Perform Work Order Scheduling Process Improvements

Work System Owner
Ed Curry

Work System Enabling Leader
Dane Theodore, Director

Priority Processes Owner
Walt Petters, Director

August 26, 2009

Revision 1
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<tr>
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<th>REVISION DATE</th>
<th>REVISION DESCRIPTION</th>
</tr>
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<tr>
<td>18</td>
<td>8/26/09</td>
<td>EZ DMAIC 20 Checkpoint Review</td>
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School Board
Superintendent
Area Superintendents
District Administration
School Administration
School Support Staff
Teachers

PO&M EXTERNAL CUSTOMERS
State of Florida
Florida Department of Education
Local Governments
Parents / Guardians
Students

Key Work Process(3.1):
PERFORM WORK ORDER SCHEDULING
Process Owner: W.Petters
PROVIDE WELL MAINTAINED, SAFE AND COMFORTABLE FACILITIES TO SUPPORT THE BPS EDUCATIONAL PROCESS.

Note: This chart represents a typical daily operation process. The school principal operates the facility in conjunction with PO&M.

DELIVERABLES:
D1 - MONTHLY WORK ORDER REPORT
D2 - ANNUAL FACILITY CONDITION ASSESSMENT REPORT

PREVENTATIVE MAINTENANCE (PM) WORK NEEDED?

IS THE FACILITY OPERATING AS-planned?

CAN PROBLEM BE FIXED BY FACILITY'S CUSTODIAL STAFF?

MANAGE FACILITIES OPERATIONS AND MAINTENANCE

Q1 - Operations Cost Per GSF
Q2 - Maintenance Cost Per GSF
Q3 - Total (Operations + Maintenance) Cost Per GSF
Q4 - PM and W/O Activity Per Year
Q5 - W/O Backlog Per Year
Q6 - PM / Service W/O Ratio
Q7 - PO&M / Facility-Generated W/O Ratio
Q8 - PM Work Order Backlog Per Year

FACILITIES OPERATIONS AND MAINTENANCE

MANAGE FACILITIES OPERATIONS AND MAINTENANCE

Q1 - Operations Cost Per GSF
Q2 - Maintenance Cost Per GSF
Q3 - Total (Operations + Maintenance) Cost Per GSF
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Q8 - PM Work Order Backlog Per Year

FACILITIES SERVICES / Robert J. Wiebel & Walt Petters 12/12/08
NEED FACILITY MAINTENANCE

"TO EFFECTIVELY AND EFFICIENTLY MAINTAIN DISTRICT FACILITIES"

DOES THE MAINTENANCE REQUIRE A ROUTINE WORK ORDER?

YES

CALL DISPATCHER

SUBMIT A ROUTINE W/O REQUEST

P1 - PHONE CALLS PER MONTH

P2 - ROUTINE WORK REQUEST PER MONTH

P3 - WORK ORDERS OPENED PER MONTH

PERFORM WORK ORDER SCHEDULING

PERFORM WORK ORDER MAINTENANCE

P4 - WORK ORDERS CLOSED PER MONTH

UPDATE DATA BASE

Q4 - WORK ORDERS PER YEAR

Q5 - WORK ORDER BACKLOG PER YEAR

Q6 - PM / SERVICE WORK ORDER RATIO

Q7 - PO&M / FACILITY - GENERATED W/O RATIO

Q8 - PM WORK ORDER BACKLOG PER MONTH
### Key Work Process (3.1): PERFORM WORK ORDER SCHEDULING

**Process Owner:** W. Petters

#### WHO

<table>
<thead>
<tr>
<th>STEP</th>
<th>SCHOOL SITE OR ANCILLARY FACILITY</th>
<th>PO&amp;M DISPATCHER</th>
<th>SUPERINTENDENT</th>
<th>LEAD TECH</th>
<th>TECHNICIAN</th>
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<tbody>
<tr>
<td>NEED</td>
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<td>RECEIVE</td>
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<td>EVALUATE</td>
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<td>QUESTION</td>
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<td>CLOSE</td>
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<tr>
<td>APPROVE</td>
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<td>SCHEDULE</td>
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<tr>
<td>MANAGED</td>
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</tr>
</tbody>
</table>

**NOTE:** UPDATE TMA DATA BASE SCHEDULE SCREEN

**NOTE:** APPROVAL OF W/O REQUEST AUTOMATICALLY GENERATED W/O IN TMA DATA BASE.

**NOTE:** EVALUATION DONE IN TMA DATA BASE.

**NOTE:** W/O AUTOMATICALLY GENERATED BY TMA WHEN W/O REQUEST IS APPROVED.

**NOTE:** DETERMINE WHO, WHEN AND WHERE THE MAINTENANCE WORK WILL BE PERFORMED.

**NOTE:** UPDATE TMA DATA BASE SCHEDULE SCREEN

**P3.1.1** - School-Generated W/O Opened Per Month

**P4.1.1** - Service W/O Opened Per Month

**P5.1.1** - PO&M-Generated W/O Opened Per Month

**Question:**

- **W/O REQUEST VALID?**
  - **YES**: APPROVE W/O REQUEST
  - **NO**: EVALUATE W/O REQUEST

- **CLOSE W/O REQUEST**

- **Schedule Work Order**

**Q4** - WORK ORDERS PER YEAR

**Q5** - WORK ORDER BACKLOG PER YEAR

**Q6** - PM / SERVICE WORK ORDER RATIO

**Q7** - PO&M / FACILITY - GENERATED W/O RATIO

**Q8** - PM WORK ORDER BACKLOG PER MONTH
INSTRUCTIONS: Please return your completed DMAIC Storyboard, along with your Process Control System (both flow chart and indicator information) and your completed Action Plan (see “Improve” checkpoint #10), via email to rseemer@etsfl.com and copy Steve Muzzy on all emails. Thank you, Bob Seemer, President & COO, Electronic Training Solutions, Inc.

Priority Process Name: PLANT OPERATION & MAINTENANCE
Work System / Leader: WALT PETTERS
Key Work Process: KWP3.1 Perform Work Order Scheduling

KWP3.1 DMAIC “Lite” Storyboard

DEFINE

1. Describe how the linkage between the process Q measures and the District’s KPIs (or strategic objective measures) was established and confirmed.

In order to meet 2008/2009 Strategic Plan 4.1.1 (KPI) to be ranked first in Florida in the percentage of classroom and school spending and last in district administration and 4.1.5 Improve and maintain control of fixed assets at all worksites by 2010 – 2011 school year, Plant Operations and Maintenance (PO&M) has deployed a computerized maintenance management system. This system monitors and collects district-wide plant operating data and creates reports. In light of need to improve PO&M efficiencies and reduce operating costs, seven (7) Q measures have been developed to collect data that can be monitored and evaluated on a pre-determined basis.

Q1. Operational Cost Per GSF (Annual)
Q2. Maintenance Cost Per GSF (Annual)
Q3. Total O&M Cost Per GSF (Annual)
Q4. PM and W.O Activity Per Year
Q5. Work Order Backlog Per Year
Q6. PM / Service W/O Ratio
Q7. PO&M / Facility – Generated W/O Ratio

2. Explain which process Q measure(s) will be improved.

In order to identify the Q measure(s) that should be focused on for improvement efforts, a Facilities PO&M Priority Process Selection Matrix and a Key In-Process Measures Determination Form were created (see Pages 7 and 8). It was determined that Key Work Process (KWP) 3.1 “Perform Work Order Scheduling” was in need of improvement. After a preliminary process analysis of the number of approved work order requests, TBD % are not being scheduled in the maintenance TMA data base. By improving work order scheduling, Q measure, Q4, Q5, Q7, and Q8 would be improved thus resulting in an overall improvement of OP&M service.

3. Develop a theme statement which will focus your process improvement efforts. The theme statement must be consistent with the measure in checkpoint #2, above.

The maintenance work order scheduling process is not formal process. Approximately 5% of completed work orders are being scheduled using the TMA Systems data base. Ninety-five (95) percent of the work orders are being manually scheduled.
4. List up to five (5) potential problem areas in this process and the associated P measure(s) for each.
   A. Supervisors not using TMA Systems Database to schedule work orders.
   B. Scheduling Culture.
   C. TMA Systems Database is not user friendly.
   D. TMA Systems Database has poor scheduling functionality.
   E. PO&M TMA Database Administrator not supporting users.
   F. Work request maintenance is not clearly defined or explained.
   G. Maintenance parts availability.

5. Select the most significant problem or opportunity and develop a problem statement which answers the questions:
   What?
   When?
   Gap between actual and targeted values?

   **Problem:** The Maintenance Department has not institutionalized the use of the TMA CMMS application to schedule the completion work orders.

   **Problem Statement:** The TMA Computerized Maintenance Management Systems application software package was purchased approximately 10 years ago. After a series of senior management changes, the software was not being use to its full capacity. During a December 2008 maintenance process improvement workshop, it was noted that 5% of work orders type 2 – 10 were being scheduled for completion using the TMA CMMS. The other 95% were not. Type 1 (Service) work orders are not scheduled because the work is typically completed the same day as the work request was submitted.

   **Gap:** Ninety-five (95) percent, of Type 2 – Type 10 work orders are scheduled using a manual process.
DMAIC “Lite” Storyboard

**ANALYZE**

6. List up to five (5) potential causes of the selected problem from checkpoint #5 in the “Measure” step.
   A. Supervisors not trained.
   B. Supervisors do not see value in scheduling using TMA CMMS.
   C. Supervisors are resistant to change.
   D. Maintenance does not have a documented TMA CMMS user guide / procedure.
   E. The use of TMA requires a basic level of computer literacy.

7. List the root causes and describe the approach used to select them from among the others.

<table>
<thead>
<tr>
<th>Root Causes</th>
<th>Approach Used To Select Root Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Supervisors not trained.</td>
<td>Team Consensus / Work Order Tracking &amp; Reporting System</td>
</tr>
<tr>
<td>B. Supervisors do not see value in</td>
<td>Team Consensus / Work Order Tracking &amp; Reporting System</td>
</tr>
<tr>
<td>scheduling using TMA CMMS.</td>
<td>Team Consensus / Work Order Tracking &amp; Reporting System</td>
</tr>
<tr>
<td>C. Supervisors are resistant to change.</td>
<td>Team Consensus / Work Order Tracking &amp; Reporting System</td>
</tr>
<tr>
<td>D. Maintenance does not have a</td>
<td>Team Consensus / Work Order Tracking &amp; Reporting System</td>
</tr>
<tr>
<td>documented TMA CMMS user guide /</td>
<td></td>
</tr>
<tr>
<td>procedure.</td>
<td></td>
</tr>
<tr>
<td>E. The use of TMA requires a basic level</td>
<td>Team Consensus / Work Order Tracking &amp; Reporting System</td>
</tr>
<tr>
<td>of computer literacy.</td>
<td></td>
</tr>
</tbody>
</table>
8. List the countermeasure(s) you considered for implementation for each selected root cause from the “Analyze” steps “A” – “D”.
   
   A. Develop and implement an in-house TMA CMMS training program.
   B. Add TMA CMMS topics to the weekly / monthly Supervisors meetings with Director.
   C. Develop in-house TMA CMMS users guide / procedure.
   D. Develop a TMA CMMS user interface team. Team to communicate with TMA Systems on a regular basis to share successes and failures of TMA CMMS deployment.

9. Determine the “effectiveness x feasibility” score for each countermeasure, and note the highest scores. See attached countermeasure matrix.

<table>
<thead>
<tr>
<th>Root Cause</th>
<th>Effectiveness</th>
<th>Feasibility</th>
<th>Overall</th>
<th>Action</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>5</td>
<td>25</td>
<td>Yes</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>5</td>
<td>25</td>
<td>Yes</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>5</td>
<td>25</td>
<td>Yes</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
<td>5</td>
<td>25</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(Hint: Refer to six sigma DMAIC course, checkpoint #18 of the “Improve” step.)

10. Develop an action plan for each countermeasure to be implemented which shows the following:

   What (description of countermeasure)
   When (projected start and end dates)
   Who (accountable person)
   Which organizations need to support you
   Estimated cost to implement

See attached countermeasure action plan matrix and action plans.

(Remember: Email your action plan(s) with this completed DMAIC “Lite” Storyboard, per instructions on page 1.)
11. Briefly explain how you know the root causes were reduced or eliminated.
   ▪ After a short learning curve, the number of unscheduled work orders contained in the TMA CMMS data base starts a downward trend.

12. Briefly explain how you know the problem was reduced.
   ▪ The number of unscheduled work orders contained in the TMA CMMS data base starts a downward trend as the Supervisors TMA CMMS scheduling learning starts to increase.

13. Briefly explain how you know the theme measure was improved.
   ▪ The number of unscheduled work orders in TMA CMMS is increasing.

14. Explain how you will prevent this problem from recurring.
   ▪ Add a review of unscheduled work orders to the weekly / monthly Supervisor’s meeting.

15. Identify which other BPS locations should consider implementing your countermeasures.
   ▪ None

16. Identify what other BPS locations could learn from this project.
   ▪ None

17. List the remaining problem areas in this process.
   ▪ Develop an advanced TMA CMMS training program and train all Supervisors.

18. List the key lessons learned from this process improvement.
   ▪ Using a structured approach to problem solving helps to increase work productivity and efficiency.
<table>
<thead>
<tr>
<th>Key Work Processes</th>
<th>Selection Factor</th>
<th>Priority Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Importance x Gap</td>
<td>Point Score</td>
</tr>
<tr>
<td>Monitor Facility Operational Systems</td>
<td>5 3</td>
<td>15</td>
</tr>
<tr>
<td>Perform Preventative Maintenance</td>
<td>5 4</td>
<td>20</td>
</tr>
<tr>
<td>Process Work Orders</td>
<td>5 5</td>
<td>25</td>
</tr>
</tbody>
</table>

**SCALE:** 5 = Extreme 4 = High 3 = Moderate 2 = Low 1 = None
# Key In-Process Measures Determination Form

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>In-Process Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. Operational Cost Per GSF (Annual)</td>
<td>1. Operational Cost Per Month (P9)</td>
</tr>
<tr>
<td>Q2. Maintenance Cost Per GSF (Annual)</td>
<td>1. Maintenance Cost Per Month (P10)</td>
</tr>
</tbody>
</table>
| Q3. Total O&M Cost Per GSF (Annual) | 1. Operational Cost Per Month (P9) 
2. Maintenance Cost Per Month (P10) |
| Q4. PM and W/O Activity Per Year | 1. PM Work Performed Per Month (P2) 
2. School Generated W/O Per Month (P3) 
3. Misc Facility Generated W/O Per Month (P4) 
4. PO&M Generated W/O Per Month (P5) |
| Q5. Work Order Backlog Per Year | 1. School Generated W/O Per Month (P3) 
2. Misc Facility Generated W/O Per Month (P4) 
3. PO&M Generated W/O Per Month (P5) |
| Q6. PM / Service W/O Ration | 1. PM Work Performed Per Month (P2) 
2. School Generated W/O Per Month (P3) 
3. Misc Facility Generated W/O Per Month (P4) 
4. PO&M Generated W/O Per Month (P5) |
| Q7. PO&M / Facility Generated W/O Ration | 1. Misc Facility Generated W/O Per Month (P4) 
2. PO&M Generated W/O Per Month (P5) |
# BPS Process Management System

## Work System: Plant Operations and Maintenance

### Leader: Walt Petters

<table>
<thead>
<tr>
<th>Priority Processes</th>
<th>Owner</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Name</td>
<td>Email</td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Email</td>
</tr>
<tr>
<td>1. Monitor Operational Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Perform Preventative Maintenance (PM) Work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Process Work Orders</td>
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</tbody>
</table>

1. | | |
2. | | |
3. | | |
4. | | |

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## Macro Process Control System

### Process Name: Facilities Operations and Maintenance

**Process Owner:** Walt Petters

**Process Customer:** The School Board of Brevard County, representing staff, students, parents and the community

**Critical Customer Requirements:**

**Current Sigma Level:** TBD

**Outcome Indicators:** Q1 – Q7

<table>
<thead>
<tr>
<th>Process Indicators</th>
<th>Control Limits</th>
<th>Checking / Indicator Monitoring</th>
<th>Contingency Plans / Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 Operational Systems Monitoring</td>
<td>Target: 99% Uptime Baseline: 100%</td>
<td>Energy Management Systems Daily EMS Personnel</td>
<td>Transfer more FTE to this task.</td>
</tr>
<tr>
<td>P2 Preventative Maintenance (PM) Work Orders per Month</td>
<td>Target: Reduce Backlog by 20% Baseline: 128</td>
<td>Monthly Activity Report Monthly</td>
<td>Transfer more FTE to this task.</td>
</tr>
<tr>
<td>P3 School-Generated Work Orders per Month</td>
<td>Target: Reduce # by 30D by 10% Baseline: 875</td>
<td>Monthly Activity Report Monthly</td>
<td>Transfer more FTE to this task.</td>
</tr>
<tr>
<td>P4 Service W/O Per Month</td>
<td>Target: Reduce # by 10% Baseline: 398</td>
<td>Monthly Activity Report Monthly</td>
<td>Transfer more FTE to this task.</td>
</tr>
<tr>
<td>P5 PO&amp;M-Generated Work Orders per Month</td>
<td>Target: Increase # by 20% Baseline: 453</td>
<td>Monthly Activity Report Monthly</td>
<td>Transfer more FTE to this task.</td>
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<tr>
<td>P6 # of Work Orders Opened / Closed per Month</td>
<td>Target: Reduce Cycle Time by 10% Baseline: 23D</td>
<td>Monthly Activity Report Monthly</td>
<td>Transfer more FTE to this task.</td>
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<tr>
<td>P7 # Backlogged Work Orders per Month</td>
<td>Target: Reduce Backlog by 10% Baseline: 6500</td>
<td>Monthly Activity Report Monthly</td>
<td>Transfer more FTE to this task.</td>
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<tr>
<td>P8 Aging W/O Per Month</td>
<td>Target: Reduce Backlog &gt; 30D by 20% Baseline: CY 2007 = 3354 W/O</td>
<td>Monthly Activity Report Monthly</td>
<td>Transfer more FTE to this task.</td>
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<tr>
<td>P9 Plant Operations Cost Per Month</td>
<td>Target: Below state average and 25th percentile of peer districts Baseline: $159,441</td>
<td>Statewide Ops. &amp; Maint. Cost Data from FDOE; Budget Data from Peer Districts Monthly</td>
<td>Analyze the distribution of the operations budget across all cost centers and look for opportunities for process improvements.</td>
</tr>
<tr>
<td>P10 Maintenance Cost Per Month</td>
<td>Target: Below state average and 25th percentile of peer districts Baseline: $419,176</td>
<td>Statewide Ops. &amp; Maint. Cost Data from FDOE; Budget Data from Peer Districts Monthly</td>
<td>Analyze the distribution of the maintenance budget across all cost centers and look for opportunities for process improvements.</td>
</tr>
<tr>
<td>Q1 Plant Operational Cost Per GSF (Annual)</td>
<td>Target: Below state average and 25th percentile of peer districts Baseline: $0.16</td>
<td>Statewide Ops. &amp; Maint. Cost Data from FDOE; Budget Data from Peer Districts Yearly</td>
<td>Analyze the distribution of the operations budget per GSF for all schools and look for opportunities for process improvements.</td>
</tr>
<tr>
<td>Q2 Maintenance Cost Per GSF (Annual)</td>
<td>Target: Below state average and 25th percentile of peer districts Baseline: $0.43</td>
<td>Statewide Ops. &amp; Maint. Cost Data from FDOE; Budget Data from Peer Districts Yearly</td>
<td>Analyze the distribution of the maintenance budget per GSF for all schools and look for opportunities for process improvements.</td>
</tr>
<tr>
<td>Q3 Total PO&amp;M Cost Per GSF (Annual)</td>
<td>Target: Below state average and 25th percentile of peer districts Baseline: $0.59</td>
<td>Statewide Ops. &amp; Maint. Cost Data from FDOE; Budget Data from Peer Districts Yearly</td>
<td>See contingency plans for P9 &amp; P10 and Q1 and Q2.</td>
</tr>
<tr>
<td>Q4 PM and W/O Activity Per Year</td>
<td>Target: Below state average and 25th percentile of peer districts Baseline: 10,960 / 46,132</td>
<td>Yearly Summary Report Yearly</td>
<td>See contingency plans for P2 – P8.</td>
</tr>
</tbody>
</table>
**Macro Process Control System**

**Process Name:** Facilities Operations and Maintenance  
**Process Owner:** Walt Petters

**Process Customer:** The School Board of Brevard County, representing staff, students, parents and the community  
**Critical Customer Requirements:**

**Process Purpose:** Provide cost effective operation and maintenance of clean, healthy and safe educational facilities

**Current Sigma Level:** TBD

**Outcome Indicators:** Q1 – Q7

<table>
<thead>
<tr>
<th>Process Indicators</th>
<th>Control Limits</th>
<th>Data to Collect</th>
<th>Timeframe (Frequency)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Indicators</td>
<td>Spec/ Targets</td>
<td>What is Checking Item or Indicator Calculation</td>
<td>When to Collect Data?</td>
<td>Who will Check?</td>
</tr>
</tbody>
</table>

| Q5 Work Order Backlog Per Year | Target: Reduce Mo Backlog By 20% Baseline: CY 2007 = 6500 | Yearly Summary Report | Yearly April 1 | W. Petters J. Hudson See contingency plans for P2 – P8. |
| Q7 PO&M / Service W/O Ratio | Target: Ratio ≥ 100% Baseline: 75.51% | Yearly Activity Report | Monthly End of month | W. Petters J. Hudson See contingency plans for P2 – P8. |

Approved: _______________________________ Date: ________________ Rev #: __________________ Rev Date: ________________
## KWP3 Process Control System

**Process Name:** Manage Work Order Processing  
**Process Customer:** The School Board of Brevard County, representing staff, students, parents and the community  
**Process Owner:** Walt Petters  
**Critical Customer Requirements:**

**Current Sigma Level:** TBD  
**Outcome Indicators:** Macro Q4 – Q5 – Q7

### Process and Quality Indicators

<table>
<thead>
<tr>
<th>Process</th>
<th>Control Limits</th>
<th>Data to Collect</th>
<th>Timeframe (Frequency)</th>
<th>Responsibility</th>
<th>Contingency Plans / Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process Indicators</strong></td>
<td><strong>And</strong></td>
<td><strong>What is Checking Item or Indicator Calculation</strong></td>
<td><strong>When to Collect Data?</strong></td>
<td><strong>Who will Check?</strong></td>
<td></td>
</tr>
<tr>
<td>P3.1 School Generated (Type 4) W/O per Month</td>
<td>Target: Reduce by 10% Baseline: 1,593 per Month</td>
<td>TMA Data Base</td>
<td>Daily</td>
<td>EMS Personnel</td>
<td>Transfer more FTE to this task.</td>
</tr>
<tr>
<td>P4.1 Service (Type 1) W/O Per Month</td>
<td>Target: Reduce by 10% Baseline: 85 per Month</td>
<td>Tracking the number of W/O Requests that are submitted and rejected after evaluation.</td>
<td>Monthly End of month</td>
<td>W. Petters J. Hudson</td>
<td>Transfer more FTE to this task.</td>
</tr>
<tr>
<td>P5.1 PO&amp;M (Type 9) W/O Per Month</td>
<td>Target: Reduce # by 10% Baseline: 1775 per Month</td>
<td>TMA Data Base</td>
<td>Monthly End of month</td>
<td>W. Petters J. Hudson</td>
<td>Transfer more FTE to this task.</td>
</tr>
<tr>
<td>P6.1 # Of W/O Opened / Closed Per Month</td>
<td>Target: Reduce # by 10% Baseline: 3,864 per Month</td>
<td>TMA Data Base</td>
<td>Monthly End of month</td>
<td>W. Petters J. Hudson</td>
<td>Transfer more FTE to this task.</td>
</tr>
<tr>
<td>P7.1 # Backlog W/O Per Month</td>
<td>Target: Increase PM W/O By 20% and Reduce Routine and Service W/O By 20% Baseline: PM 10,960 / All Others 46,132</td>
<td>TMA Data Base</td>
<td>Monthly End of month</td>
<td>W. Petters J. Hudson</td>
<td>Transfer more FTE to this task.</td>
</tr>
<tr>
<td>Q4 PM and W/O Activity Per Year</td>
<td>Target: Increase PM W/O By 20% and Reduce Routine and Service W/O By 20% Baseline: PM 10,960 / All Others 46,132</td>
<td>TMA Data Base</td>
<td>Yearly April 1</td>
<td>W. Petters J. Hudson</td>
<td>See contingency plans for P1 – P4</td>
</tr>
<tr>
<td>Q5 Work Order Backlog Per Year</td>
<td>Target: Reduce Mo Backlog By 20% Baseline: 53,602</td>
<td>Yearly Summary Report</td>
<td>Yearly April 1</td>
<td>W. Petters J. Hudson</td>
<td>See contingency plans for P2 – P8.</td>
</tr>
<tr>
<td>Q7 PO&amp;M / Service W/O Ratio</td>
<td>Target: Ratio ≥ 100% Baseline: 75.51%</td>
<td>Yearly Activity Report</td>
<td>Monthly</td>
<td>W. Petters J. Hudson</td>
<td>See contingency plans for P2 – P8.</td>
</tr>
</tbody>
</table>

Approved: ___________________________ Date: _____________ Rev #: ___________ Rev Date: _
# Key Work Process (KWP) 3.1 Process Control System

**Process Name:** Perform Work Order Scheduling

**Process Customer:** The School Board of Brevard County, representing staff, students, parents and the community

**Process Owner:** Walt Petters

**Critical Customer Requirements:**
- Current Sigma Level: TBD

**Process Purpose:** To schedule work orders.

**Outcome Indicators:** Macro Q4, Q5, Q6, Q7 & Q8

<table>
<thead>
<tr>
<th>Process and Quality Indicators</th>
<th>Control Limits</th>
<th>Data to Collect</th>
<th>Timeframe (Frequency)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process</strong></td>
<td><strong>Indicators</strong></td>
<td><strong>And</strong></td>
<td><strong>Specs/ Targets</strong></td>
<td><strong>What is Checking Item or Indicator Calculation</strong></td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td><strong>Indicators</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P3.1.1</td>
<td>School Generated (Type 4) W/O per Month</td>
<td>Target: Reduce by 10%</td>
<td>Baseline: 1,593 per Month</td>
<td>TMA Data Base</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P4.1.1</td>
<td>Service (Type 1) W/O Per Month</td>
<td>Target: Reduce by 10%</td>
<td>Baseline: 85 per Month</td>
<td>Tracking the number of W/O Requests that are submitted and rejected after evaluation.</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>P5.1.1</td>
<td>PO&amp;M (Type 9) W/O Per Month</td>
<td>Target: Reduce # by 10%</td>
<td>Baseline: 1,775 per Month</td>
<td>TMA Data Base</td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Q4</td>
<td>PM and W/O Activity Per Year</td>
<td>Target: Increase PM W/O By 20% and Reduce Routine and Service W/O By 20%</td>
<td>PM 10,960 / All Others 46,132</td>
<td>TMA Data Base</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>Work Order Backlog Per Year</td>
<td>Target: Reduce M&amp;c Backlog By 20%</td>
<td>Baseline: 53,602</td>
<td>Yearly Summary Report</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>Q6</td>
<td>PM / Service W/O Ratio</td>
<td>Target: Ratio ≥ 3</td>
<td>Baseline: 2.268</td>
<td>Yearly Activity Report</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q7</td>
<td>PO&amp;M / Service W/O Ratio</td>
<td>Target: Ratio ≥ 100%</td>
<td>Baseline: 75.51%</td>
<td>Yearly Activity Report</td>
</tr>
<tr>
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</tbody>
</table>

Approved: ___________________________ Date: ___________________________ Rev #: ___________________________ Rev Date: __________

And
## Countermeasures Matrix

### Problem
The Maintenance Department has not institutionalized the use of the TMA CMMS application to schedule the completion work orders.

### Root Cause
1. Supervisors not trained.
2. Supervisors do not see value in scheduling using TMA CMMS and are resistant to change.
3. Maintenance does not have a documented TMA CMMS user guide / procedure.
4. Maintenance does not have a documented TMA CMMS user guide / procedure.

### Countermeasure
- Develop and implement an in-house TMA CMMS training program.
- Add TMA CMMS topics to the weekly / monthly Supervisors meetings with Director.
- Develop in-house TMA CMMS users guide / procedure.
- Develop a TMA CMMS user interface team. Team to communicated with TMA Systems on a regular basis to share successes and failures of TMA CMMS deployment.

### Practical Methods
- Training program to be developed by in-house staff.
- Develop a Supervisor’s meeting agenda to include Change Management topics.
- Develop users guide using in-house staff.
- Director to assign key staff to the TMA CMMS Interface Team.

### Effectiveness x Feasibility = Overall

<table>
<thead>
<tr>
<th>EFFECTIVENESS</th>
<th>FEASIBILITY</th>
<th>OVERALL</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
<td>25</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>25</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>25</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Scale:** 1 = Negligible  2 = Somewhat  3 = Moderate  4 = Very  5 = Extreme
**KWP 3.1 Countermeasure Action Plan Matrix**

<table>
<thead>
<tr>
<th>COUNTERMEASURE</th>
<th>PROJECTED START DATE</th>
<th>PROJECTED END DATE</th>
<th>ACCOUNTABLE PERSON</th>
<th>SUPPORT ORGANIZATION</th>
<th>ESTIMATED COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Develop and implement an in-house TMA CMMS training program.</td>
<td>2/9/09</td>
<td>04/9/09</td>
<td>Walt Petters</td>
<td>None</td>
<td>The cost of staff time develop a TMA CMMS training program and to train all supervisors.</td>
</tr>
<tr>
<td>B. Add TMA CMMS topics to the weekly / monthly Supervisors meetings with Director.</td>
<td>2/9/09</td>
<td>2/9/09</td>
<td>Walt Petters</td>
<td>None</td>
<td>The cost of staff time to attend staff meeting.</td>
</tr>
<tr>
<td>C. Develop in-house TMA CMMS users guide / procedure.</td>
<td>2/9/09</td>
<td>3/9/09</td>
<td>Walt Petters</td>
<td>None</td>
<td>The cost of staff time to develop a TMA CMMS user guide.</td>
</tr>
<tr>
<td>D. Develop a TMA CMMS user interface team. Team to communicate with TMA Systems on a regular basis to share successes and failures of TMA CMMS deployment</td>
<td>2/5/09</td>
<td>2/9/09</td>
<td>Walt Petters</td>
<td>None</td>
<td>Director’s time to appoint staff to team.</td>
</tr>
</tbody>
</table>
### KWP3.1 Action Plan #1 - Perform Work Order Scheduling

**Date:** 5-Feb-09  
**Owners:** Walt Petters  
**Comments:** Countermeasures A & C are combined into one action plan. Countermeasures B & D do not require an action plan because the implementation duration is one to two days.

**Root Cause:** Supervisors are not trained to use TMA CMMS to schedule work orders.  
**Countermeasure:** Develop and implement an in-house TMA CMMS training program to include all TMA CMMS training materials.  
**Practical Method:** Use in-house staff to develop and implement the TMA CMMS training program and materials.

<table>
<thead>
<tr>
<th>No.</th>
<th>Task</th>
<th>Accountable Person</th>
<th>Bi-Week</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Develop Training Program</td>
<td>Key Staff</td>
<td>Scheduled</td>
<td>Completed</td>
</tr>
<tr>
<td>3</td>
<td>Develop Training Material &amp; User Guide</td>
<td>Key Staff</td>
<td>Scheduled</td>
<td>Completed</td>
</tr>
<tr>
<td>4</td>
<td>Train Supervisors</td>
<td>Key Staff</td>
<td>Scheduled</td>
<td>Completed</td>
</tr>
<tr>
<td>5</td>
<td>TMA CMMS Scheduling Rollout</td>
<td>Key Staff</td>
<td>Scheduled</td>
<td>Completed</td>
</tr>
<tr>
<td>6</td>
<td>Training Assessment</td>
<td>Key Staff</td>
<td>Scheduled</td>
<td>Completed</td>
</tr>
<tr>
<td>7</td>
<td>Update Training Program and / or Materials and User Guide</td>
<td>Key Staff</td>
<td>Scheduled</td>
<td>Completed</td>
</tr>
<tr>
<td>8</td>
<td>Monitor Work Order Scheduling</td>
<td>Director &amp; Supervisors</td>
<td>Scheduled</td>
<td>Completed</td>
</tr>
</tbody>
</table>
Note 1: May be required if flow chart has internal work process in addition to individual steps.
**Macro Process Name:** Perform Work Order Scheduling  
**Key Work Process:** KWP3 – Manage Work Order Processing  
**Work System / Leader:** Ed Curry  
**Process Owner:** Walt Petters  
**DMAIC Status:** Improve Cycle: Yes  
**Refine Cycle:** No

### DEFINE

#### 1. The stakeholder and need were identified.
- Yes: **X**  
- No:  
- Rating: **5**  

Comment: Internal and external customers were identified.

#### 2. An indicator measuring our performance in meeting the need was developed.
- Yes: **X**  
- No:  
- Rating: **5**  

Comment: After a preliminary process analysis of the number of approved work order requests, 95% are not being scheduled in the maintenance TMA data base. By improving work order scheduling, Q measure, Q4, Q5, Q7, and Q8 would be improved thus resulting in an overall improvement of OP&M service.

#### 3. A theme statement consistent with the indicator was selected.
- Yes: **X**  
- No:  
- Rating: **5**  

Comment: A theme statement consistent with the indicator was selected.  
**Theme Statement:** The maintenance work order scheduling process is not formal process. Approximately 5% of completed work orders are being scheduled using the TMA Systems data base. Ninety-five (95) percent of the work orders are being manually scheduled.

#### Rating Legend:
- **5** = Checkpoint Fully Satisfied  
- **4** = Meets Most Criteria of Checkpoint  
- **3** = Meets Minimal Requirement of Checkpoint  
- **2** = Checkpoint Somewhat/Partially Satisfied  
- **1** = Checkpoint Not Addressed
### MEASURE

4. The theme was stratified from various viewpoints and a significant problem was chosen.  
   
   Yes: X  No:  
   Rating: 5  

Comment: The theme was stratified into seven problems. Each problem was analyzed during a brainstorming session with the significant problem chosen.

   A. Supervisors not using TMA Systems Database to schedule work orders.  
   B. Scheduling Culture.  
   C. TMA Systems Database is not user friendly.  
   D. TMA Systems Database has poor scheduling functionality.  
   E. PO&M TMA Database Administrator not supporting users.  
   F. Work request maintenance is not clearly defined or explained.  
   G. Maintenance parts availability.

5. A target for improvement was established based on the stakeholder's need and its impact on the theme indicator was determined.  
   
   Yes: X  No:  
   Rating: 5  

Comment: A target has been established to improve the number of work orders that were being scheduled in TMA.

6. A problem statement that addressed the gap between the actual and target values was developed.  
   
   Yes: X  No:  
   Rating: 5  

Comment: Actual and target gap values have been identified. Gap: Ninety-five (95) percent, of Type 2 – Type 10 work orders are scheduled using a manual process. Target: Increase the number scheduled to 15%.

**Rating Legend:**  
5 = Checkpoint Fully Satisfied / 4 = Meets Most Criteria of Checkpoint / 3 = Meets Minimal Requirement of Checkpoint  
2 = Checkpoint Somewhat/Partially Satisfied / 1 = Checkpoint Not Addressed
ANALYZE

7. Potential causes most likely to have the greatest impact on the problem were selected. Yes: X No: Rating: 5
Comment: Five potential causes were selected:
   A. Supervisors not trained.
   B. Supervisors do not see value in scheduling using TMA CMMS.
   C. Supervisors are resistant to change.
   D. Maintenance does not have a documented TMA CMMS user guide / procedure.
   E. The use of TMA requires a basic level of computer literacy.

8. A relationship between the root causes and the problem was verified with data. Yes: X No: Rating: 4
Comment: The five causes were verified by reviewing department records.

9. Root causes were selected and the impact of each root cause on the gap was determined. Yes: No: Rating: 5
Comment: The impact of the root cause on the gap was determined.

Rating Legend:
5 = Checkpoint Fully Satisfied / 4 = Meets Most Criteria of Checkpoint / 3 = Meets Minimal Requirement of Checkpoint
2 = Checkpoint Somewhat/Partially Satisfied / 1 = Checkpoint Not Addressed
10. Countermeasures were selected to address verified root causes.

Yes: X  No:  Rating: 5

Comment: Four countermeasures were developed to address the five root causes listed in Macro DMAIC Storyboard.

A. Develop and implement an in-house TMA CMMS training program.
B. Add TMA CMMS topics to the weekly / monthly Supervisors meetings with Director.
C. Develop in-house TMA CMMS users guide / procedure.
D. Develop a TMA CMMS user interface team. Team to communicate with TMA Systems on a regular basis to share successes and failures of TMA CMMS deployment.

11. The method for selecting the appropriate practical methods was clear and considered effectiveness and feasibility.

Yes: X  No:  Rating: 5

Comment: An effectiveness and feasibility matrix was used to select which countermeasures to deploy. Practical methods were developed for each counter measure by using a brainstorming session. See Macro Storyboard package for effectiveness and feasibility matrix.

12. The action plan reflected accountability, schedule, and cost, and was implemented.

Yes: X  No:  Rating: 5

Comment: One action plan was developed. A countermeasure action plan matrix was developed which shows deployment accountability, schedule and associated cost.

Rating Legend:
5 = Checkpoint Fully Satisfied / 4 = Meets Most Criteria of Checkpoint / 3 = Meets Minimal Requirement of Checkpoint
2 = Checkpoint Somewhat/Partially Satisfied / 1 = Checkpoint Not Addressed
## CONTROL

13. **[Results]** The effect of countermeasures on the root causes was demonstrated.  
   
   Yes: ☑  No:  
   
   Rating: 5  

   Comment: The effect of four countermeasures on the five root causes was demonstrated.

   A. A TMA CMMS training program has started and is ongoing.  
   B. Special TMA CMMS meetings with the Supervisors, Director and other support staff are being held.  
   C. Develop in-house TMA CMMS users guide / procedure has not started. It has been estimated that the start of the procedure development will start on August, 27th.  
   D. A TMA CMMS user interface team composed of the following personnel.  
      a. TMA CMMS Data Base Administrator  
      b. PO&M Director  
      c. PO&M Support Staff

14. **[Results]** The effect of countermeasures on the problem was demonstrated.  
   
   Yes: ☑  No:  
   
   Rating: 5  

   Comment: As of the beginning of August, 26, 2009 the percentage of work orders being scheduled in TMA has not improved.

15. **[Results]** The improvement target was achieved and causes of significant variation were addressed.  
   
   Yes:  No: ☑  
   
   Rating: 2  

   Comment: The improvement target has not been met.

16. **[Results]** The effect of countermeasures on the theme indicator representing the stakeholder’s need was demonstrated.  
   
   Yes: ☑  No:  
   
   Rating: 2  

   Comment: The effect of countermeasures on the theme indicator representing the stakeholder’s need has not been demonstrated.

**Rating Legend:**

5 = Checkpoint Fully Satisfied  /  4 = Meets Most Criteria of Checkpoint  /  3 = Meets Minimal Requirement of Checkpoint  
2 = Checkpoint Somewhat/Partially Satisfied  /  1 = Checkpoint Not Addressed
## CONTROL

17. **[Standardization]** A method was established to document, permanently change, and communicate the revised process or standard, and was implemented.

| Yes: | No: X | Rating: 3 |

Comment: The countermeasure method has been communicated verbally. The countermeasure method has not been documented to permanently change and communicate the revised process.

18. **[Standardization]** Specific areas for replication were identified, and an action plan was developed to promote organizational learning.

| Yes: X | No: | Rating: 5 |

Comment: This checkpoint was analyzed. The countermeasure has been standardized across all nine repair centers.

19. **[Future Plans]** Any remaining problems of the theme were addressed.

| Yes: X | No: | Rating: 5 |

Comment: The TMA CMMS procedure has not been developed. This is impacting the completion of the training.

## CONTROL

20. **[Future Plans]** Lessons learned, P-D-C-A of the ets Six Sigma DMAIC Method, and team growth were assessed and documented.

| Yes: X | No: | Rating: 4 |

Comment: The problem solving activity to improve the theme occurred over numerous brainstorming and data analysis sessions. Data was examined from varying view points to understand the problem and gap. Lessons learned were discussed but not documented. The PO&M operation uses a Computerized Maintenance Management System (CMMS) to schedule and track maintenance activities. Data can be collected at all levels of the maintenance cycle. Currently PO&M is working with TMA Systems to modify the CMMS to drill down the data collection to give the system uses more drop-down window choices when entering maintenance data. The monthly maintenance overview report is distributed to all Facilities managers and school district administrators. The report is a useful tool to identify problem trends and to inform stakeholders about maintenance activities that affect this school site or facilities infrastructure.

**Rating Legend:**

- 5 = Checkpoint Fully Satisfied
- 4 = Meets Most Criteria of Checkpoint
- 3 = Meets Minimal Requirement of Checkpoint
- 2 = Checkpoint Somewhat/Partially Satisfied
- 1 = Checkpoint Not Addressed
## Key Work Process (3.1): PERFORM WORK ORDER SCHEDULING

<table>
<thead>
<tr>
<th>SUPPLIER</th>
<th>INPUTS</th>
<th>PROCESS</th>
<th>OUTPUTS</th>
<th>CUSTOMERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>District &amp; School Administration</td>
<td>Work Order Sent By Email or Phone Call</td>
<td>RECEIVE WORK ORDER REQUEST</td>
<td>Accepted Routine Work Order and Completed Phone Call</td>
<td>Dispatcher or Maintenance Supervisors</td>
</tr>
<tr>
<td>Dispatcher or Maintenance Supervisors</td>
<td>Received W/O Email or Completed Phone Call</td>
<td>EVALUATE WORK ORDER REQUEST</td>
<td>Completed Work Order Evaluation</td>
<td>Maintenance Supervisors</td>
</tr>
<tr>
<td>Maintenance Supervisors</td>
<td>Completed Work Order Evaluation</td>
<td>APPROVE OR DISAPPROVE WORK ORDER REQUEST</td>
<td>Approved or Disapproved Work Order Request</td>
<td>Maintenance Supervisors</td>
</tr>
<tr>
<td>Maintenance Supervisors</td>
<td>Approved Work Order Request</td>
<td>EVALUATE &amp; SCHEDULE WORK ORDER</td>
<td>Work Order Assigned to Maintenance Team or Technician</td>
<td>District &amp; School Administration &amp; Instructional Departments</td>
</tr>
</tbody>
</table>

To Effectively and Efficiently Maintain District Facilities

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FACILITIES SERVICES / Dane Theodore / Walt Petters 8/17/09