CHARACTERIZATION OF COTTON GIN TOTAL PARTICULATE MATTER EMISSIONS BASED ON EPA STACK SAMPLING METHODOLOGIES

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Abstract

A project to characterize cotton gin emissions in terms of stack sampling was conducted during the 2008 through 2011 ginning seasons. The impetus behind the project was the urgent need to collect additional cotton gin emissions data to address current regulatory issues. EPA AP-42 emission factors are generally assigned a rating that is used to assess the quality of the data being referenced. The ratings can range from A (Excellent) to E (Poor). EPA current total particulate emission factor quality ratings for cotton gins are extremely low. Cotton gins received these low ratings because the data were collected almost exclusively from a single geographical region. The objective for this study was to collect additional total particulate emission factor data for cotton gin systems in regions across the cotton belt based on the EPA approved stack sampling methodologies: Other Test Method 27; Method 201A; and Method 17. Emission factors were developed for 17 different ginning systems including: unloading, 1st stage seed-cotton cleaning, 2nd stage seed-cotton cleaning, 3rd stage seed-cotton cleaning, overflow, 1st stage lint cleaning, 2nd stage lint cleaning, combined lint cleaning, cyclone robber, 1st stage mote, 2nd stage mote, combined mote, mote cyclone robber, mote cleaner, mote trash, battery condenser and master trash. Results showed very good agreement in measured total emissions for the gin systems among the three sampling methods (Figure 1). Total particulate emission factors were generally lower than AP-42 values (Figure 2). Combining the measured emission factors for systems that represent a typical gin in AP-42 (Table 1), the typical AP-42 gin total particulate emission factor was 1.743 lb/bale; about 27% less than the current AP-42 value of 2.4 lb/bale. If the test results were merged with AP-42, in most cases more than doubling the size of the dataset, the merged total particulate emission factor for the typical AP-42 gin would be 1.914 lb/bale; about 20% less than the current AP-42 value.

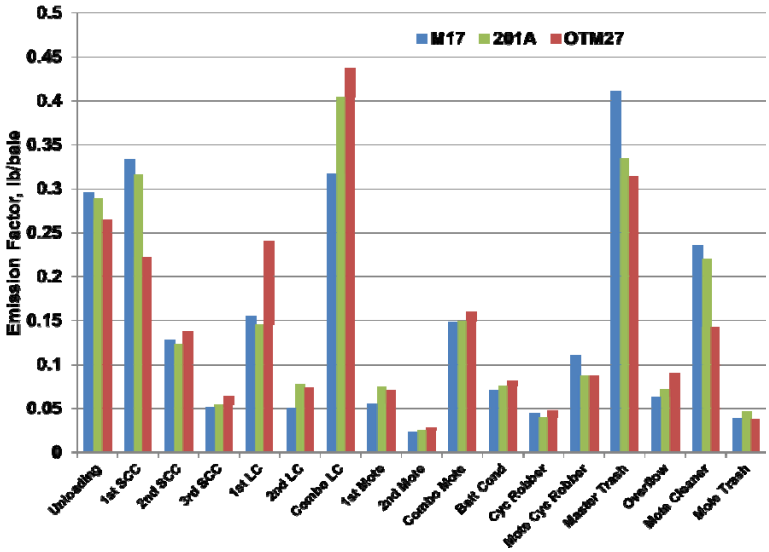

Figure 1. Average measured total emission factors from EPA Method 17, Method 201A, and Other Test Method 27.

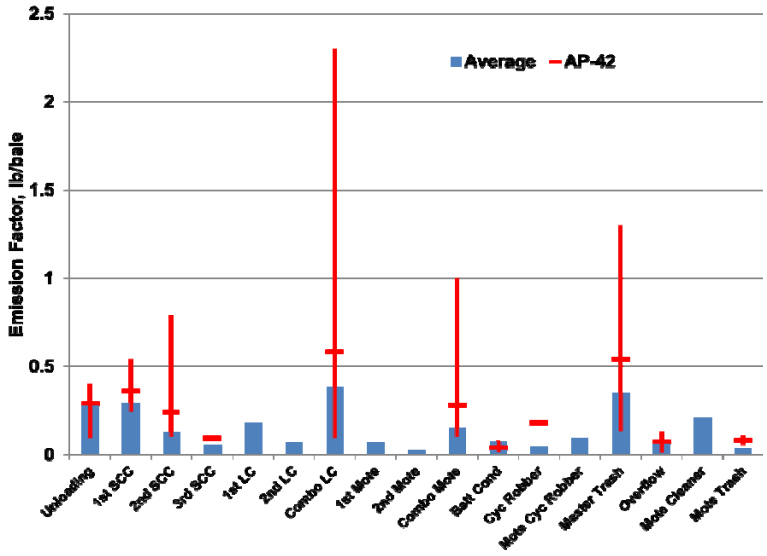

Figure 2. Average measured total particulate emission factors compared to EPA AP-42 emission factor averages (horizontal, red bars) and ranges (vertical, red error bars).

Table 1. Average measured total particulate emission factors compared and merged with EPA AP-42 emission factors.

	Unloading	1st Seed-cotton Cleaning	2nd Seed-cotton Cleaning	Combined Lint Cleaning	Combined Mote Systems	Battery Condenser	Master Trash	Overflow	Typical AP-42 Gin
Measured, lb/bale	0.283	0.291	0.129	0.384	0.153	0.076	0.353	0.075	1.743
No. of tests	9	21	13	20	21	18	15	9	
AP-42, lb/bale	0.285	0.359	0.243	0.583	0.277	0.039	0.535	0.071	2.4
No. of tests	8	7	7	6	9	5	4	4	
Difference									
Measured – AP-42	-0.6%	-19%	-47%	-34%	-45%	92%	-34%	5%	-27%
Merged, lb/bale	0.284	0.308	0.169	0.430	0.190	0.068	0.392	0.074	1.914
No. of tests	17	28	20	26	30	23	19	13	
Difference									
Merged – AP-42	-0.3%	-14%	-31%	-26%	-31%	72%	-27%	4%	-20%