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INTRODUCTION

National Emission Standards for Hazardous Air Pollutants (NESHAP) for Reinforced Plastic Composites Production were promulgated April 21, 2003, and amended on August 25, 2005. These NESHAP apply to reinforced plastic composites production operations located at major sources of emissions of hazardous air pollutants (HAP). A major source is a source that emits or has the potential to emit (considering controls) 10 tons per year or more of any single HAP or 25 tons per year or more of any combination of HAP. For purposes of these NESHAP, reinforced plastic composites production is limited to operations in which reinforced or non-reinforced plastic composites or plastic molding compounds are manufactured using thermoset resins and/or gel coats that contain styrene.

Under the NESHAP (rule), several compliance options are available to demonstrate compliance with emission requirements for centrifugal casting and open molding. This document includes sample calculations that illustrate how compliance calculations would be performed for several scenarios under different compliance options. Additional information including a small entity compliance guide (whose information would be applicable to any size facility), applicability flowchart, and frequently asked questions are available on EPA's Air Toxics Website, Rule and Implementation Information for Reinforced Plastic Composites Production at http://www.epa.gov/ttn/atw/rpc/rpcpg.html.

USING TABLE 1

Several of the compliance options rely on emissions factors calculated for specific open molding and centrifugal casting operations. Table 1 of the rule includes equations for calculating these emissions factors. A copy of this table is included in Appendix A of this document. To use Table 1, you must know what type of operation you have, what application method is used, the HAP content of the resin or gel coat used in the operation, whether the resin/gel coat is vapor suppressed, and whether vacuum bagging is used. If you are using a vapor suppressed resin, you must also know the vapor suppressant effectiveness (VSE) factor of the resin. The VSE factor is the percent reduction in organic HAP emissions expressed as a decimal measured by the VSE test method of Appendix A of the rule.

To use Table 1, you first locate the appropriate type of operation (open molding or centrifugal casting) in the first column. You then select the appropriate application method from the second column. (The application method choices vary depending on the type of operation.) Next, move to the appropriate row in the third column considering whether the vapor suppressed resins and/or vacuum bagging are being used. Once you have found the correct row for the application, you select the emissions factor equation from the fourth or fifth column of the table. You must use the equations in the fourth column if the organic HAP content of the resin/gel coat is less than 33 percent, and you must use the equation in the fifth column if the organic HAP content is equal to or greater than 33 percent. Note that when performing the calculations with equations from Table 1, you must use the decimal format for the percent HAP. Also, the percent HAP is determined based on the total organic HAP content. In most cases this is the same as the styrene content. However, many gel coats contain methyl methacrylate. A gel coat containing 30 percent styrene and 5 percent methyl methacrylate has a HAP content of 35 percent, which would be entered as 0.35 into the Table 1 equation. Any other organic HAP in a resin or get coat would also be added to the organic HAP content.

Following are four examples illustrating the calculation of emissions factors for several scenarios:

Example 1: If a non-vapor suppressed resin containing 43 percent HAP is mechanically applied with nonatomized technology, use equation 1.c.i in the fifth column of Table 1 to calculate the emissions factor (EF). You use the equation from the fifth column because the HAP content is equal to or greater than 33 percent. The appropriate equation is as follows:

$$EF = ((0.157 \times \%HAP) - 0.0165) \times 2000$$

And the emissions factor is calculated as:

$$EF = ((0.157 \times 0.43) - 0.0165) \times 2000 = 102 \text{ lb/ton}$$

Example 2: If a non-vapor suppressed resin containing 32 percent HAP is used for a centrifugal casting operation where heated air is blown through the molds, use the second centrifugal casting equation in the fourth column of Table 1. You use the equation from the

fourth column because the HAP content is less than 33 percent. The appropriate equation is as follows:

$$EF = 0.558 \times \%HAP \times 2000$$

And the emissions factor is calculated as:

$$EF = 0.558 \times 0.32 \times 2000 = 357 \text{ lb/ton}$$

Example 3: If a non-vapor suppressed resin containing 48 percent HAP is applied with mechanical atomized technology using vacuum bagging/closed-mold curing with roll-out, use equation 1.b.iii from the fifth column of Table 1. You use the equation from the fifth column because the HAP content is equal to or greater than 33 percent. The appropriate equation is as follows:

$$EF = ((0.714 \times \%HAP) - 0.18) \times 2000 \times 0.85$$

And the emissions factor is calculated as:

$$EF = ((0.714 \times 0.48) - 0.18) \times 2000 \times 0.85 = 277 \text{ lb/ton}$$

Example 4: If a non-vapor suppressed gel coat containing 30 percent HAP is applied with mechanical nonatomized technology, use equation 1.g in the fifth column of Table 1. Note the parenthetical statement on the header of the fourth column that states the equation for nonatomized gel coat application in column four only applies if the gel coat HAP content is less than 19 percent. You use the equation from the fourth column because the HAP content is greater then 19 percent. The appropriate equation is as follows:

$$EF = ((0.4506 \times \%HAP) - 0.0505) \times 2000$$

And the emissions factor is calculated as:

$$EF = ((0.4506 \times 0.30) - 0.0505) \times 2000 = 169 \text{ lb/ton}$$

OPTION 1: DEMONSTRATING THAT AN INDIVIDUAL RESIN OR GEL COAT, AS APPLIED, MEETS THE APPROPIATE EMISSIONS LIMIT.

Under this option in section 63.5810(a) of the rule, you demonstrate compliance by showing that an individual resin or gel coat, as applied, and considering any controls, meets the appropriate emissions limit in Table 3 or 5. A copy of these tables is included in Appendix B of this document.

To determine compliance under this option, you calculate the emission factor for an individual resin or gel coat, as applied, and compare the emission factor to the emission limit in Table 3 or 5. Note that if a specific resin is applied using multiple methods, such as a combination of manual and mechanical, mechanical nonatomized and mechanical atomized, or any other combination, the emission factor calculate must be performed for each application method.

Example 5: Suppose Facility A is an existing facility subject to limits in Table 3. The facility uses a non-corrosion resistant/high strength (non-CR/HS) resin with an organic HAP content of 38 percent, applied using nonatomized spray. The emission factor for this resin, as applied, is 86 lb/ton calculated using Equation 1.c.i of Table 1 in the rule. The emission limit for this operation as shown in table 3 of the rule is 88 lb/ton. Therefore, this resin, as applied, complies with its emission limit. If the facility also applied the same resin using atomized resin application, the emission factor would change to 183 lb/ton, and the resin would not comply with its emission limit.

Example 6: Facility A also uses a 41 percent HAP resin that contains a vapor suppressant with a vapor suppressant effectiveness factor of 0.5 applied using nonatomized spray. The emission factor calculated using Equation 1.c.ii from Table 1 would be 74.2 lb/ton. This is below the emission limit of 88 lb/ton. Therefore, this resin, as applied complies with its emission limit as long as nonatomized mechanical application and vapor suppressant continue to be used.

Example 7: Facility A uses a 35 percent HAP white gel coat with atomized spray. The emission factor calculated using equation 1.f in Table 1 of the rule would be 336 lb/ton, which is above the allowable emission limit of 267 lb/ton. Therefore, this gel coat, as applied, does not comply with its emission limit. However, if the facility controlled the gel coat spray booth emissions by 47.5 percent overall (50 percent capture efficiency and 95 percent control), the emission factor would now be 176 lb/ton, and the gel coat is in compliance. This would require that the facility demonstrate the capture and control efficiency using the appropriate test methods in the NESHAP.

OPTION 2: INDIVIDUAL LIMITS

Under this option in section 63.5810(b) of the rule, you would calculate the weighted average emission factor all or part of the resins and gel coat in each separate grouping in table three. There are three steps to this compliance demonstration:

1. Calculate the emissions factor for each different process stream within each operation type using the equations in Table 1 of the rule. Process streams are considered unique if any of the following vary: organic HAP content, application technique, or control technique.

2. Calculate the weighted average emissions factor for each operation type by calculating the weighted average of the individual process stream emissions factors.

3. Compare the weighted average emissions factor to the emissions limit in Table 3 or 5 of the rule. If the emission factor is less than or equal to the emissions limit, you are in compliance.

For example, if you have ten resins that are non-CR resins and that are applied using mechanical application, you would calculate a weighted emissions factor for the ten resins and compare this to the emission limit of 88 lb/ton for non-CR mechanically applied resins in Table 3 of the rule. You can also choose to only use part of the ten resins, and demonstrate compliance for the others under option 1 previously discussed, or option 4.

Two examples are shown for different combinations of process streams.

Example 8: Open Molding, No add-on controls

Suppose Facility C uses 4 different non-vapor suppressed resins in 2 operations as described below:

Facility C Resin Use and Operations				
Operation Type	**Application Method**	**Resin ID**	**Resin HAP Content**	**Tons of Resin Used**
Noncorrosion-resistant manual application	Manual	Resin A	32 percent	150
	Manual	Resin B	38 percent	25
Corrosion-resistant mechanical application	Nonatomized	Resin C	42 percent	175
	Nonatomized	Resin D	45 percent	200
	Atomized	Resin D	45 percent	15

First, calculate the emissions factor for each process stream (resin and application method) using equations from Table 1 as illustrated below. Note that even though there are only four different resins, there are five process streams with unique emissions factors.

Resin A: EF = 0.126 × 0.32 × 2000 = 80.64 lb/ton
Resin B: EF = ((0.286 × 0.38) – 0.0529) × 2000 = 111.56 lb/ton
Resin C: EF = ((0.157 × 0.42) – 0.0165) × 2000 = 98.88 lb/ton
Resin D (nonatomized): EF = ((0.157 × 0.45) – 0.0165) × 2000 = 108.30 lb/ton

Resin D (atomized): EF = ((0.714 × 0.45) – 0.18) × 2000 = 282.60 lb/ton

Second, calculate the weighted average emissions factor for each operation as follows:

Noncorrosion-resistant Manual Application:

$$EF = \frac{(80.64\ \text{lb/ton} \times 150\ \text{tons}) + (111.56\ \text{lb/ton} \times 25\ \text{ton})}{(150\ \text{tons} + 25\ \text{tons})} = 85.1\ \text{lb/ton}$$

Corrosion-resistant Mechanical Application:

$$EF = \frac{(98.88\ \text{lb/ton} \times 175\ \text{tons}) + (108.30\ \text{lb/ton} \times 200\ \text{tons}) + (282.60\ \text{lb/ton} \times 15\ \text{tons})}{(175\ \text{tons} + 200\ \text{tons} + 15\ \text{tons})} = 110.8\ \text{lb/ton}$$

Third, compare the weighted average emissions factor to the emissions limit. The limit for non-CR/HS manual application is 87 lb/ton, and the limit for corrosion-resistant mechanical application is 112 lb/ton. Because the weighted average emissions factor of each operation is less than their respective limit, the facility is in compliance.

Example 9: Centrifugal Casting, Add-on Control

Suppose Facility D has a centrifugal casting operation with unheated air blown through the molds. The facility uses 560 tons of non-CR/HS Resin A with a HAP content of 50 percent and 200 tons of Resin B with a HAP content of 31 percent. This operation has add-on control achieving 75 percent emissions reduction. The emissions limit for this operation is 20 lb/ton. The compliance calculation is similar to Example 7 above, but there is an additional step because an add-on control factor must be included in the emissions factor calculation for each process stream. The add-on control factor represents the percentage of emissions going into the control device that are still emitted from the control device.

First, calculate the add-on control factor (CF) as follows:

$$CF = 1 - \frac{75\%}{100\%} = 0.25$$

Second, calculate the emissions factor for each process stream as follows:

Resin A: EF = (0.026 × 0.50 x 2000) × 0.25 = 6.5 lb/ton
Resin B: EF = (0.026 × 0.31 x 2000) × 0.25 = 4.03 lb/ton

Third, the weighted average emissions factor for the centrifugal casting operation is calculated as follows:

$$EF = \frac{(6.5\ \text{lb/ton} \times 560\ \text{tons}) + (4.03\ \text{lb/ton} \times 200\ \text{tons})}{(560\ \text{tons} + 200\ \text{tons})} = 5.9\ \text{lb/ton}$$

Fourth, compare the weighted average emissions factor and the emissions limit. Because the weighted average emissions factor of 5.9 lb/ton is lower than the limit of 20 lb/ton, the operation is in compliance.

OPTION 3: AVERAGE EMISSIONS FACTORS

This option in section 63.5810(c) of the rule, allows you to demonstrate compliance with a weighted average emissions limit for all open molding operations and a separate weighted average emissions limit for all centrifugal casting operations. Open molding operations cannot be averaged with centrifugal casting operations. The weighted averages are calculated over the last 12-month period (rolling average). The calculation is done in three steps:

1. Calculate the weighted average emissions limit. This is calculated as the sum of each emissions limit multiplied by the amount of each corresponding material used divided by the total material used.

2. Calculate a weighted average emissions factor. The process is similar to step 1 but uses the equations in Table 1 to estimate actual emissions.

3. Compare the weighted average emissions limit to the weighted average emissions factor. If the emissions factor is less then or equal to the emission limit, you are in compliance.

Two example calculations are shown below to illustrate this process for different scenarios.

Example 10: Basic Open Molding Calculation

Suppose Facility E has several open molding operations, but no centrifugal casting operations. The resins and operations in which they are used are shown in the table below. Assume for purposes of calculations that Facility E is an existing facility subject to the limits in Table 3 (included in Appendix B of this report) with no add-on controls. The facility must meet an emissions limit that is a weighted average of the emissions limits applicable to each operation and application method.

Facility E Resin Use and Operations			
Operation/Application Description	**Resin HAP Content**	**Resin Used (tons/yr)**	**Table 3 Emissions Limit (lb/ton)**
CR/HS mechanical nonatomized application	50 percent	100	112
Non-CR/HS mechanical nonatomized application	35 percent	250	87
Tooling manual application	43 percent	75	157

First, calculate the weighted average emissions limit (EL) that the facility must meet:

$$EL = \frac{(112\ \text{lb/ton x}\ 100\ \text{tons}) + (87\ \text{lb/ton x}\ 250\ \text{tons}) + (157\ \text{lb/ton x}\ 75\ \text{tons})}{(100\ \text{tons} + 250\ \text{tons} + 75\ \text{tons})} = 105.2\ \text{lb/ton}$$

Second, calculate a weighted average actual emissions factor. Start by calculating emissions factors for each resin using the equations in Table 1 and then use those factors to calculate the weighted average emissions factor.

Emissions factors for each resin:

Nonatomized mechanical (50%): EF = ((0.157 × 50%) – 0.0165) × 2000 = 124.00 lb/ton
Nonatomized mechanical (35%): EF = ((0.157 × 35%) – 0.0165) × 2000 = 76.90 lb/ton
Manual application (43%): EF = ((0.286 × 43%) – 0.0529) × 2000 = 140.16 lb/ton

Weighted average emissions factor:

$$EF = \frac{(124.00\ \text{lb/ton} \times 100\ \text{tons}) + (76.90\ \text{lb/ton} \times 250\ \text{tons}) + (140.16\ \text{lb/ton} \times 75\ \text{tons})}{(100\ \text{tons} + 250\ \text{tons} + 75\ \text{tons})} = 99.1\ \text{lb/ton}$$

Third, compare the weighted average emissions limit and the weighted average emissions factor. In this case, the emissions factor of 99.1 lb/ton is below the limit of 105.2 lb/ton, so Facility E is in compliance.

Example 11: Facility with Open Molding and Centrifugal Casting.

Suppose Facility F has a combination of open molding and centrifugal casting operations. Assume for purposes of calculation that Facility F is an existing facility. The calculations are similar to Example 9 except that two different weighted average emissions limits and weighted average emissions factors must be calculated because open molding operations cannot be averaged with centrifugal casting operations. Facility F's resin use and operations are described in the table below:

Facility F Resin Use and Operations			
Operation/Application Description	**Resin HAP Content**	**Resin Used (tons/yr)**	**Table 3 Emissions Limit (lb/ton)**
Centrifugal Casting, CR/HS	50 percent	600	25
Centrifugal Casting, non-CR/HS	32 percent	25	20
Mechanical nonatomized application, non-CR/HS	35 percent	450	87
Tooling manual application	49 percent	65	157

First, calculate the weighted average emissions limits that the facility must meet. Separate limits must be calculated for centrifugal casting and open molding.

Emissions Limit for Centrifugal Casting:

$$EL = \frac{(25\ \text{lb/ton x } 600\ \text{tons}) + (20\ \text{lb/ton x } 25\ \text{tons})}{(600\ \text{tons} + 25\ \text{tons})} = 24.8\ \text{lb/ton}$$

Emissions Limit for Open Molding:

$$EL = \frac{(87\ \text{lb/ton x } 450\ \text{tons}) + (157\ \text{lb/ton x } 65\ \text{tons})}{(450\ \text{tons} + 65\ \text{tons})} = 95.8\ \text{lb/ton}$$

Second, calculate the weighted average actual emissions factors for centrifugal casting and open molding. Start by calculating emissions factors for each resin using the equations in Table 1 and then use those factors to calculate the weighted average emissions factors.

Emissions factors for each resin and operation:

Centrifugal casting (50%):	EF = 0.026 × 0.50 × 2000 = 26.00 lb/ton
Centrifugal casting (32%):	EF = 0.026 × 0.32 × 2000 = 16.64 lb/ton
Nonatomized mechanical (35%):	EF = ((0.157 × 0.35) – 0.0165) × 2000 = 76.90 lb/ton
Manual application (49%):	EF = ((0.286 × 0.49) – 0.0529) × 2000 = 174.48 lb/ton

Weighted average emissions factor for centrifugal casting:

$$EF = \frac{(26.00\ \text{lb/ton} \times 600\ \text{tons}) + (16.64\ \text{lb/ton} \times 25\ \text{tons})}{(600\ \text{tons} + 25\ \text{tons})} = 25.6\ \text{lb/ton}$$

Weighted average emissions factor for open molding:

$$EF = \frac{(76.90\ \text{lb/ton} \times 450\ \text{tons}) + (174.48\ \text{lb/ton} \times 65\ \text{tons})}{(450\ \text{tons} + 65\ \text{tons})} = 89.2\ \text{lb/ton}$$

Third, compare the weighted average emissions factors to their respective weighted average emissions limits. In this scenario, Facility F's open molding operation is in compliance because the emissions factor of 89.2 lb/ton is lower than the limit of 95.8 lb/ton. Facility F's centrifugal casting operation is not in compliance because the emissions factor of 25.6 lb/ton is greater than the limit of 24.8 lb/ton. However, if Facility F were to switch from a 50 percent HAP resin to a 48 percent HAP resin, the weighted average emissions factor would be calculated as follows:

Emissions factors for each resin and operation:

Centrifugal casting (48%):	EF = 0.026 × 0.48 × 2000 = 24.96 lb/ton
Centrifugal casting (32%):	EF = 0.026 × 0.32 × 2000 = 16.64 lb/ton

Weighted average emissions factor for centrifugal casting:

$$EF = \frac{(24.96\ \text{lb/ton} \times 600\ \text{tons}) + (16.64\ \text{lb/ton} \times 25\ \text{tons})}{(600\ \text{tons} + 25\ \text{tons})} = 24.6\ \text{lb/ton}$$

The centrifugal casting operation would now be in compliance because the emissions factor of 24.6 lb/ton is lower than the limit of 24.8 lb/ton.

OPTION 4: USING THE SAME RESIN

If you use the same noncorrosion-resistant resin, the same corrosion-resistant and/or high-strength resin, or the same tooling resin across different open molding operations and centrifugal casting operations, this option allows you to comply with the organic HAP limit for one of the operations in which you use the resin rather than with the individual emissions limit for each operation. This option is described in section 63.5810(d) of the rule. To take maximum advantage of this option, you would choose to comply with the organic HAP content limit for that operation that allowed the highest organic HAP content. Table 7, which is included in Appendix C, shows the various combinations of resin types and operations that can use this option, with the highest organic HAP limit for each combination shown in the last column.

The "same resin" option is not a stand-alone option. To use this option, a facility must first demonstrate compliance with an applicable limit using one of the other three options. Once compliance is demonstrated with one limit, the facility may then use the "same resin" option to demonstrate compliance when using resin(s) of the same type in another operation.

In simple terms (and as illustrated in Example 11 below), a facility with two open molding operations, A and B, using the same tooling resin would first determine if it is compliance on an individual operation basis; that is, the facility would use Table 3 to determine compliance for Operation A and for Operation B. If one of the operations (e.g., Operation B) was not in compliance (i.e., the HAP content of the tooling resin exceeded the allowable HAP content for Operation B), the facility could then use the "same resin" option to determine if Operation B is in compliance. (The compliance status of Operation A would still be determined using Table 3.) If the HAP content of the tooling resin is less than the highest organic HAP content that can be used for Operation B (last column in Table 7), then Operation B is in compliance and the entire facility is thus in compliance. In sum, the "same resin" option allows a facility an alternative compliance determination if the facility can not comply on an individual resin basis or even if averaging does not allow the facility to demonstrate compliance.

The following five examples illustrate using the "same resin" option, starting with a simple scenario and ending with a complex scenario.

Example 11:

Suppose Facility G uses a high-strength resin for centrifugal casting and filament application. The resin has HAP content of 45 percent. Under Option 1, Complying with Individual Limits (as found in Table 3), the centrifugal casting operation is in compliance because the 48 percent HAP resin results in an emission factor 23.4 lb/ton which is below the emission limit of 25 lb/ton. The filament application operation would not be in compliance because the 45 percent HAP resin has an emission factor of 187.5 lb/ton which is above the emission limit of 171 lb/ton. Under the "same resin" option, Facility G is allowed to determine the compliance status of the filament application option using the limits in Table 7. (The compliance status of the centrifugal casting operation is still determined using the limits from Table 3.) In this example, Facility G would use Condition 1.b of Table 7 to determine the maximum allowable organic HAP content for its filament application operation. As seen in Table 7, if a facility has high-strength resin and

centrifugal casting, the highest HAP content allowed for filament application is 48 percent. Therefore, Facility G's filament application operation is now considered to be in compliance because the high-strength resin's organic HAP content of 45 percent is less than the 48 percent allowed under the "same resin" option.

Example 13:

In a slightly different scenario, suppose Facility H uses the same high-strength resin with a HAP content of 45 percent for mechanical nonatomized application and filament application. The facility is in compliance with the individual emissions limit (Table 3) for mechanical resin application, but not for filament application. The facility then looks to Table 7 to determine if the filament application operation is in compliance under the same resin option. Condition 2.a of Table 7 says that if a facility has high-strength resin and nonatomized mechanical application, the highest HAP content allowed for filament application is 46.2 percent. In this situation, Facility H's resin with HAP content of 45 percent does meet the limit.

Example 14:

Suppose Facility I uses two different resins. One resin is a high-strength resin with a HAP content of 47 percent and the other resin is a non-CR/HS resin with a HAP content of 44 percent. Both resins are used for centrifugal casting and filament application. Under "same resin" option, the facility cannot average the two resins because they are different types of resins, so each resin must be evaluated for compliance individually.

First, consider the high-strength resin with a HAP content of 47 percent. Under the individual limit option, the centrifugal casting operation is in compliance, but the filament application operation is not. Using the "same resin" option, under condition 1.b of Table 7, the maximum HAP content allowed for filament application of a high-strength resin if the facility has centrifugal casting is 48 percent. The HAP content of the resin is lower than the limit, so the facility would be in compliance for this resin.

Second, consider the non-CR/HS resin with a HAP content of 44 percent. Under the individual limit option, the centrifugal casting operation is not compliance, but the filament application operation is in compliance. Using the "same resin" option, under condition 4.c of Table 7, the maximum HAP content allowed for centrifugal casting with a non-CR/HS resin if the facility has filament application is 45 percent. The HAP content of the resin is lower than the limit, so the facility would be in compliance for this resin.

Example 15:

Suppose Facility J is an existing source subject to the limits in Table 3 using three different tooling resins in two application operations: manual application and atomized mechanical application. The table below shows the amount of each type of resin used in each process:

Facility J Resin Usage Previous 12 months			
	Tooling Resin A	**Tooling Resin B**	**Tooling Resin C**
HAP Content	47 percent	45 percent	43 percent
Emission Factor for manual application	163	152	140
Emission Factor for atomized mechanical application	311	283	254
Tons used for Manual Application	100	50	65
Tons used for Atomized Mechanical Application	115	70	55

Facility J first assesses whether it can demonstrate whether its resins can demonstrate compliance on an individual as applied resin basis (Option 1). The emission factors for manual application of the tooling resins range from 140 to 163. The factor of resin A exceeds the allowable emissions limit of 157 lb/ton. The emission factors for atomized application range from 254 to 311. Resin C would be in compliance, but resins A and B would not. Therefore Facility J can not demonstrate compliance on an individual resin basis as applied.

Next, Facility J assesses whether it can demonstrate compliance using averaging for individual limits (Option 2), which requires calculating a weighted average for each operation. Using the steps shown under Option 2, Facility J determines that the weighted average emissions factor for manual application is less than the allowable emissions limit for that operation, but that the weighted average emissions factor for atomized mechanical application is higher than the allowable emissions limit for that operation. Thus, under the averaging option, Facility J is in compliance for its manual application operation, but not in compliance for their atomized application operation.

Facility J then moves to Option 3 and tries to average emissions across all open molding resins. Using the steps shown in Option 3, Facility J calculates the weighted average emissions limit and weighted average emissions factor and determines that the emissions factor is higher than the limit; therefore, the facility still cannot demonstrate compliance.

Finally, Facility J assesses the compliance status of the atomized application operation under the "same resin" option. Facility J can use the HAP content limits in Table 7 to demonstrate compliance when these same resins are used in another operation. In this case, Facility J is using the same tooling resins for both manual application and atomized mechanical application. The Table 7 limit for tooling resin used in atomized mechanical applications for a facility that uses the same tooling resin in a manual application is 45.9 percent HAP.

Facility J first determines if the HAP content of the individual tooling resins each meet this limit; they do not. Because the "same resin" option allows a facility to use a weighted average to comply with the Table 7 limit, Facility J next calculates the weighted average HAP content for the atomized mechanical application of the tooling resins as follows:

$$\frac{(0.47 \times 110 \text{ tons}) + (0.45 \times 50 \text{ tons}) + (0.43 \times 55 \text{ tons})}{(110 \text{ tons} + 50 \text{ tons} + 55 \text{ tons})} = 45.5\%$$

Because the weighted average HAP content of the tooling resins is less than the Table 7 limit of 45.9 percent, Facility J's atomized mechanical application operation is in compliance. As indicated above, the facility's manual application operation is in compliance when the weighted average HAP content is considered.

Example 16:

Now consider that Facility K is an existing source subject to the limits in Table 3 using the same three tooling resins as Facility J in Example 14 in the same two operations, but the amount of each resin used in each process is different. The table below shows the amount of each type of resin used in each process, and the same steps should be followed to determine compliance:

Facility K Resin Usage Previous 12 months			
	Resin A	**Resin B**	**Resin C**
HAP Content	47 percent	45 percent	43 percent
Tons used for Manual Application	90	65	75
Tons used for Atomized Mechanical Application	175	45	35

As in example 14, Facility K uses averaging to comply with individual limits (Option 2) and determines that it is in compliance for manual application but not mechanical application. Next, Facility J tries using Option 3 to average across multiple open molding operations. The weighted average actual emissions factor is greater than the weighted average emissions limit, so Facility K still cannot demonstrate compliance.

Facility K now assesses the compliance status of the atomized mechanical application under the "same resin" option. Facility K can use the HAP content limits in Table 7 to demonstrate compliance when these same resins are used in another operation. In this case, Facility K is using the tooling resins for both manual application and mechanical application and is in compliance with the Table 3 limit for manual application. The Table 7 limit for atomized mechanical tooling resin application for a facility that also has manual tooling resin application is 45.9 percent HAP. The weighted average HAP content for the atomized mechanical application of the tooling resins is calculated as follows:

$$\frac{(0.47 \times 175 \text{ tons}) + (0.45 \times 45 \text{ tons}) + (0.43 \times 35 \text{ tons})}{(175 \text{ tons} + 45 \text{ tons} + 35 \text{ tons})} = 46.1\%$$

The weighted average HAP content at Facility K exceeds the Table 7 limit of 45.9 percent, so Facility K is not compliance. This example illustrates that Table 7 does have some limitations for using resins that exceed the allowable HAP content. Usage of resins with HAP contents higher than applicable limits must be balanced by using lower HAP resins in the same processes.

Appendix A

Table 1 from the Reinforced Plastic Composites NESHAP

Table 1 to Subpart WWWW of Part 63--Equations to Calculate Organic HAP Emissions Factors for Specific Open Molding and Centrifugal Casting Process Streams[1]

As specified in §63.5810, use the equations in the following table to calculate organic HAP emissions factors for specific open molding and centrifugal casting process streams:

If your operation type is a new or existing...	And you use...	With...	Use this organic HAP Emissions Factor (EF) Equation for materials with less than 33 percent organic HAP (19 percent organic HAP for nonatomized gel coat) [2,3,4] ...	Use this organic HAP emissions Factor (EF) Equation for materials with 33 percent or more organic HAP (19 percent for nonatomized gel coat) [2,3,4] ...
1. open molding operation	a. manual resin application	i. nonvapor-suppressed resin	EF = 0.126 x %HAP x 2000	EF = ((0.286 x %HAP)-0.0529) x 2000
		ii. vapor-suppressed resin	EF = 0.126 x %HAP x 2000 x (1-(0.5 x VSE factor))	EF = ((0.286 x %HAP)-0.0529) x 2000 x (1-(0.5 x VSE factor))
		iii. vacuum bagging/closed-mold curing with roll out	EF = 0.126 x %HAP x 2000 x 0.8	EF = ((0.286 x %HAP)-0.0529) x 2000 x 0.8
		iv. vacuum bagging/closed-mold curing without roll-out	EF = (0.126 x %HAP x 2000 x 0.5	EF = ((0.286 x %HAP)-0.0529) x 2000 x 0.5
	b. atomized mechanical resin application	i. nonvapor-suppressed resin	EF = 0.169 x %HAP x 2000	EF = ((0.714 x %HAP)-0.18) x 2000
		ii. vapor-suppressed resin	EF = 0.169 x %HAP x 2000 x (1-(0.45 x VSE factor))	EF = ((0.714 x %HAP)-0.18) x 2000 x (1-(0.45 x VSE factor))

1. open molding operation	b. atomized mechanical resin application	iii. vacuum bagging/closed-mold curing with roll-out	EF = 0.169 x %HAP x 2000 x 0.85	EF = ((0.714 x %HAP)-0.18) x 2000 x 0.85
		iv. vacuum bagging/closed-mold curing without roll-out	EF = 0.169 x %HAP x 2000 x 0.55	EF = ((0.714 x %HAP)-0.18) x 2000 x 0.55
	c. nonatomized mechanical resin application	i. nonvapor-suppressed resin	EF = 0.107 x %HAP x 2000	EF = ((0.157 x %HAP)-0.0165) x 2000
		ii. vapor-suppressed resin	EF = 0.107 x %HAP x 2000 x (1-(0.45 x VSE factor))	EF = ((0.157 x %HAP)-0.0165) x 2000 x (1-(0.45 x VSE factor))
		iii. closed-mold curing with roll-out	EF = 0.107 x %HAP x 2000 x 0.85	EF = ((0.157 x %HAP)-0.0165) x 2000 x 0.85
		iv. vacuum bagging/closed-mold curing without roll-out	EF = 0.107 x %HAP x 2000 x 0.55	EF = ((0.157 x %HAP)-0.0165) x 2000 x 0.55
	d. atomized mechanical resin application with robotic or automated spray control [5]	nonvapor-suppressed resin	EF = 0.169 x %HAP x 2000 x 0.77	EF = 0.77 x ((0.714 x %HAP)-0.18) x 2000
	e. filament application [6]	i. nonvapor-suppressed resin	EF = 0.184 x %HAP x 2000	EF = ((0.2746 x %HAP)-0.0298) x 2000

1. open molding operation	e. filament application [6]	ii. vapor-suppressed resin	EF = 0.12 x %HAP x 2000	EF = ((0.2746 x %HAP)-0.0298) x 2000 x 0.65
	f. atomized spray gel coat application	nonvapor-suppressed gel coat	EF = 0.445 x %HAP x 2000	EF = ((1.03646 x %HAP)-0.195) x 2000
	g. nonatomized spray gel coat application	nonvapor-suppressed gel coat	EF = 0.185 x %HAP x 2000	EF = ((0.4506 x %HAP)-0.0505) x 2000
	h. atomized spray gel coat application using robotic or automated spray	nonvapor-suppressed gel coat	EF = 0.445 x %HAP x 2000 x 0.73	EF = ((1.03646 x %HAP)-0.195) x 2000 x 0.73
2. centrifugal casting operations [7,8]	a. heated air blown through molds	nonvapor-suppressed resin	EF = 0.558 x (%HAP) x 2000	EF = 0.558 x (%HAP) x 2000
	b. vented molds, but air vented through the molds is not heated	nonvapor-suppressed resin	EF = 0.026 x (%HAP) x 2000	EF = 0.026 x (%HAP) x 2000

Footnotes to Table 1

[1] The equations in this table are intended for use in calculating emission factors to demonstrate compliance with the emission limits in subpart WWWW. These equations may not be the most appropriate method to calculate emission estimates for other purposes. However, this does not preclude a facility from using the equations in this table to calculate emission factors for purposes other then rule compliance if these equations are the most accurate available.

[2] To obtain the organic HAP emissions factor value for an operation with an add-on control device multiply the EF above by the add-on control factor calculated using Equation 1 of §63.5810. The organic HAP emissions factors have units of lbs of organic HAP per ton of resin or gel coat applied.

[3] Percent HAP means total weight percent of organic HAP (styrene, methyl methacrylate, and any other organic HAP) in the resin or gel coat prior to the addition of fillers, catalyst, and promoters. Input the percent HAP as a decimal, i.e., 33 percent HAP should be input as 0.33, not 33.

[4] The VSE factor means the percent reduction in organic HAP emissions expressed as a decimal measured by the VSE test method of appendix A to this subpart.

[5] This equation is based on an organic HAP emissions factor equation developed for mechanical atomized controlled spray. It may only be used for automated or robotic spray systems with atomized spray. All spray operations using hand held spray guns must use the appropriate mechanical atomized or mechanical nonatomized organic HAP emissions factor equation. Automated or robotic spray systems using nonatomized spray should use the appropriate nonatomized mechanical resin application equation.

[6] Applies only to filament application using an open resin bath. If resin is applied manually or with a spray gun, use the appropriate manual or mechanical application organic HAP emissions factor equation.

[7] These equations are for centrifugal casting operations where the mold is vented during spinning. Centrifugal casting operations where the mold is completely sealed after resin injection are considered to be closed molding operations.

[8] If a centrifugal casting operation uses mechanical or manual resin application techniques to apply resin to an open centrifugal casting mold, use the appropriate open molding equation with covered cure and no rollout to determine an emission factor for operations prior to the closing of the centrifugal casting mold. If the closed centrifugal casting mold is vented during spinning, use the appropriate centrifugal casting equation to calculate an emission factor for the portion of the process where spinning and cure occur. If a centrifugal casting operation uses mechanical or manual resin application techniques to apply resin to an open centrifugal casting mold, and the mold is then closed and is not vented, treat the entire operation as open molding with covered cure and no rollout to determine emission factors.

Appendix B
Table 3 from the Reinforced Plastic Composites NESHAP

Table 3 to Subpart WWWW of Part 63--Organic HAP Emissions Limits for Specific Open Molding, Centrifugal Casting, Pultrusion and Continuous Lamination/Casting Operations

As specified in §63.5805, you must meet the following organic HAP emissions limits that apply to you:

If your operation type is...	And you use...	Your organic HAP emissions limit is [1]..
1. open molding - corrosion-resistant and/or high strength (CR/HS)	a. mechanical resin application	113 lb/ton
	b. filament application	171 lb/ton
	c. manual resin application	123 lb/ton
2. open molding - non-CR/HS	a. mechanical resin application	88 lb/ton
	b. filament application	188 lb/ton
	c. manual resin application	87 lb/ton
3. open molding - tooling	a. mechanical resin application	254 lb/ton
	b. manual resin application	157 lb/ton
4. open molding - low-flame spread/low-smoke products	a. mechanical resin application	497 lb/ton
	b. filament application	270 lb/ton
	c. manual resin application	238 lb/ton
5. open molding - shrinkage controlled resins [2]	a. mechanical resin application	354 lb/ton
	b. filament application	215 lb/ton
	c. manual resin application	180 lb/ton

If your operation type is...	And you use...	Your organic HAP emissions limit is [1]..
6. open molding - gel coat [3]	a. tooling gel coating	440 lb/ton
	b. white/off white pigmented gel coating	267 lb/ton
	c. all other pigmented gel coating	377 lb/ton
	d. CR/HS or high performance gel coat	605 lb/ton
	e. fire retardant gel coat	854 lb/ton
	f. clear production gel coat	522 lb/ton
7. centrifugal casting - CR/HS	a. resin application with the mold closed, and the mold is vented during spinning and cure	25 lb/ton [4]
	b. resin application with the mold closed, and the mold is not vented during spinning and cure	NA - this is considered to be a closed molding operation
	c. resin application with the mold open, and the mold is vented during spinning and cure	25 lb/ton [4]
	d. resin application with the mold open, and the mold is not vented during spinning and cure	Use the appropriate open molding emission limit [5]

If your operation type is...	And you use...	Your organic HAP emissions limit is [1]..
8. centrifugal casting - non-CR/HS	a. resin application with the mold closed, and the mold is vented during spinning and cure	20 lb/ton [4]
	b. resin application with the mold closed, and the mold is not vented during spinning and cure	NA - this is considered to be a closed molding operation
	c. resin application with the mold open, and the mold is vented during spinning and cure	20 lb/ton [4]
	d. resin application with the mold open, and the mold is not vented during spinning and cure	Use the appropriate open molding emission limit [5]
9. pultrusion [6]	N/A	reduce total organic HAP emissions by at least 60 weight percent
10. continuous lamination/ casting	N/A	reduce total organic HAP emissions by at least 58.5 weight percent or not exceed a organic HAP emissions limit of 15.7 lbs of organic HAP per ton of neat resin plus and neat gel coat plus

Footnotes to Table 3

[1] Organic HAP emissions limits for open molding and centrifugal casting are expressed as lb/ton. You must be at or below these values based on a 12-month rolling average.

[2] This emission limit applies regardless of whether the shrinkage controlled resin is used as a production resin or a tooling resin.

[3] If you only apply gel coat with manual application, for compliance purposes treat the gel coat as if it were applied using atomized spray guns to determine both emission limits and emission factors. If you use multiple application methods and any portion of a specific gel coat is applied using nonatomized spray, you may use the nonatomized spray gel coat equation to calculate an emission factor for the manually applied portion of that gel coat. Otherwise, use the atomized spray gel coat application equation to calculate emission factors.

[4] For compliance purposes, calculate your emission factor using only the appropriate centrifugal casting equation in item 2 of Table 1 to this subpart, or a site specific emission factor for after the mold is closed as discussed in §63.5796.

[5] Calculate your emission factor using the appropriate open molding covered cure emission factor in item 1 of Table 1 to this subpart, or a site specific emission factor as discussed in §63.5796.

[6] Pultrusion machines that produce parts that meet the following criteria: 1,000 or more reinforcements or the glass equivalent of 1,000 ends of 113 yield roving or more; and have a cross sectional area of 60 square inches or more are not subject to this requirement. Their requirement is the work practice of air flow management which is described in Table 4 to this subpart.

Appendix C
Table 7 from the Reinforced Plastic Composites NESHAP

Table 7 to Subpart WWWW of Part 63--Options Allowing Use of the Same Resin Across Different Operations That Use the Same Resin Type

As specified in §63.5810(d), when electing to use the same resin(s) for multiple resin application methods, you may use any resin(s) with an organic HAP content less than or equal to the values shown in the following table, or any combination of resins whose weighted average organic HAP content based on a 12-month rolling average is less than or equal to the values shown the following table:

If your facility has the following resin type and application method...	**The highest resin weight percent organic HAP content, or weighted average weight percent organic HAP content, you can use for...**	**is...**
1. CR/HS resins, centrifugal casting [1,2]	a. CR/HS mechanical	48.0 [3]
	b. CR/HS filament application	48.0
	c. CR/HS manual	48.0
2. CR/HS resins, nonatomized mechanical	a. CR/HS filament application	46.4
	b. CR/HS manual	46.4
3. CR/HS resins, filament application	CR/HS manual	42.0
4. non-CR/HS resins, filament application	a. non-CR/HS mechanical	45.0 [3]
	b. non-CR/HS manual	45.0
	c. non-CR/HS centrifugal casting [1 2]	45.0
5. non-CR/HS resins, nonatomized mechanical	a. non-CR/HS manual	38.5
	b. non-CR/HS centrifugal casting [1,2]	38.5
6. non-CR/HS resins, centrifugal casting [1,2]	non-CR/HS manual	37.5
7. tooling resins, nonatomized mechanical	tooling manual	91.4
8. tooling resins, manual	tooling atomized mechanical	45.9

Footnotes for Table 7

[1] If the centrifugal casting operation blows heated air through the molds, then 95 percent capture and control must be used if the facility wishes to use this compliance option.

[2] If the centrifugal casting molds are not vented, the facility may treat the centrifugal casting operations as if they were vented if they wish to use this compliance option.

[3] Nonatomized mechanical application must be used.