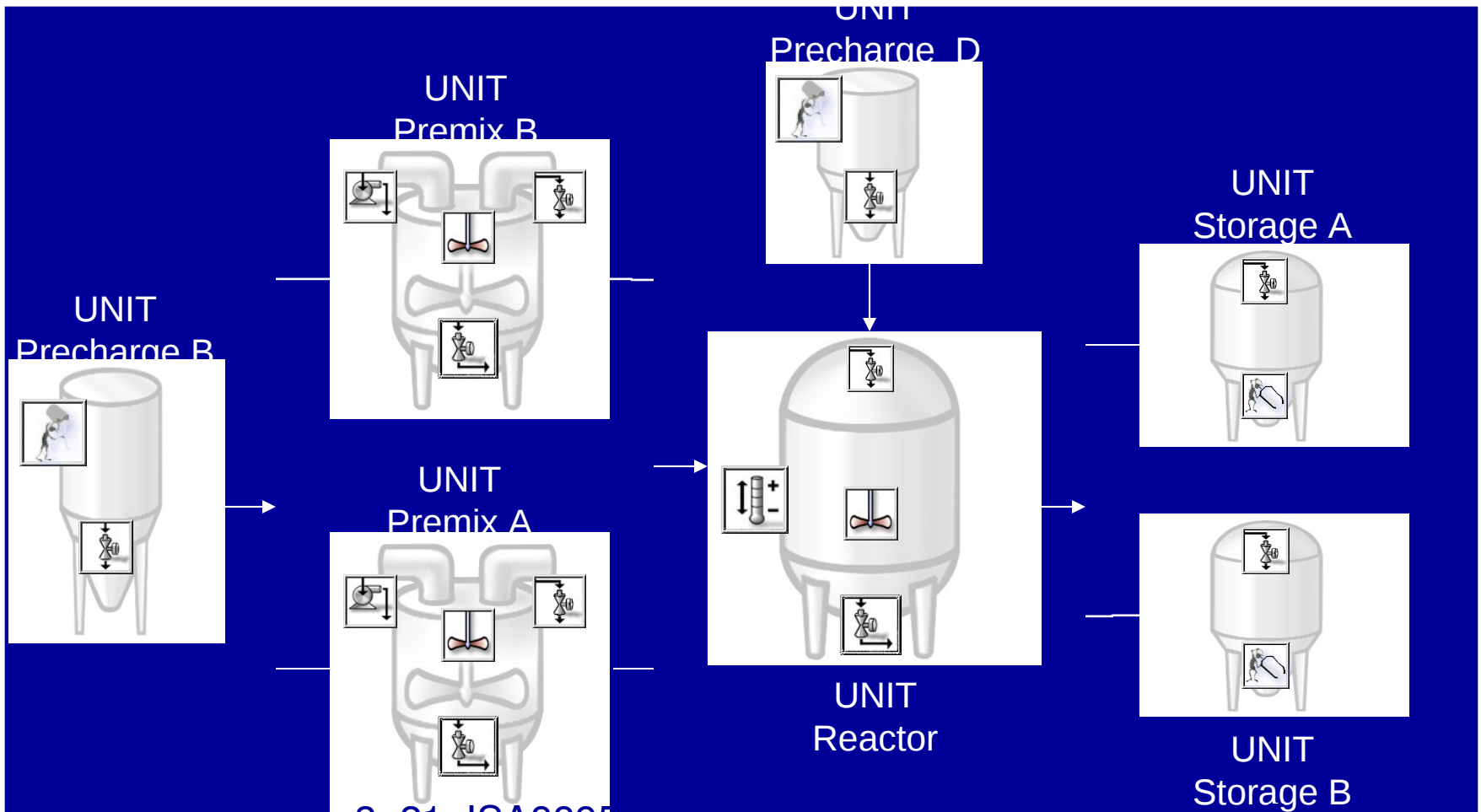
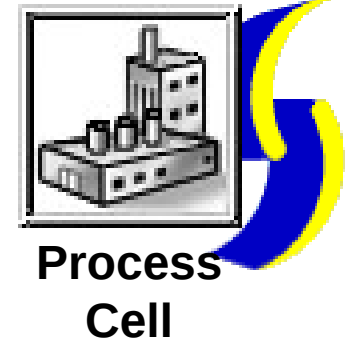


Automated Phase

Identifies the data exchanged with a section of code in the controller that implements the function



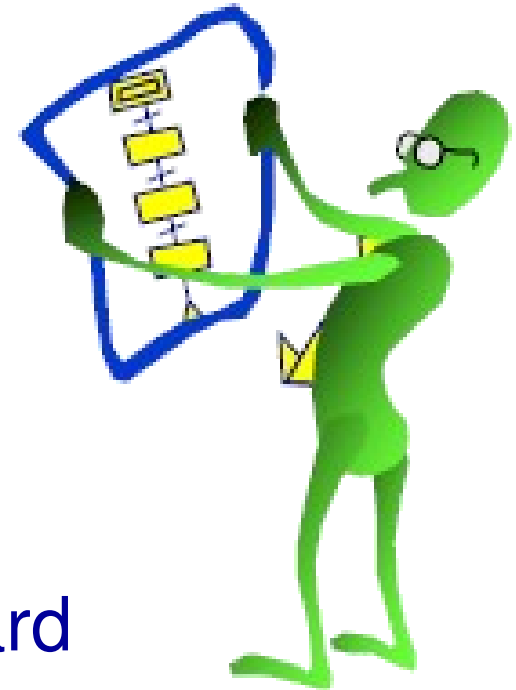
# A Full Equipment Model



# Recipes



- Recipes define how to make products
- Recipes are created using the Recipe Editor
- Recipes are executed in the OpenBatch run time system
- Recipes follow the S88.01 standard

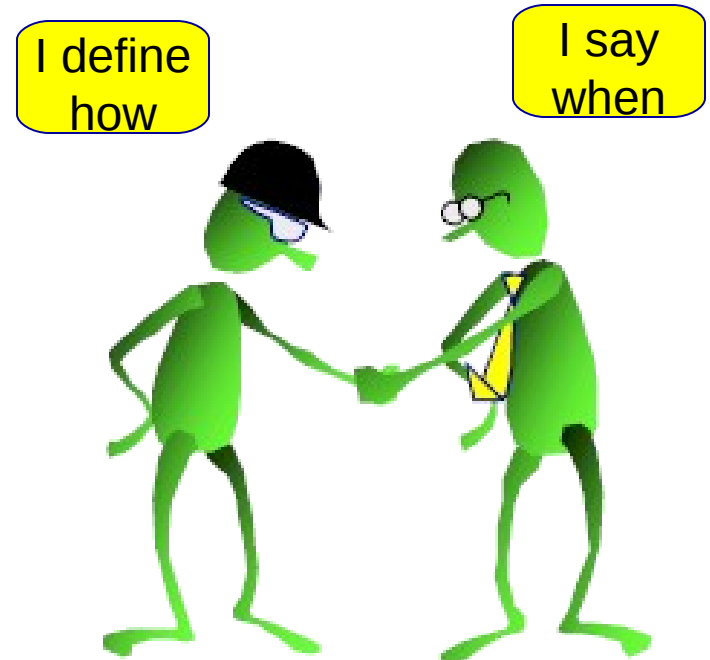


Recipe  
Definition

# Recipes and Equipment



- Recipes use the equipment information defined in the Equipment Editor
- Recipes define the ordering and sequencing of the equipment phases
- The recipes specify when the phases are to run, but the equipment phases do all of the real work



# Recipe Format



- Recipes are created, and displayed in a graphical format called SFCs - Sequential Function Charts
- This format allows the easy display of sequential steps, alternate steps, and parallel steps



# Recipe Editor



- The recipe editor is used to create and modify recipes
- Usually there is one recipe per product
- The main part of a recipe is the "PROCEDURE"
  - The ordering of actions required to make the product
- The procedure is structured according to the S88.01 model

Recipes are made up of Unit Procedures, Operations, and phases

The same Unit Procedures and Operations can be used in multiple recipes to speed recipe development

# Rapid Editing



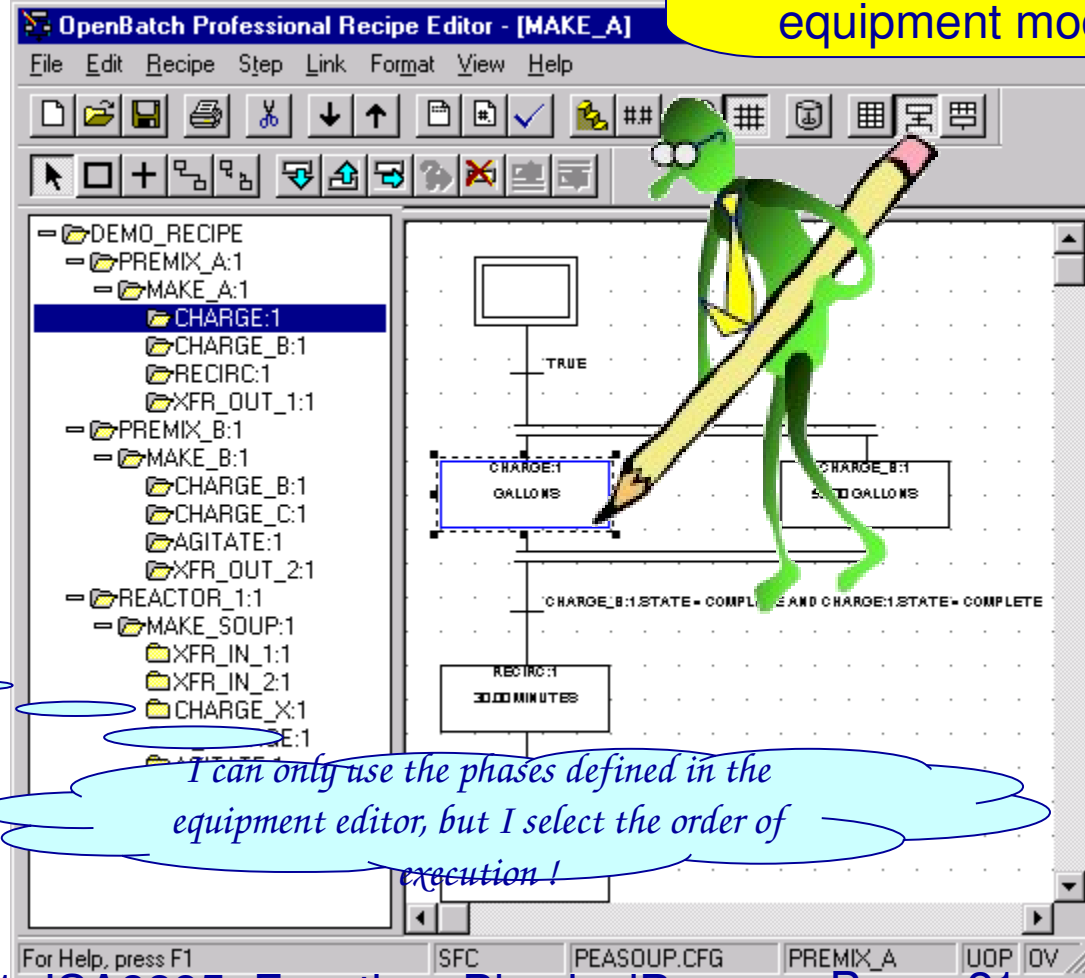
- The recipe editor has features to make recipe creation and editing easy and error free.
- Recipes can be modified at any time and made immediately available for execution.

The screenshot shows the 'OpenBatch Professional Recipe Editor' interface. On the left is a tree view of recipe components, including 'DEMO\_RECIPE', 'PREMIX\_A:1', 'MAKE\_A:1', 'CHARGE:1', 'CHARGE\_B:1', 'RECIRC:1', 'XFR\_OUT\_1:1', 'PREMIX\_B:1', 'MAKE\_B:1', 'CHARGE\_B:1', 'CHARGE\_C:1', 'AGITATE:1', 'XFR\_OUT\_2:1', 'REACTOR\_1:1', 'MAKE\_SOUP:1', 'XFR\_IN\_1:1', 'XFR\_IN\_2:1', 'CHARGE\_X:1', 'M\_CHARGE:1', 'AGITATE:1', 'TMP\_CTL:1', 'RECIRC:1', and 'DUMP:1'. The main area displays a process flow diagram with boxes for 'CHARGE:1', 'CHARGE\_B:1', and 'REACTOR:1'. A green cartoon character is pointing at the 'CHARGE:1' box. A yellow callout bubble contains the text 'Editing shortcuts make it easy to create and edit recipes'. A blue callout bubble contains the text 'The shortcuts make sure the recipes are correctly defined.' The status bar at the bottom shows 'For Help, press F1', 'SFC', 'PEASOUP.CFG', 'PREMIX\_A', and 'UOP OV'.

# Recipe Editing

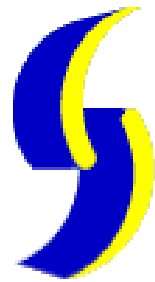
- The lowest level of the procedure is a "Recipe Phase"
- A recipe phase references an equipment phase
  - For a specific piece of equipment
  - Or for a class of equipment

Recipes use the phases defined in the equipment model



*I can only use the phases defined in the equipment editor, but I select the order of execution!*

# Recipes in a Simple Table Format



- Simple recipes require simple display
- So simple recipes can be displayed in a table format for occasional users

Recipes can be displayed and edited in the graphical view or in the table view.

	STEPS	AMOUNT TO CHARGE
1	CHARGE:1	Operator
2	CHARGE_B:1	55.00
3	RECIRC:1	30.00
4	XFR_OUT_1:1	45.00

The table view is more compact and easier to understand for simple recipes

# Multiple Views



- You can even show the table view and the graphical SFC view at the same time
- Using the recipe editor, recipes can be created in very short times
- Using the alternate views, recipes can be read and reviewed by people not familiar with OpenBatch

It is even possible to see the table and graphical view at the same time.

The screenshot displays the OpenBatch software interface. On the left, a tree view shows the recipe structure for 'DEMO\_RECIPe', including 'PREMIX\_A:1', 'MAKE\_A:1', 'CHARGE:1', 'CHARGE\_B:1', 'RECIRC:1', 'XFR\_OUT\_1:1', 'PREMIX\_B:1', 'MAKE\_B:1', 'REACTOR', 'MAKE', 'XFR\_IN\_1:1', 'XFR\_IN\_2:1', 'CHARGE\_M', 'CHARGE\_Y', 'CHARGE\_X', 'AGITATE', 'IMPACT', 'RECIRC:1', and 'DUMP1:1'. The 'CHARGE:1' step is selected. On the right, a table view shows the steps and their amounts:

	STEPS	AMOUNT TO CHARGE
1	CHARGE:1	Operator
2	CHARGE_B:1	55.00
3	RECIRC:1	30.00
4	XFR_OUT_1:1	45.00

Below the table, a graphical SFC view shows a sequence of steps: 'CHARGE:1' (GALLONS) and 'CHARGE\_B:1' (55.00 GALLONS). A green cartoon character is pointing at the 'CHARGE:1' step in the table and the SFC view. A blue speech bubble at the bottom of the SFC view contains the text: 'These are easy to understand, but they are also very powerful tools!'.

# Phase Parameters



Define the parameter values that will be sent to the equipment phase when this recipe runs.

- When you create a recipe you can specify the specific parameters to be sent to a phase before it executes
- Such as a temperature setpoint, or the amount of material to add

	Name	Type	Origin	Low	Value	High	EU	Display
1	AMOUNT_TO_CHARGE	Real	Operator	.00	45.50	100.00	GALLONS	<input checked="" type="checkbox"/>

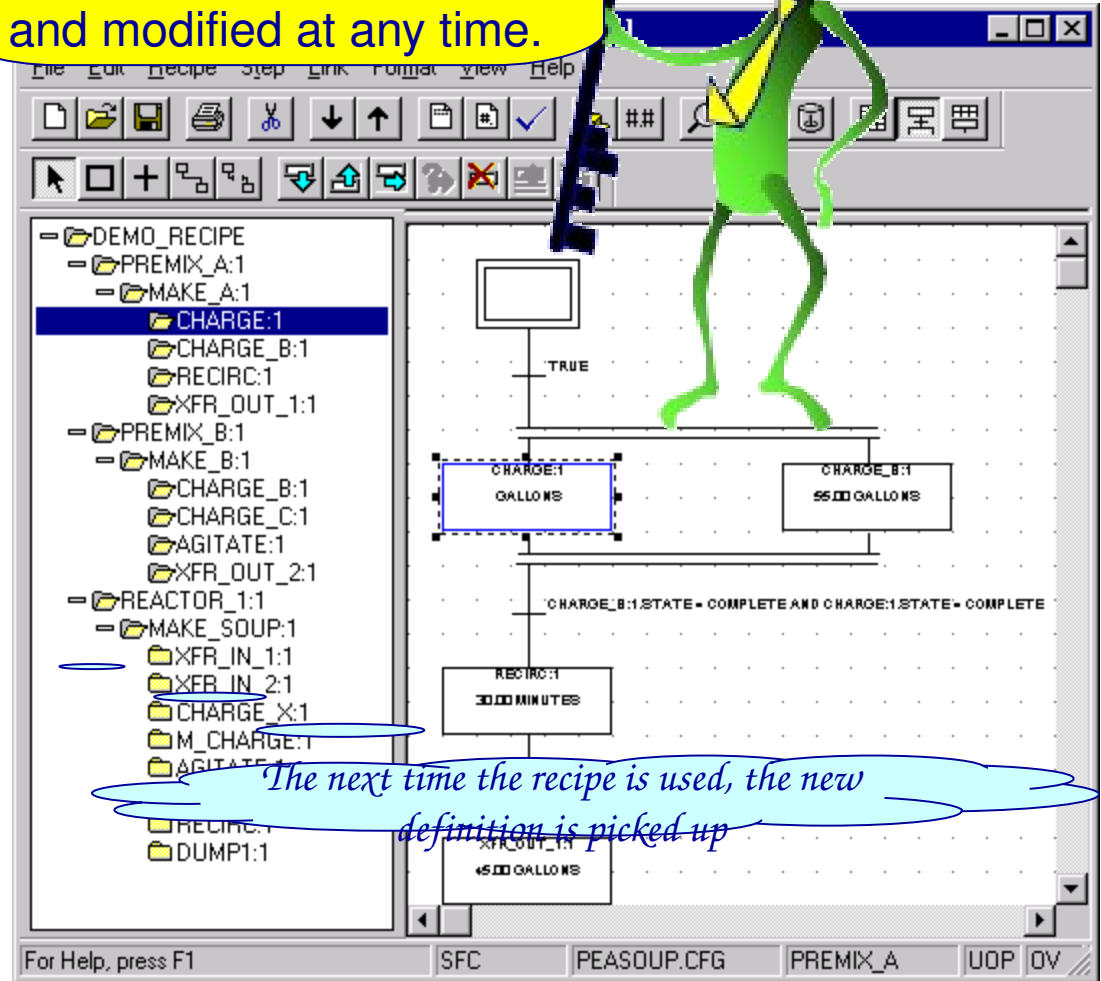
*This is how I use a phase to perform different tasks based on the recipe I am defining!*

# Recipe Summary



- Recipes are the key element of batch automation
- They define how to make a specific product, without specifying how the underlying functions are preformed
- OpenBatch includes other information as well
  - Formula values
  - Author identification
  - Comments
  - Equipment requirements

With the right authority, recipes can be created and modified at any time.

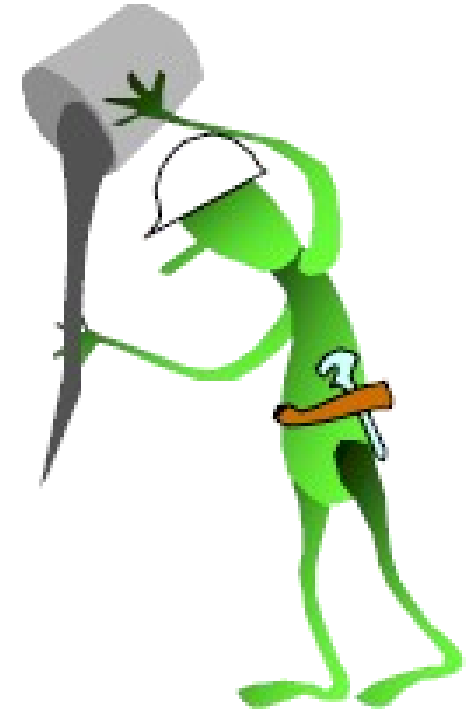


The next time the recipe is used, the new definition is picked up

# Batch Execution



- OpenBatch is not just a recipe editor, it also executes the recipes
- There is a run-time component of OpenBatch that runs recipes under operator control



Batch  
Execution

# Recipes and Operations



- Operations is where it all comes together
- Operators execute batches and select equipment they will run against

I will use your  
recipe definitions

I will use your  
equipment definitions



# Batch Execution

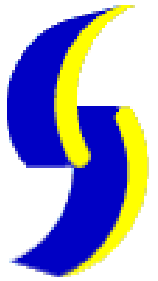


Usually the OpenBatch server is configured to auto start, so I don't have to worry about this software stuff

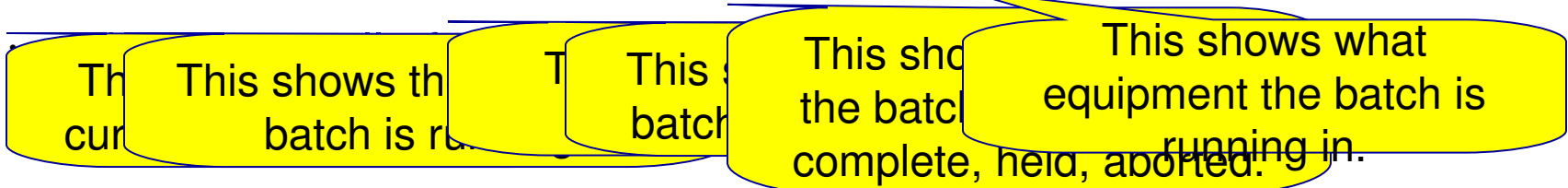
- Batches are executed in the OpenBatch run time system
- OpenBatch runs as a Windows-NT service
  - OpenBatch can auto start, so no operator intervention is required
- An OpenBatch server can communicate to multiple PLC and DCS systems to control multiple process cells
- OpenBatch uses DDE and OPC to communicate to control equipment





# Operation - Batch List

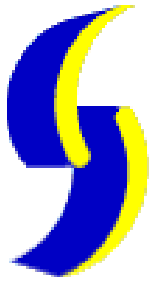


- The Batch List is usually shown as an Active-X control in an HMI, or in a WEB Browser



Batch ID	Recipe	Description	Start Time	Elapsed Time	State	Mode	Failure	Process Cell	Units In Use
 T55272	DEMO_RECIFE	PEA SOUP		0:00:00	IDLE	MANUAL		PEA_SOUP1	PREMIX_B,PREMIX_A,REACTOR_1
 T663483	CLEAN_REACTOR	CLEAN THE REACT...		0:00:00	IDLE	MANUAL		PEA_SOUP1	REACTOR_1

# Operation - Controlling Batches



- A simple right click brings up the menu to add and control batches
  - Batches can run in manual, semi-automatic, or automatic mode
  - Operators can start, hold, restart, stop, or abort batches
- Use the "Create" command to add new batches with the correct privileges

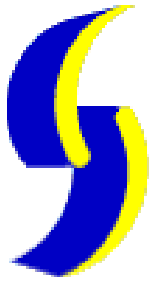
I use the "Comment" command to add a comment to the batch journal

Description	Mode
DELETE	Q_AUTO
ING	Q_AUTO

I use the "Remove" command to remove completed batches from the batch list

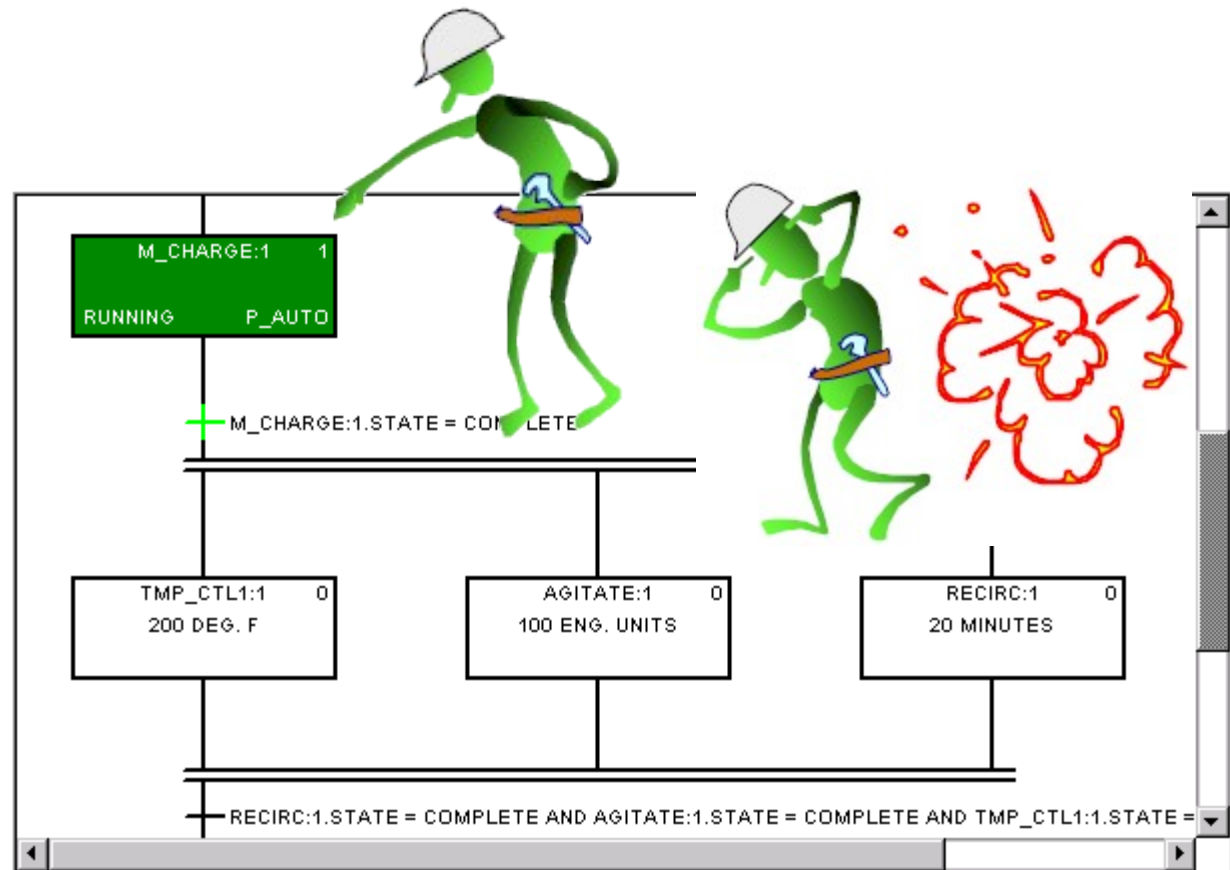
I usually only use these when something goes wrong

# Operations - Recipe Procedure



- Another Active-X control is the procedure view
- This can also be included in any HMI display to display and control a specific batch's recipe

I usually only control the order of execution when something goes wrong

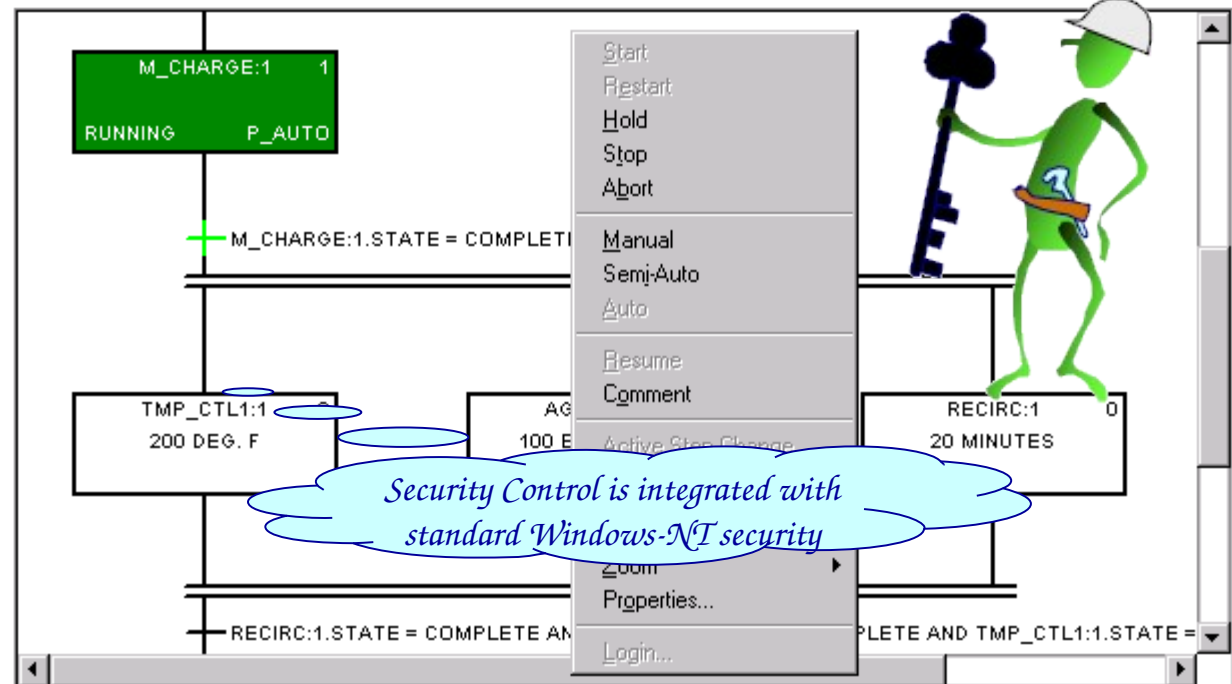


# Recipe Procedure - Control

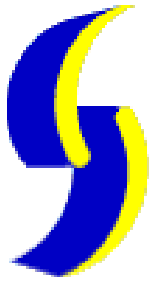


- Right click to bring up the menu to control
- These can also be easily configured as buttons
- The newest version of OpenBatch further integrates these controls into your HMI or DCS displays

Performing these actions require I have the right security privileges

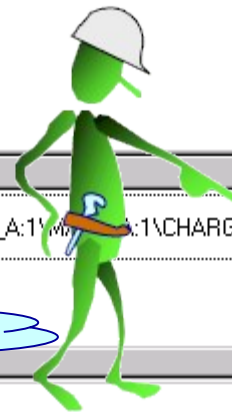


# Operations - Prompts



- When Procedure Manager is not installed, then the "Prompt List" Active-X control provides access to "prompts"
- Prompts are requests for values from the operator
  - These are report parameters that the operator must supply for the batch to continue

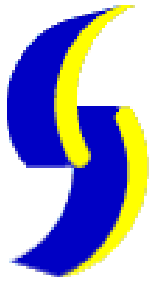
I need to enter a value for the batch to continue



Time	Batch ID	Source Step	Description	Type	Default	EU
06/14/1999 11:28:08 AM	T55272	12:DEMO_RECIPE\PREMIX_A:1\...	AMOUNT_TO_CHARGE	Prompt	45.5	GALLONS

*Prompts are defined in the recipe editor*

# Classical Operations View



- OpenBatch also has a stand alone operations interface
- All of the previous functions, as well as additional functions for debugging, are provided by this Windows-NT application

I can do all batch actions from this application



Usually I will control the batches using the Active-X controls and my HMI or browser

OpenBatch Professional View - [PROCEDURE AS SFC]

Step: T55272

- PREMIX\_A:1
  - MAKE\_A:1
    - CHARGE:1
    - CHARGE\_B:1
    - RECIRC:1
    - XFR\_OUT\_1:
  - PREMIX\_B:1
- REACTOR\_1:1
  - MAKE\_SOUP:1
    - XFR\_IN\_1:1
    - XFR\_IN\_2:1
    - CHARGE\_X:1
    - M\_CHARGE:
    - AGITATE:1
    - TMP\_CTL1:1
    - RECIRC:1

Procedure: DEMO\_RECIP | COMPLETE | MANUA

REACTOR\_1:1.STATE = COMPLETE AND PREMIX\_B:1.STATE = COMPLETE AND PREMIX\_...

Recipe Information | Prompts | Parameters | Reports | Arbitration

Identifier: DEMO\_RECIP | Procedure Information: PEA SOUP

14:08:06 | T55272

# Batch Journals and Reports



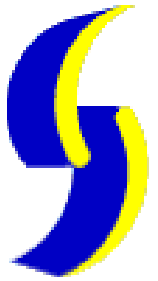
- OpenBatch also collects all of the information about the execution of a batch into a batch log
- Reports can be built against the batch log, or the information can go into a database for analysis

This information is very valuable, and it is automatically recorded.

*The electronic batch log means I need to do less paperwork!*



# OpenBatch Programs



- The following programs are provided with OpenBatch
- Not all programs need to be installed on all computers
- OpenBatch runs as a client server architecture
  - Editing may be done from any computer on the network
  - Viewing may be done from any computer network

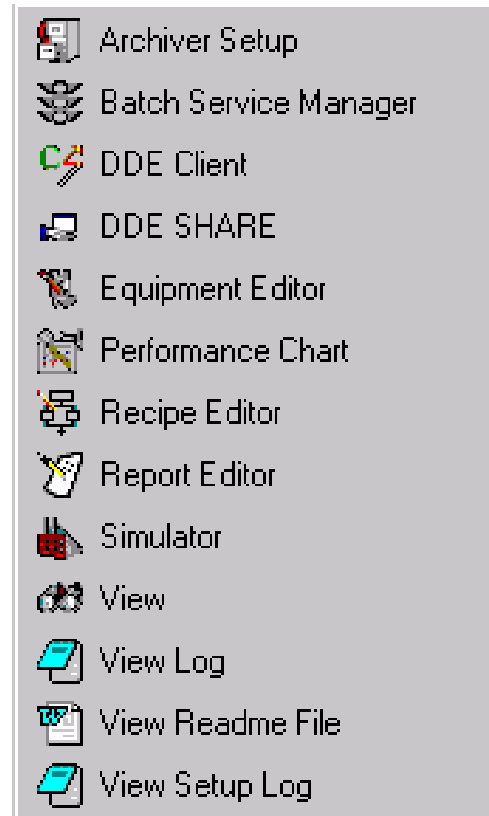
The Archiver saves the batch log into a database batch server

This starts the equipment editor

This starts the recipe editor

This starts the report editor

This starts the standalone OpenBatch viewer

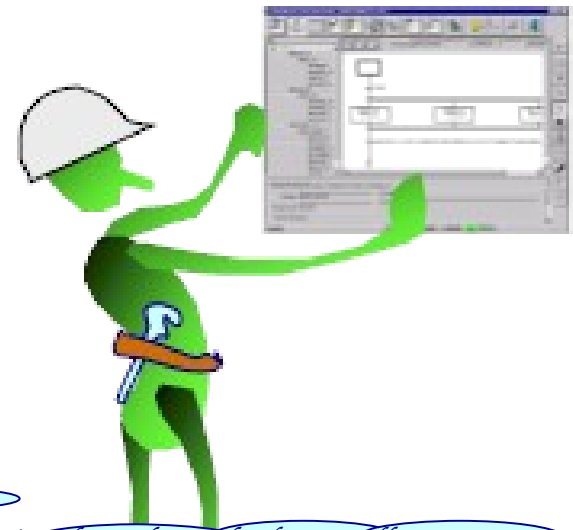


# Operations Summary



- OpenBatch is recipe execution, batch logging, batch reporting, and recipe editing
- Sequentia provides complete solutions for batch automation
  - OpenBatch
    - Recipe execution
  - Production Manager
    - Manual and semi-automated operations
  - Procedure Manager
    - Integration with ERP systems

OpenBatch is the open solution. They work with all major control vendors.



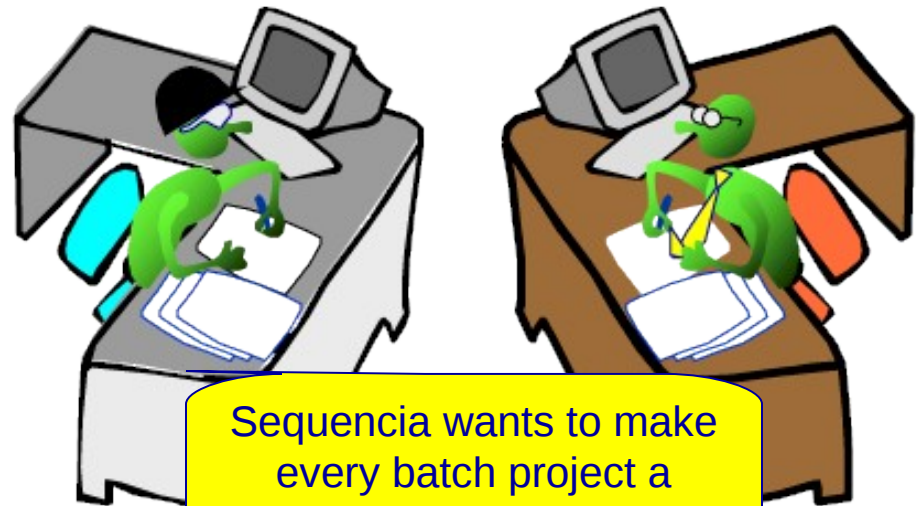
*OpenBatch works with Honeywell, Rockwell, GE, Aspen Technologies, Siemens, Ci Technologies, and many others.*

# Services and Training

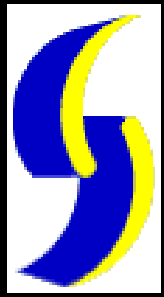


- Least we forget, Sequencia also offers services
  - Help in defining the equipment layout and organization
  - Help in defining the phases
  - Help in initial recipe building
- And Training
  - On site
  - Any Sequencia office

Sequencia has a large staff of batch experts to help.



Sequencia wants to make every batch project a successful project !



**S E Q U E N C I A**

**For more information visit our web site at**

**[www.sequencia.com](http://www.sequencia.com)**

**or contact our sales coordinator at**

**[sales@sequencia.com](mailto:sales@sequencia.com) or call 602-896-3800**