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**ADVANCED MONITORING SOLUTIONS**  
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**Fuel Flow-to-Load**  
**Quality Assurance Testing**  
**40CFR75 Appendix D**

# Appendix D - QA Testing

- Fuel flowmeter accuracy test due every 4 operating quarters
  - Operating quarter means a calendar quarter where there are at least 168 unit operating hours
- No grace period for missed flowmeter accuracy tests
  - Data considered “out-of-control” starting with the first operating hour following the quarter of the missed test
  - Data is invalid until an accuracy test is completed

# Appendix D - QA Testing

- Quarterly fuel flow-to-load tests are an optional supplement to flowmeter accuracy testing (40CFR75 App. D 2.1.7)
  - Can extend the interval between flowmeter accuracy tests up to 20 calendar quarters
    - Deadline extension also applies to Primary Element Inspections for orifice, nozzle, and venturi type flowmeters
  - A baseline period must be completed prior to using quarterly fuel flow-to-load tests

# Fuel Flow-to-Load Baseline

- A baseline fuel flow-to-load ratio shall be calculated from a minimum of 168 operating hours
- The baseline data must be obtained no later than the end of the fourth calendar quarter following the calendar quarter of the most recent QA procedure (or the date the meter was re-installed if applicable)
  - More data included in the baseline period will allow a more accurate ratio result

# Fuel Flow-to-Load Baseline

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- While baseline data collection is in progress, submit a fuel flow-to-load record each quarter with a test result of “INPROG”
  - Use ECMPS to add “In Progress” records

# Fuel Flow-to-Load Baseline

**Add/Edit QA/Cert Test Data**

Facility ID (ORISPL):    State:    Location: T-2    System/Component:    Test Result:    Year/Quarte:    Facility Name:

Miscellaneous Tests | Linearity Tests | RATA Tests | 7-Day Calibration Tests | Fuel Flow-to-Load Baseline Data | **Fuel Flow-to-Load Tests** | Fuel Flowmeter Accuracy Tests | Transmitter Transducer Tests | Cycle Time Tests | Online Offline Calibration Tests | HG Linearity Tests

| Monitoring System ID | Test Number | Test Reason Code | Test Result Code | Reporting Period | Test Basis Code | Evaluation Status | Remove? |
|----------------------|-------------|------------------|------------------|------------------|-----------------|-------------------|---------|
| <b>Add</b>           |             |                  |                  |                  |                 |                   |         |

**Fuel Flow-to-Load Test**

Monitoring System ID: 210    GAS

Test Number: 210-2020-Q2-1

Test Reason Code: QA    Quality Assurance

Test Result Code: INPROG    Baseline Data Collection In Progress

Reporting Period: 2020 QTR 2

Test Basis Code:   

Average Absolute Percent Difference:   

Number of Hours Used in Analysis:   

Number of Hours Excluded for Co-Firing:   

Number of Hours Excluded for Ramping:   

Number of Hours Excluded for Low Range:   

Test Comment:   

Expand >>    **Save**    Cancel

1. Click "Add" to create a blank fuel flow-to-load record

2. Fill out only these fields

3. Click "Save"

# Fuel Flow-to-Load Baseline

- At the end of the baseline period use EDR Generator to calculate the baseline fuel flow-to-load ratio
  - EDR Generator > QA/QC Records > Fuel Flow/Load tab

Unit/Stack/Pipe QA/Certification Tests

Unit/Stack/Pipe ID: CT1  
EDR Description: UNIT1

Go To Unit/Stack/Pipe View Q/A Reports

7-Day Cal | Linearity | Flow/Load | RATA | Qualification | Cycle Time | Offline Cal | Fuel Meter | Transmitter | Fuel Flow/Load | App E | Unit Default | Misc | Extension/Exemption | QA/Cert

Fuel Flow-to-Load Test (formerly RTs 629, 630)

| Enabled | Unit Stack or Pipe ID | System ID | Test Number | Baseline Start Date/Time | Baseline End Date/Time | Most Recent Accuracy Test Number | Baseline Ratio/GHR |
|---------|-----------------------|-----------|-------------|--------------------------|------------------------|----------------------------------|--------------------|
|---------|-----------------------|-----------|-------------|--------------------------|------------------------|----------------------------------|--------------------|

View/Edit Add New

Click "Add New" to start the baseline wizard

# Fuel Flow-to-Load Baseline

- Step 1: select the quarter/year for the end of the baseline period, the fuel flow system ID, and the latest accuracy test dates

Fuel Flow-to-Load Baseline Wizard

Unit/Stack/Pipe ID  Fuel Flow Monitoring System ID

Step 1 of 3) Supply a value for each field

|                                    |  |
|------------------------------------|--|
| Quarter and Year                   | <input type="text" value="2"/> <input type="text" value="2020"/>   |
| Test Basis                         | <input checked="" type="radio"/> Flow-to-load Ratio <input type="radio"/> Gross Heat Rate                      |
| Fuel Flow Monitoring System ID     | <input type="text" value="102"/>   |
| Latest PEI Test Date / Test Number | <input type="text" value="06/15/19 00:00"/> <input type="text" value="1"/>                                     |
| Accuracy Test Date / Test Number   | <input type="text" value="05/20/19 00:00"/> <input type="text" value="3"/> Reinstallation <input type="text"/> |
| Baseline Analysis Start Date/Time  | <input type="text" value="06/15/19 0:00"/>   |
| Baseline Analysis End Date/Time    | <input type="text" value="06/30/20 23:00"/>  |
| Baseline Test Number               | <input type="text" value="1"/>   |

The start and end date will be automatically filled in, but different dates can be manually entered



# Fuel Flow-to-Load Baseline

- Step 2: verify the correct tags names are listed for fuel flow, load, etc.

Fuel Flow-to-Load Baseline Wizard

Unit/Stack/Pipe ID  Fuel Flow Monitoring System ID

Step 2 of 3) Review the tags used for the baseline calculation.

**Note: it is strongly recommended that you do not change the information automatically supplied by the wizard (unless the wizard was unable to supply a tag name).**

**Tags to Use in Baseline Calculations**

|                              |  |
|------------------------------|--|
| Hourly Fuel Flow Tag         | <input type="text" value="U1_GasFlowTotal_100scfh_1"/> |
| Hourly Load Tag              | <input type="text" value="U1_LoadTotal_MWe_1H"/>       |
| Multiple Fuels Combusted Tag | <input type="text"/>                                   |
| Hourly Fuel Usage Time Tag   | <input type="text" value="U1_OperatingTime_Hr_1H"/>    |

# Fuel Flow-to-Load Baseline

- Step 3: end your baseline period

Fuel Flow-to-Load Baseline Wizard

Unit/Stack/Pipe ID  Fuel Flow Monitoring System ID

Step 3 of 3) Decide whether to end the baseline period now or in a subsequent quarter.

| Baseline Analysis Period  | Analysis Results   |
|---|--|
| <input type="text" value="06/15/19 0:00"/> Baseline Start Date/Time | Data Points <input type="text" value="2521"/> (168 points required)                        |
| <input type="text" value="06/30/20 23:00"/> Baseline End Date/Time  | Avg Flow/HI <input type="text" value="15562.3"/> Avg Load <input type="text" value="250"/> |
| <input type="text" value="06/30/20 23:00"/> Baseline End Deadline   | Baseline Ratio <input type="text" value="62.25"/>  |
| <input type="button" value="End Baseline Period"/>                  | <input type="button" value="Recalculate Results"/>   |

Click "End Baseline Period" to end the baseline and save the results

# Quarterly Fuel Flow-to-Load Tests

- Each quarter following your baseline, submit fuel flow-to-load tests to extend the interval between accuracy tests up to 20 calendar quarters

Unit/Stack/Pipe QA/Certification Tests

Unit/Stack/Pipe ID: CT1  
EDR Description: UNIT1

7-Day Cal | Linearity | Flow/Load | RATA | Qualification | Cycle Time | Offline Cal | Fuel Meter | Transmitter | Fuel Flow/Load | App E | Unit Default | Misc | Extension/Exemption | QA/Cert

**Fuel Flow-to-Load Test (formerly RTs 629, 630)**

| Enabled                             | Unit, Stack or Pipe ID | System ID | Test Number | Baseline Start Date/Time | Baseline End Date/Time | Most Recent Accuracy Test Number | Baseline Ratio/GHR |
|-------------------------------------|------------------------|-----------|-------------|--------------------------|------------------------|----------------------------------|--------------------|
| <input checked="" type="checkbox"/> | CT1                    | 102       | 1           | 06/15/19 0:00            | 06/30/20 23:00         | 3                                | 62.25              |

The Fuel Flow/Load tab displays a list of all baselines. To add a quarterly fuel flow-to-load test double click on the baseline, or select the baseline and click "View/Edit"

View/Edit | Add New

# Quarterly Fuel Flow-to-Load Tests

EDR Baseline and Quarterly Fuel Flow-to-Load Tests

Unit/Stack/Pipe ID: CT1  
Enabled:   
Monitoring System ID: 102  
Test Number: 1  
Average Load: 250  
Test Comment:

Accuracy Test Number: 3  
PEI Test Number: 1  
Beginning of Baseline Period: 06/15/19 0:00  
Completion of Baseline Period: 06/30/20 23:00  
Baseline In Progress:

**Baseline Fuel Flow-to-Load or GHR Ratio/Results**

Avg Fuel Flow, Ratio, Units: 15562.3 62.25 1  
Avg Heat Input, GHR, Units:

**Hours Excluded from Baseline Analysis**

CoFiring Multiple Fuels: 0  
Load Ramping: 0  
Operating in Lower 25%: 0  
Exclude Baseline Hours

**Quarterly Fuel Flow-to-load or GHR Test (formerly RT630)**

| Enabled                  | Quarter/Year | Test Number | Test Basis | AVG Diff | Result | Hours Used | Test Reason | Co Firing | Load Ramp | Low Load | Test Comment |
|--------------------------|--------------|-------------|------------|----------|--------|------------|-------------|-----------|-----------|----------|--------------|
| <input type="checkbox"/> |              |             |            |          |        |            |             |           |           |          |              |

Exclude Quarterly Hours

Add New Quarterly Test

Click "Add New Quarterly Test" to open the fuel flow-to-load test wizard

# Quarterly Fuel Flow-to-Load Tests

- Follow the wizard to enter a quarterly test

Fuel Flow-to-Load Quarterly Test Wizard

Unit/Stack/Pipe ID  Fuel Flow Monitoring System ID

Step 1 of 3) Supply a value for each field

Quarter and Year

Test Basis Indicator

Quarterly Check Test No.

Reason For Test

1. Select the Quarter and Year

Fuel Flow-to-Load Quarterly Test Wizard

Unit/Stack/Pipe ID  Fuel Flow Monitoring System ID

Step 2 of 3) Review the tags used for the quarterly test calculations.

**Note: it is strongly recommended that you do not change the information automatically supplied by the wizard (unless the wizard was unable to supply a tag name).**

**Tags to Use in Baseline Calculations**

Hourly Fuel Flow Tag

Hourly Load Tag

Multiple Fuels Combusted Tag

Hourly Fuel Usage Time Tag

2. Verify the correct tag names are listed for fuel flow, load, etc.

# Quarterly Fuel Flow-to-Load Tests

- Step 3 of the wizard will inform you of the results of the test. There are 3 possibilities:
  1. There are insufficient data points. Fuel flow-to-load tests are not required for quarters with fewer than 168 operating hours. Save the record to indicate there was insufficient data for the quarter.
  2. The test passed.
  3. The test failed. Some fuel flow-to-load ratios may be excluded from the analysis, a passing result may still be possible.

# Quarterly Fuel Flow-to-Load Tests

- Non-representative hours may be excluded from the analysis. The following hours may be considered non-representative (40CFR75 App. D 2.1.7.3)
  - Any hour in which the unit combusted another fuel (for units that do not normally co-fire fuels)
  - Any hour in which the load differed by more than 15% from the preceding or subsequent hour
  - Any hour in which the unit burned only one type of fuel (for units that normally co-fire different fuels)
  - Any hour in which load was in the lower 25% of the range of operation (unless operation in the lower 25% is considered normal)

# Quarterly Fuel Flow-to-Load Tests

- How to exclude hours from the analysis when a fuel flow-to-load test fails:

EDP Baseline and Quarterly Fuel Flow-to-Load Tests

Unit/Stack/Pipe ID: CT1  
Enabled:   
Monitoring System ID: 102  
Test Number: 1  
Average Load: 250  
Test Comment:

Accuracy Test Number: 3  
PEI Test Number: 1  
Beginning of Baseline Period: 06/15/19 0:00  
Completion of Baseline Period: 06/30/20 23:00  
Baseline In Progress:

**Baseline Fuel Flow-to-Load or GHR Ratio/Results**

Avg Fuel Flow, Ratio, Units: 15562.3 62.25 1  
Avg Heat Input, GHR, Units:

**Hours Excluded from Baseline Analysis**

CoFiring Multiple Fuels: 0  
Load Ramping: 0  
Operating in Lower 25%: 0

**Quarterly Fuel Flow-to-load or GHR Test (formerly RT630)**

| Enabled                             | Quarter/Year | Test Number | Test Basis | AVG Diff | Result | Hours Used | Test Reason | Co Firing                | Load Ramp                | Low Load                 | Test Comment |
|-------------------------------------|--------------|-------------|------------|----------|--------|------------|-------------|--------------------------|--------------------------|--------------------------|--------------|
| <input checked="" type="checkbox"/> | 3            | 2020        | 1          | Q        | 12.5   | FAILED     | QA          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |              |
| <input type="checkbox"/>            |              |             |            |          |        |            |             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |              |

Select the failed test and click the "Exclude Quarterly Hours" button



# Quarterly Fuel Flow-to-Load Tests

Exclude Hours from Quarterly Analysis

Quarter/Year | 3 | 2019 | Difference Limit | 10.0 % | Calculation Type | Flow-to-Load

| Date/Time      | Hourly Fuel Flow Rate or Heat Input | Hourly Load | Burning Multiple Fuels   | Ratio | Difference from Baseline Ratio | Co Firing                | Load Bumping             | Low Load                 |
|----------------|-------------------------------------|-------------|--------------------------|-------|--------------------------------|--------------------------|--------------------------|--------------------------|
| 07/23/19 8:00  | 4665.1                              | 31          | <input type="checkbox"/> | 150.5 | 104.48                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/23/19 9:00  | 8770.7                              | 72          | <input type="checkbox"/> | 121.8 | 65.49                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/23/19 10:00 | 8968                                | 74          | <input type="checkbox"/> | 121.2 | 64.67                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/23/19 11:00 | 3967.1                              | 26          | <input type="checkbox"/> | 152.6 | 107.34                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/23/19 12:00 | 2156.9                              | 6           | <input type="checkbox"/> | 359.5 | 388.45                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/23/19 13:00 | 3434.7                              | 10          | <input type="checkbox"/> | 343.5 | 366.71                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/23/19 14:00 | 3604                                | 12          | <input type="checkbox"/> | 300.3 | 308.02                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/23/19 15:00 | 4374.7                              | 40          | <input type="checkbox"/> | 109.4 | 48.64                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/23/19 16:00 | 9182.7                              | 128         | <input type="checkbox"/> | 71.7  | 2.58                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/23/19 17:00 | 6020.9                              | 70          | <input type="checkbox"/> | 86    | 16.85                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/25/19 2:00  | 2745.7                              | 7           | <input type="checkbox"/> | 392.2 | 432.88                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/25/19 3:00  | 3310.7                              | 8           | <input type="checkbox"/> | 413.8 | 462.23                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/25/19 4:00  | 3957.3                              | 30          | <input type="checkbox"/> | 131.9 | 79.21                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 07/25/19 5:00  | 5858.7                              | 64          | <input type="checkbox"/> | 91.5  | 24.32                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <b>Totals</b>  |                                     |             |                          |       | 11.9                           | 0                        | 0                        | 0                        |

Recalculate Results

Save Results

Hours Used | 1331 | Result | FAILED | Failed quarterly evaluation

1. Click one of these boxes and the wizard will automatically identify hours to be excluded

2. After excluding hours click "Recalculate Results" and see if your result changes to a Passed. Click "Save Results" to save the recalculated changes.

# Quarterly Fuel Flow-to-Load Tests

- Consequences of a failed fuel flow-to-load test (40CFR75 App. D 2.1.7.4):
  - New flowmeter accuracy test will need to be completed
  - Fuel flow data is invalid starting with the first operating hour following the quarter of the failed test until accuracy testing is passed