



San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Technical Evaluation of Sensor Technology (TEST) Program

*Dylos Sensor
2020 – 4th Quarter*



Introduction and Sensor Profile

This analysis report is focused on assessing the performance of the Dylos DC1100 sensor as a part of the District's Technical Evaluation of Sensor Technology (TEST) Program. The Dylos sensor uses optical laser-based particle counting methodology to estimate the concentration of PM2.5 and PM10. The Dylos sensor counts and measures the size of the individual particles to calculate a mass concentration.

Background and Approach of Evaluation Test

In May 2019, the District installed three Dylos sensors at the Clovis-Villa air monitoring station for the purpose of testing the Dylos sensors in the San Joaquin Valley and comparing the performance of the collocated Dylos sensors to the Federal Equivalent Method (FEM) PM2.5 analyzer. The data sets analyzed for this report compare PM2.5 data collected from the Dylos sensors and the MetOne BAM-1020 FEM monitor collocated at the regulatory air monitoring site. The scatter plots and time series graphs below show how the datasets compare for both hourly values and the 24-hour average.

Overview of Analysis Findings from Current Period

The analysis for this report covers the time period of October 2020 through December 2020 (2020 – 4th quarter). During this period, hourly data was removed from the calculation of bias when either the Dylos sensor or regulatory monitor did not have a valid hourly sample. For the 24-hour averages, only days with 18 or more valid hourly samples (75% or greater completeness) are included.

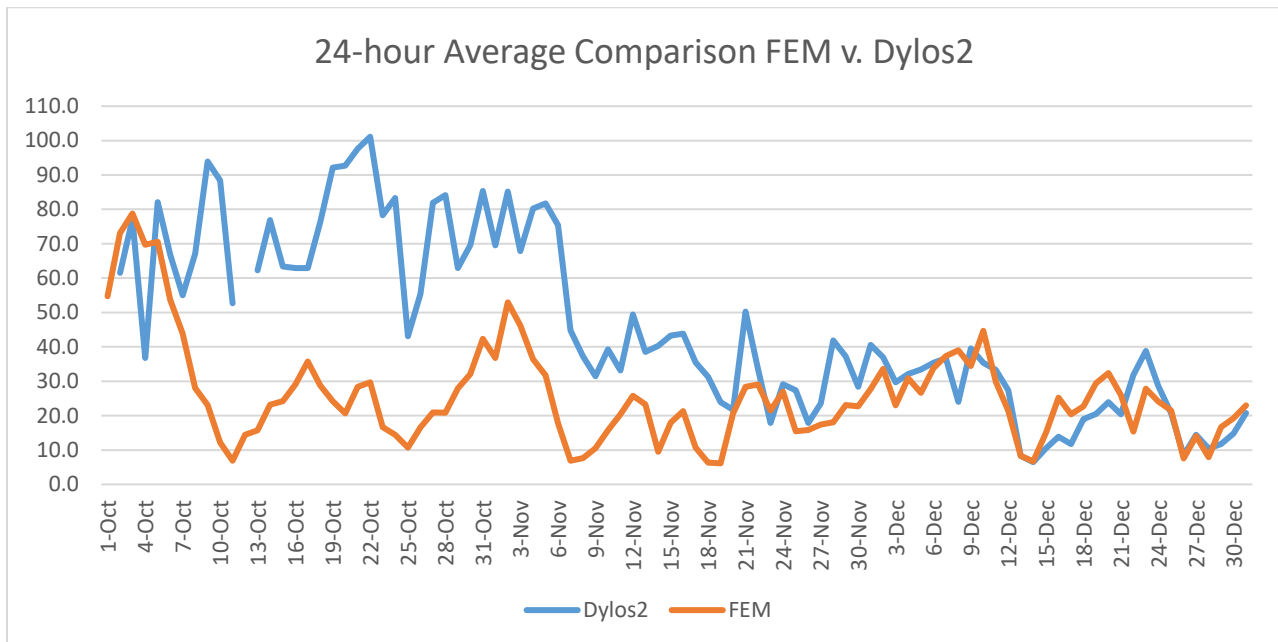
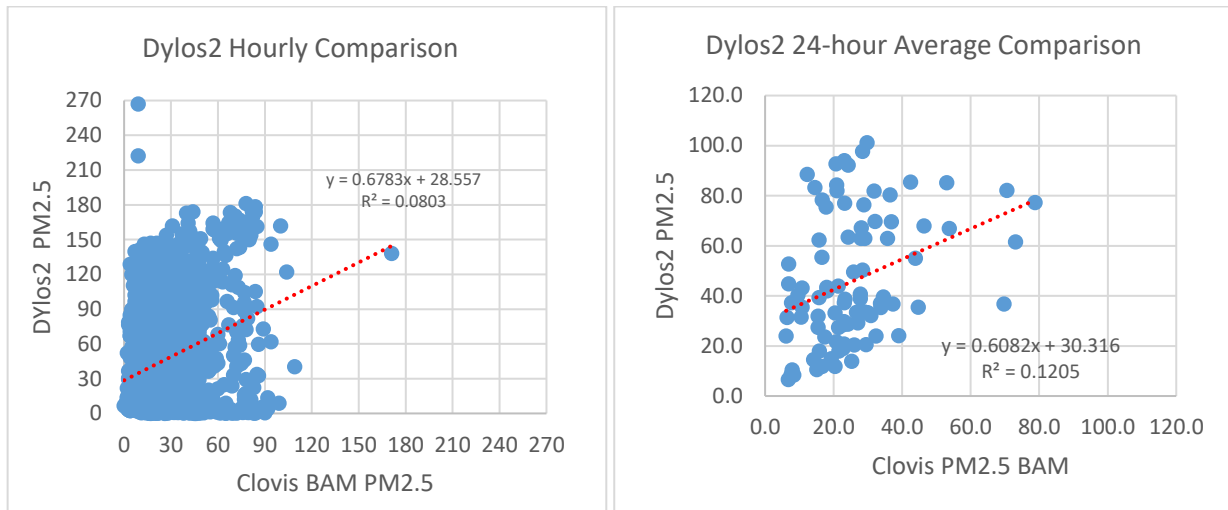
Of the three Dylos sensors collocated at the Clovis, only Dylos 2 and Dylos 3 sensors captured enough data during the 2020 4th quarter to complete analysis against the FEM. The Dylos 1 sensor reported intermittent data, which was not enough data to analyze for this report.

Seasonally, PM2.5 is typically highest during the winter months and lowest during the summer months. Weather systems can influence PM2.5 levels by either trapping pollutants near the surface or dispersing them. Generally, California's weather pattern is characterized by high pressure systems and low pressure systems that move through the region every two to four days in alternating fashion however the high pressure systems that built over the region in October 2020 remained in place for longer durations of time. Much of October was characterized by elevated PM2.5 levels due to the combination of extended periods of strong stability and wildfire smoke impacts. Wildfire activity subsided in November 2020 and PM2.5 concentrations were able to decrease through the month. An alternating pattern of high and low pressures systems moved through region during December, however, the trajectories of most of the low pressure systems that passed through were such that they did not provide good dispersion for the Valley. Thus the majority of December was governed by stability and elevated PM2.5 levels.

Analysis of Dylos Sensor Performance

Dylos 2

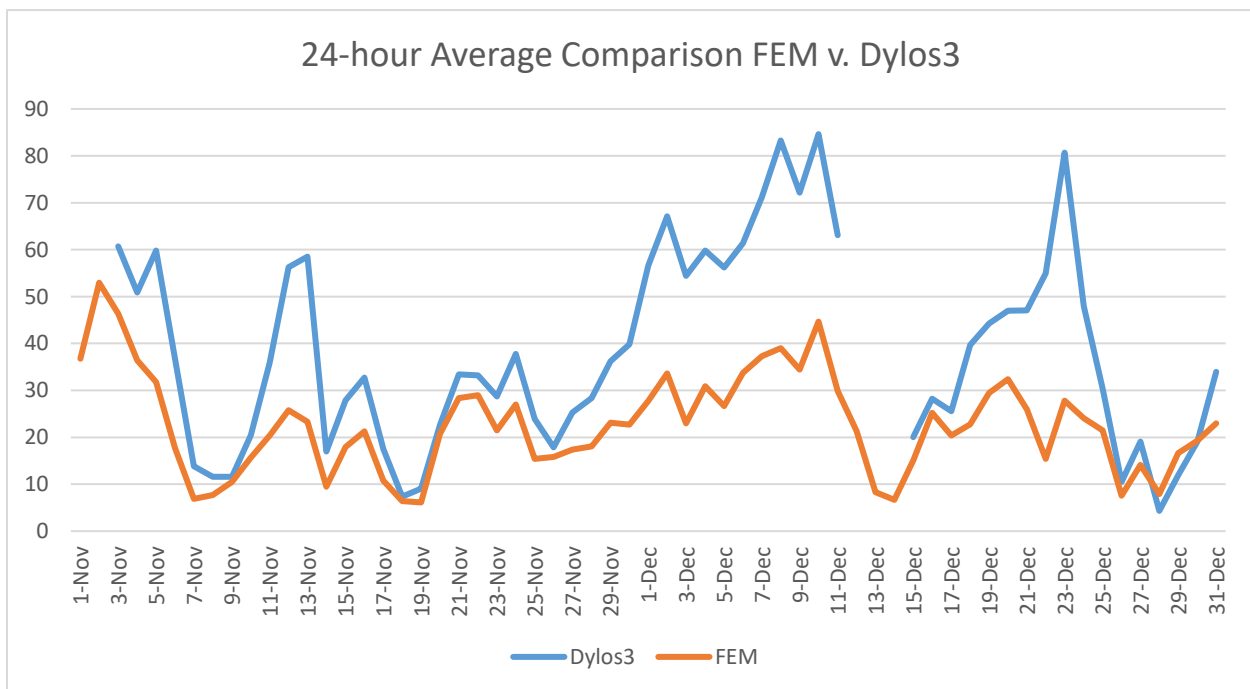
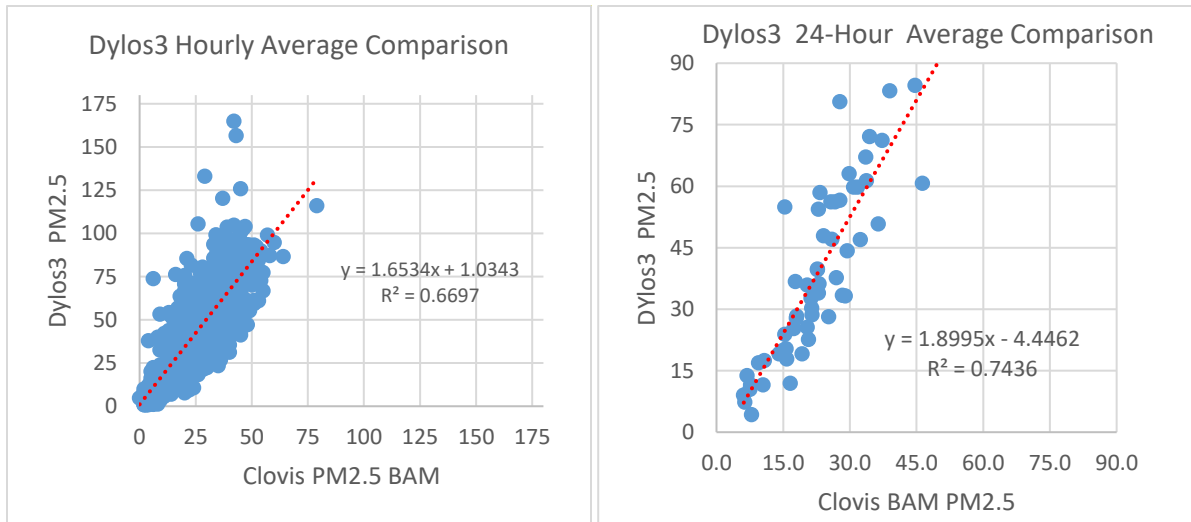
For the 24-hour average, Dylos data had a 20.26 $\mu\text{g}/\text{m}^3$ high bias during the October 2020 through December 2020 period. For the hourly average, Dylos data had a 20.31 $\mu\text{g}/\text{m}^3$ high bias over the same period.



Dylos 3

There were intermittent measurements from Dylos 3 during this period. Only data from November through December 2020 were used in the analysis below.

For the 24-hour average, Dylos data had a 15.8 $\mu\text{g}/\text{m}^3$ high bias during the November 2020 through December 2020 period. For the hourly average, Dylos data had a 15.8 $\mu\text{g}/\text{m}^3$ high bias over the same period.



Dylos 1

There were intermittent measurements from Dylos1 sensors during this period. When data becomes more consistent, the sensor will be included in future reports.

Statistical Summary

The following table provides a statistical summary of the PM2.5 data collected during the analysis period of this report. Note the Dylos1 and Dylos3 sensors collected intermittent data during this period.

Clovis-Villa	Average 24-hr	Max 1-hr	Max 24-hr	1-hr R2	1-hr Slope	1-hr Intercept	24-hr R2	24-hr Slope	24-hr Intercept
Dylos 1	---	---	---	---	---	---	---	---	---
Dylos 2	45.9	266.8	101.1	0.0803	0.6783	28.557	0.1205	0.6082	30.316
Dylos 3	38.4	165.1	84.6	0.6697	1.6534	1.0343	0.7436	1.8995	-4.4462
FEM	25.9	171.0	78.8						