

§ 1065.372

(10) Set $x_{NO_{wet}}$ equal to $x_{NO_{meas}}$ from paragraph (e)(9) of this section.

(11) Use $x_{NO_{wet}}$ to calculate the quench according to § 1065.675.

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(g) * * *

(1) You may omit this verification if you can show by engineering analysis that for your NO_x sampling system and your emission calculations procedures, the combined CO₂ and H₂O interference for your NO_x CLD analyzer always affects your brake-specific NO_x emission results within no more than ±1.0% of the applicable NO_x standard.

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§ 1065.372 NDUV analyzer HC and H₂O interference verification.

(a) *Scope and frequency.* If you measure NO_x using an NDUV analyzer, verify the amount of H₂O and hydrocarbon interference after initial analyzer installation and after major maintenance.

(b) *Measurement principles.* Hydrocarbons and H₂O can positively interfere with an NDUV analyzer by causing a response similar to NO_x. If the NDUV analyzer uses compensation algorithms that utilize measurements of other gases to meet this interference verification, simultaneously conduct such measurements to test the algorithms during the analyzer interference verification.

(c) *System requirements.* A NO_x NDUV analyzer must have combined H₂O and HC interference within ±2% of the flow-weighted mean concentration of NO_x expected at the standard, though we strongly recommend keeping interference within ±1%.

(d) *Procedure.* Perform the interference verification as follows:

(1) Start, operate, zero, and span the NO_x NDUV analyzer according to the instrument manufacturer's instructions.

(2) We recommend that you extract engine exhaust to perform this verification. Use a CLD that meets the specifications of subpart C of this part to quantify NO_x in the exhaust. Use the CLD response as the reference value. Also measure HC in the exhaust with a FID analyzer that meets the specifications of subpart C of this part. Use the

FID response as the reference hydrocarbon value.

(3) Upstream of any sample dryer, if one is used during testing, introduce the engine exhaust to the NDUV analyzer.

(4) Allow time for the analyzer response to stabilize. Stabilization time may include time to purge the transfer line and to account for analyzer response.

(5) While all analyzers measure the sample's concentration, record 30 seconds of sampled data, and calculate the arithmetic means for the three analyzers.

(6) Subtract the CLD mean from the NDUV mean.

(7) Multiply this difference by the ratio of the flow-weighted mean HC concentration expected at the standard to the HC concentration measured during the verification. The analyzer meets the interference verification of this section if this result is within ±2% of the HC concentration expected at the standard.

(e) *Exceptions.* The following exceptions apply:

(1) You may omit this verification if you can show by engineering analysis that for your NO_x sampling system and your emission calculations procedures, the combined HC and H₂O interference for your NO_x NDUV analyzer always affects your brake-specific NO_x emission results by less than 0.5% of the applicable NO_x standard.

(2) You may use a NO_x NDUV analyzer that you determine does not meet this verification, as long as you try to correct the problem and the measurement deficiency does not adversely affect your ability to show that engines comply with all applicable emission standards.

EFFECTIVE DATE NOTE: At 73 FR 37312, June 30, 2008, § 1065.372 was amended by revising paragraphs (d)(7) and (e)(1), effective July 7, 2008. For the convenience of the user, the revised text is set forth as follows:

§ 1065.372 NDUV analyzer HC and H₂O interference verification.

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(d) * * *

(7) Multiply this difference by the ratio of the flow-weighted mean HC concentration

expected at the standard to the HC concentration measured during the verification. The analyzer meets the interference verification of this section if this result is within $\pm 2\%$ of the NO_x concentration expected at the standard.

(e) * * *

(1) You may omit this verification if you can show by engineering analysis that for your NO_x sampling system and your emission calculations procedures, the combined HC and H_2O interference for your NO_x NDUV analyzer always affects your brake-specific NO_x emission results by less than 0.5% of the applicable NO_x standard.

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§ 1065.376 Chiller NO_2 penetration.

(a) *Scope and frequency.* If you use a chiller to dry a sample upstream of a NO_x measurement instrument, but you don't use an NO_2 -to- NO converter upstream of the chiller, you must perform this verification for chiller NO_2 penetration. Perform this verification after initial installation and after major maintenance.

(b) *Measurement principles.* A chiller removes water, which can otherwise interfere with a NO_x measurement. However, liquid water in an improperly designed chiller can remove NO_2 from the sample. If a chiller is used without an NO_2 -to- NO converter upstream, it could therefore remove NO_2 from the sample prior NO_x measurement.

(c) *System requirements.* A chiller must allow for measuring at least 95% of the total NO_2 at the maximum expected concentration of NO_2 .

(d) *Procedure.* Use the following procedure to verify chiller performance:

(1) *Instrument setup.* Follow the analyzer and chiller manufacturers' start-up and operating instructions. Adjust the analyzer and chiller as needed to optimize performance.

(2) *Equipment setup.* Connect an ozonator's inlet to a zero-air or oxygen source and connect its outlet to one port of a three-way tee fitting. Connect an NO span gas to another port of the tee. Connect a heated line at 100°C to the last port, and connect a heated three-way tee to the other end of the line. Connect a dewpoint generator, set at a dewpoint of 50°C , to one end of a heated line at 100°C . Connect the other end of the line to the heated tee and connect a third 100°C heated line to

the chiller inlet. Provide an overflow vent line at the chiller inlet.

(3) *Adjustments.* For the following adjustment steps, set the analyzer to measure only NO (i.e., NO mode), or only read the NO channel of the analyzer:

(i) With the dewpoint generator and the ozonator off, adjust the NO and zero-gas flows so the NO concentration at the analyzer is at least two times the peak total NO_x concentration expected during testing at the standard. Verify that gas is flowing out of the overflow vent line.

(ii) Turn on the dewpoint generator and adjust its flow so the NO concentration at the analyzer is at least at the peak total NO_x concentration expected during testing at the standard. Verify that gas is flowing out of the overflow vent line.

(iii) Turn on the ozonator and adjust the ozonator so the NO concentration measured by the analyzer decreases by the same amount as the maximum concentration of NO_2 expected during testing. This ensures that the ozonator is generating NO_2 at the maximum concentration expected during testing.

(4) *Data collection.* Maintain the ozonator adjustment in paragraph (d)(3) of this section, and keep the NO_x analyzer in the NO only mode or only read the NO channel of the analyzer.

(i) Allow for stabilization, accounting only for transport delays and instrument response.

(ii) Calculate the mean of 30 seconds of sampled data from the analyzer and record this value as NO_{ref} .

(iii) Switch the analyzer to the total NO_x mode, (that is, sum the NO and NO_2 channels of the analyzer) and allow for stabilization, accounting only for transport delays and instrument response.

(iv) Calculate the mean of 30 seconds of sampled data from the analyzer and record this value as $\text{NO}_{x\text{meas}}$.

(v) Turn off the ozonator and allow for stabilization, accounting only for transport delays and instrument response.

(vi) Calculate the mean of 30 seconds of sampled data from the analyzer and record this value as $\text{NO}_{x\text{ref}}$.

(5) *Performance evaluation.* Divide the quantity of $(\text{NO}_{x\text{meas}} - \text{NO}_{\text{ref}})$ by the