AQ-SPEC

Air Quality Sensor Performance Evaluation Center

Sensor Description

Manufacturer/Model:
Ecomesure/EcomSmart

Pollutants:
CO

Time Resolution:
1-min

Type: Electrochemical

Additional Information

Field evaluation report:
http://www.aqmd.gov/aq-spec/evaluations/criteria-pollutants/field

Lab evaluation report:
http://www.aqmd.gov/aq-spec/evaluations/criteria-pollutants/laboratory

AQ-SPEC website:
http://www.aqmd.gov/aq-spec

Evaluation Summary

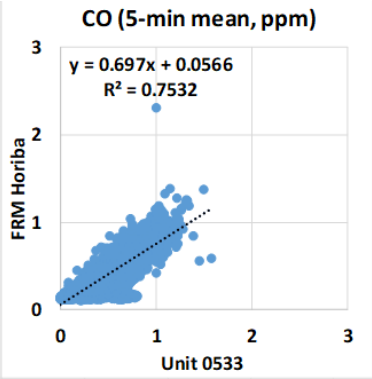
- Overall, the accuracy of the Ecomesure EcomSmart sensors ranged from 75.4% to 77.7%. Overall, the sensors overestimated the CO measurements from FRM T300U in the laboratory experiments at 20°C and 40% RH at all CO concentrations tested.
- The Ecomesure EcomSmart sensors exhibited high precision for all T/RH combinations and all CO concentrations.
- The Ecomesure EcomSmart sensors (IDs: 0531, 0532, 0533) showed low to moderate intra-model variability in the field and laboratory evaluations.
- Data recovery was ~96% - 100% from all units in both field and laboratory evaluations.
- The Ecomesure EcomSmart sensors showed strong correlations ($0.75 < R^2 < 0.81$, 5-min mean) with the corresponding FRM Horiba data in the field evaluation and very strong correlations with the FRM T300U in the laboratory evaluations ($R^2 \sim 0.91$).
- The same three Ecomesure EcomSmart units were tested both in the field (1st stage of testing) and in the laboratory (2nd stage of testing). Note that Unit 0531 did not transmit data for all experiments carried out at 35°C and the interferent tests.

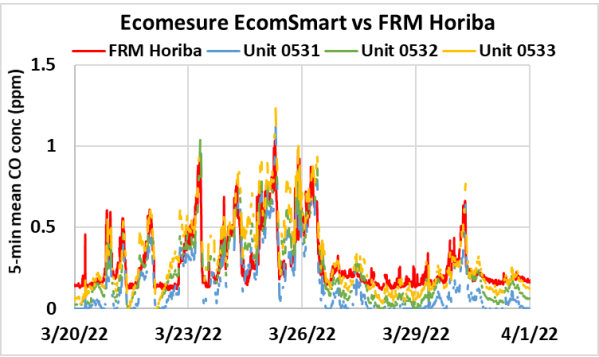
Field Evaluation Highlights

- Deployment period 03/10/2022 to 05/10/2022 : the three Ecomesure EcomSmart sensors showed strong correlations with the corresponding FRM CO data.
- The units exhibited moderate intra-model variability and data recovery for CO measurements was ~96% from all units.

5-min mean

$0.75 < R^2 < 0.81$





Coefficient of Determination (R^2) quantifies how the three sensors followed the CO concentration change by the reference instruments.

An R^2 approaching the value of 1 reflects a near perfect agreement, whereas a value of 0 indicates a complete lack of correlation.

Laboratory Evaluation Highlights

Accuracy (CO)

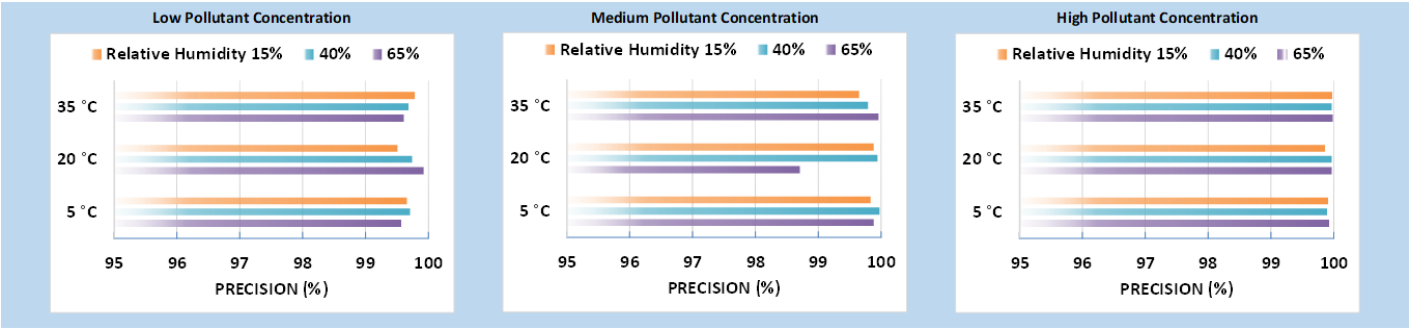
$$A\,(\%) = 100 - \frac{|\bar{X} - \bar{R}|}{\bar{R}} * 100$$

Steady State (#)	Sensor Mean (ppm)	FRM T300U (ppm)	Accuracy (%)
1	1.3	1.1	77.5
2	5.1	4.1	75.4
3	8.9	7.3	77.7

Accuracy was evaluated by a concentration ramping experiment at 20°C and 40% RH. The sensor's readings at each ramping steady state are compared to the reference instrument.

A negative % means sensors' overestimation by more than two fold. The higher the positive value (close to 100%), the higher the sensor's accuracy.

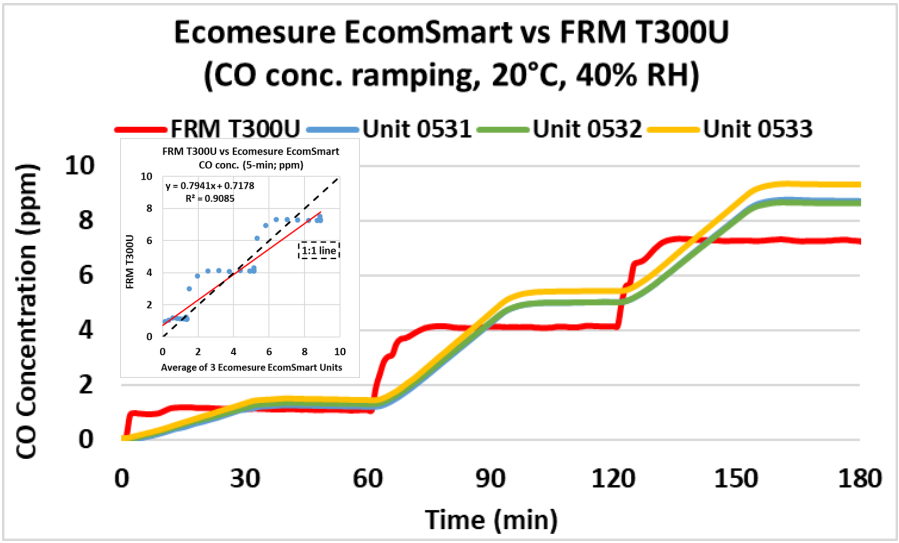
Precision (CO)



100% represents high precision.

Sensor's ability to generate precise measurements of CO concentration at low, medium, and high pollutant levels were evaluated under 9 combinations of T and RH, including extreme weather conditions like cold and dry (5°C and 15% RH) cold and humid (5°C and 65% RH), hot and humid (35°C and 65% RH), or hot and dry (35°C and 15% RH).

Coefficient of Determination



The Ecomesure EcomSmart sensors showed very strong correlations with the corresponding FRM T300U CO data ($R^2 \sim 0.91$) at 20°C and 40% RH.

Climate Susceptibility

From the laboratory studies, temperature and relative humidity had minimal effect on the precision of the Ecomesure EcomSmart sensors' CO measurements.

Observed Interferents

N/A

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