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## **BWXT Y-12: Creative Solutions for Meeting Calibration & Inspection Challenges**

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EDUCATING

NETWORKING

INFLUENCING

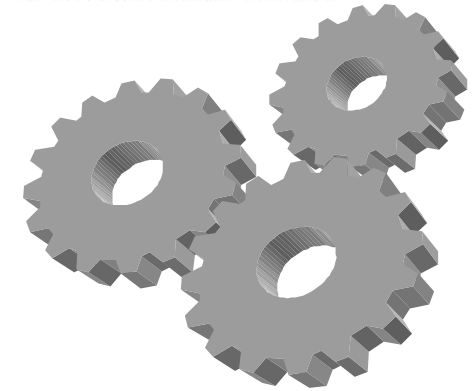
# Learning Points

- Creative ways to use standard functionality to meet key Calibration & Inspection business requirements
- Using Flexible Specifications during Results Recording to handle “Floating Specifications”
- Using the “Services for Object” & “Archive Link” to capture additional calibration specific information including Comments & Data Sheets

# Scope of the Implementation

## What is BWXT Y-12?

- BWXT Y-12 is a limited liability corporation that is a partnership between BWX Technologies and Bechtel solely for the purpose of managing the Y-12 National Security Complex for the National Nuclear Security Administration (formerly Department of Energy)
- We are an integrated management and operating (M&O) contractor for NNSA which means:
  - The federal government owns the whole facility
  - BWXT Y-12 has no capital investment
  - All of our business records belong to the federal government
- We have over 400 buildings including 13 major manufacturing facilities on 811 acres.
- Employment ~4,700
- Annual Budget ~\$700M



# Scope of the Implementation

## Metrology

- Lab Calibrations
  - 3,500 pieces of equipment
  - Physical & Electrical - comprised of 18 disciplines (Torque, Temperature, Pressure, Current/Voltage, Mass, etc)
  - Dimensional –comprised of 2 major disciplines (Gear & Gage)
- Field Calibrations
  - 5,000 pieces of equipment
  - Work requires use of Permits, Work Start Authorization etc.
  - Uses Object Lists & multiple Maintenance Items to group “like” equipment all due on the same frequency at the same time

# Scope of the Implementation

## Inspections

- Maintenance Inspections
  - 16,000 pieces of equipment
  - Most inspections are performed in conjunction with Maintenance activities
  - Uses Functional Location hierarchy to automatically determine what equipment is in a building
- Fire Department Inspections
  - 1,600 Fire Systems
  - Extinguishers, Building, Wet Pipe, Dry Pipe, Deluge, & Hydrants
  - Systems consist of multiple object types (Sprinklers, Drain Valves, etc.)
  - Most systems have multiple schedules (Monthly, Semi-Annual, Annual)

# Scope of the Implementation

## “Typical” Master Data Setup

- Equipment & Functional Location task lists
  - Tolerance limits & crafts require frequent changes
  - All Crafts required to complete a job are in the task list
  - Inspection Points differ by organization
  - Metrology captures Equipment As Left & As Found conditions
  - Fire Department captures Functional Location & Component ID
  - Maintenance Inspection is on Equipment although maintenance plans created at Functional Location level
- Primarily use Single Cycle Plans
  - Use of 100% Shift Factors & Completion Confirmation
  - Use of Scheduling Period

# Creative Solutions – It's a Date

## Influencing The Schedule

- Date is entered by User at time of printing Calibration Sticker
  - Initially stored on QAPP append structure
- Passed to Equipment Classification
  - Date Last Calibrated & Date Due
  - Characteristics set to “Not Ready for Input”
- Invoking User Exit on Scheduling Maintenance Plan
  - SMOD – IPRM0002 (Determine planned date info for maintenance plan)
  - Influenced first “planned” call, SAP calculates the rest
  - Used by Maintenance Inspections to have inspection come due on last day of the month

# Creative Solutions – It’s a Date

## Benefits at a Glance

- Met our Business Requirement
  - System Dates must be in sync with the Calibration Sticker dates at all times
  - Removed the “Human” factor caused by hand written stickers and separate data entry
- Flexibility
  - Allows cycles to be altered without changing master data
    - Ready for Issue Items
    - NIST & Sandia Items
- Unforeseen Bonus
  - Gives users an easy way to find their expiring equipment

# Creative Solutions – It's a Date

**Change Equipment : Classification**

Class overview | Measuring points/counters

Equipment: 10004610 | Category: Test/measurement equipment  
 Description: Torque Wrench | Intern.note  
 Status: INST | CAL  
 Valid From: 01/01/2001 | Valid To: 12/31/9999

General | Organization | Structure | Classification | PRT data | Warranty

**Classification**

- Priority Matrix
- Fire Barrier
- Calibrated Device Level: Instrument Device
- Calibration Location: Shop
- Next Calibration Due Date: 05/02/2005
- Last Calibration Date: 05/03/2004
- Recorded Inspector
- CR 1 – Instrument Range: CW FULL RANGE
- CR 1 – Calibration Range: CW FULL RANGE
- CR 1 – Action Adjustment: + OR - 5% OF READING
- CR 1 – Calibration Tolerance: +/- 5% OF READING
- CR 1 – Check Points: 0%
- 20%
- 40%
- 60%
- 80%
- 100%
- CR 1 – Unit of Measurement: FTL

**Schedule Maintenance Plan: Single cycle plan 00000002195**

Start | Start in cycle | Restart | Manual call | Schedule overview list

Maintenance plan: 2195 | 10004610 Annual

Scheduled calls | Manual calls | Maintenance plan scheduling parameters | Maintenance plan additional data

C...	PlanDate	Call date	Comple...	Scheduling Type / Status	Act...	Unit
1	05/02/2005			New start Called		
2	05/01/2006	03/04/2006		Scheduled Hold		

# Creative Solutions – Following Up

## Statusing Equipment

- Equipment User Statuses
  - Numbered status reflects the calibration disposition
  - Non-Numbered status used to track calibration process
- Inspection Point Usage Decisions (UD)
  - Codes configured to match User Statuses
  - Different codes & statuses used per organization
- Follow Up Action
  - Called at time of Inspection Lot UD
  - Allows for Multiple pieces of equipment & As Found/As Left data
  - Utilized Function Module STATUS\_CHANGE\_EXTERN to perform Equipment update

# Creative Solutions – Following Up

The screenshot displays two SAP windows. The left window, titled 'Equipment', shows details for equipment 10005952, categorized as 'Test/measurement equipment' with a description of 'PSI Gauge 0 - 30'. The 'Status' tab is active, showing 'Business processes' and 'System status'. Under 'System status', 'INST Installed' is checked. The 'Status with status no.' section lists several options, with '10 CAL Calibrated' selected. The 'Status w/o status no.' section includes 'APCK Awaiting Pickup' (checked), 'BCAL Being Calibrated', 'DBMC Deferred By ORMC', 'DBUO Deferred By Using Organizat...', 'DEF Awaiting PRDR/NCR Decisi...', and 'ORMC At ORMC' (checked). At the bottom, 'ChangeDocuments' is checked and the 'Status profile' is set to 'PM\_EQCAL Calibrated Equip User S...'. The right window, titled 'Usage Decision for Partial Lot', shows a tree view under 'Decision Usage decisions'. The 'INSP-PT Inspection Point Usage Decisions' folder is expanded, listing several decision types: 'ASIS In Tolerance Not Adjusted', 'CAL Calibration Needed', 'CLBD In Tolerance Adjusted', 'DEVA Deviated Accepted', 'LCAL Limited Calibration', 'RFI Ready For Issue', 'RJCT Rejected', and 'VERI Verification/One Time Cal'. A 'Choose' button with a green checkmark is visible at the bottom of this window.

# Creative Solutions – Following Up

## TECOing the Order

- Control Key Check
  - Due to integrated tasks, last operation must be QM01
- Prompt for Completion Date
  - Standard Pop-Up for Actual Completion date
  - TECO sets the Completion date and updates Maintenance Call
  - Update AFKO Append field for Calibration Completion (used in turnaround time calculations)
- Follow Up Action
  - Called at time of Inspection Lot UD
  - Both actions were modeled after QM\_PM “standard” follow up action

# Creative Solutions – Traceability

## Capturing Standards Used

- Equipment Classification
  - Characteristic used to define the Device Level
  - Types of Standards – Primary, Secondary, Working
- Shortfall of using Production Resource Tools (PRTs)
  - QGD2 – No incorporation of legacy data without historical orders
  - Planned versus Actual cumbersome
- Recording a Standard Used
  - Function performed in Results Recording via SMOD QEEM0024
  - Custom Z Table created to store standards
  - Allows for multiple standards to be recorded

# Creative Solutions – Traceability

## Capturing Standards Used

- Benefits
  - Solution allows seamless way to record standards (eliminated a separate transaction)
  - Additional checks performed
    - Standard is valid to be used on that day (statically recorded)
    - Device level is appropriate to be used
    - Verification of the 4:1 rule
- Forward/Reverse Traceability
  - Custom ALV report created
  - Allow users to identify all instruments calibrated by the standard (Forward)
  - Allows users to identify which standards were used to calibrate a device (Reverse)

# Creative Solutions – Traceability

## Capturing Standards Used

The screenshot shows the SAP 'Record Results: Record Lab Standards' interface. The 'Equipment' field is set to '000000000010019066'. Below this is a table titled 'Capture Lab Standards Used' with the following data:

Status	Standard Used	Description	Next Due Dt	StsCd
●●●	10001187	100g Set	03/02/2006	
●●●	10001438	Barometer	05/10/2005	
●●●	10002216	Humidity Sensor	03/23/2005	
●●●	10002383	Mass Lab	11/08/2005	
●●●	10005129	100g set	10/13/2005	
●●●	10005443	Mass Comparator 6 gram	11/29/2005	

At the bottom of the interface, the status codes are defined as:

- (L) Invalid Calibration Level for Standard Used
- (D) Invalid Next Due Date for Standard Used



# Creative Solutions – Piggy Backing

## Fire Department Inspections

- Procedural Requirements
  - Fire Systems inspected for overall effectiveness
  - Systems are made up of multiple components
  - Inspections are performed on the individual components
  - Most systems encompass over 100+ components
- Structure of Master Data
  - Functional Locations setup for the individual fire systems
  - Installed components differentiated by Object Type
  - Task List operations & characteristics created per Component Type inspected (defined on operation enhancement)
  - 1:1 Correlation with Equipment Object Type

# Creative Solutions – Piggy Backing

## Fire Department Inspections

- Generation of the Inspection Lot
  - Workflow kicked off on Work Order Save (after Release only)
  - Finds all equipment installed in the functional location
  - Creates an Inspection Point per equipment in the correct operation for that component type
- Benefits
  - Allows for individual equipment inspection and valuation AND allows for a UD to be made on the system as a whole
  - Leverages work performed by the Technical Object team by dynamically determining what needs to be inspected by the functional location hierarchy (simplifies QM data maintenance, no object list, etc.)
  - Program defaults results to Satisfactory to speed up data entry

# Creative Solutions – Piggy Backing

## Fire Department Inspections

Inspector 00693859 Insp. start time 00/00/0000 00:00:00

- 50001327 - Y53-54-FDO-376 - Annual WPS Non-OSR
  - 0020 ATV work center CC Shift Fire Protection Inspections
    - Functional Location Y-F-920401-FPS-WPS-003 /Component ATV001
      - 0010 Closed
      - Functional Location Y-F-920401-FPS-WPS-003 /Component ATV002
      - Further inspection
    - 0030 CRM work center CC Shift Fire Protection Inspections
      - Functional Location Y-F-920401-FPS-WPS-003 /Component CRM001
        - 0010 Interlocked tested (Sat / Unsat)
        - Further inspection
      - 0040 FDC work center CC Shift Fire Protection Inspections
        - Functional Location Y-F-920401-FPS-WPS-003 /Component FDC001
          - 0010 Gaskets are in place and in good condition
          - 0020 Check Valve is not leaking
          - 0030 Automatic drain valve is in place and open
          - 0040 Visible and Accessible
          - 0050 Plugs or caps in place & undamaged
          - 0060 Couplings or swivels are free of damage
          - 0070 Proper identification
          - Further inspection
        - 0050 ITV work center CC Shift Fire Protection Inspections
          - Functional Location Y-F-920401-FPS-WPS-003 /Component ITV001
            - 0010 Record time for alarm event to be received
          - Functional Location Y-F-920401-FPS-WPS-003 /Component ITV002
          - Further inspection
        - 0060 LTS work center CC Shift Fire Protection Inspections
          - Functional Location Y-F-920401-FPS-WPS-003 /Component LTS001
            - 0010 Temperature switch activates and is reset
          - Functional Location Y-F-920401-FPS-WPS-003 /Component LTS002
          - Functional Location Y-F-920401-FPS-WPS-003 /Component LTS003
          - Functional Location Y-F-920401-FPS-WPS-003 /Component LTS004
          - Functional Location Y-F-920401-FPS-WPS-003 /Component LTS005
          - Further inspection



# Floating Specifications

## Flexible Specifications in Results Recording

- Floating Specifications - Definition
  - Calibration of a Thermometer or Thermocouple where a Bath is used
  - Targets are not achievable and will never be hit exactly (Vacuum Calibrations)
  - Tolerance limits not known until time of calibration ( $\pm$  % of Reading)
- Solution Possibilities
  - Multiple characteristics setup to capture the reading of the standard, the unit under test, and a calculated characteristic to verify the difference between the 2 against the tolerance limits
  - 4.7 BADI – QPAP\_FLEX\_PLAN

# Floating Specifications

## Flexible Specifications in Results Recording

- Implementing the BADI during Results Recording
  - When all else fails, read the directions
  - SMODs needed
    - QEEM0024 – Additional Functions for user key +US4
    - QEEM0028 – Program the name of the pushbutton
  - The function module QST05\_FLEX\_PLAN\_RES\_REC is called in EXIT\_SAPLQEEM\_024
- Something for Nothing
  - Common dialog screen is provided “Flexible Selection and Changing of Specifications”

# Floating Specifications

## Flexible Specifications in Results Recording

- Lessons Learned
  - Using this BADI at time of Results Recording offers Flexibility
  - Specifications are stored and changed in QAMV – Operation Level
  - Once Results are recorded for a characteristic, this BADI can no longer be called for that characteristic
    - Use an Attribute to invalidate result(s) and then call
  - Using the standalone screen to change targets, and upper & lower tolerance limits takes time
  - Excel can be used to streamline with copy & paste or custom function to pull in specifications from Excel

# Floating Specifications

## Flexible Specifications in Results Recording

Flexible Selection and Changing of Specifications

InspCharact.

Ch...	SText insp.char	T...	Q...	R...	Lower spec. lmt	1st lower limit	Target value	1st upper limit	Upper Limit	D...	Unit o...	CodeGr...	Pla
80	Temperature @ 32 °F		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	30.000	31.500	32.000	33.500	34.000	3	°F		
90	Temperature @ 200 °F		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	195.00	198.00	200.00	202.00	205.00	2	°F		
110	Temperature @ 400 °F		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	395.00	398.00	400.00	402.00	405.00	2	°F		
130	Temperature @ 600 °F		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	595.00	598.00	600.00	602.00	605.00	2	°F		
150	Temperature @ 800 °F		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	795.00	798.00	800.00	802.00	805.00	2	°F		
170	Temperature @ 1000 °F		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	995.00	998.00	1000.00	1002.00	1005.00	2	°F		
190	Temperature @ 1200 °F		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1195.00	1198.00	1200.00	1202.00	1205.00	2	°F		
210	Temperature @ 1382 °F		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1377.00	1380.00	1382.00	1384.00	1387.00	2	°F		

Copy All

# Services for Objects

## Capturing Additional Information





- What is it?
  - Generic Object Services (Menu path or Button)
  - Allows users to enter Notes and/or attachments against an object
  - Objects are Master Data and Transactional Data
  - Can be used with Archive Link
  - Can be used with Workflow
- What we Capture
  - Notes – Additional Metrologists, Environmental Conditions, Deviated Accepted comments, anything else that the Metrologist needs to add to the report
  - Attachments – Data Sheets (Excel & Word) & Scanned in hard copies, can be selected and appended to the calibration report

# Services for Objects

## Capturing Additional Information

Service: Attachment list

AttachmentFor140000001370

	Title	Creator Name	Created On
	M281922-2-25-05	Tarver,R.W. 0003...	02/25/2005
	ATTACHMENT	Tarver,R.W. 0003...	

✓ ✗

# Key Learning Points

- The maintenance “planned” date can be influenced depending on your requirements
- Storing calibration specific information on the equipment master allows users to easily query the system
- Inspection points & the master data structure allow creative ways to simplify data setup and maintenance
- Using the screen exit on Results Recording allows multiple functions to be carried out during results recording
- Flexible Specifications during results recording is easy to implement and an effective tool if tolerances can not be planned

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