

Eliminating the Mandatory Testing Requirement for Toxic Air Contaminants for Hot Mix Asphalt Plants in Michigan

Prepared by
Michigan Department of Environmental Quality
Air Quality Division
June 1, 2012

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1.0 Summary

The Michigan Department of Environmental Quality, Air Quality Division (AQD), has the responsibility for maintaining Michigan's air quality. One of the ways the AQD achieves this is through the permitting process. The permitting process estimates emissions from various industrial source types, sets emission limits for the pollutants, and assesses the effect on human health and the environment.

One of the source types permitted by the AQD are hot mix asphalt (HMA) plants. Traditionally the AQD has included emission limits for the federally regulated pollutants of particulate matter (PM), carbon monoxide (CO), sulfur dioxide (SO₂), and oxides of nitrogen (NO_x) in permits for HMA plants. The emission limits for these pollutants are typically expressed in terms of pounds per hour, tons per 12-month rolling time period, and pounds per ton of HMA paving material produced.

Since 2000, the AQD has also included emission limits for the thirteen other pollutants of concern listed below. These values are expressed in terms of pounds of pollutant per ton HMA paving material produced. The AQD has also included the requirement to perform emission testing to verify compliance with the emission limits for these thirteen pollutants.

The thirteen pollutants of concern are:

- Acrolein
- Arsenic
- Benzene
- Ethyl benzene
- Formaldehyde
- Hydrogen chloride
- Lead
- Manganese
- Napthalene
- Nickel
- Sulfuric acid mist
- Toluene
- Xylene

The AQD has reviewed the results of actual stack test data and concluded that the emission factors contained in the permit template are reasonable factors and provide an adequate compliance margin. Therefore, the AQD has determined there is sufficient technical justification for no longer including the mandatory testing requirements for these thirteen pollutants in permits issued after June 1, 2012.

2.0 Recommendations

Based upon the AQD's analysis of the data, the following recommendations are made:

- The test data indicates that there is sufficient justification for removing the testing requirements for the following thirteen pollutants:
 - Acrolein
 - Arsenic
 - Benzene
 - Ethyl benzene
 - Formaldehyde
 - Hydrogen chloride
 - Lead
 - Manganese
 - Napthalene
 - Nickel
 - Sulfuric acid mist
 - Toluene
 - Xylene

- If the testing requirements are removed, the AQD will continue to maintain the authority to require testing under General Condition 13.

- Although it is recommended to delete the testing requirements for the above pollutants, it is **not** recommended to remove the emission limits from permits.

- The allowable emission limits, which are contained in the permit template, are appropriate and do not need to be revised.

- It should be noted that there may be circumstances where the emission limits may need to be more stringent than the default values. Examples include unusual site and dispersion characteristics and/or the specific materials proposed to be processed.

- For some of the pollutants, there is a large compliance margin between the allowable emissions and the actual emissions. Without site specific test results, the default limit will be used to calculate facility-wide hazardous air pollutant (HAP) emissions. The permit engineer should verify that facility HAP limits will not be exceeded using the projected annual HMA production of the plant and the default emission limits.

- For those facilities that have the mandatory testing included in their active permit and have not completed the testing, the facility may submit a permit application requesting the permit conditions be revised. The AQD will not, however, eliminate the testing requirements for facilities that were required to complete their testing prior to June 1, 2012.

Attached to this report, as Appendix A, is a copy of the updated Asphalt Plant Permit Template with the mandatory testing requirements for the thirteen pollutants removed.

The AQD is also proposing the following additional changes to the Asphalt Plant Permit Template:

- The addition of PM10 and PM2.5 emission limits
- Updates to applicable requirements
- Formatting updates

3.0 Data Analysis

To begin this analysis, AQD started with a list of 154 asphalt plants identified as having “active permits.” 26 of the 154 permits were Wayne County air permits and were not included in the accumulated data. Of the remaining 128 state permits, 27 required stack testing in order to demonstrate compliance with their limits for some or all of the thirteen pollutants of concern. Of the 27 plants required to test, only 17 have successfully completed their testing. The remaining 10 plants were either not built; are not currently in operation; are not required to have their testing completed yet; or have not yet done their required testing.

The 17 plants included in this analysis were assigned a generic plant number to allow for anonymity. Due to the timeframes for permit issuance and available test data, all plants were not required to test for all thirteen pollutants. For example, Plant 5 was only required to test for hydrogen chloride. The plants tested varied in type (i.e. dual drum, counter-flow, etc.). There were also several cases where non-detectable levels of different pollutants were recorded.

For each data set of test results, an average emission rate, maximum emission rate, low emission rate, and standard deviation were calculated. In many of the tests it appears that there was a single outlier identified. Although the specific reason for the high measured value was not verified, it is possible that the testing protocol or procedures may have introduced these errors. AQD testing staff agreed that these outlier values should be eliminated from the evaluation. As such, where applicable, a separate analysis was done and new statistics were calculated excluding the outlier. It should also be noted that when there were no detectable levels of a toxic air contaminant measured, the test value was not included in the analysis.

Following is a summary of the statistical information on a pollutant specific basis:

Table 1. Stack Sampling Data Summary

Toxic Air Contaminant	High test value, lb/ton	Low test value, lb/ton	Average test value, lb/ton	Standard Deviation	Default Allowable Limit, lb/ton
Acrolein	8.83E-4	4.00E-6	1.52E-4	0.00024	1.00E-3
Arsenic	8.32E-7	5.25E-8	2.64E-7	2.68E-7	1.00E-6
Benzene	8.94E-4	3.80E-5	3.61E-4	0.00024	1.00E-3
Ethyl benzene	4.00E-4	5.46E-6	8.67E-5	0.00013	1.00E-3
Formaldehyde	4.30E-5	2.00E-3	1.25E-3	0.0013	1.00E-2
Hydrogen chloride	1.25E-3	2.40E-5	3.44E-4	0.00034	6.00E-3
Lead	3.50E-6	2.11E-9	1.36E-6	9.25E-7	1.50E-5
Manganese	3.50E-5	1.18E-6	9.24E-6	1.04E-5	5.00E-5
Napthalene	2.00E-4	6.20E-6	5.47E-5	5.95E-5	1.00E-3
Nickel	3.39E-6	1.62E-7	1.54E-6	1.12E-6	1.00E-4
Sulfuric acid mist	2.20E-3	4.00E-5	7.87E-4	7.40E-4	3.20E-3
Toluene	1.63E-3	6.55E-7	2.70E-4	1.6E-4	6.00E-3
Xylene	4.94E-4	1.33E-6	1.39E-4	1.60E-4	1.00E-3

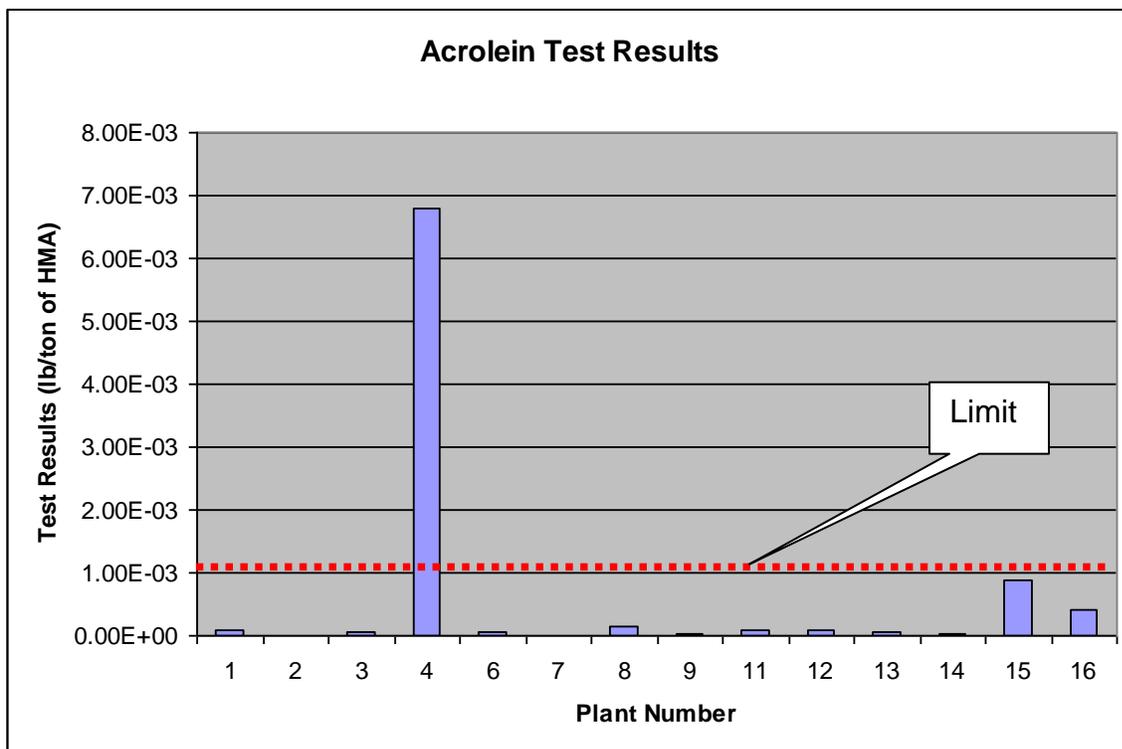
Acrolein

Allowable Limit = 1.00E-3 lb/ton HMA

Following are the stack test results for acrolein:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	9.4000E-05	dual drum	recycled used oil
2	1.3200E-05	double barrel drum	not specified in test report
3	7.1600E-05	counter-flow	recycled used oil
4	6.8000E-03	counter-flow	recycled used oil
6	6.7300E-05	parallel flow	natural gas
7	4.0000E-06	counter-flow	not specified in test report
8	1.4000E-04	counter-flow	recycled used oil
9	3.0000E-05	counter-flow	recycled used oil
11	1.0000E-04	counter-flow	recycled used oil
12	8.2000E-05	parallel flow	recycled used oil
13	6.0000E-05	parallel flow	recycled used oil
14	2.0200E-05	counter-flow	natural gas
15	8.8300E-04	parallel flow	recycled used oil
16	4.1000E-04	counter-flow	recycled used oil

Following is a graphical summary of the test data:

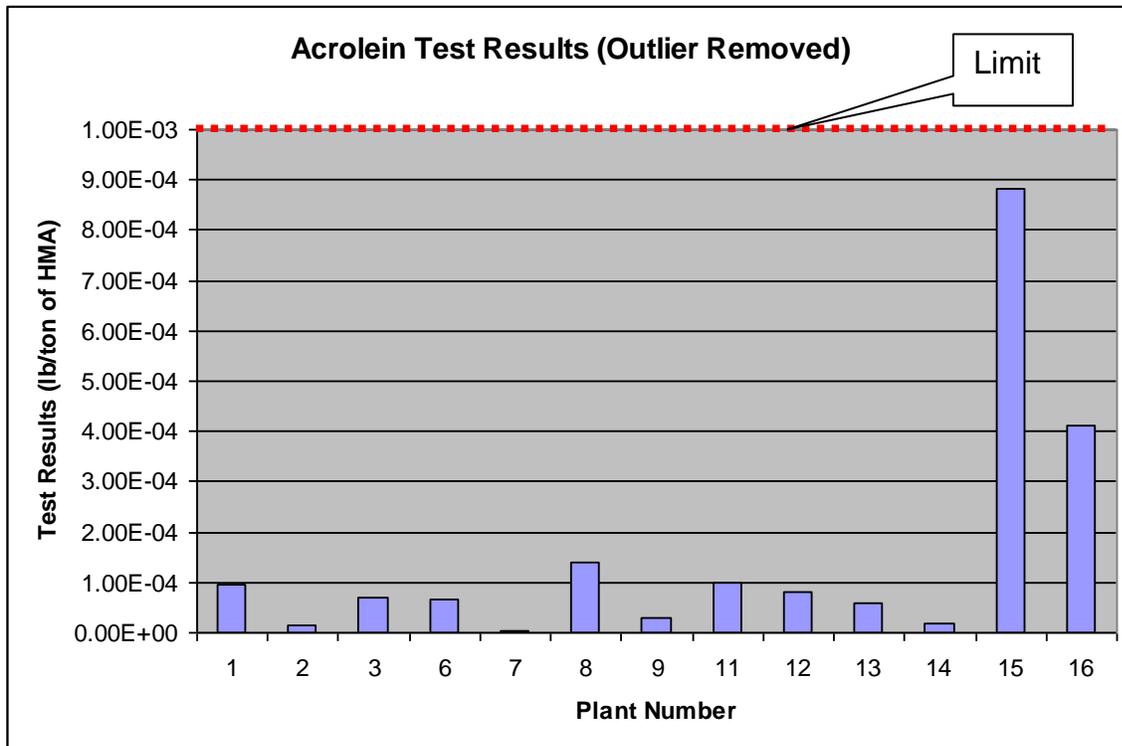


High Value: 6.8E-3 lb/ton
Low Value: 4E-6 lb/ton
Average Value: 6.27E-4 lb/ton
Standard Deviation: 0.00179

The current default allowable limit for acrolein is 0.001 lbs/ton.

Average test value percentage of default limit: 62.7%

An analysis of the data indicates that one test (No. 4) is substantially higher and out of range as compared to the rest of the test results. If this test data is excluded the data analysis indicates the following:



High Value: 8.83E-4 lb/ton
Low Value: 4.0E-6 lb/ton
Average Value: 1.52E-4 lb/ton
Standard Deviation: .00024

Average test value percentage of default limit: 15.2%

Recommendation: Based upon an analysis of the test data there is justification for removing the requirement to test for acrolein. The data indicates that one test value is clearly out of range with the other test values, however, even if this data is included with the other test data, the average tested value is still below the default permit allowable limit for acrolein.

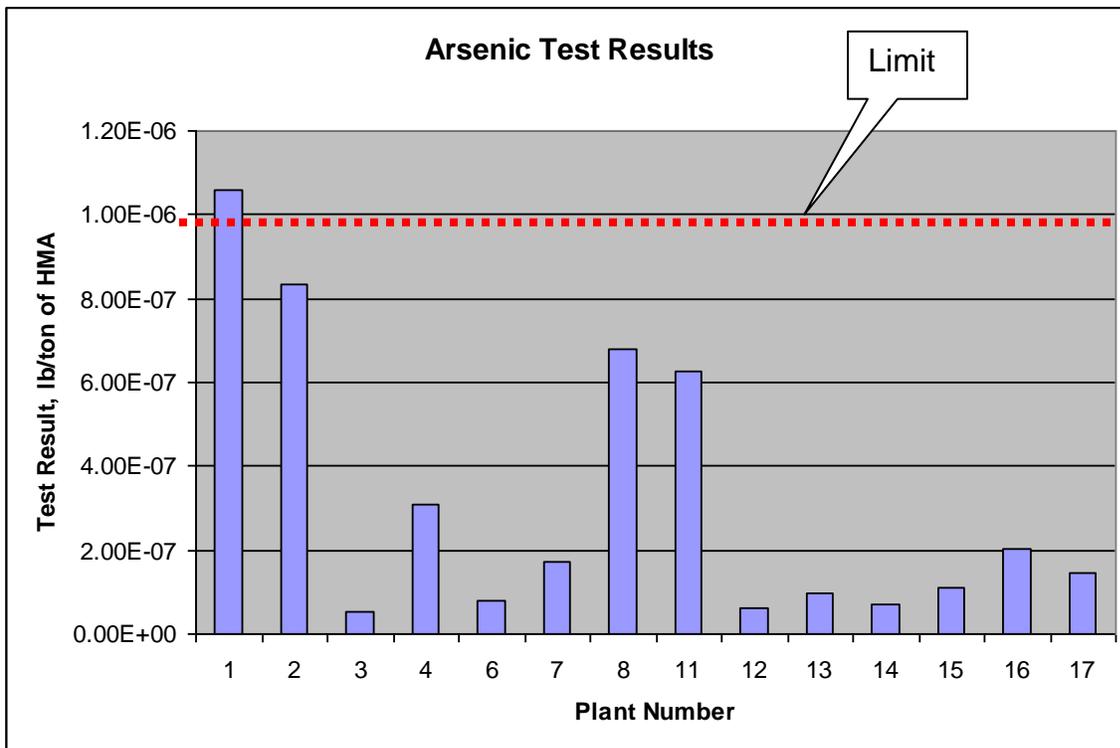
Arsenic

Allowable Limit = 1.00E-6 lb/ton HMA

Following are the stack test results for arsenic:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	1.0600E-06	Dual drum	recycled used oil
2	8.3200E-07	double barrel drum	not specified in test report
3	5.2500E-08	counter-flow	recycled used oil
4	3.1000E-07	counter-flow	recycled used oil
6	7.9700E-08	parallel flow	natural gas
7	1.7000E-07	counter-flow	not specified in test report
8	6.7800E-07	counter-flow	recycled used oil
11	6.2500E-07	counter-flow	recycled used oil
12	6.2900E-08	parallel flow	recycled used oil
13	9.6300E-08	parallel flow	recycled used oil
14	6.9200E-08	counter-flow	natural gas
15	1.1100E-07	parallel flow	recycled used oil
16	2.0100E-07	counter-flow	recycled used oil
17	1.4400E-07	counter-flow	recycled used oil

Following is a graphical analysis of the test data:

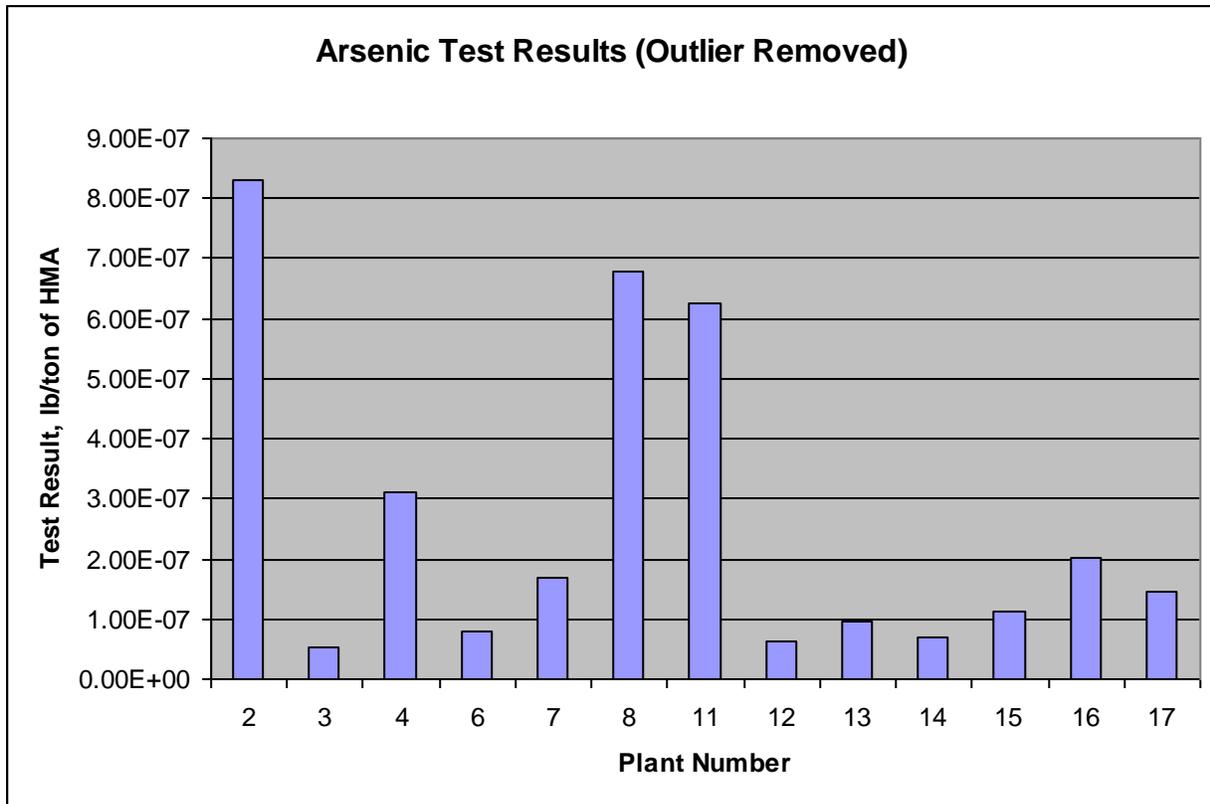


High Value: 1.06E-6 lb/ton
Low Value: 5.25E-8 lb/ton
Average Value: 3.21E-7 lb/ton
Standard Deviation: 3.34E-7

The current default allowable limit for arsenic is 0.000001 lbs/ton.

Average test value percentage of default limit: 32.1%

An analysis of the data indicates that one test (No. 1) is above the allowed limit. If this test data is excluded the data analysis indicates the following:



High Value: 8.32E-07 lb/ton
Low Value: 5.25E-8 lb/ton
Average Value: 2.64E-07 lb/ton
Standard Deviation: 2.68E-07

Average test value percentage of default limit: 26.4%

Recommendation: Based upon an analysis of the test data there is justification for removing the requirement to test for arsenic. The data indicates that one test value is clearly out of range with the other test values, however even if this data is included with the other test data, the average tested value is still below the default permit allowable limit for arsenic.

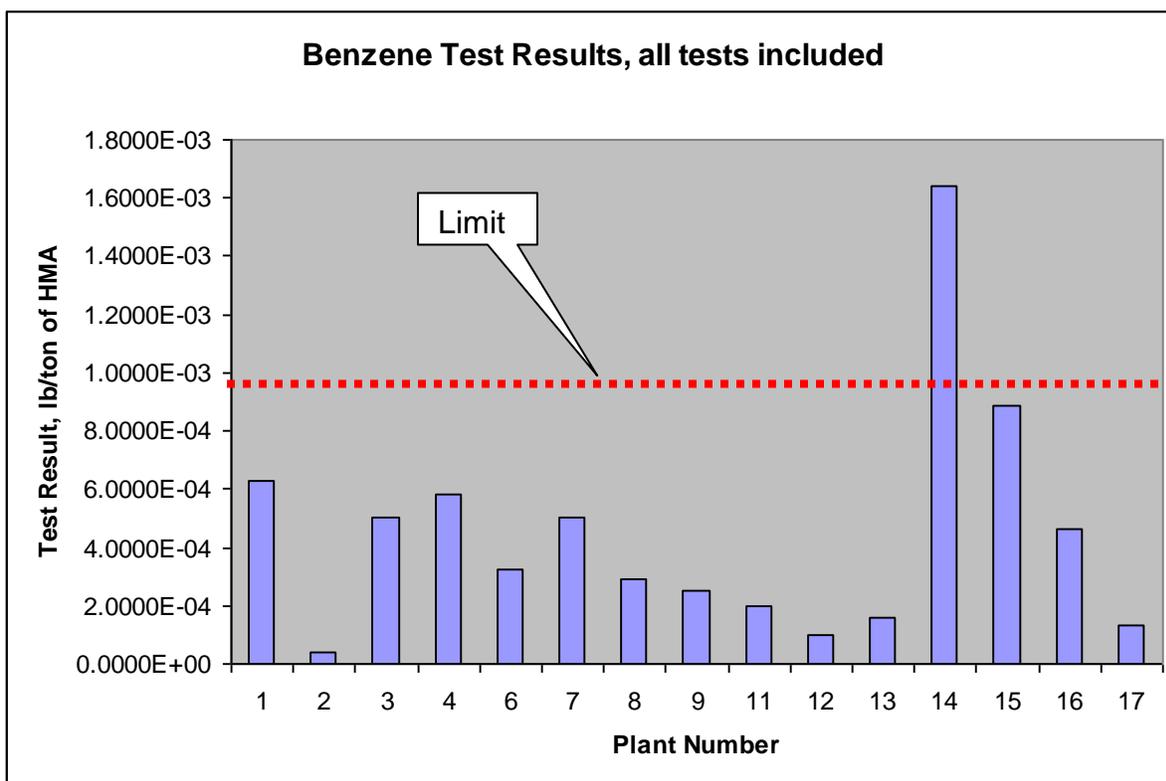
Benzene

Allowable Limit = 1.00E-3 lb/ton HMA

Following are the stack test results for benzene:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	6.3000E-04	dual drum	recycled used oil
2	3.8000E-05	Double barrel drum	not specified in test report
3	5.0100E-04	counter-flow	recycled used oil
4	5.8400E-04	counter-flow	recycled used oil
6	3.2700E-04	parallel flow	natural gas
7	5.0000E-04	counter-flow	not specified in test report
8	2.9000E-04	counter-flow	recycled used oil
9	2.5000E-04	counter-flow	recycled used oil
11	2.0000E-04	counter-flow	recycled used oil
12	1.0000E-04	parallel flow	recycled used oil
13	1.6000E-04	parallel flow	recycled used oil
14	1.6400E-03	counter-flow	natural gas
15	8.9000E-04	parallel flow	recycled used oil
16	4.6000E-04	counter-flow	recycled used oil
17	1.3100E-04	counter-flow	recycled used oil

Following is a graphical analysis of the data:

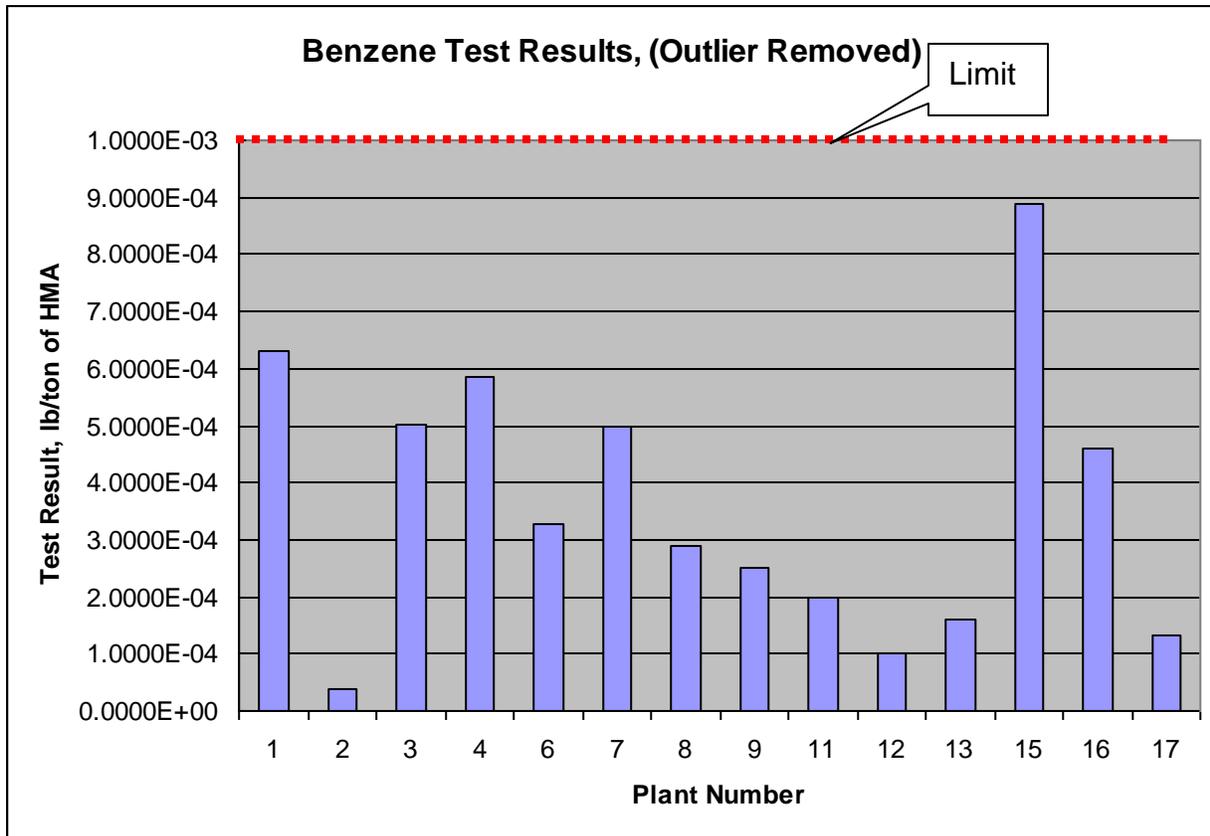


High Value: 1.64E-3 lb/ton
Low Value: 3.8E-5 lb/ton
Average Value: 4.7E-4 lb/ton
Standard Deviation: .0004

The current default limit for benzene is 0.001 lbs/ton.

Average test value percentage of default limit: 47%

An analysis of the data indicates that one test is substantially higher and out of range as compared to the rest of the test results. If this test data is excluded the data analysis indicates the following:



High Value: 8.9E-4 lb/ton
Low Value: 3.8E-5 lb/ton
Average Value: 3.61E-4 lb/ton
Standard Deviation: .00024

Average test value percentage of default limit: 36.1%

Recommendation: Based upon an analysis of the test data there is justification for removing the requirement to test for benzene. The data indicates that one test value is clearly out of range with the other test values, however even if this data is included with the other test data, the average tested value is still below the default permit allowable limit for benzene.

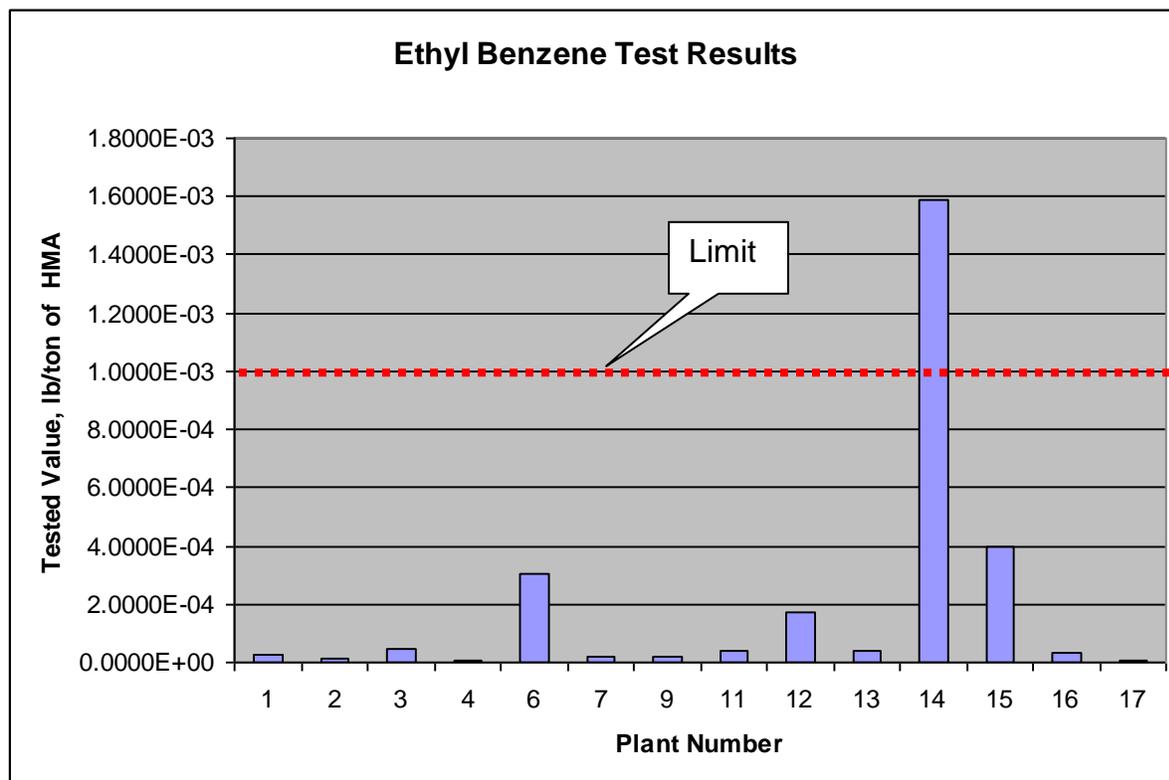
Ethylbenzene

Allowable Limit = 1.00E-3 lb/ton HMA

Following are the stack test results for ethylbenzene:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	2.8000E-05	dual drum	recycled used oil
2	1.2700E-05	double barrel drum	not specified in test report
3	4.9400E-05	counter-flow	recycled used oil
4	5.4600E-06	counter-flow	recycled used oil
6	3.0400E-04	parallel flow	natural gas
7	2.0000E-05	counter-flow	not specified in test report
8	non-detectable	counter-flow	recycled used oil
9	2.0000E-05	counter-flow	recycled used oil
11	4.0000E-05	counter-flow	recycled used oil
12	1.7000E-04	parallel flow	recycled used oil
13	4.0000E-05	parallel flow	recycled used oil
14	1.5900E-03	counter-flow	natural gas
15	4.0000E-04	parallel flow	recycled used oil
16	3.0000E-05	counter-flow	recycled used oil
17	6.9900E-06	counter-flow	recycled used oil

Following is a graphical analysis of the test data:

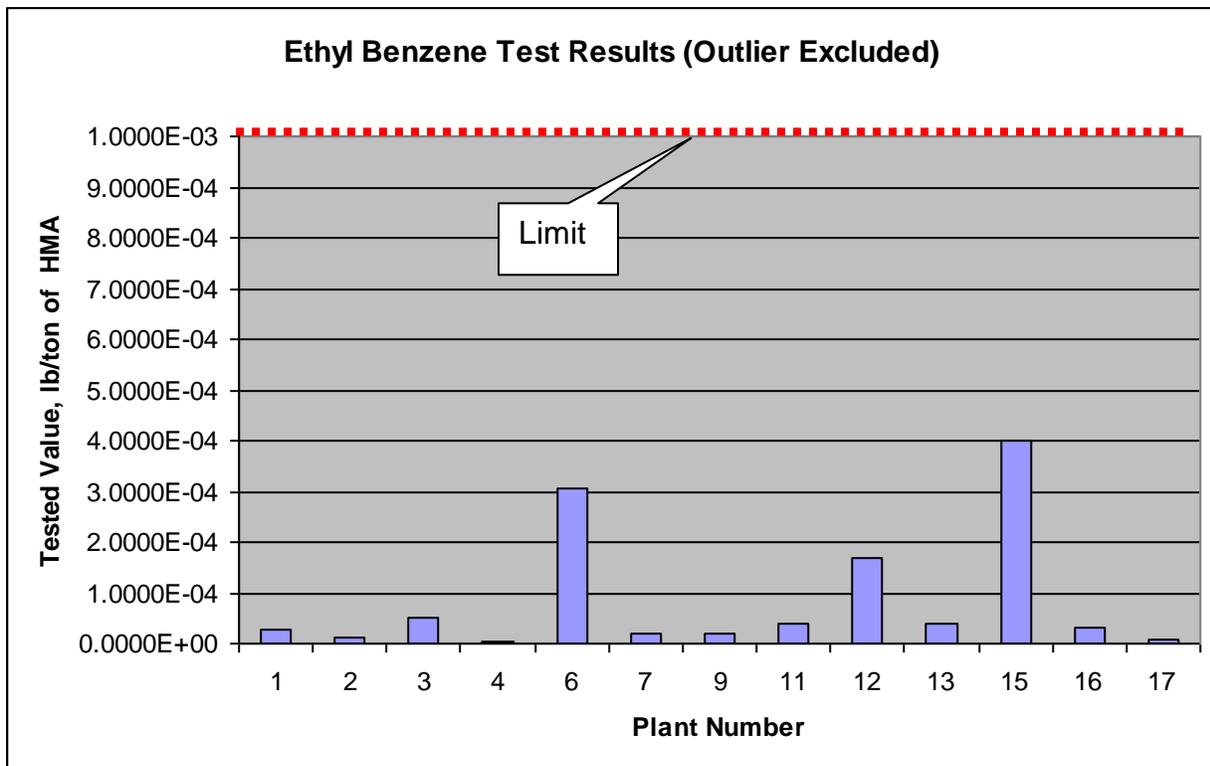


High Value: 1.59E-3 lb/ton
Low Value: 5.46E-6 lb/ton
Average Value: 1.94E-4 lb/ton
Standard Deviation: .00042

The current default limit for ethylbenzene is 0.001 lbs/ton.

Average test value percentage of default limit: 19.4%

An analysis of the data indicates that one test is substantially higher and out of range as compared to the rest of the test results. If this test data is excluded the data analysis indicates the following:



High Value: 4E-4 lb/ton
Low Value: 5.46E-6 lb/ton
Average Value: 8.67E-5 lb/ton
Standard Deviation: .00013

Average test value percentage of default limit: 8.67%

Recommendation: Based upon an analysis of the test data there is justification for removing the requirement to test for ethylbenzene. The data indicates that one test value is clearly out of range with the other test values, however even if this data is included with the other test data, the average tested value is still below the default permit allowable limit for ethylbenzene.

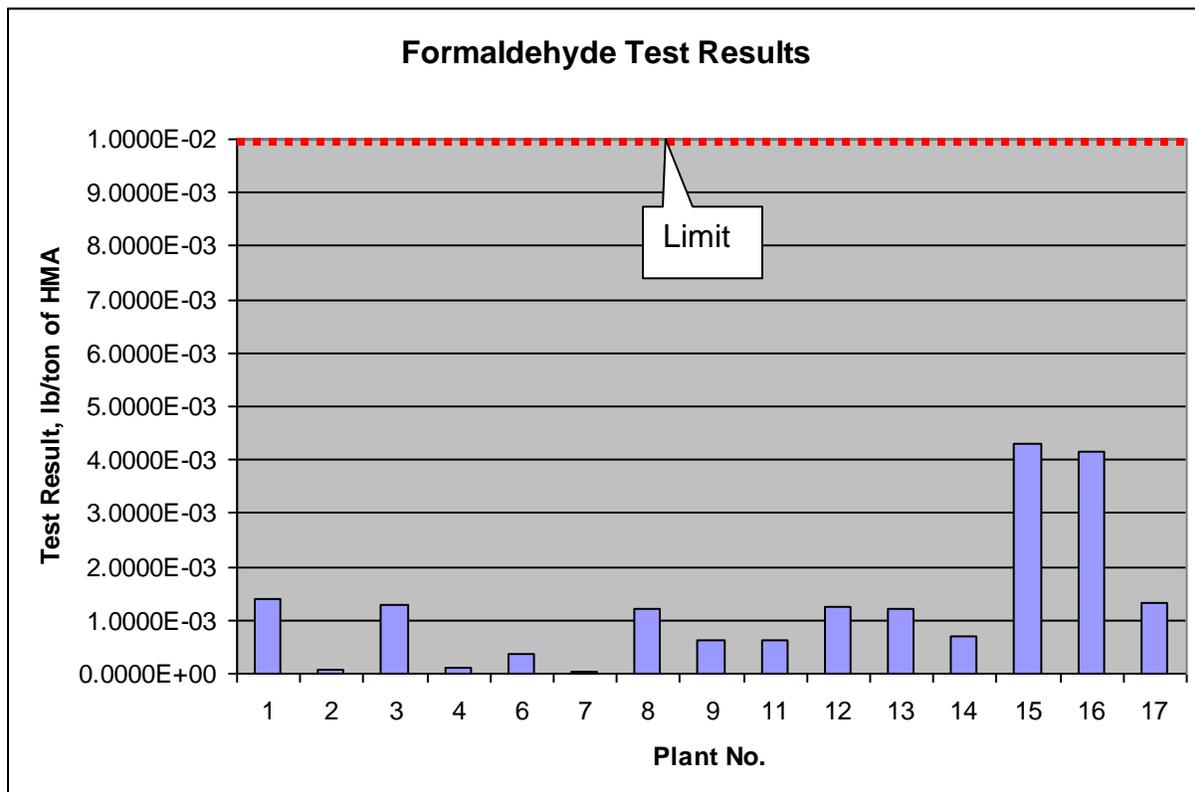
Formaldehyde

Allowable Limit = 1.00E-2 lb/ton HMA

Following are the stack test results for formaldehyde:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	1.3800E-03	dual drum	recycled used oil
2	7.4100E-05	double barrel drum	not specified in test report
3	1.3000E-03	counter-flow	recycled used oil
4	1.0000E-04	counter-flow	recycled used oil
6	3.8400E-04	parallel flow	natural gas
7	2.0000E-05	counter-flow	not specified in test report
8	1.2200E-03	counter-flow	recycled used oil
9	6.4000E-04	counter-flow	recycled used oil
11	6.4000E-04	counter-flow	recycled used oil
12	1.2600E-03	parallel flow	recycled used oil
13	1.2100E-03	parallel flow	recycled used oil
14	6.8900E-04	counter-flow	natural gas
15	4.3000E-03	parallel flow	recycled used oil
16	4.1600E-03	counter-flow	recycled used oil
17	1.3400E-03	counter-flow	recycled used oil

Following is a graphical analysis of the test data:



High Value: 4.3E-3 lb/ton
Low Value: 2E-5 lb/ton
Average Value: 1.25E-3 lb/ton
Standard Deviation: .0013

The current default limit for formaldehyde is 0.01 lbs/ton.

Average test value percentage of default limit: 12.5.%

Recommendation: Based upon an analysis of the test data and the fact that all tests done show results below the allowed limit, that there is justification for removing the requirement to test for formaldehyde.

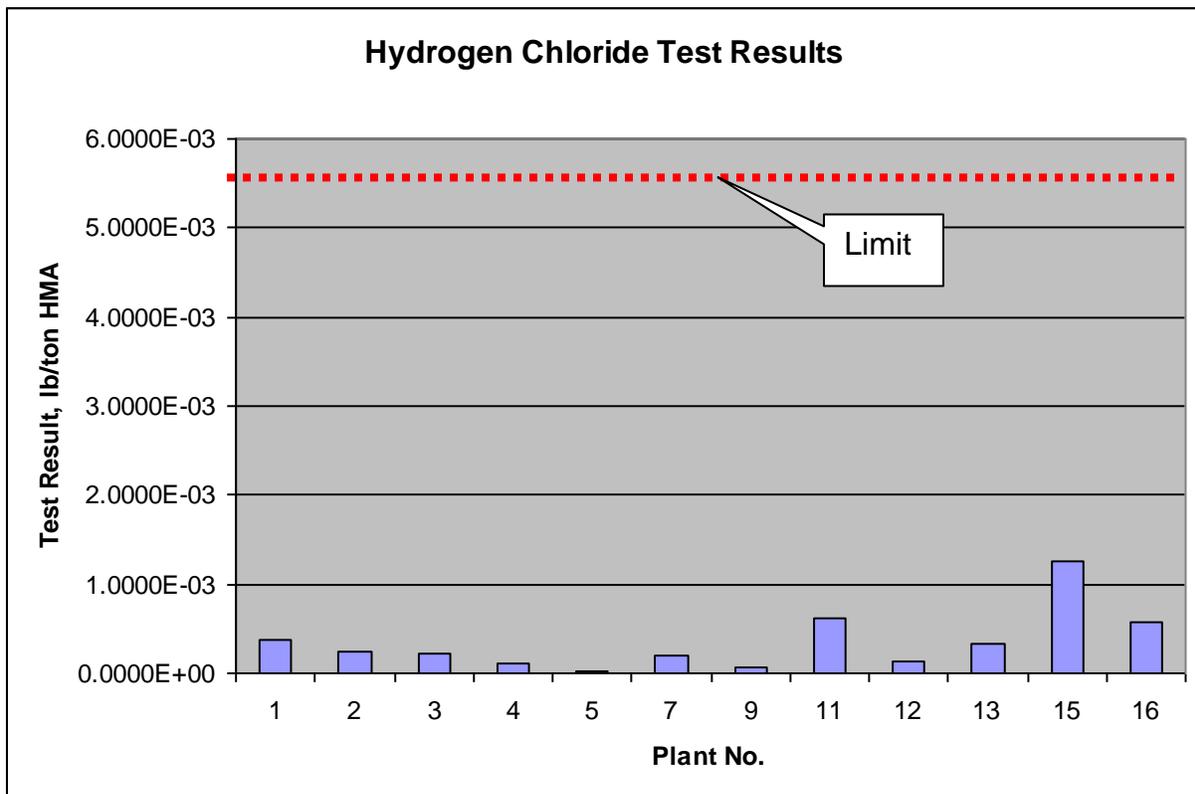
Hydrogen Chloride

Allowable Limit = 6.00E-3 lb/ton HMA

Following are the stack test results for hydrogen chloride:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	3.7000E-04	dual drum	recycled used oil
2	2.5000E-04	double barrel drum	not specified in test report
3	2.1400E-04	counter-flow	recycled used oil
4	9.9500E-05	counter-flow	recycled used oil
5	2.4000E-05	dual drum	not specified in test report
7	2.0000E-04	counter-flow	not specified in test report
9	6.0000E-05	counter-flow	recycled used oil
11	6.2000E-04	counter-flow	recycled used oil
12	1.3700E-04	parallel flow	recycled used oil
13	3.3000E-04	parallel flow	recycled used oil
15	1.2500E-03	parallel flow	recycled used oil
16	5.7000E-04	counter-flow	recycled used oil

Following is graphical analysis of the test data:



High Value: 1.25E-3 lb/ton
Low Value: 2.4E-5 lb/ton
Average Value: 3.44E-4 lb/ton
Standard Deviation: 0.00034

The current default limit for hydrogen chloride is 0.006 lbs/ton.
Average test value percentage of default limit: 5.73%

Recommendation: Based upon an analysis of the test data and the fact that all tests done show results below the allowed limit, that there is justification for removing the requirement to test for hydrogen chloride.

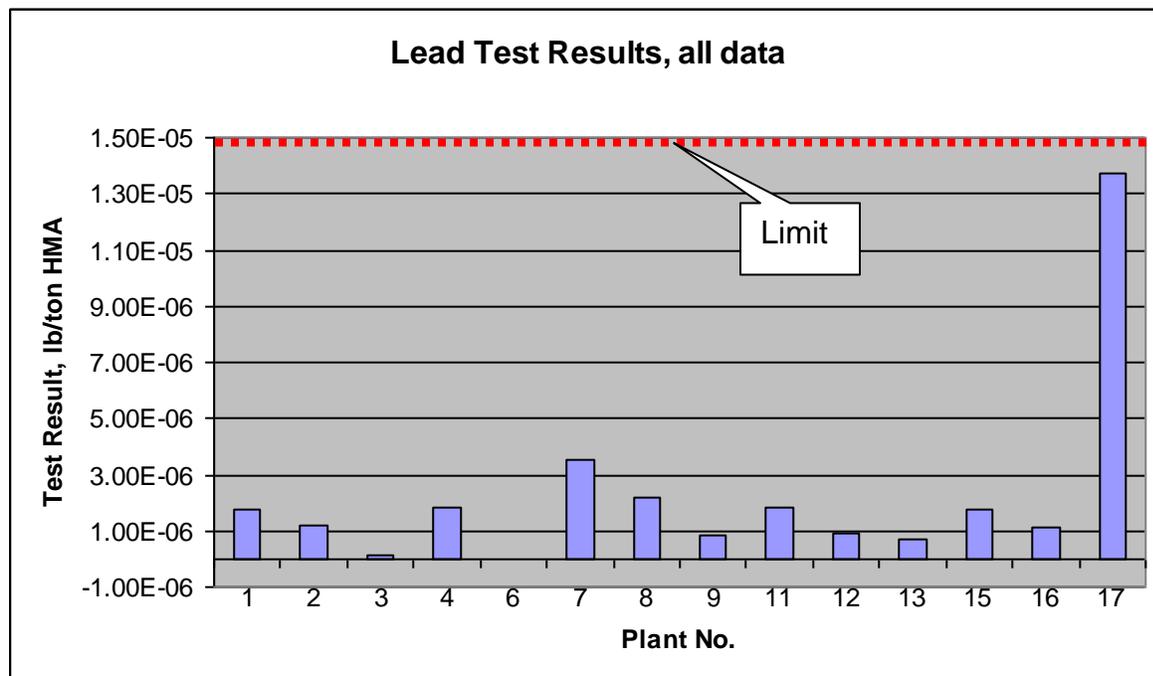
Lead

Allowable Limit = 1.50E-5 lb/ton HMA

Following are the stack test results for lead:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	1.7700E-06	dual drum	recycled used oil
2	1.1600E-06	double barrel drum	not specified in test report
3	1.5800E-07	counter-flow	recycled used oil
4	1.8000E-06	counter-flow	recycled used oil
6	2.1100E-09	parallel flow	natural gas
7	3.5000E-06	counter-flow	not specified in test report
8	2.2100E-06	counter-flow	recycled used oil
9	8.1900E-07	counter-flow	recycled used oil
11	1.8100E-06	counter-flow	recycled used oil
12	9.2300E-07	parallel flow	recycled used oil
13	7.1000E-07	parallel flow	recycled used oil
15	1.7300E-06	parallel flow	recycled used oil
16	1.1500E-06	counter-flow	recycled used oil
17	1.3700E-05	counter-flow	recycled used oil

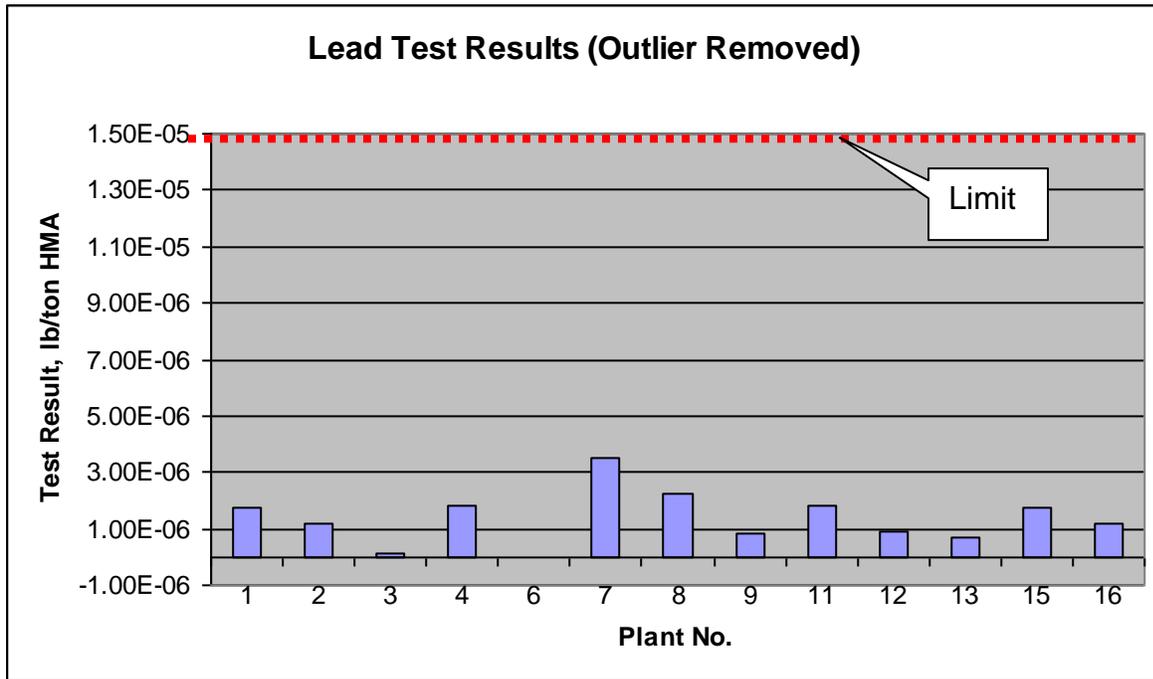
Following is a graphical analysis of the test data:



High Value: 1.37E-5 lb/ton
 Low Value: 2.11E-9 lb/ton
 Average Value: 2.25E-6 lb/ton
 Standard Deviation: 3.41E-6

The current default limit for lead is 1.5E-5 lbs/ton.
 Average test value percentage of default limit: 15%

An analysis of the data indicates that one test is substantially higher and out of range as compared to the rest of the test results. If this test data is excluded the data analysis indicates the following:



High Value: 3.50E-06 lb/ton
 Low Value: 2.11E-09 lb/ton
 Average Value: 1.36E-06 lb/ton
 Standard Deviation: 9.25E-07

Average test value percentage of default limit: 9.1%

Recommendation: Based upon an analysis of the test data and the fact that all tests done show results below the allowed limit, that there is justification for removing the requirement to test for lead.

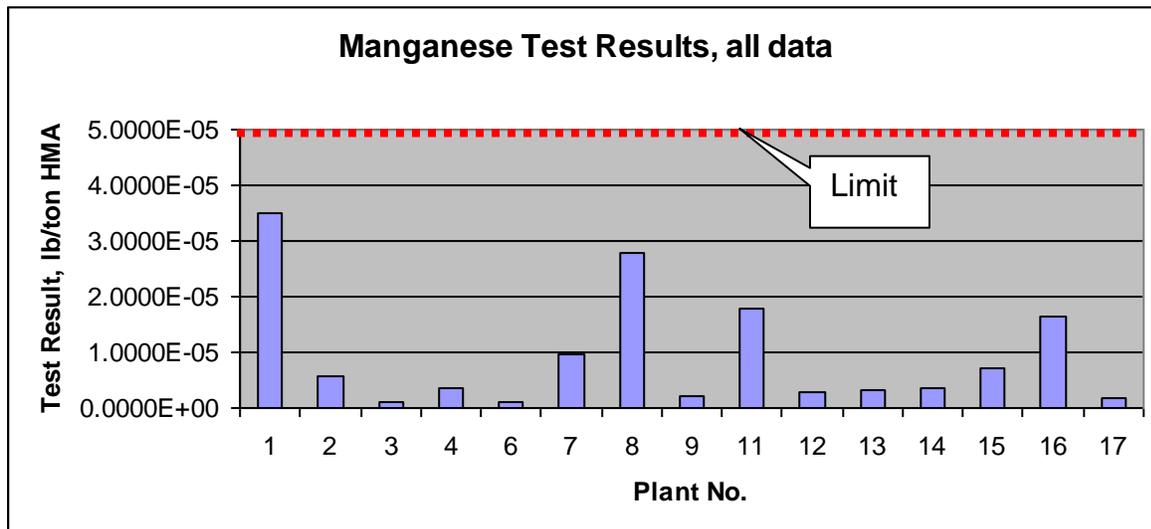
Manganese

Allowable Limit = 5.00E-5 lb/ton HMA

Following are the stack test results for manganese:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	3.5000E-05	dual drum	recycled used oil
2	5.8000E-06	double barrel drum	not specified in test report
3	1.1800E-06	counter-flow	recycled used oil
4	3.4000E-06	counter-flow	recycled used oil
6	1.1800E-06	parallel flow	natural gas
7	9.7000E-06	counter-flow	not specified in test report
8	2.7700E-05	counter-flow	recycled used oil
9	2.0000E-06	counter-flow	recycled used oil
11	1.7700E-05	counter-flow	recycled used oil
12	2.8800E-06	parallel flow	recycled used oil
13	3.1400E-06	parallel flow	recycled used oil
14	3.6400E-06	counter-flow	natural gas
15	7.0400E-06	parallel flow	recycled used oil
16	1.6500E-05	counter-flow	recycled used oil
17	1.7000E-06	counter-flow	recycled used oil

Following is a graphical analysis of the test data:



High Value: 3.5E-05 lb/ton
Low Value: 1.18E-06 lb/ton
Average Value: 9.24E-06 lb/ton
Standard Deviation: 1.04E-05

The current default limit for manganese is 5E-5 lbs/ton.

Average test value percentage of default limit: 19.92%

Recommendation: Based upon an analysis of the test data and the fact that all tests done show results below the allowed limit, that there is justification for removing the requirement to test for manganese.

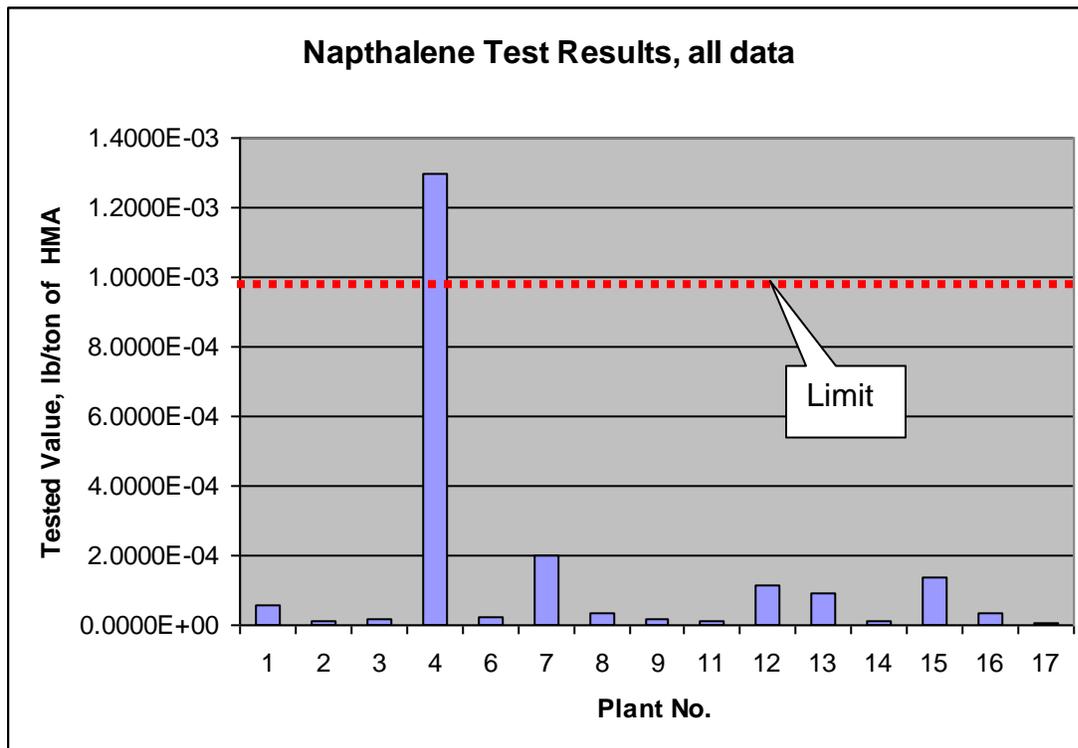
Naphthalene

Allowable Limit = 1.00E-3 lb/ton HMA

Following are the stack test results for naphthalene:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	5.6000E-05	dual drum	recycled used oil
2	9.0300E-06	double barrel drum	not specified in test report
3	1.5700E-05	counter-flow	recycled used oil
4	1.3000E-03	counter-flow	recycled used oil
6	2.5000E-05	parallel flow	natural gas
7	2.0000E-04	counter-flow	not specified in test report
8	3.7000E-05	counter-flow	recycled used oil
9	1.8000E-05	counter-flow	recycled used oil
11	1.0000E-05	counter-flow	recycled used oil
12	1.1600E-04	parallel flow	recycled used oil
13	8.9000E-05	parallel flow	recycled used oil
14	8.9400E-06	counter-flow	natural gas
15	1.3900E-04	parallel flow	recycled used oil
16	3.7000E-05	counter-flow	recycled used oil
17	6.2000E-06	counter-flow	recycled used oil

Following is a graphical analysis of the test data:

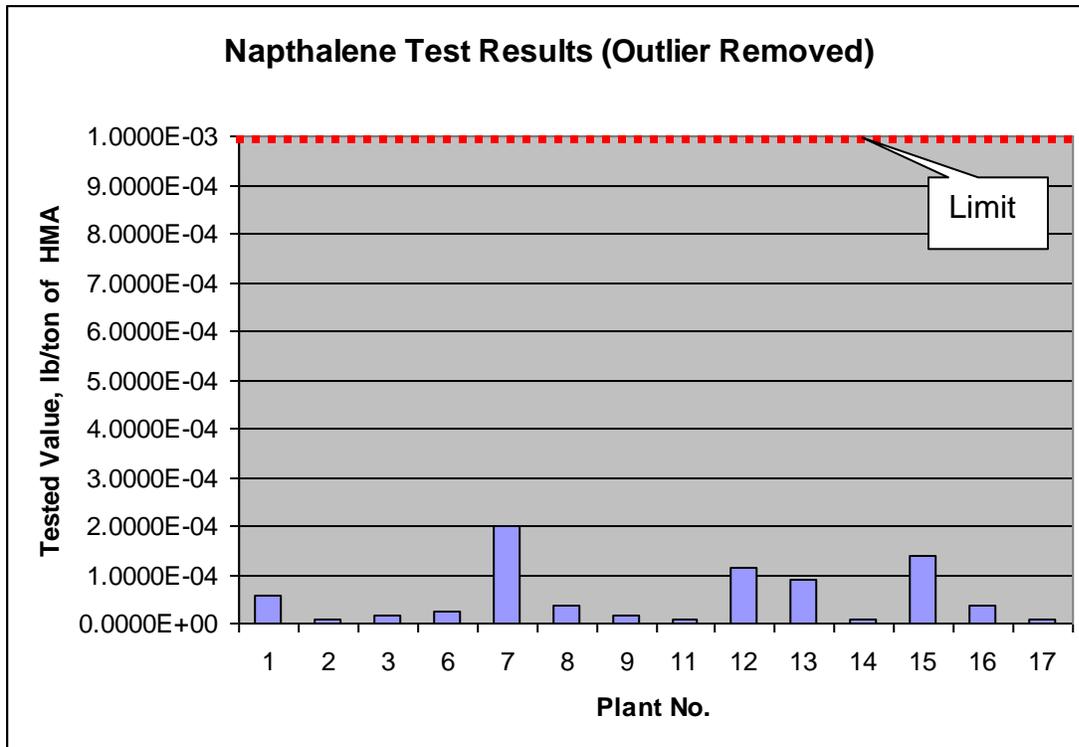


High Value: 1.3E-03 lb/ton
Low Value: 6.2E-06 lb/ton
Average Value: 1.38E-04 lb/ton
Standard Deviation: 0.0003

The current default limit for naphthalene is .001 lbs/ton.

Average test value percentage of default limit: 13.8%

An analysis of the data indicates that one test is substantially higher and out of range as compared to the rest of the test results. If this test data is excluded the data analysis indicates the following:



High Value: 2.0E-04 lb/ton
Low Value: 6.2E-06 lb/ton
Average Value: 5.47E-05 lb/ton
Standard Deviation: 5.95E-05

Average test value percentage of default limit: 5.5%

Recommendation: Based upon an analysis of the test data there is justification for removing the requirement to test for naphthalene. The data indicates that one test value is clearly out of range with the other test values, however even if this data is included with the other test data, the average tested value is still below the default permit allowable limit for naphthalene.

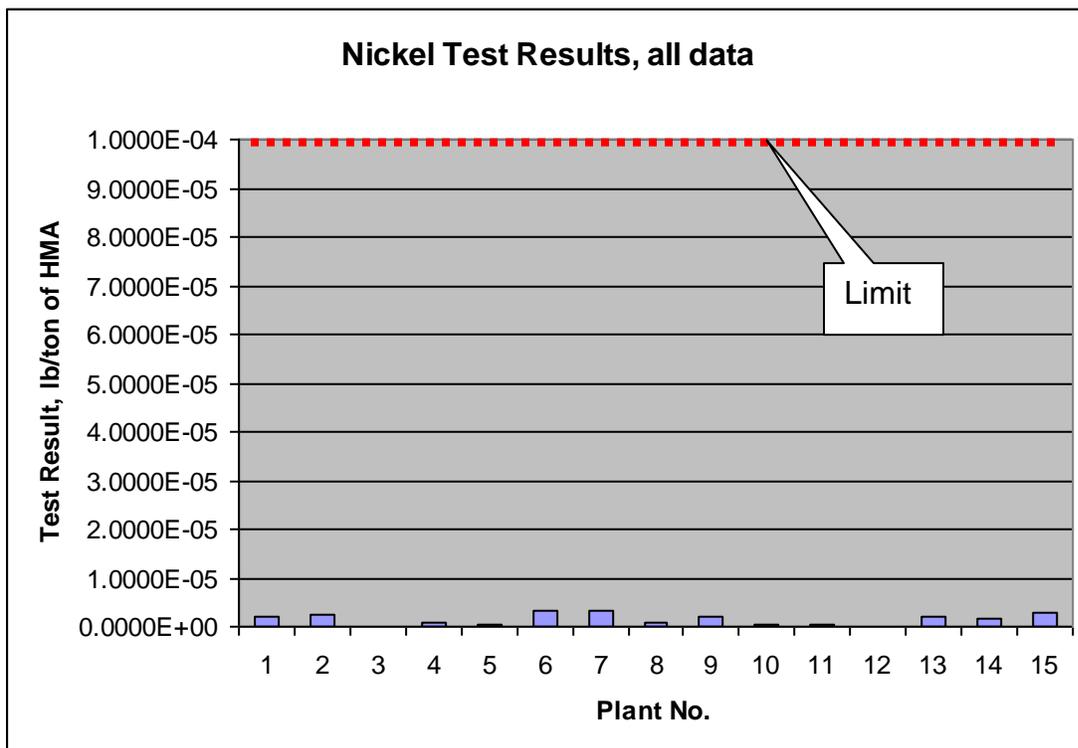
Nickel

Allowable Limit = 1.00E-4 lb/ton HMA

Following are the stack test results for nickel:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	2.0300E-06	dual drum	recycled used oil
2	2.3200E-06	double barrel drum	not specified in test report
3	1.6200E-07	counter-flow	recycled used oil
4	9.9000E-07	counter-flow	recycled used oil
6	2.6500E-07	parallel flow	natural gas
7	3.1000E-06	counter-flow	not specified in test report
8	3.3900E-06	counter-flow	recycled used oil
9	6.6300E-07	counter-flow	recycled used oil
11	2.2400E-06	counter-flow	recycled used oil
12	5.9300E-07	parallel flow	recycled used oil
13	5.2200E-07	parallel flow	recycled used oil
14	1.7000E-07	counter-flow	natural gas
15	2.0300E-06	parallel flow	recycled used oil
16	1.8000E-06	counter-flow	recycled used oil
17	2.8800E-06	counter-flow	recycled used oil

Following is a graphical analysis of the test data:



High Value: 3.39E-06lb/ton
Low Value: 1.62E-07 lb/ton
Average Value: 1.54E-06 lb/ton
Standard Deviation: 1.12E-06

The current default limit for nickel is 1E-4 lbs/ton.

Average test value percentage of default limit: 1.5%

Recommendation: Based upon an analysis of the test data and the fact that all tests done show results below the allowed limit, that there is justification for removing the requirement to test for nickel.

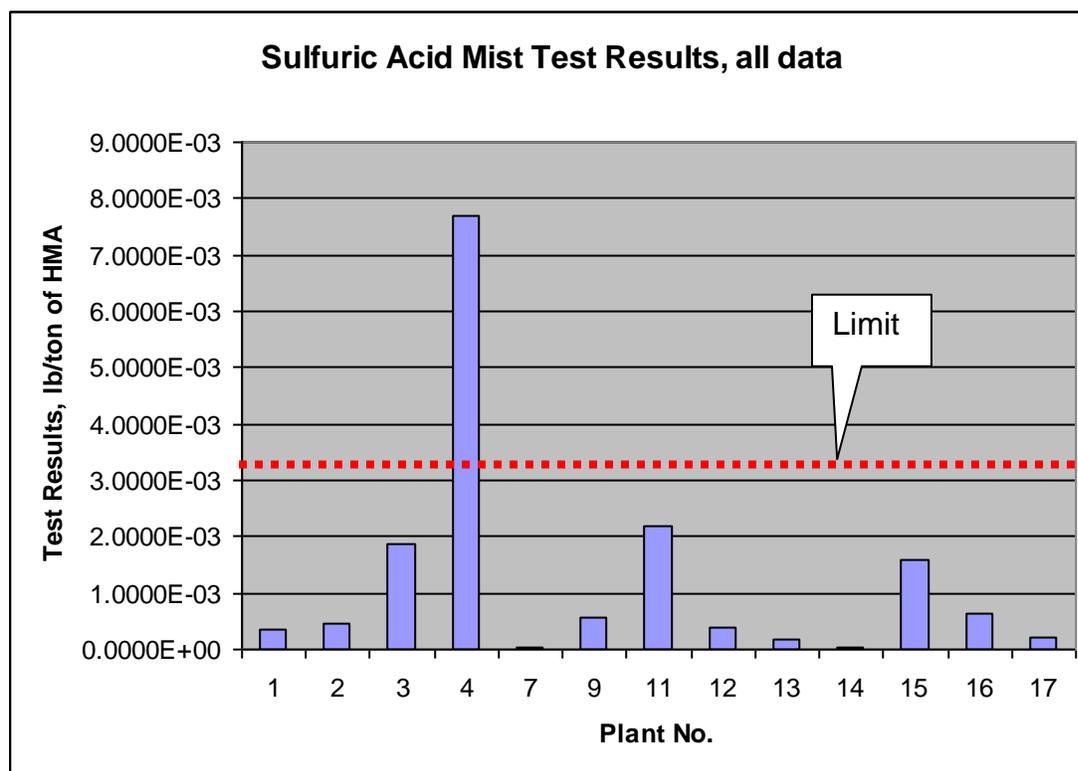
Sulfuric Acid Mist

Allowable Limit = 3.20E-3 lb/ton HMA

Following are the stack test results for sulfuric acid mist:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	3.6000E-04	dual drum	recycled used oil
2	4.6000E-04	double barrel drum	not specified in test report
3	1.8600E-03	counter-flow	recycled used oil
4	7.7000E-03	counter-flow	recycled used oil
7	4.0000E-05	counter-flow	not specified in test report
8	non-detectable	counter-flow	recycled used oil
9	5.6000E-04	counter-flow	recycled used oil
10	non-detectable	Dual drum	not specified in test report
11	2.2000E-03	counter-flow	recycled used oil
12	3.9000E-04	parallel flow	recycled used oil
13	1.6000E-04	parallel flow	recycled used oil
14	4.3400E-05	counter-flow	natural gas
15	1.6000E-03	parallel flow	recycled used oil
16	6.5000E-04	counter-flow	recycled used oil
17	2.1200E-04	counter-flow	recycled used oil

Following is a graphical analysis of the test data:

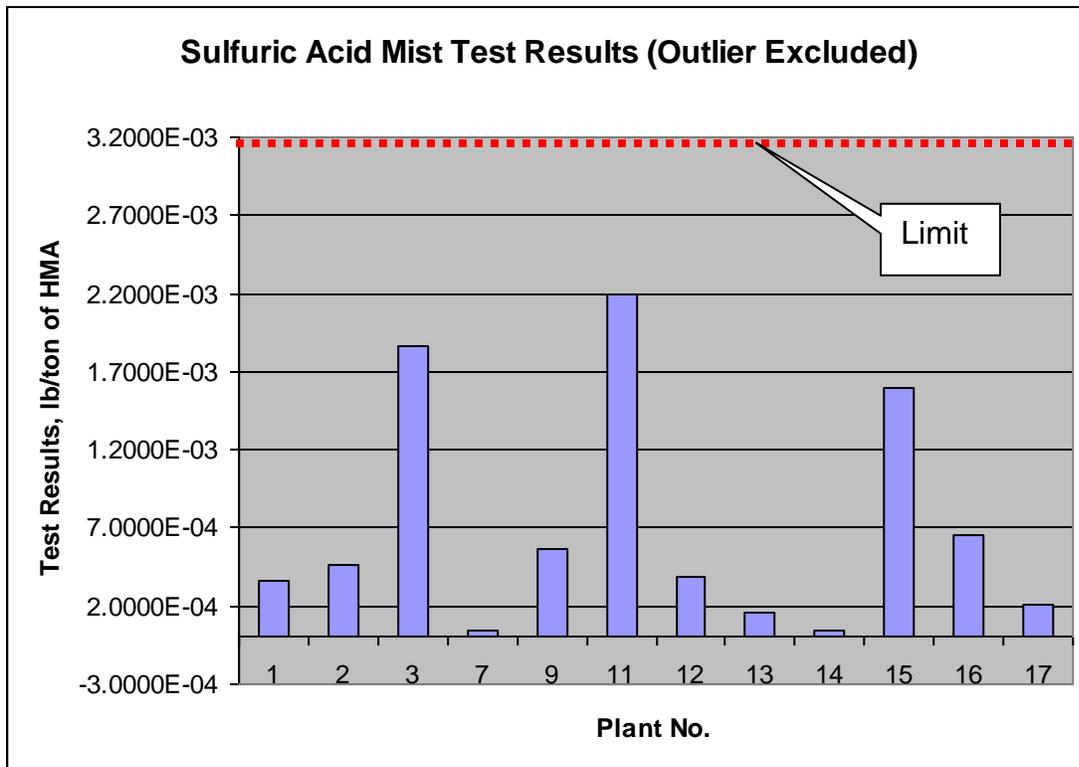


High Value: 7.7E-03 lb/ton
Low Value: 4E-05 lb/ton
Average Value: 1.25-03 b/ton
Standard Deviation: 0002

The current default limit for sulfuric acid mist is .0032 lbs/ton.

Average test value percentage of default limit: 39%

An analysis of the data indicates that one test is substantially higher and out of range as compared to the rest of the test results. If this test data is excluded the data analysis indicates the following:



High Value: 2.2E-3 lb/ton
Low Value: 4E-5 lb/ton
Average Value: 7.11E-4 lb/ton
Standard Deviation: .00074

Average test value percentage of default limit: 22.2%

Recommendation: Based upon an analysis of the test data there is justification for removing the requirement to test for sulfuric acid mist. The data indicates that one test value is clearly out of range with the other test values, however even if this data is included with the other test data, the average tested value is still below the default permit allowable limit for sulfuric acid mist.

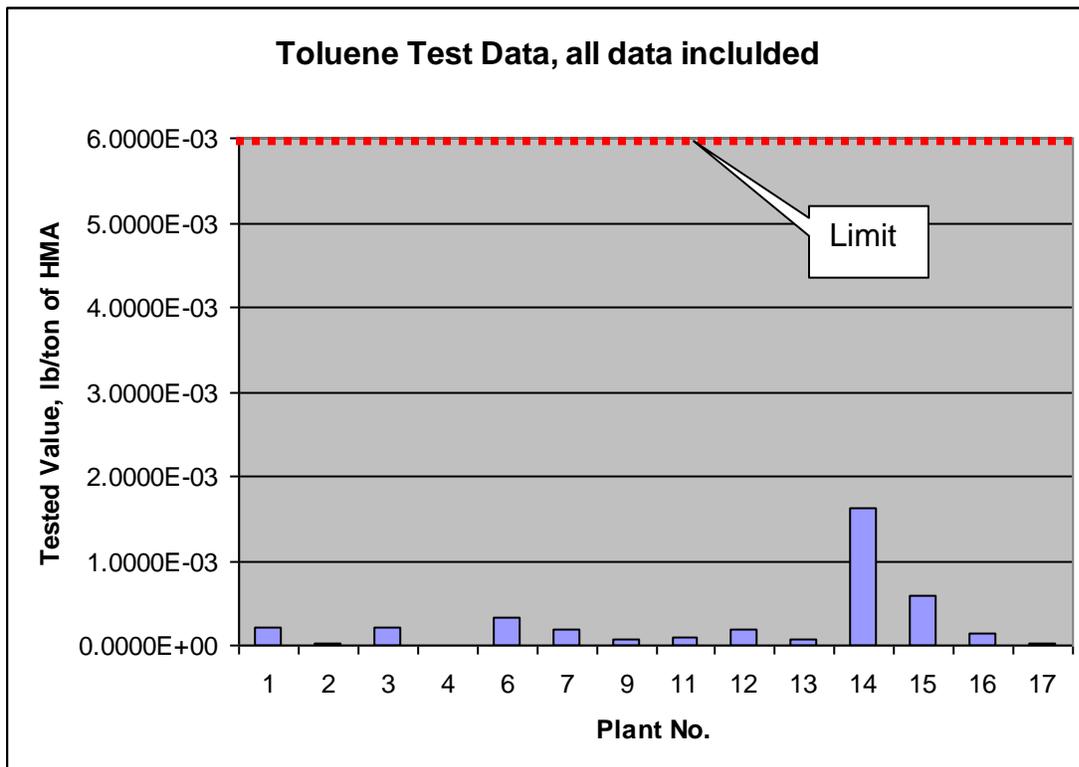
Toluene

Allowable Limit = 6.00E-3 lb/ton HMA

Following are the stack test results for toluene:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	2.1000E-04	dual drum	recycled used oil
2	2.5000E-05	double barrel drum	not specified in test report
3	2.1300E-04	counter-flow	recycled used oil
4	6.5500E-07	counter-flow	recycled used oil
6	3.2800E-04	parallel flow	natural gas
7	2.0000E-04	counter-flow	not specified in test report
8	non-detectable	counter-flow	recycled used oil
9	6.0000E-05	counter-flow	recycled used oil
11	9.0000E-05	counter-flow	recycled used oil
12	1.9000E-04	parallel flow	recycled used oil
13	8.0000E-05	parallel flow	recycled used oil
14	1.6300E-03	counter-flow	natural gas
15	5.8000E-04	parallel flow	recycled used oil
16	1.4000E-04	counter-flow	recycled used oil
17	3.4400E-05	counter-flow	recycled used oil

Following is a geographical analysis of the test data:



High Value: 1.63E-3 lb/ton
Low Value: 6.55E-7 lb/ton
Average Value: 2.7E-4 lb/ton
Standard Deviation: 0.016

The current default limit for toluene is 0.006 lbs/ton.

Average test value percentage of default limit: 4.5%

Recommendation: Based upon an analysis of the test data and the fact that all tests done show results below the allowed limit, that there is justification for removing the requirement to test for toluene.

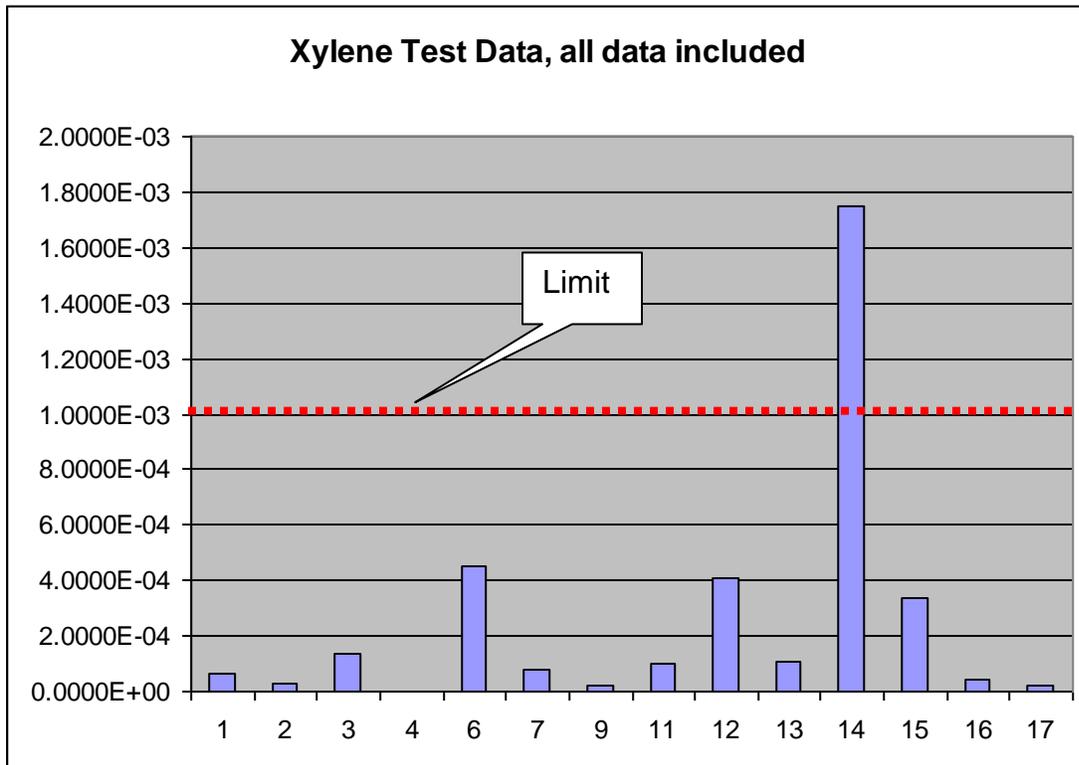
Xylene

Allowable Limit = 1.00E-3 lb/ton HMA

Following are the stack test results for xylene:

Plant No.	Tested Value (lb/ton HMA)	Plant Type	Fuel
1	6.8000E-05	dual drum	recycled used oil
2	2.9700E-05	double barrel drum	not specified in test report
3	1.3500E-04	counter-flow	recycled used oil
4	1.3300E-06	counter-flow	recycled used oil
6	4.4900E-04	parallel flow	natural gas
7	8.0000E-05	counter-flow	not specified in test report
8	non-detectable	counter-flow	recycled used oil
9	2.0000E-05	counter-flow	recycled used oil
11	1.0000E-04	counter-flow	recycled used oil
12	4.1000E-04	parallel flow	recycled used oil
13	1.1000E-04	parallel flow	recycled used oil
14	1.7500E-03	counter-flow	natural gas
15	3.4000E-04	parallel flow	recycled used oil
16	4.0000E-05	counter-flow	recycled used oil
17	2.3500E-05	counter-flow	recycled used oil

Following is a graphical analysis of that test data:

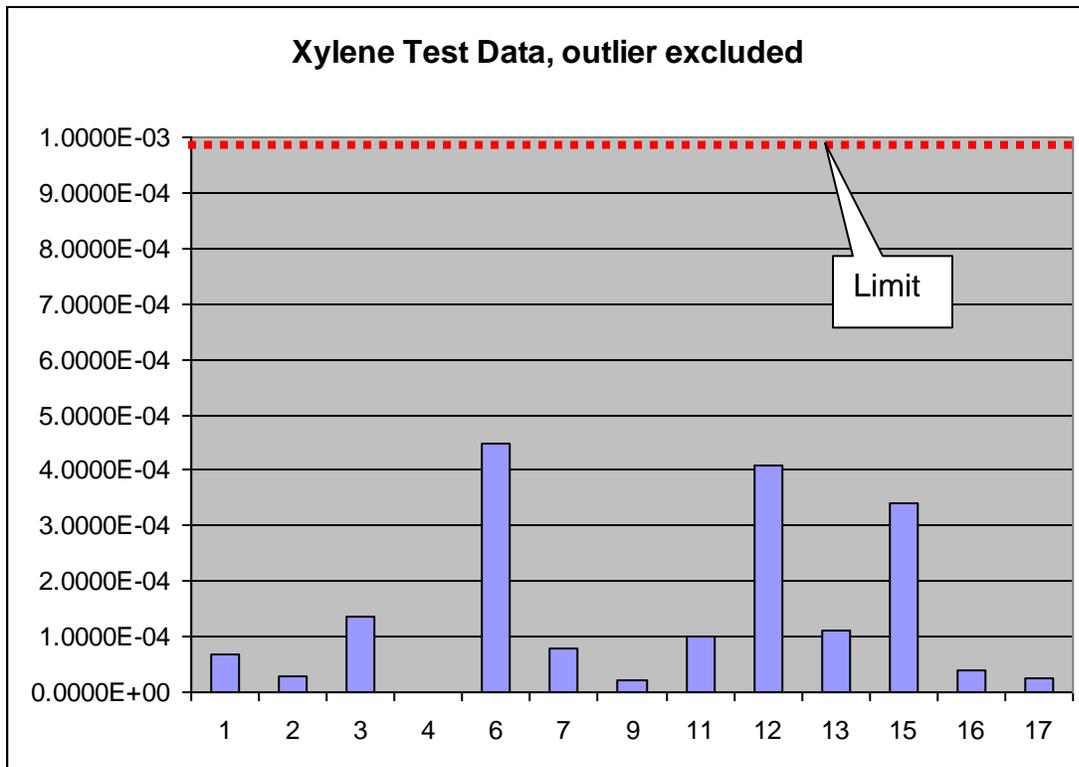


High Value: 1.75E-03 lb/ton
Low Value: 1.33E-06 lb/ton
Average Value: 2.54E-04 lb/ton
Standard Deviation: 0.00046

The current default limit for xylene is 0.001 lbs/ton.

Average test value percentage of default limit: 25.4%

An analysis of the data indicates that one test is substantially higher and out of range as compared to the rest of the test results. If this test data is excluded the data analysis indicates the following:



High Value: 4.49E-04 lb/ton
Low Value: 1.33E-06 lb/ton
Average Value: 1.39E-04 lb/ton
Standard Deviation: 0.00016

Average test value percentage of default limit: 13.9%

Recommendation: Based upon an analysis of the test data there is justification for removing the requirement to test for xylene. The data indicates that one test value is clearly out of range with the other test values, however even if this data is included with the other test data, the average tested value is still below the default permit allowable limit for xylene.