



Standard Operating Procedure
Air Quality Section
Department of Labour & Social Insurance

Issue Date:

07/02/2011

Rev.:

1

DLI-SOP- 234 Level 2 maintenance of CO analysers

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Purpose

To describe the procedure to be followed for performing special maintenance and calibration of the EC/ML 9830B CO analysers in the monitoring network.

Principle

This SOP applies to EC/ML 9830B CO analysers.

Staff involved

This SOP is intended for the staff of the maintenance company who performs the activities described.

Equipment


- Carbon Monoxide monitor (Ecotech EC/ML 9830B)
- Station data processor (Ecotech)

Documentation and forms

This SOP requires the form *DLI-F-37 CO Analyser Maintenance Report*.

The completed form is stored in electronic form in the file *DLI-F-37 CO Analyser Maintenance Report-sn-yyyy-mm-dd.xls*, where *sn* denotes the analyser serial number, *yyyy* the year, *mm* the month and *dd* the date of the maintenance.

The paper copy of the form is stored in the history log book of the analyser.

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Procedure

General

Perform the scheduled maintenance as required by the maintenance schedule DLI-QD-103.

Registration of general information and status parameters

Registration of general information:


- Enter name of customer, analyser model, analyser serial number and job number in **Customer**, **Instrument**, **ID No.** and **System/Job No.** fields respectively.
- Enter name of operator, date of test, start time and where the test was performed in **Maintenance Performed by**, **Date**, **Time Begin** (left field) and **Location** fields respectively.

Registration of reference information (section Calibration Equipment, where applicable):

- Enter flow calibrator model, calibrator serial number, pressure calibrator model and calibrator serial number in **Flow Calibrator Model**, **ID/Serial No.**, **Pressure Calibrator Model** and **ID/Serial No.** fields respectively.

Registration of analyser status parameters (section Displayed Instrument Parameters):

- On the analyser keyboard hit **<Exit>** to return to the primary screen.
- Push the **Select** button to enter the main menu. Use the **Up** and **Down** arrows on the keyboard to navigate in the main menu. Push **<Return>** to select a menu item.
- Choose **INSTRUMENT STATUS**.
- From the **INSTRUMENT STATUS** menu read the status parameters and enter them into their respective fields in the **Displayed Instrument Parameters** section of the form.
- Hit **<Exit>** to return to the primary screen.
- Hit **Select** to enter the main menu, choose **SYSTEM TEMPERATURES**.
- From the **SYSTEM TEMPERATURES** menu read the status parameters and enter them into their respective fields in the **Displayed Instrument Parameters** section of the form.
- Hit **<Exit>** to return to the primary screen.
- Hit **Select** to enter the main menu, choose **TEST MENU**.
- In the **TEST MENU** choose **OUTPUT TEST** menu.
- In the **OUTPUT TEST** menu choose **PREPROCESSOR POTS**.
- From the **PREPROCESSOR POTS** menu read the status parameters and enter them into their respective fields in the **Displayed Instrument Parameters** section of the form.

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- Hit <Exit> to return to the primary screen.
- From the primary screen record the measurement units in the **Instrument units** field.
- Compare the recorded values with the acceptance limits. If any values are outside the limits the cause must be investigated.

Pressure and flow calibration

The pressure and flow calibration procedure is taken from the 9830B Series Carbon monoxide Analyzer Service Manual. The pressure calibration menu is accessed from the hidden menu. It is assumed that the analyser has been running for at least one hour for the temperature of the flow block to stabilise at 50 °C.

To access the pressure calibration menu:

- From the primary screen press simultaneously press the keys <Up arrow> + <Pg Up> + <Enter> to enter the Hidden menu.
- From the Hidden menu, select the **PRESSURE CALIBRATION MENU**.


Pressure calibration:

- Turn off the pump
- Disconnect the inlet tubing from the flow block and connect a calibrated pressure transducer to this inlet.
- Allow 30 seconds for the pressure reading to stabilise to ambient pressure on both the calibrated pressure transducer and the analyzer. This reading (in TORR) should be the ambient pressure. Set this value as **PRESSURE 1 HIGH** and press <Enter>. Note: to convert from millibar to TORR, multiply the pressure by 0.75.
- Enter the **PRESSURE 1 HIGH** value in the **Pressure and Flow Calibration - PRESSURE 1 HIGH** field.
- Connect the pump to the exhaust port and turn it on.
- From the **PRESSURE CALIBRATION MENU** set the **VALVE SEQUENCING OFF** and press <Enter>.
- Allow the pump to evacuate the cell and the pressure reading to stabilize. This reading should be low (typically 100 to 200 torr), and is dependent upon the capacity of the pump. Set this value as **PRESSURE 1 LOW** and press <Enter>.
- Enter the **PRESSURE 1 LOW** value in the **PRESSURE 1 LOW** field.
- Disconnect the pressure transducer from the flow control inlet and reconnect the inlet tubing.

Continue with the flow calibration.

Flow calibration:

- From the Hidden menu, select the **FLOW CALIBRATION MENU**.
- Set the **CRITICAL ORIFICE** to 1.000 and press <Enter>.

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- Press Reset on the analyzer secondary panel.
- The actual flow should now be checked by turning on the pump and connecting a flow meter to the sample inlet of the analyzer. The flow should read approximately 1 slpm. If the flow is too low, perform the sintered filter/orifice replacement procedure. If flow is too high, there is probably a leak.
- Enter the observed gas flow in the **Gas flow** field.

DFU Replacement

The DFU replacement procedure is taken from the 9830B Carbon Monoxide Analyzer Service Manual. For figures and details on part numbers consult this manual.

The zero air entering the CO-CO₂ converter is filtered by a disposable filtration unit (DFU) to prevent contamination of the pneumatics and Rx cell. Failure of the DFU could result in poor zero readings or cell contamination. The DFU is located inside the rear of the CO-CO₂ converter.

Change DFU:

- Turn off the analyzer and turn off the pump.
- Remove and retain the Kynar nut from the end of the DFU.
- Remove and replace the DFU, ensuring that direction of flow is correct (from rear to front of analyzer).
- Reinstall the Kynar nut, ensuring that the ferrules are properly installed in the nuts.
- Turn on the pump.
- Enter **Y** in the **DFU changed** field if it was changed. Otherwise enter **N**.

CO-CO₂ Converter test


1. Refer to chapter 3.3.6 CO-CO₂ converter Check of the A & B Series Carbon Monoxide Analyzer Service Manual for instructions on replacement.
2. Enter **Y** in the CO-CO₂ converter Check field if it was checked. Otherwise enter **N**.

Cleaning and replacing parts

References are made to the **Maintenance** section of the form.

Cleaning the lines:

- The pneumatic lines (sample and exhaust) may be cleaned by removing and washing with a methanol cotton swab pushed through and dried by blowing with zero air or dry nitrogen. Do not clean the scrubber.
- Enter **Y** in the **Lines cleaned** field if it was changed. Otherwise enter **N**.

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Changing the sintered filter:

3. Refer to chapter 3.3.5 Sintered Filter Replacement of the 9830 A & B Series Carbon Monoxide Analyzer Service Manual for instructions on replacement.
4. Enter **Y** in the **Sintered filter changed** field if it was changed. Otherwise enter **N**.

Finalizing the visit and completing the form

- Enter the end time of the calibration in the **Time Begin/End** field (right field) in the form.
- Sign the form in the **Technicians Signature** and **Date** fields.
- Before leaving the station record the visit in the station visit log.
- After returning to the lab store the form in the instrument history log book.

Relevant documentation

DLI-QD-103
Form *DLI-F-37 CO Analyser Maintenance Report*

Reference Procedures

Carbon monoxide (Ecotech EC/ML 9830B) manual

Revision History

Revision 0