Calibrate Hastings HFC-203 Flow Controller

Tank Farm Maintenance Procedure

CALIBRATION

USQ # GCX-2

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions to perform calibration of Hastings Instruments Flow Controller Model HFC-203.

1.2 Scope

This procedure applies to Hastings Instruments Flow Controller Model HFC-203 with flow meter installed in GEMS sample cabinet and power available to exhauster.

2.0 INFORMATION

NONE

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Lockouts and tag-outs or over-tagging requirements shall be performed in accordance with DOE-0336, Hanford Site Lockout/Tagout Procedure.

3.1.2 Contact IH for appropriate Sample Plan.

3.1.3 All identified hazards will be addressed in the pre-job safety meeting.

3.2 Radiation and Contamination Control

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

3.3 Environmental

The following document has been referenced during the review of this procedure:

- TFC-ESHQ-ENV-STD-06, ALARACT 16.1, Tank farm ALARACT demonstration for work on potentially contaminated ventilation system components.
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Supplies

The following supplies may be needed to perform this procedure:

- Power supply (for bench calibration) ± (15) VDC @ 50mA
- Twistlock to u-ground adapter and extension cord to connect vacuum pump to convenience receptacle
- Calibrated rotometer (0.35 to 4.35 SCFM or equivalent)
- Calibrated digital multimeter (voltmeter)
- Multi-turn potentiometer, 1K to 10K ohm rating with short connecting wire (To provide control signal to valve)
- Flexible tubing for connections
- Hastings 400 Power Supply
- Various tube fittings and clamps
- Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Performance Documents

The following documents may be needed during the performance of this procedure:

- TO-060-245 Operate SY241 Primary Exhaust System
- TO-060-240, Operate SY241-VTA-EF-003 Annulus Exhauster System
- H-14-020131 sheet 4, (SY Farm).
5.0 PROCEDURE

NOTE - This Procedure applies to 500/1000 cfm portable exhausters.

Special Instructions

Before a component can be replaced, the Responsible Engineer must determine the safety classification and suitability of a replacement component for the specific application.

All maintenance or repairs must be recorded on Comment Page with appropriate Responsible Engineer signature for component verification.

Repairs not affecting design or configuration, including replacement of like for like parts/equipment may be conducted within this procedure.

If performance of any steps in this procedure is not required for procedure completion, steps not performed are to be marked, "N/A" in appropriate Data Sheet signoff space, and explained in comments/remarks section of Data Sheet.

Section 5.6 may be performed out of sequence.

Depending on the type of calibration (i.e. bench or field) Sections 5.1 or 5.2 may be worked out of sequence or not at all.

5.1 Bench Calibration

5.1.1 ENSURE exhauster is not running.

5.1.2 CLOSE appropriate isolation valve to isolate Hastings Flow Control Valve (FCV) from system.

5.1.3 REMOVE Hastings FCV for bench calibration.

NOTE - The following inspection is required per ANSI N13.1, Section 7.6.1.

5.1.4 INSPECT inlet of FCV for deposits (moisture, crystallization, foreign matter, etc.).

5.1.5 IF visible deposits are present, STOP calibration.

5.1.5.1 NOTIFY FWS/Engineering AND

RECEIVE instructions from FWS/Engineering.

5.1.5.2 DOCUMENT findings and directions from FWS/Engineering on datasheet.

5.1.5.3 PROCEED as directed by FWS/Engineering.
5.1 Bench Calibration (Cont.)

NOTE - For Step 5.1.6 be aware of the direction of flow on the FCV.

5.1.6 CONNECT FCV model HFC-203 to vacuum pump and M&TE rotometer.

5.1.7 CONNECT Hastings 400 power supply to the Hastings Flow Control valve USING 15 Pin cable to Channel 1 (J1).

5.1.8 CONNECT M&TE DMM (set to voltage) to the output of the Hastings Power Supply (J5) Channel (1).

5.1.9 IF not already on, TURN Power Supply on.

5.1.10 SELECT Channel (1).

5.1.11 SELECT Open.

5.1.12 START vacuum pump AND REGULATE from 2 scfm to 4 scfm.

Special Instructions

There will be a short delay when changing input values. Allow time for system to stabilize.

5.1.13 ADJUST flow through rotometer as follows:

5.1.13.1 SELECT Channel (1).

5.1.13.2 SELECT Auto.

5.1.13.3 USING Keypad on Hasting 400 Power supply, ADJUST flow until calibrated rotometer displays the input value(s) being tested.

5.1.14 RECORD As-Found output values on Data Sheet.

5.1.15 IF As-Found values are within tolerance per Data Sheet RECORD values in As-Left column of Data Sheet AND GO TO Step 5.1.24.

5.1.16 ADJUST zero (0) as follows:

- SELECT Channel (1)
- ENTER .30 on Hastings Power Supply.
5.1 Bench Calibration (Cont.)

5.1.17 ALLOW readings to stabilize.

5.1.18 ADJUST Zero pot on Hastings Control Valve UNTIL rotometer reads .30.

5.1.19 ADJUST Span as follows:
- SELECT Channel (1)
- ENTER 2.0 on Hastings Power Supply.

5.1.20 ALLOW reading(s) to stabilize.

5.1.21 ADJUST Span Pot on Hastings Control Valve UNTIL rotometer reads 2.0.

5.1.22 REPEAT Steps 5.1.16 through 5.1.21 UNTIL values are within tolerance per Data Sheet.

5.1.23 RECORD as-left values on Data Sheet.

5.1.24 DISCONNECT M&TE.

5.1.25 RETURN Hastings FCV to system.

5.1.26 OPEN appropriate isolation valve (restoring flow path) AND
GO TO Section 5.6.
5.2 Field Calibration

5.2.1 CONNECT tubing and rotometer test setup to Tee as shown in Figure 2.

5.2.2 DISCONNECT control signal wiring.

5.2.3 CONNECT control potentiometer and voltmeter to test points as shown in Figure 3.

5.2.4 ENSURE isolation valve V-301 or V-302 is CLOSED for system being calibrated.

NOTE - Pumps may be started and stopped by switching XXX-VTP-SS-102 to pump 1 or pump 2 or by using twist lock to u-ground adapter connected to skid convenience receptacle (breaker VTP-MPZ-5).

- Breaker MPZ-8 feeds Vacuum Pumps, Cabinet Heater, and Fans.

5.2.5 ENSURE the desired vacuum pump is ON for associated Hastings Flow Control Valve.

5.2.6 ADJUST control potentiometer to indicate 0.5 ± 0.25 Vdc as measured by voltmeter on signal output terminals AND

ALLOW 15 to 30 minutes to warm-up and stabilize.

5.2.7 GO TO Section 5.3.
5.3  As-Found - Range and Span

**Special Instructions**

Acceptable tolerance for Sections 5.3 and 5.4 is ± 0.25 Vdc. Flow rate must be adjusted to specified setting ± 0.1 SCFM (within one quarter of a minor division on rotometer).

5.3.1  **ADJUST** control potentiometer to control rotometer flow to value as indicated on Data Sheet AND

**RECORD** output voltage in the as-found column of Data Sheet.

5.3.2  **IF** device is out of tolerance, **PROCEED** to Section 5.4,

**OR**

**IF** device is within tolerance but deemed marginal (i.e. approaching specified upper or lower limit) at craftsman’s discretion, **PROCEED** to Section 5.4,

**OR**

**IF** device is within tolerance, **RECORD** data in as-left column AND

**PROCEED** to Section 5.6.
5.4 Calibration - Zero and Span

5.4.1 CHECK associated pump is turned OFF AND IF not, TURN-OFF associated pump.

5.4.2 ADJUST zero adjustment on tested flow meter until 0.0 (± 0.25) Vdc is displayed on voltmeter.

5.4.3 TURN-ON associated pump.

5.4.4 ADJUST control potentiometer to provide span flow rate on rotometer.

5.4.5 ADJUST span adjustment on tested flow meter until 5.00 ± 0.25 Vdc is displayed on voltmeter.

5.4.6 REPEAT Steps 5.4.1 through 5.4.5 until readings are within tolerance.

5.5 As-Left

5.5.1 IF span and/or zero adjustments were required, REPEAT Section 5.3 AND RECORD in as-left column.

5.6 Functional Test

5.6.1 PERFORM Functional Test per 6-FCD-569, Section 5.1.
5.7 Restoration

5.7.1 RETURN all breakers to initial condition.

5.7.2 IF not already removed, DISCONNECT AND REMOVE test equipment.

5.7.3 RETURN system to service as directed by Shift Manager.

5.8 Review

5.8.1 INFORM responsible Shift Manager per Work Package that calibration is complete.

5.8.2 INFORM FWS calibration is complete.

5.8.3 The FWS MUST REVIEW AND ENSURE the following:

- 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 Comments/Remarks of Data Sheet, as applicable.

5.9 Records

This procedure is performed within a work package, as such, the procedure in its entirety will be maintained as a record per the Work Control process.

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 - Hastings Flow Controller Adjustment Location
Calibrate Hastings HFC-203 Flow Controller

Figure 2 - Hastings Flow Controller Calibration Setup

Valve V-301 or V-302 (Closed)

Atmosphere

Calibration Rotameter

Hastings HFC-203 FCV-301 or FCV-302

To Vacuum Pump
Figure 3 - FCV-301 and FCV-302 Setup

- FCV-301-15 (+5.00 VDC REF)
- FCV-301-6 (FLOW SIGNAL)
- FCV-301-14 (CONTROL SIGNAL)
- FCV-301-12 (VALVE COMMON)

- FCV-302-15 (+5.00 VDC REF)
- FCV-302-6 (FLOW SIGNAL)
- FCV-302-14 (CONTROL SIGNAL)
- FCV-302-12
Attachment 1 – Functional Test – Interlock/Alarms

NOTE - For Retrieval/Closure project portable exhausters (POR06 and POR-008). Functional testing shall be performed by procedure 6-FCD-569 (Section 5.1).

- When testing LOW FLOW ALARM/INTERLOCK, upon introduction of trip set point, an approximate 20 second lapse will occur and vacuum pumps will switch over. After an additional approximate 20 seconds, the LOW FLOW ALARM/INTERLOCK will become active. There may also be a delay when testing HIGH FLOW ALARM.

[1] **DISCONNECT** test equipment (M&TE).
[2] **REPLACE** caps on testing Tees.
[3] **ENSURE** isolation valves VTP-V-301 and VTP-V-302 are OPEN.
[4] **CONNECT** vacuum pump to original twist lock connection in vacuum pump enclosure (ENCL-302).
[5] **REFER** to applicable procedure for operation of exhauster, to START fan.
[6] **ADJUST** control pot to actuate alarms **AND**
   **RECORD** alarm trip point.
[7] **RESTART** fan per applicable procedure.
[8] **ADJUST** control pot to actuate interlocks **AND**
[9] **RECORD** interlock trip point.
[10] **DISCONNECT** control potentiometer and voltmeter.
[11] **ENSURE** the control signal wiring is connected.
[12] **STOP** fan.