Tank Farm Maintenance Procedure

Effluent Treatment Facility

USQ Not Required – ETF is a Hazard Category 3 Radiological Facility

CHANGE HISTORY (≤ LAST 5 REV-MODS)

<table>
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<th>Rev-Mod</th>
<th>Release Date</th>
<th>Justification</th>
<th>Summary of Changes</th>
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<td>07/26/2016</td>
<td>Correct Use Type</td>
<td>Change from continuous use to reference use per document owner’s direction.</td>
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<td>A-0</td>
<td>10/26/2015</td>
<td>Converting to WRPS Format</td>
<td>New Procedure, Supersedes ETF-PRO-MN-51449 (EL18103)</td>
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</tbody>
</table>

Table of Contents

1.0 PURPOSE AND SCOPE.................................................................................................................. 2
  1.1 Purpose........................................................................................................................................ 2
  1.2 Scope........................................................................................................................................... 2

2.0 INFORMATION............................................................................................................................... 2
  2.1 Terms and Definitions................................................................................................................... 2

3.0 PRECAUTIONS AND LIMITATIONS......................................................................................... 2
  3.1 Radiation and Contamination Control ......................................................................................... 2
  3.2 Environmental Compliance ......................................................................................................... 2

4.0 PREREQUISITES.......................................................................................................................... 3
  4.1 Special Tools, Equipment, and Supplies....................................................................................... 3
  4.2 Performance Documents.............................................................................................................. 3

5.0 PROCEDURE.............................................................................................................................. 4
  5.1 Initial Power-up Sequence ............................................................................................................ 4
  5.2 Calibration with Calibration Cable .............................................................................................. 4
  5.3 Calibration without Calibration Cable ......................................................................................... 6
  5.4 Restoration .................................................................................................................................. 8
  5.5 Acceptance Criteria ..................................................................................................................... 8
  5.6 Review ....................................................................................................................................... 8
  5.7 Records ..................................................................................................................................... 9

Figure 1 – Analog Amplifier Test Hookup...................................................................................... 10
1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides a safe, uniform method for calibration of Foxboro® model E83 vortex flowmeters.

1.2 Scope

This procedure applies to calibrating Foxboro model E83 vortex flowmeters.

2.0 INFORMATION

2.1 Terms and Definitions

- CENELEC - Comité Européen de Normalisation Électrotechnique (European Committee for Electrotechnical Standardization).

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Radiation and Contamination Control

3.1.1 Work in radiological areas will be performed using a radiological work permit following review by Radiological Control per ALARA Work Planning procedure, TFC-ESH-RP_RWP-C-03.

3.2 Environmental Compliance

3.2.1 In the event of a spill/leak/release, notify the SOM/FWS and respond per ETF-ERP-85B-003, Emergency Spill or Release at ETF.
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

NOTE - Measuring and Test Equipment used to collect acceptance criteria data during performance of this procedure shall meet the following requirements:
- Be within its current calibration cycle as evidenced by an affixed calibration label
- Be capable of desired range
- Accuracy is equal to or greater than M&TE tolerance specified on PM/S data sheet or is at least four times greater than specified device tolerance.

The following supplies may be needed to perform this procedure:
- Foxboro calibration cable, P/N K0146HP
- Frequency generator (10 to 3,000 Hz, 0 to 7 V square wave, 5% tolerance)
- CMD
- 50 Vdc power supply, if not loop powered.

4.2 Performance Documents

The following documents may be needed to perform this procedure:
- Vendor information MI 019-190, E83SA Vortex Flow Meter Instructions.
5.0 PROCEDURE

5.1 Initial Power-up Sequence

NOTE - For CENELEC-certified (flameproof) flowmeters, the cover locks are to be removed prior to removing the covers.

5.1.1 REMOVE amplifier and field terminals compartment covers.

5.1.2 IF calibrating flowmeter without calibration cable, GO TO Section 5.3.

5.2 Calibration with Calibration Cable

5.2.1 CONNECT calibration cable and frequency generator to CAL IN connector at top front right corner of amplifier (Figure 1).

5.2.2 LIFT negative lead AND

CONNECT CMD in series with 4 to 20 mA output.

NOTE - Full-scale frequency is found on amplifier adhesive label or data sheet.

5.2.3 SET frequency generator for 5.0 V square wave output at full-scale frequency.

5.2.4 RECORD as-found CMD indication on PM/S data sheet.

5.2.5 DISCONNECT coaxial cable from frequency generator.

5.2.6 SHORT coaxial cable center conductor to shield.

5.2.7 RECORD as-found CMD indication on PM/S data sheet.

5.2.8 IF as-found values are within tolerance per PM/S data sheet, and no adjustments are required, RECORD as-found data in as-left column on data sheet AND

GO TO Step 5.2.19.
5.2 Calibration with Calibration Cable (Cont.)

5.2.9 **ENSURE** course span switches are properly set per Coarse Span Switches Table for full-scale frequency.

### Coarse Span Switches Table

<table>
<thead>
<tr>
<th>COURSE SPAN FREQUENCY STEP</th>
<th>FREQUENCY (HZ) AT THE UPPER RANGE VALUE</th>
<th>SWITCH POSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12.5 TO 25</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>25 TO 50</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>50 TO 100</td>
<td>ON</td>
</tr>
<tr>
<td>4</td>
<td>100 TO 200</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>200 TO 400</td>
<td>ON</td>
</tr>
<tr>
<td>6</td>
<td>400 TO 800</td>
<td>OFF</td>
</tr>
<tr>
<td>7</td>
<td>800 TO 1600</td>
<td>ON</td>
</tr>
<tr>
<td>8</td>
<td>1600 TO 3200</td>
<td>ON</td>
</tr>
</tbody>
</table>

5.2.10 **ENSURE** medium span switches are properly set per Medium Span Switches Table for full-scale frequency.

### Medium Span Switches Table

<table>
<thead>
<tr>
<th>PERCENT OF COURSE SPAN FREQUENCY STEP</th>
<th>MEDIUM SPAN SWITCHPOSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>0 TO 25</td>
<td>ON</td>
</tr>
<tr>
<td>25 TO 50</td>
<td>OFF</td>
</tr>
<tr>
<td>50 TO 75</td>
<td>ON</td>
</tr>
<tr>
<td>75 TO 100</td>
<td>OFF</td>
</tr>
</tbody>
</table>

5.2.11 **SHORT** input coaxial cable center conductor to shield.

5.2.12 **ADJUST** zero pot for 4.00 mA CMD indication.

5.2.13 **REMOVE** short **AND**

**RECONNECT** coaxial cable to frequency generator.

5.2.14 **SET** frequency generator for 5.0 V square wave output at full-scale frequency.

5.2.15 **ADJUST** span pot for 20.00 mA CMD indication.

5.2.16 **IF** 20.00 mA output cannot be obtained, **ADJUST** course or medium span switches.
5.2 Calibration with Calibration Cable (Cont.)

5.2.17 **REPEAT** Span and Zero adjustments until no further adjustments are necessary.

5.2.18 **RECORD** as-left values on PM/S data sheet.

5.2.19 **DISCONNECT** CMD.

5.2.20 **RECONNECT** lifted lead.

5.2.21 **GO TO** Section 5.4.

5.3 Calibration without Calibration Cable

5.3.1 **REMOVE** analog amp board (two Phillips screws).

5.3.2 **REMOVE** brown and yellow wires from terminal strip terminals B and Y.

5.3.3 **CONNECT** frequency generator to terminals B (+) and Y (-).

5.3.4 **LIFT** negative lead **AND**

**CONNECT** CMD in series with 4 to 20 mA output.

**NOTE** - Full-scale frequency is found on amplifier adhesive label or PM/S data sheet.

5.3.5 **SET** frequency generator for 5.0 V square wave output at full-scale frequency.

5.3.6 **RECORD** as-found CMD indication on PM/S data sheet.

5.3.7 **DISCONNECT** frequency generator from terminal strip terminals B and Y.

5.3.8 **SHORT** terminal strip terminals B and Y together.

5.3.9 **RECORD** as-found CMD indication on PM/S data sheet.

5.3.10 **IF** as-found values are within tolerance per PM/S data sheet, and no adjustments are required, **RECORD** as-found data in as-left column on data sheet **AND**

**GO TO** Step 5.3.21.
5.3 Calibration without Calibration Cable (Cont.)

5.3.11 **ENSURE** course span switches are properly set per Coarse Span Switches Table for full-scale frequency.

### Coarse Span Switches Table

<table>
<thead>
<tr>
<th>COURSE SPAN FREQUENCY STEP</th>
<th>FREQUENCY (HZ) AT THE UPPER RANGE VALUE</th>
<th>SWITCH POSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12.5 TO 25</td>
<td>OFF  ON  OFF</td>
</tr>
<tr>
<td>2</td>
<td>25 TO 50</td>
<td>OFF  ON  OFF</td>
</tr>
<tr>
<td>3</td>
<td>50 TO 100</td>
<td>OFF  ON  OFF</td>
</tr>
<tr>
<td>4</td>
<td>100 TO 200</td>
<td>OFF  ON  ON</td>
</tr>
<tr>
<td>5</td>
<td>200 TO 400</td>
<td>OFF  ON  OFF</td>
</tr>
<tr>
<td>6</td>
<td>400 TO 800</td>
<td>ON   OFF  ON</td>
</tr>
<tr>
<td>7</td>
<td>800 TO 1600</td>
<td>ON   ON  OFF</td>
</tr>
<tr>
<td>8</td>
<td>1600 TO 3200</td>
<td>ON   ON  ON</td>
</tr>
</tbody>
</table>

5.3.12 **ENSURE** medium span switches are properly set per Medium Span Switches Table for full-scale frequency.

### Medium Span Switches Table

<table>
<thead>
<tr>
<th>PERCENT OF COARSE SPAN FREQUENCY STEP</th>
<th>MEDIUM SPAN SWITCH POSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 TO 25</td>
<td>N   P   R</td>
</tr>
<tr>
<td>25 TO 50</td>
<td>OFF ON OFF</td>
</tr>
<tr>
<td>50 TO 75</td>
<td>ON  OFF ON</td>
</tr>
<tr>
<td>75 TO 100</td>
<td>OFF OFF ON</td>
</tr>
</tbody>
</table>

5.3.13 **SHORT** terminal strip terminals B and Y together.

5.3.14 **ADJUST** zero pot for 4.00 mA CMD indication.

5.3.15 **REMOVE** short **AND** 

**RECONNECT** frequency generator to terminals B (+) and Y (-).

5.3.16 **SET** frequency generator for 5.0 V square wave output at full-scale frequency.

5.3.17 **ADJUST** Span pot for 20.00 mA CMD indication.

5.3.18 **IF** 20.00 mA output cannot be obtained, **ADJUST** course or medium span switches.
5.3 Calibration without Calibration Cable (Cont.)

5.3.19 **REPEAT** Span and Zero adjustments until no further adjustments are necessary.

5.3.20 **RECORD** as-left values on PM/S data sheet.

5.3.21 **DISCONNECT** CMD and frequency generator.

5.3.22 **RECONNECT** brown and yellow wires to terminal strip terminals B and Y.

5.3.23 **RECONNECT** analog amp board.

5.4 Restoration

5.4.1 **RESTORE** to as-found conditions.

5.4.2 **INFORM** SOM test is complete and instrument/equipment/system may be returned to service.

5.5 Acceptance Criteria

Acceptance criteria has been met when steps in this procedure have been satisfactorily performed and results are recorded on the data sheet(s).

5.6 Review

5.6.1 **INFORM** FWS test is complete.

5.6.2 *(FWS)* **REVIEW AND ENSURE** the following:

- Completed data sheets meet the acceptance criteria
- Comments sections are filled out appropriately
- Work requests needed as a result of this procedure are identified and generated
- Work request number(s) of any work documents generated as a result of this procedure, are recorded in the Comments/Remarks section of the data sheet.
5.7 Records

The performance of this procedure generates no records. However PM/S data sheets associated with the procedure are records and are maintained in the work package as record material.

The record custodian identified in the Company Level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Figure 1 – Analog Amplifier Test Hookup

Frequency Generator
10 Hz to 3000 Hz
0V to 7 V Square Wave

Foxboro Calibration Cable

10.5 to 50 Vdc Power Supply

DMM