Environmental Protection Agency

§ 1065.376

Chiller NO\textsubscript{2} penetration.

(a) Scope and frequency. If you use a chiller to dry a sample upstream of a NO\textsubscript{x} measurement instrument, but you don’t use an NO\textsubscript{x}-to-NO converter upstream of the chiller, you must perform this verification for chiller NO\textsubscript{2} penetration. Perform this verification...
(b) **Measurement principles.** A chiller removes H\textsubscript{2}O, which can otherwise interfere with a NO\textsubscript{X} measurement. However, liquid H\textsubscript{2}O remaining in an improperly designed chiller can remove NO\textsubscript{2} from the sample. If a chiller is used without an NO\textsubscript{2}-to-NO converter upstream, it could remove NO\textsubscript{2} from the sample prior NO\textsubscript{X} measurement.

(c) **System requirements.** A chiller must allow for measuring at least 95% of the total NO\textsubscript{2} at the maximum expected concentration of NO\textsubscript{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 and data collection.**
   - (i) Zero and span the total NO\textsubscript{X} gas analyzer(s) as you would before emission testing.
   - (ii) Select an NO\textsubscript{2} calibration gas, balance gas of dry air, that has an NO\textsubscript{2} concentration within ±5% of the maximum NO\textsubscript{2} concentration expected during testing.
   - (iii) Overflow this calibration gas at the gas sampling system’s probe or overflow fitting. Allow for stabilization of the total NO\textsubscript{X} response, accounting only for transport delays and instrument response.
   - (iv) Calculate the mean of 30 seconds of recorded total NO\textsubscript{X} data and record this value as $x_{NOxref}$.
   - (v) Stop flowing the NO\textsubscript{2} calibration gas.
   - (vi) Next saturate the sampling system by overflowing a dewpoint generator’s output, set at a dewpoint of 50 °C, to the gas sampling system’s probe or overflow fitting. Sample the dewpoint generator’s output through the sampling system and chiller for at least 10 minutes until the chiller is expected to be removing a constant rate of H\textsubscript{2}O.
   - (vii) Immediately switch back to overflowing the NO\textsubscript{2} calibration gas used to establish $x_{NOxref}$. Allow for stabilization of the total NO\textsubscript{X} response, accounting only for transport delays and instrument response. Calculate the mean of 30 seconds of recorded total NO\textsubscript{X} data and record this value as $x_{NOxmeas}$.

   (viii) Correct $x_{NOxmeas}$ to $x_{NOxdry}$ based upon the residual H\textsubscript{2}O vapor that passed through the chiller at the chiller’s outlet temperature and pressure.

(3) **Performance evaluation.** If $x_{NOxdry}$ is less than 95% of $x_{NOxref}$, repair or replace the chiller.

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

1. You may omit this verification if you can show by engineering analysis that for your NO\textsubscript{X} sampling system and your emission calculations procedures, the chiller always affects your brake-specific NO\textsubscript{X} emission results by less than 0.5% of the applicable NO\textsubscript{X} standard.

2. You may use a chiller 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.

§ 1065.378 NO\textsubscript{2}-to-NO converter conversion verification.

(a) **Scope and frequency.** If you use an analyzer that measures only NO to determine NO\textsubscript{X}, you must use an NO\textsubscript{2}-to-NO converter upstream of the analyzer. Perform this verification after installing the converter, after major maintenance and within 35 days before an emission test. This verification must be repeated at this frequency to verify that the catalytic activity of the NO\textsubscript{2}-to-NO converter has not deteriorated.

(b) **Measurement principles.** An NO\textsubscript{2}-to-NO converter allows an analyzer that measures only NO to determine total NO\textsubscript{X} by converting the NO\textsubscript{2} in exhaust to NO.

(c) **System requirements.** An NO\textsubscript{2}-to-NO converter must allow for measuring at least 95% of the total NO\textsubscript{2} at the maximum expected concentration of NO\textsubscript{2}.

(d) **Procedure.** Use the following procedure to verify the performance of a NO\textsubscript{2}-to-NO converter: