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Innovative Product Exemption Provision

Background

CARB has proposed the use of the Innovative Product Exemption (IPE) for use with Hair Spray, Dry Shampoo or Personal Fragrance Product to utilize Compressed Air, Nitrogen or Carbon Dioxide propellant. CARB has stated the goal of this IPE provision is to provide an alternative way to propel these products to replace the propellant HFC-152 which will lower the Global Warming Potential (GWP) of products.

CARB has provided a chart with Representative HFC-152a formulations for products; these representative products are listed below:

Table 94511(d)(1): Representative HFC-152a Product Formulations

Product Category and Applicable VOC Standard	Weight Percent by Ingredient				
	Ethanol	HFC-152a	Fragrance	Other VOC or LVP-VOC*	Non-Volatiles and Exempt VOCs**
Hair Finishing Spray: 50% VOC	45	45	0.1	3.9	6
Dry Shampoo: 55% VOC	30	29	0.2	30.8	10
Dry Shampoo: 50% VOC	30	33	0.2	26.8	10
Personal Fragrance Product: 70% VOC	40	15	2	30	13
Personal Fragrance Product: 50% VOC	30	30	2	22	16

*Includes VOCs and LVP-VOCs. Average MIR of 0.09

** MIR of 0.00.



IPE GWP Reduction Proposal

CARB is attempting to provide a pathway for Industry to lower the GWP of the three targeted categories by using an alternate propellant system, which in their proposal is compressed gas. In this proposal CARB has criteria to maintain the MIR value of the product to prevent any increase in Ozone Forming Potential (OFP). This limitation is vital to maintain the VOC emissions proposed by CARB in this rulemaking. The use of Reactivity is a perfect way to ensure that OFP is maintained per product. In addition, there is criteria for not reducing non-propellant mass.

This proposal is very narrow in concept and would be extremely difficult, based on chemistry and physics, to implement. In addition, this proposal may have unintended negative environmental consequences. Aerosol products using compressed gases often are unable to expel all of the actives out of the can which can leave undesired waste in the can and hinder the recycling process. CARB should be commended for not only seeking solutions that are outside the regular command and control, but also maintain OFP and are a potential offset for GWP. Using CARB's goal of reducing GWP in propellants and maintaining OFP this proposal could be broadened to use more tools to reduce GWP while maintaining OFP of a product.

As an alternative, instead of considering only the propellant, it is more appropriate to use the solvent/propellant blend for a product. Especially for aerosols, the Solvent/Propellant blend is critical to the performance of the product. In compressed gas applications the solvent portion is critical to the spray performance. Also, several additional compounds, solvent and propellant, could be utilized to complete the goal of reducing GWP and maintaining OFP of a product.

New IPE GWP Reduction Proposal

Using the solvent/propellant blend for a product is the most critical portion of the Aerosol product. For this proposal the solvent/propellant blend is the Ethanol/HFC-152a portion of the Representative sample. If we focus on the solvent/propellant blend, then we assume the remaining portion of the product is the active portion. The active portion will likely be maintained with whatever solvent/propellant blend is used. Thus, considering only the solvent/propellant mixture broadens the proposal and offers numerous other possibilities. For example, the Representative Product formulation solvent/propellant for a 50% Hair Finishing Spray per CARB's proposal is the following:

50% Hair Spray
Ethanol 45%
HFC-152a 45%

If one assumes the other 10% of the formula is the active portion, this 10% will remain the same. The above solvent propellant/blend percent is 90%. This is simply the 45% Ethanol plus the 45% HFC-152a. The solvent/propellant blend MIR is the following:

Ethanol 45% x 1.53 MIR Value = 0.70
HFC-152a 45% x 0.02 MIR Value = 0.01
0.71



Thus, the solvent/propellant blend is 90% of the product with an MIR value of 0.71. CARB has stated at least a 50% reduction in HFC-152a is needed to qualify for the IPE. This proposal represents other unique ways to comply with the IPE using liquefied propellants and other compounds.

Hairspray Example

Here are other options to maintain the reduced GWP and maintain the OFP of a product.

Example 1	MIR Value		%	MIR x %	Note
Ethanol	1.53	X	40%	0.61	
Isopropanol	0.61	X	5%	0.03	
HFO-1234ze	0.10	X	25%	0.03	50% reduction in GWP Propellant
HFC-152a	0.02	X	20%	0	
			90%	0.68	Below 0.71 MIR of Solvent/Propellant

Note: Solvent/propellant blend maintained

Example 2	MIR Value		%	MIR x %	Note
Ethanol	1.53	X	36%	0.55	
HFO-1233zd	0.04	X	9%	0	
A-46	0.60	X	25%	0.15	50% reduction in GWP Propellant
HFC-152a	0.02	X	20%	0	
			90%	0.70	At 0.71 MIR of Solvent/Propellant

Note: Solvent/propellant blend maintained

Example 3	MIR Value		%	MIR x %	Note
Ethanol	1.53	X	33%	0.50	
HFO-1233zd	0.04	X	15%	0.01	
A-46	0.60	X	30%	0.18	100% reduction in GWP Propellant
HFO-1234ze	0.10	X	15%	0.02	
			90%	0.71	At 0.71 MIR of Solvent/Propellant

Note: Solvent/propellant blend maintained

- All GWP propellant removed



Example 4	MIR Value	X	%	MIR x %	Note
Ethanol	1.53	X	30%	0.46	
Isopropanol	0.61	X	15%	0.09	
A-46	0.60	X	25%	0.15	50% reduction in GWP Propellant
HFC-152a	0.02	X	20%	0	
			90%	0.70	Below 0.71 MIR of Solvent/Propellant

Note: Solvent/propellant blend maintained

Dry Shampoo

The Solvent/Propellant blend MIR for The Representative Dry Shampoo product is the following:

	MIR Value	X	%	MIR x %	
Ethanol	1.53	X	30	0.46	
HFC-152a	0.02	X	29	0.01	
			59%	0.47	0.47 MIR is the Solvent/Propellant blend

Note: Solvent/Propellant blend is 59%

For 50% Dry Shampoo Representative Product

	MIR Value	X	%	MIR x %	
Ethanol	1.53	X	30	0.46	
HFC-152a	0.02	X	33	0.01	
			63%	0.47	0.47 MIR is the Solvent/Propellant blend

Note: Solvent/Propellant blend is 63%

Dry Shampoo Examples

Given that the MIR for the Solvent/Propellant blend is the same these examples work for both 55% and 50% limits

Example 1	MIR Value	X	%	MIR x %	Note
Ethanol	1.53	X	29%	0.44	
HFO-1233zd	0.04	X	1%	0	
HFO-1234ze	0.10	X	15%	0.02	50% reduction in GWP Propellant
HFC-152a	0.02	X	14%	0	
			59%	0.46	0.46 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 59%



Example 2	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	25%	0.43	
Isopropanol	0.61 X	2%	0.01	
HFO-1234ze	0.10 X	15%	0.02	50% reduction in GWP Propellant
HFC-152a	0.02 X	14%	0	
		59%	0.46	0.46 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 59%

Example 3	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	23%	0.35	
Isopropanol	0.61 X	7%	0.02	
A-46	0.60 X	15%	0.09	50% reduction in GWP Propellant
HFC-152a	0.02 X	14%	0	
		59%	0.46	0.46 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 59%

Example 4	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	9%	0.13	
A-46	0.60 X	50%	0.30	100% reduction in GWP
		59%	0.43	0.43 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 59%

Personal Fragrance

The Solvent/Propellant blend MIR for the Representative Personal Fragrance Product is the following:

For 70% VOC limit

	MIR Value	%	MIR x %	
Ethanol	1.53 X	40	0.61	
HFC-152a	0.02 X	15	0.00	
		55%	0.61	0.61 MIR is the Solvent/Propellant blend

Note: Solvent/Propellant blend is 55%



For 50% VOC limit

	MIR Value	%	MIR x %	
Ethanol	1.53 X	30	0.46	
HFC-152a	0.02 X	30	0.01	
		60%	0.47	0.47 MIR is the Solvent/Propellant blend

Note: Solvent/Propellant blend is 60%

Personal Fragrance Examples

For 70% VOC limit MIR content 0.61 Solvent/Propellant blend 55%

Example 1	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	38%	0.58	
HFO-1233zd	0.04 X	1%	0	
HFO-1234ze	0.10 X	8%	0.01	50% reduction in GWP Propellant
HFC-152a	0.02 X	7%	0	
		55%	0.61	0.61 MIR is at Solvent/Propellant blend

Note: Solvent/Propellant blend is 55%

Example 2	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	37%	0.57	
Isopropanol	0.61 X	3%	0.02	
HFO-1234ze	0.10 X	8%	0.01	50% reduction in GWP Propellant
HFC-152a	0.02 X	7%	0	
		55%	0.60	0.60 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 55%

Example 3	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	36%	0.55	
HFO-1233zd	0.04 X	4%	0.00	
A-46	0.60 X	8%	0.05	50% reduction in GWP Propellant
HFC-152a	0.02 X	7%	0	
		55%	0.60	0.60 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 55%



Example 4	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	34%	0.55	
Isopropanol	0.61 X	6%	0.01	
A-46	0.60 X	8%	0.05	50% reduction in GWP Propellant
HFC-152a	0.02 X	7%	0	
		55%	0.61	0.61 at MIR Solvent/Propellant blend

Note: Solvent/Propellant blend is 55%

For 50% VOC Limit MIR content 0.47 Solvent/Propellant 60%

Example 1	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	29%	0.44	
HFO-1233zd	0.04 X	1%	0.00	
HFO-1234ze	0.10 X	15%	0.02	50% reduction in GWP Propellant
HFC-152a	0.02 X	15%	0	
		60%	0.46	0.46 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 60%

Example 2	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	28%	0.43	
Isopropanol	0.61 X	2%	0.01	
HFO-1234ze	0.10 X	15%	0.02	50% reduction in GWP Propellant
HFC-152a	0.02 X	15%	0	
		55%	0.46	0.46 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 55%

Example 3	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	23%	0.35	
HFO-1233zd	0.04 X	7%	0.00	
A-46	0.60 X	15%	0.10	50% reduction in GWP Propellant
HFC-152a	0.02 X	15%	0	
		60%	0.45	0.45 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 60%



Example 4	MIR Value	%	MIR x %	Note
Ethanol	1.53 X	20%	0.31	
Isopropanol	0.61 X	10%	0.06	
A-46	0.60 X	15%	0.09	50% reduction in GWP Propellant
HFC-152a	0.02 X	15%	0	
		60%	0.46	0.46 MIR is below Solvent/Propellant blend

Note: Solvent/Propellant blend is 60%

Summary

Using the Solvent/Propellant blend MIR for the new GWP Reduction IPE affords the product manufacturers a larger variation of options to reformulate their products to these stringent limits. Adding in the Reactivity concept allows for the use of certain compounds that have lower Reactive values than currently utilized compounds. These examples are only a paper formulations and not necessarily desirable formulas for products. There may be certain characteristics of the compounds described above that will limit the individual use of these compounds. Characteristics such as odor, cost, compatibility and flammability may restrict some use of these compounds. In addition, there are likely other compounds that could be used that have not been considered here.

However, these examples are an attempt to show the kind of flexibility and potential for manufacturers to innovate their product lines. This provision will allow a format for product manufacturers to explore expanded options to provide more efficient and effective products while achieving compliance to help CARB reach and maintain Air Quality goals.

Once approved, the IPE product would have its own unique VOC limit which CARB enforcement and laboratory could check for compliance, the same as any other product.

Conclusion

The NAA supports CARB's willingness to provide alternatives to command-and-control regulations and will continue to work with CARB on the Compressed Gas portion of this IPE. Currently, given the unique and restrictive characteristics of compressed gas this endeavor may hinder industry's ability to innovate to help CARB achieve its goals now and in the future. The current language proposed is unclear and confusing. In addition, CARB staff has not provided one viable example of a product that could utilize the Compressed Gas IPE.

This proposal adds an additional IPE to CARB's original IPE proposal. It still maintains the original goal which is to provide Industry a pathway to limit the use of GWP compound while maintaining the OFP of products. Actually, this proposal could reduce any increase in GWP compounds and could reduce the amount of GWP compounds currently being utilized.



Reactivity is sound science and utilizing it within an IPE allows CARB to leverage the creativity of Industry to help meet our mutual goals. This proposal balances the fine line between Ozone formation and reducing GWP compounds. Finally, the use of the IPE provision allows CARB to review in detail any product that proposes to use this provision.

CARB maintains the ability to grant or deny any manufacturer the use of this provision, thus ensuring that VOC reductions are maintained.

The NAA looks forward to working with CARB to make this provision workable, and more importantly, useable for the Industry.

Thank you in advance for considering this proposal.