



SmartPlant Instrumentation

Specification Module Challenges at CB&I

- **Management of Change**
- **Implementing a Global Library**

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Specification Module Challenge 1: Management of Change

Objective:

Meet corporate/project requirement to identify any changes to the specification data since the last issued revision of the datasheet.

Review of the Methods of Managing Change in the Specification Module:

1. “Compare to Revision”
2. “Mark Changes”
3. Spec Binder
4. “f_changevalue” Function

Review of the “Compare to Revision” Feature for Management of Change



“Compare to Revision” Feature:

The screenshot shows the 'Actions' menu in a software application. The menu items are:





- Open Specification... (Ctrl+I)
- Save (Ctrl+S)
- Save As...
- Save as Excel
- Import Data...
- Copy from Template
- Copy from Sp...
- Export Data...
- Revisions...
- Expand No...
- Manufact...
- Models... (Alt+D)
- Compare with External...
- Compare with Revision...**
- Change Spec Form... (Ctrl+H)
- Print (Ctrl+P)
- Associate Instrument Specifications Forms...
- Refresh (F5)

The background shows a table with columns for Tag Number, Supply, Scale, Volts, Amps, and Type. The table data is as follows:

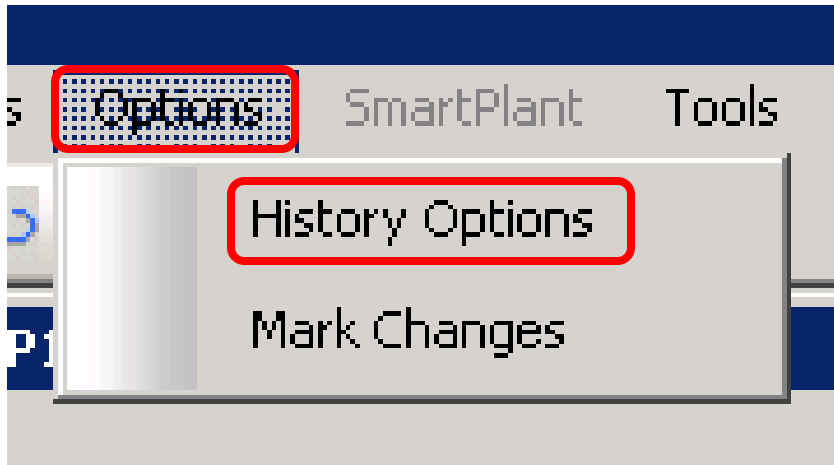
Tag Number	Supply	Scale	Volts	Amps	Type
47					
48			120 Vac		
49					

Other visible elements include the 'GENERAL' and 'PROCESS DATA' sections on the left, and a table with columns for 'Component', 'Min.', 'Norm.', 'Max.', and 'UOM' on the right.

“Compare to Revision” Feature:

Comments:	
Must be executed on a tag-by-tag basis, no bulk execution.	
Creates a comparison report for each tag.	
Changed values are highlighted on the screen.	
Changed values are not highlighted in the printed version.	

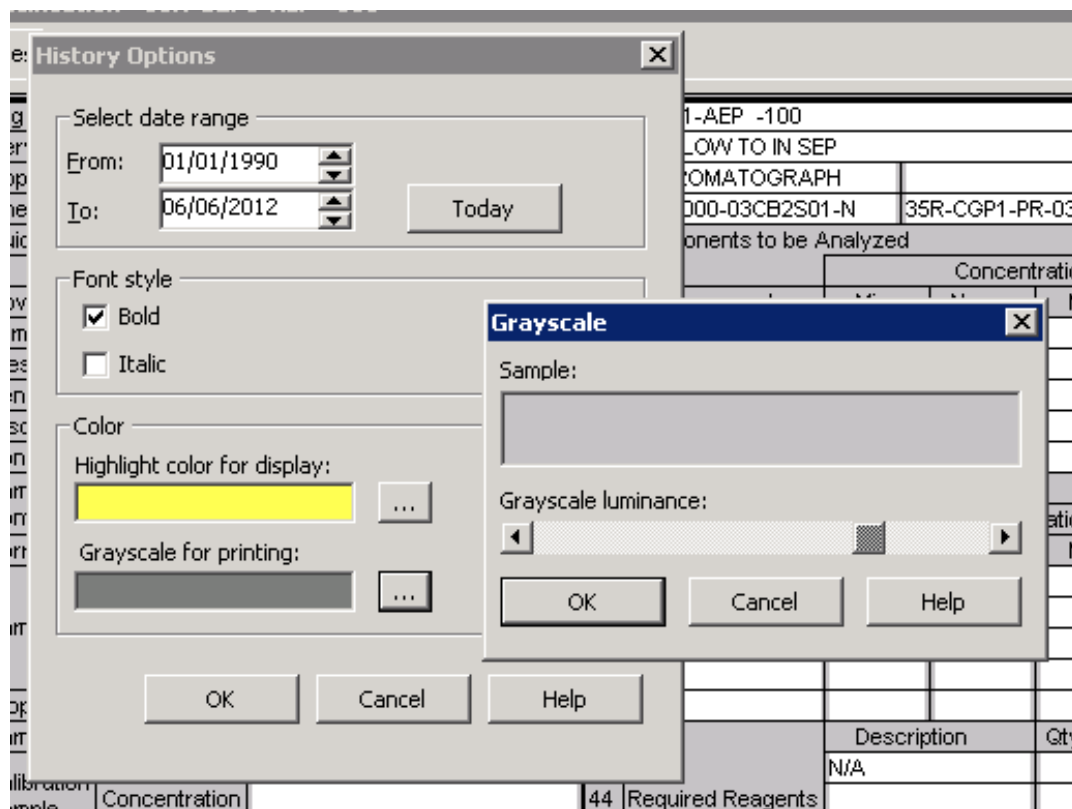
“Mark Changes” Feature:



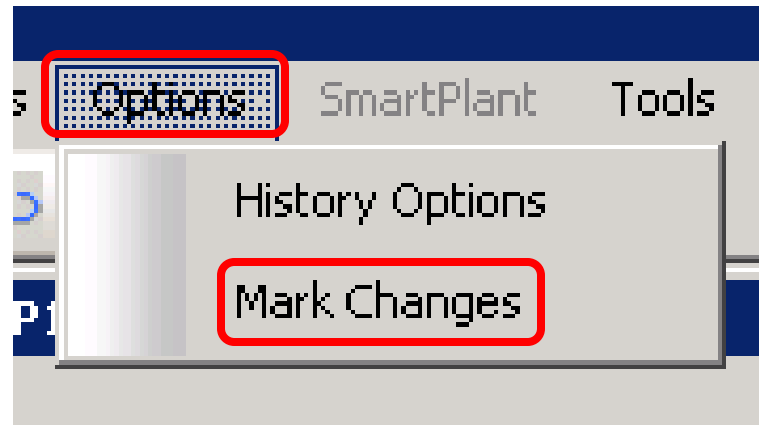
1. Open the datasheet.
2. Select “History Options” from the “Options” drop-down menu.

“Mark Changes” Feature:

3. Define the style to be used to mark changes.



“Mark Changes” Feature:



4. With the datasheet open, select “Mark Changes” from the “Options” drop-down menu.

Use of the “Mark Changes” Feature for Management of Change



GENERAL		1 Tag Number		35R-CGP1-AEP -100			
		2 Service		N GAS FLOW TO IN SEP			
		3 Application		Equipment Number		GAS CHROMATOGRAPH	
		4 Line Number		P&ID Number		20"-PG-1000-03CB2S01-N 35R-CGP1-PR-03-000004	
		5 Fluid	State	Gas		Gas/Vapor	26 Components to be Analyzed
		6	Minimum	Normal	Maximum	UOM	27 Concentration
		7 Flow					28 Component Min. Norm. Max. UOM
		8 Temperature		140	200	°F	29 SEE NOTES
		9 Pressure		347	650	psi-g	30
		10 Density		1.52		lb/ft³	31
		11 Viscosity		0.013		cP	32
		12 Conductivity					33
		13 Sample	Type	34 Other Components			
		14 Contaminant	Particle Size	35 Concentration			
PROCESS DATA		15 Corrosive	Sampling Rate	36 Component Min. Norm. Max. UOM			
		16	Contact Materials	37 SEE NOTES			
		17 Sample	Line Length	225	ft		38
		18	Tap Conn Size	2	in		39
		19	Piping Size	20	in		40
		20 Proprietary Info.	No				41
		21 Sample Verification Mthd					42 Description Qty. Consumption
		22 Calibration	Type	43 N/A			
		23 Sample	Concentration	44 Required Reagents			
		24	Flow Rate	45			
		25					46

EXAMPLE

Use of the “Mark Changes” Feature for Management of Change



Comments:

The “Mark Changes” selection, once set, remains active during the user’s session. Therefore any bulk printing or saving to PDFs will have the changes highlighted.

Note: The “Mark Changes” setting is maintained in the INI file and the users menu option may not reflect the actual setting.



Changes will be identified based on a defined window of time, not since the last revision. Example: Changes from January 1, 2012 through June 7, 2012.





Spec Binder:

Spec Binder Module handles the Management of Change issue very well but is not an acceptable approach to handling datasheets for detailed design since the individual datasheets are deliverables.

The “f_changevalue” Function is described in the “SPI Basic Engineering User’s Guide”.

Specifications

Display Revision Changes for Spec Properties

1. Open a page in the **Page Editor**.
 2. Do one of the following to display the **Edit Fields and Headers** floating toolbar:
 - Click **Actions > Edit Fields and Headers**.
 - On the **Page Editor** toolbar, click .
 3. On the **Edit Fields and Headers** toolbar, click  and then click the page at the position where you want to place the computed field.
 4. On the **Computed Field** dialog box, type a name for the computed field.
 5. In the **Expression** box, type the following expression:
f_changevalue(cmpnt_id,rev_id,dwg_id,"<field name>")
TIP For example, to show changes for the maximum pressure, the expression is written as follows:
f_changevalue(cmpnt_id,rev_id,dwg_id,"pd_press_max")
 6. Click **Verify** to verify that the expression you entered is a valid InfoMaker expression.
 7. Click **OK**.
 8. To show the change in the specification, do the following:
 9. Modify an existing value of a property for which you added a computed field to display changes for the last revision.
 10. Close the specification sheet and re-open it the following day.
 11. Add a revision to the specification sheet and refresh the display.
- TIPS**
- The indication appears only after the day advances on your computer's clock.
 - The indication appears only for existing values that were changed at the last revision. If you enter a new value for a property that previously did not have a value, no change is indicated.

QUESTION:

What is the “f_changevalue” function?

ANSWER:

The f_changevalue function, when included in the spec page PSR file, displays the current revision when the data field it references has been changed since the previous revision.

Use of the “f_changevalue” Function for Management of Change



Step 1: Create a REV column for datasheet.

P&ID:				
Line No.:				
Fluid State:Not Defined				
Crit Temp TC:				
Flow	Norm. Flow	Min. Flow	Shut-Off	Max. Design
			-	-
			-	-
			-	-
			-	-
			-	-
			-	-
			-	-
			-	-
			0	-
	/	/	-	-
			-	-

Create REV column on right side of datasheet.

Use of the “f_changevalue” Function for Management of Change



Step 2: Add a computed field using the f_changevalue.
Cmpnt_id, rev_id, dwg_id are required. Add referenced data field in quotes.

The screenshot shows a software interface with a 'Modify Expression' dialog box. The dialog box has a title bar with a close button (X) and contains the following elements:

- Expression:** A text area containing the expression: `f_changevalue(cmpnt_id,rev_id,dwg_id,"cmpnt_serv")`
- Buttons:** OK, Cancel, Verify, and Help.
- Functions:** A list of mathematical and string functions including `abs(x)`, `acos(x)`, `asc(s)`, `ascA(s)`, `asin(s)`, `atan(s)`, `avg(#x for all)`, and `bitmap(s)`.
- Columns:** A list of column names including `spec_form_id`, `dwg_id`, `area_id`, and `olant_id`.

A blue callout box at the bottom of the image contains the expression: `f_changevalue(cmpnt_id,rev_id,dwg_id,"field")`. A grey arrow points from this callout box to the expression field in the 'Modify Expression' dialog box.

Step 3: The f_changevalue function will only process one data field. When there is more than one field in the row additional computed fields have to be created. Stack these directly on top of each other.

Note: Use “line_id” for the “line_num” data field.

Use of the “f_changevalue” Function for Management of Change



The f_changevalue function successfully populates the changes that are included in the current revision.





Max. Flow	Norm. Flow	Min. Flow	Shut-Off	Max. Design
125.6	104.7	52.33	-	-
1022	1022	1022	1310	1310
375	375.3	375		
647	647	647	-	-
28.6	28.6	28.6	-	-150/150
	20.58		-	-
2.116	2.116	2.116	-	-
			-	-
0.664	0.664	0.664	-	-
82.5	68.7	34.3	-	-
55	45.8	22.9	0	-
85/ 80	85/ 79	85/ 75	-	-
			-	-

55	* Type	Spring-diaphragm
56	* MFR & Model	Masoneilan / 88
57	* Size	16 Eff Area 160 in2
58	On/Off	YES Modulating YES
59	Spring Action	Open/Close Close

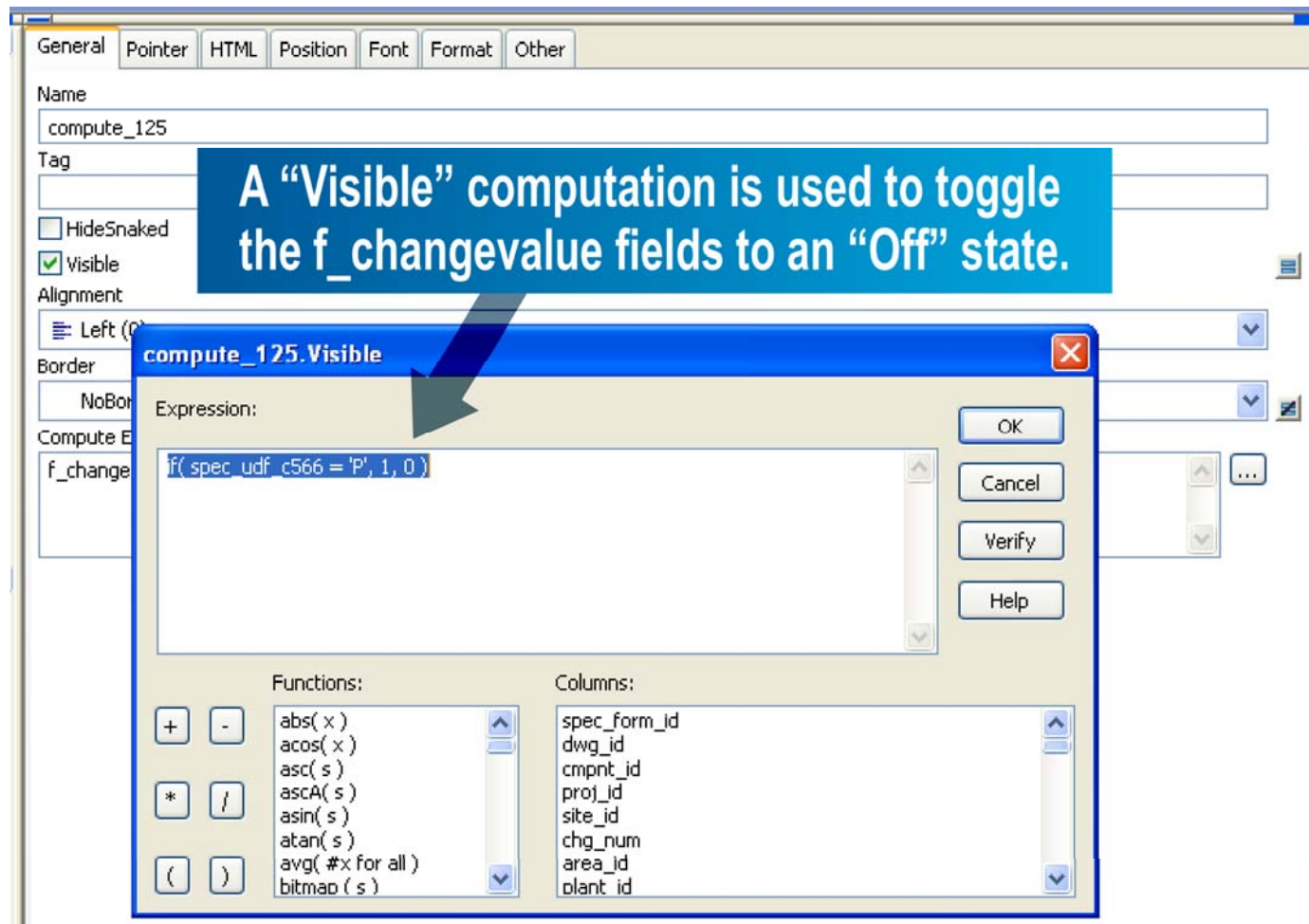
Current revision displayed.

Current revision displayed.

“f_changevalue” Function:

Comments:	
Works with all batch printing or saving datasheets as PDF files.	
Requires significant processing time; depending upon the size of the CHANGE_LOG table.	
Function is always ‘active’ and therefore will require processing time to open the datasheet. Created hidden fields to toggle function fields off.	
The resulting ‘look’ is consistent with industry standards and met project expectations.	

Use of the “f_changevalue” Function for Management of Change



A “Visible” computation is used to toggle the f_changevalue fields to an “Off” state.

compute_125.Visible

Expression: `if(spec_udf_c566 = 'P', 1, 0)`

Buttons: OK, Cancel, Verify, Help

Functions:

- abs(x)
- acos(x)
- asc(s)
- ascA(s)
- asin(s)
- atan(s)
- avg(#x for all)
- bitmap(s)

Columns:

- spec_form_id
- dwg_id
- cmpnt_id
- proj_id
- site_id
- chg_num
- area_id
- plant_id

Common Problem: “False Positives”

Any time data is changed and then reversed the activity will be reported as changed.

Example: User changes value from “0” to “1” and then back to “0”.

Which method best suits the need?

- X** “Compare to Revision”
- ?** “Mark Changes” **Maybe**
- X** Spec Binder
- X** “f_changevalue” Function

Project asked for and obtained an exemption from the requirement.

Will the Specification Module “Bulk Comparison” feature scheduled for the 2014 release of SPI solve our predicament?

We need it to!



**Specification Module
Challenge 2:**

**Implementing a Global
Datasheet Library for
CB&I**

Objective:

Meet corporate requirement to develop and maintain a single, common SPI datasheet (specification) library.

Obstacles – Overcoming the Differences:

1. Differences between CB&I offices in codes normally used (i.e. NEC, IEC).
2. Differences between offices in the spelling of words used in the datasheet header.

Examples: analyzer / analyser, vapor / vapour.

3. Differences between the work processes of each office related to type of projects typically executed by each office. Some specialize in FEED, some in LNG, others Refining, etc.

IMPORTANT: We did NOT want deny projects the ability to modify datasheets to meet project specific needs or client requests.

Examples of Customized Functionality

Projects using NEC
area classification
definitions see
Class, Division,
Group header and
data fields.

58	Service Description	
59	Area Classification	Class 1 / Division 1 / Group A
60		
61	SIL Certified	
62	Criticality Rating	
63		

Projects using IEC
area classification
definitions see
Zone, Gas Group,
Temperature Class.

58	Service Description	
59	Zone/Gas Group/Temp. Class	Zone 0 / IIA / T1
30	IEC Standard Acc. To	IEC 60079-18
31	SIL Certified	
32	Criticality Rating	
33		

Examples of Customized Functionality - Continued

Differences in the spelling of data headers can be addressed. Data fields required for European projects are toggled on.

US Datasheet

14	Viscosity
15	Vapor pressure
16	
17	
18	Calculated Cv

European Datasheet

14	VISCOSITY
15	Vapour pressure
16	Dyn Pump Pressure Loss
17	Dyn Syst Pressure Loss
18	Calculated Cv

Examples of Customized Functionality - Continued

European Datasheet

112	Limit Switch Model Number	
s 113	Req.No./Item No.	
114	Commodity Code	

The US datasheet not only has different headers and data fields on lines 113 and 114, the requisition number data field has additional width in the US version.

US Datasheet

112	Limit Switch Model Number	
113	Requisition No.	
114		

Methods Used to Accomplish Customizations

1. Plant, area, and unit UDFs store values that are used to toggle headers and data fields 'on' or 'off'.
 - a) UNIT_UDF_C01 was used for "IEC" or "NEC" definition.
 - b) UNIT_UDF_C02 was used to define CB&I project host office.
2. User-Defined View was created including the plant, area, and unit UDFs and loaded as a user-defined specification view.

Methods Used to Accomplish Customizations - Continued

3. Infomaker computations are used to control visibility settings for headers and data fields and data field length.

Example Computation Codes

1. *if(unit_udf_c01 = 'IEC', 1, 0)*

Used for header/data field visibility. Entered for “Visible” setting on “General” tab.

2. *if(unit_udf_c02 in ('Houston','Tyler'), 1088, 795)*

Used for data field length. Entered for “Width” setting on “Position” tab.

Questi o no?

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