

A Cost Benefit Analysis:
Proposed Regulation
Title 250 – Department of Environmental Management
Chapter 120 – Air Resources
Subchapter 05 – Air Pollution Control
Part 51 – Control of VOC Emissions from Fiberglass Boat Manufacturing

Rhode Island Department of Environmental Management
Office of Air Resources

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Executive Summary

The purpose of this cost benefit analysis is to determine if the proposed regulation by Rhode Island Department of Environmental Management's ("RIDEM") Office of Air Resources ("OAR") would have any significant adverse impacts on the fiberglass boat manufacturing industry in Rhode Island. The proposed rulemaking is to implement control measures to limit VOC emissions from fiberglass boat manufacturing materials including open mold resins, gel coats and cleaning solvents. The regulation aims to reduce the amount of VOCs released into the atmosphere than compared to the current status quo.

An in-depth analysis of all costs and benefits that could be monetized were looked at for this report. Costs that were determined are as follows; cost of resins, tooling materials, gel coats, cleaning materials, and opportunity costs. Benefits included ground-level ozone reduction, reduction in asthma related hospital visits, and avoided agricultural crop loss. Previous studies from the USEPA and other reputable sources were used to monetize all costs and benefits possible. Some costs and benefits were not able to be monetized but should be considered an important factor in the analysis.

The analysis determined that the net present value of the proposed regulation over a period of 3 years would yield \$2,799,161.20.

Introduction and Background

The proposed regulation will apply to any facility that manufactures fiberglass boat hulls or decks or related parts, builds molds to make fiberglass boat hulls or decks or related parts, or makes polyester resin putties for assembling fiberglass boats, whose total actual VOC emissions, before controls, are greater than or equal to fifteen (15) pounds per day. The rule will not apply to facilities that solely manufacture parts of boats, such as hatches, seats, or lockers, or boat trailers, and do not manufacture hulls or decks of boats from fiberglass or build molds to make fiberglass boat hulls or decks. Affected sources will be subject to emission limitations, work practice standards, and recordkeeping and reporting requirements.

There are a few options within the proposed regulation that the facility can choose to do to limit the VOC emissions from their molding operations. These options include a low monomer VOC content for open molding resins and gel coats, an emission averaging calculation, add-on emission controls, and/or adjusting the emission rate for filled resins. Depending on the facility, and what technology or materials being used currently, will determine which option best suits their business practices. Such as if the facility were to purchase low monomer resins/gelcoats that would be in compliant with the regulation, rather than installing emission control technology.

It should be noted that many of the boat building facilities within the state have permits with the Office of Air Resources already. These permits include limitations on various processes, emissions, and chemical use, etc. One fiberglass boat manufacturer for example, has limitations on MMA (Methyl Methacrylate) use, a chemical that would be included in the proposed regulation. The permit limits the MMA content of gel coats to less than or equal to 15% by weight. The proposed regulation has a monomer VOC content limit (weight percent) of 33% (clear) or 48% (pigmented). Having the permit limit already set below the regulation limit would allow for the any extra chemicals to add up to the percent weight VOC content limit. However, it can be assumed that since most of these facilities are already permitted with low limitations, that they are currently purchasing resins, gel coats, and cleaning materials within the proposed regulated limits.

An economic analysis is required to determine if the proposed regulation will have an impact on businesses within Rhode Island.

Objectives

Economic Impact on Businesses within Rhode Island

According to the Rhode Island Marine Trades Association, there are currently 19 boatbuilders/manufacturers within the state (RIMTA). Of the 19, it is assumed that up to 10 companies use processes being looked at in this regulation, hull and deck building. Many companies within the state only do processes such as patch work or repair of boats. These processes are not subject to the proposed regulation, as long as these facilities do not manufacture boat hulls or decks. Many of these facilities that are building decks and hulls have permits with the OAR already limiting their VOC emissions, including Styrene and MMA. As explained earlier within the report, most facilities are already purchasing low VOC (and VOC Monomer content) resins, gel coats, and cleaning materials due to the 2001 NESHAP. As discussed within the cost analysis portion of this report, many facilities can use the

Outside Analysis

United States Environmental Protection Agency (“USEPA”)

Office of Air Quality Planning and Standards

Control Techniques Guidelines for Fiberglass Boat Manufacturing Materials

September 2008 (“the report”) (EPA (3))

In September 2008, the USEPA released a report to provide information to air pollution control authorities that can assist them in determining RACT for VOC from fiberglass boat manufacturing operations. The USEPA evaluated (EPA (3)) the sources of VOC emissions in

this industry and the available control techniques for addressing these emissions (EPA (3) pg. 1). This includes VOC emissions from the use of gel coats, resins, and materials used to clean application equipment used during operations. It is recommended that the control approaches discussed in the report apply to each fiberglass boat manufacturing facility where total actual VOC emissions from all fiberglass boat manufacturing operations covered are equal to or exceed 15 lbs. per day (EPA (3) pg. 3). The analysis and control techniques evaluated in this report were incorporated into Part 51, "Control of VOC Emissions from Fiberglass Boat Manufacturing," the proposed regulation by RIDEM's Office of Air Resources.

USEPA conducted a cost effectiveness analysis to determine if the recommended control options were feasible to the fiberglass boat manufacturing facilities in the U.S. It was determined that out of the 223 facilities within the U.S. there are 91 facilities in ozone nonattainment areas. From the 91 facilities found, it was determined that only 67 facilities would be above the recommended 15 lb./day VOC emissions threshold. It was found that in total these 67 facilities emitted around 1,601 tons per year of VOC or an average of 24 tons per year of VOC per facility (EPA (3) pg. 33). These facilities were recommended to use low-VOC content resins and gel coats with specified application methods and low-VOC and low vapor pressure cleaning materials. Since the recommendation is based upon the 2001 NESHAP for boat manufacturing (Federal Register pg.2) the facilities that are considered major sources of HAP are already in compliance and have already adopted these control methods. It was determined by USEPA that there are no anticipated additional VOC emissions reductions from these major source facilities (EPA (3) pg. 33).

The study focuses on area sources (not major sources of HAP) because it was not included in the 2001 NESHAP. These sources are not required to implement measures as required in the 2001 NESHAP, therefore they would be able to achieve significant VOC emissions reductions. Of the original 223 fiberglass boat manufacturing facilities identified, 23 facilities are located within area sources. The report found that these facilities in aggregate emitted 115 tons per year of VOC. It was estimated that through the measures outlined in the USEPA report, VOC emissions would reduce by about 40 tons per year (EPA (3) pg. 34). This equates to around 1.7 tons per year per facility identified. Based upon the 2001 NESHAP, the EPA estimated a cost of \$5,096.07 per ton of HAP reduced in 2018 dollars (Bureau of Labor Statistics). The report explains that nearly all of the HAP that are reduced by the NESHAP are styrene and MMA (Methyl Methacrylate), which account for nearly all of the VOC emitted from processes addressed by the recommendations in the report (EPA (3) pg. 34). It is expected that the cost to reduce HAP and VOC are nearly equal. Therefore, the initial cost for this project will be \$5,096.07 in \$2018 per ton VOC reduced. This value can be considered a high estimate because the original report was written in 2008, and was assuming that these facilities had not taken steps to comply with 2001 NESHAP already. Since it has been 10 years since the release of this report, and as explained within the report itself, it is assumed that facilities will incur little to no cost to comply with VOC limitations.

The chemicals being used in fiberglass boat manufacturing currently are in compliance with 2001 NESHAPs and are available for all sized facilities to purchase. It is assumed that after the report was written in 2008, that most, if not all, facilities switched over to compliant chemicals already. Also, the application method in which the chemicals are used had shifted from conventional atomized methods to non-atomized methods in result of the 2001 NESHAP. The non-atomized methods are found to be beneficial to facilities to utilize due to increased productivity, thus higher economic benefit. The USEPA estimates that facilities will likely incur little, to no increased costs due to a state implementation of a regulation as recommended by the report. An estimated cost of \$8,500 per facility was found in this report as a result of the cost of installing air pollution control equipment. It is again assumed that all, or most of the facilities have already complied with 2001 NESHAP and would not incur this cost. Of the estimated 10 facilities studied in this analysis, it can be assumed that at least 2/3rd of them already have air pollution control devices installed. Therefore, a total initial cost of \$25,500 will be used as a liberal estimate.

Focusing specifically on Rhode Island, it is assumed the facilities in question regarding the proposed regulation would already be in compliance with 2001 NESHAP, therefore have little to no cost to be in compliance with the proposed regulation. The materials listed in the proposed regulation would be widely available and have most likely already been adopted by all facilities in the fiberglass boat manufacturing industry.

Alternative

An alternative for this cost benefit analysis was not considered, as the alternative is the current status-quo.

Assumptions

The table below includes all assumptions for this analysis.

Assumptions	Value
Discount Rate	3%
Lifetime	3 Years

A discount rate of 3% is used for this analysis as based upon the EPA Regulatory Impact Analysis (EPA (4)) that was conducted in July 2011. This discount rate was widely used among many analyses that have to do with air quality standards for ozone.

A project lifetime of 3 years was used based upon the timeline written within the regulation. The facilities within the fiberglass boat manufacturing industry are required to come into compliance with the proposed regulation by January 1, 2022.

Analysis

Analysis of Impacts – Costs

The following cost analysis for the proposed regulation was taking the most cost-effective option for the average fiberglass boat manufacturer which was determined to be the weighted average monomer VOC content or emissions averaging option. This would allow facilities to keep current materials used, if monomer VOC content is over limitation, and still be in compliance with the proposed regulation. For the net present value calculation, the most cost-effective option will be used. Air Inventories collected by the OAR have shown (from fiberglass boat manufacturers) that all or a large majority of the resins, gel coats, tooling materials, and cleaning materials are all currently in compliance with the proposed regulation. Therefore, there is little cost associated with implementing the regulation.

Cost of In Compliant Resins

Current air inventories the OAR receives each year from facilities that would be subject to the proposed regulation have shown that many of the resins used would be in compliance already. Larger facilities that manufacture fiberglass boats have reported a few resins that would be out of compliance with the low monomer VOC content option, however could be in compliance if using the other options listed in the proposed regulation.

If complying with the monomer VOC content option, for example, one boat manufacturing facility in RI that would be subject to this regulation has reported one resin that has been used in the past 2 years that would be out of compliance with the proposed regulation. According to the facilities records, there are about 5-8 resins that would not be within compliance with the proposed regulation, (Styrene content higher than regulation,) so these types of resins would need to be replaced with lower VOC versions. Although, it should be noted that only one of the 5-8 has been used within the past 2 years. The average price for a noncompliant resin is around \$74 (Castro Composites), while the average price for an in-compliance resin is \$68 (Bottom Paint). (These values were compared to two different marine polyester resins.) Therefore, the only cost difference would be \$6 per gallon, only if using the monomer VOC content limitation. This cost difference will be included in the sensitivity analysis. A facility reported in an air inventory sent to OAR that 5 gallons of a gel coat was used in a year. The price used in the sensitivity analysis for a cost incurred will be $(\$6 \text{ cost difference} \times 5 \text{ gallons}) = \30 per year. The regulated amount of facilities expected would be 10, therefore the total cost to fiberglass boat manufacturing companies would be $(\$30 \times 10 \text{ facilities}) = \300 per year.

Cost of In Compliant Gel Coats

Data from past air inventories collected from companies that would be subject to the proposed regulation have found that majority of used gel coats (white) are within compliance. Little or no cost would be incurred to those that use the weighted average monomer VOC content calculation or the emissions averaging calculation as outlined in the proposed regulation. No change in formulation would be needed as long as facilities mixed gel coats in compliance with the regulation limits. This would allow the boat manufacturing facilities to keep the current gel coats with high monomer VOC content to continue to use these materials without purchasing new or compliant ones. Since the average facilities most used gel coat is in compliance with the proposed regulations limitations, it can be assumed that no cost would be incurred by the facilities.

If looking at facilities that would be changing their gel coats to be in compliance with monomer VOC content limitations, average costs were looked at. The average price of a gel coat is around \$50 for a gallon or \$160 for a 5-gallon barrel (Gel Coat). Distributors of this gel coat list the same price for gel coats within compliance monomer VOC content, and out of compliance with the proposed regulation limitations. This concludes that there would be no price difference for gel coats being used. Differences that are possible would be instances such as changing to different brands or changing distributors when purchasing the gel coats.

Cost of In Compliant Tooling Materials

Tooling materials reported to the OAR in the air inventories have shown that many of the fiberglass boat manufacturing facilities within the state have one or two materials used currently to be out of compliance with the proposed regulation. If a facility chooses to use the weighted average or emissions averaging option to comply with the regulation, they would not have to repurchase materials.

The average price of a noncompliant tooling gel coat is around \$120 (Bottom (2)) when compared to a compliant one at a price of \$180 (Fibre Glast). This is a \$60 difference which can be considered a significant cost to companies. However, it has been found through air inventories that tooling gel coats are not used as much when compared to other materials. For example, one facility reported using around 80 gallons of orange tooling in a year, when compared to using 1428 gallons of a resin in the same year. This data shows that tooling resin is a small portion of the fiberglass boat manufacturing process. This cost incurred is under the assumption that the facility would choose to replace materials to meet monomer VOC content limitations. This cost incurred will be used in the sensitivity analysis, at a price of $(\$60 \times 80 \text{ gallons}) = \$4,800$ per year. The regulated amount of facilities expected would be 10, therefore the total cost to fiberglass boat manufacturing companies would be $(\$4800 \times 10) = \$48,000$ per year. This number is considered a high estimate because tooling gels are not used as often as other materials according to reports received by OAR.

Cost of In Compliant Cleaning Materials

Through an analysis of cleaning products used by facilities that submit air inventories to the OAR, no cleaning materials have reported having styrene or MMA content in it, therefore there are no costs associated with this requirement. If there was a cleaning material that contained a high monomer VOC content, it would be most cost-effective for the facility to use the weighted average or emissions averaging option.

Opportunity Cost

Opportunity cost represents the benefits a business misses out on when choosing one alternative over another (Investopedia). This is an important cost to consider when implementing a regulation on an industry. Although the projected cost is small compared to the benefits seen, the business could still have used funds elsewhere. For example, facilities that have one or two resins or gel coats that would not meet thresholds outlined in the proposed regulation, could incur a small cost to purchase materials within compliance. The difference paid is considered an opportunity cost to the business. However, since the option of averaging emissions or weighted average monomer VOC content can be the most cost-effective for those facilities with out-of-compliance materials, the opportunity cost for the proposed regulation is considerably low. These options allow facilities to keep any materials that are not within threshold of the proposed regulation, and still continue business as is.

Analysis of Impacts – Benefits

Improved Air Quality (Improved Health and Welfare of Public) - Ozone

The proposed regulation would help to reduce ground-level ozone formation. Ground-level ozone, a hazard to public health and welfare, is not emitted directly from the processes of fiberglass boat manufacturing but is formed by a photochemical reaction between VOCs and NO_x in the presence of sunlight.

The EPA regulates ground-level ozone as a criteria air pollutant due to its widespread adverse health and environmental effects. High exposure can lead to serious human and animal health and welfare threats, complications include respiratory illnesses and decreased lung function, agricultural crop loss, foliar injury to sensitive plant species, and damage to forests, ecosystems and infrastructure (PA DEP pg. 4). Implementing the proposed regulation would not only positively benefit the population of Rhode Island, but also any downwind states and environments.

High levels of ground-level ozone correlate to increased respiratory disease and higher mortality rates. Ozone inflames and damages the lining of the lungs, which damaged cells can regenerate after a few days. However, prolonged exposure can lead to permanent lung scarring, thus loss of lung function and lower quality of life. During high ambient ozone days, people with asthma are more likely to seek doctor's attention or use of medication (PA DEP pg. 5). The more high-level ozone air quality days there are, the more those at risk need to seek medical attention,

thus incurring costs. The proposed regulation would help alleviate the amount of VOC being converted into ozone, thus reducing the amount of costs accrued on those affected.

The EPA conducted a Regulatory Impact Analysis – Final National Ambient Air Quality Standard for Ozone in July 2011 (EPA (4)) which found cost and benefits associated with ozone. Currently the 8-hour ozone standard for Rhode Island is 0.070 ppm. The study consisted of looking at 8-hour ozone standards of 0.075 ppm, 0.070 ppm, and 0.065 ppm nationally, 0.070 ppm being the new standard proposed by NAAQS. In summary the benefits for an 8-hour ozone standard of 0.070 ppm would result in monetized benefits in a range of \$19.5 to \$55.4 billion in 2018\$) with a discount rate of 3% by 2020 for the nation as a whole (EPA (4) pg. 22).

Using this determination, when compared to the Rhode Island population, the benefits would be positive, just not as substantial as compared to the whole country. If using the lower estimate of \$13 billion in benefits during the year 2006 (original analysis), the RI population can be compared to the US total population to determine an estimate of a portion of the total benefit. United State population during 2006 was 298.4 million, while Rhode Island had a population of 1.063 million. RI being .35% of the total population, it can be assumed that the benefit from the EPA study would result in \$68,165,000 in 2018\$. The factors included in this analysis are as follows;

- Infant Hospital Admissions, Respiratory
- Emergency Room Visits, Respiratory
- School Loss Days
- Acute Respiratory Symptoms
- Hospital Admissions, Respiratory
- Mortality

These factors were considered the most prominent health related issues associated with high ground-level ozone. When considering an 8-hour ozone standard of 0.070 ppm, these factors would be reduced in correlation to the lowered VOC content emitted through regulations. The less VOCs emitted, the less ozone created, thus lower related health issues. This is not only beneficial to the individual health-wise, but cost-wise as well as the study expresses. It can be assumed that the total benefit according to this study for the state of Rhode Island by 2020 would be \$68,165,000 in 2018\$. This number is not included in the net present value calculation as the study did not conclude annual benefits within their analysis. Therefore, it cannot be used to calculate the annual benefit for Rhode Island. However, the value will be included in the total benefit, and added to the year 2020 (as projected in the EPA analysis) in the net present value calculation in the sensitivity analysis.

Reduced Asthma Related Hospital Visits in Rhode Island

Rhode Island Department of Health in 2014 released a study on chronic conditions within the state, listing asthma as one of the conditions. This study looked at the amount of people within the state, hospital records, and costs. Using RIDOH data on chronic conditions in RI,

(Appendix C) asthma is the 4th most common condition within the state. The data provided finds that 45,282 citizens in RI are listed as insured with asthma on their medical records (RIDOH). It was also found that out of 1,000 insured Rhode Islanders, 297 people are admitted to the hospital for inpatient care. Using this data, this concludes that around 13,448 people per year in the state are seeking medical attention at the hospital for asthma related issues (as of the year 2014 per RIDOH study). RIDOH determined that asthma resulted in \$505.45 million in 2018\$ of health care spending. Using the data, it can be concluded that of those being admitted to the hospital, each person would spend about \$37,585.51 per year. This does not indicate the total monetary cost incurred on the individual but includes both individual and insurance company costs.

Using the EPA analysis, Regulatory Impact Analysis – Final National Ambient Air Quality Standard for Ozone in July 2011, it was found that reducing ozone would result in 6600 fewer hospital visits per year (EPA (4) pg. 26). The study also found various other factors that would reduce including work loss days, school loss days, etc. Of the entire value found, hospital visits reduced account for .19% of the total decrease in morbidity (total of 3,448,780 reduction). Using this value, it can be calculated that the total reduction in spending per year for asthma will be \$960,355. This is considered an annual benefit per year.

Avoided Crop Loss – Agriculture in RI

As discussed before, VOCs are a contributing factor to ground-level ozone creation, which has a negative effect on agriculture. High concentration of ozone can result in crop yield loss from both reduced seed production and visible injury to some leaf crops (PA DEP pg.5). Currently the number of farms according to the Rhode Island Department of Environmental Management's Division of Agriculture, there are 1,243 farms in the state (RIDEM Agriculture). Agricultural numbers are increasing in New England when compared to the rest of the country. Since 2007, the economic class of farmers between income bracket of \$50,000 - \$249,000 had a 32% increase. This shows that a large part of Rhode Island's economic infrastructure includes farming. According to RIDEM Division of Agriculture, the overall sales for farmers within the state has risen. Specifically looking at farms with sales above \$1 million, has risen 16%. The United States Department of Agriculture (USDA) found in 2012, RI had a market value of sales to be \$59,652,000 (USDA (1) pg. 7). Below are the breakdowns of value of sales by farms within the state.

Farms by value of sale			
Value	# of Farms	% Change since 2007	Value with % Change
Less than \$2,500	451	+ 6%	\$1,195,150
\$2,500 - \$4,999	186	+ 6%	\$985,602
\$5,000 – \$9,999	162	+ 6%	\$1,717,028
\$10,000 - \$24,999	179	+ 6%	\$4,743,310
\$25,000 - \$49,999	68	+ 6%	\$3,603,927

\$50,000 - \$99,999	89	+ 4%	\$9,255,907
\$100,000 or more	108	+ 4%	\$11,232,000

*The higher value in the value range was taken for this analysis.

As seen above, each value range results in significant income for farmers in the state. Since specific sales per farm were not report, this is not an accurate representation of total sales for RI. Farming sales have been steady since the report in 2012 done by the USDA, therefore the market sales value of \$59,652,000 can be used as an annual income for the state. (The current dollar value is \$65,231,780 in \$2018.)

The EPA estimates that the benefits of reducing ozone exposure on the agricultural industry would result in \$499.98 million to \$774.97 million \$2018. The median number of this benefit being, \$637.475 million \$2018 (EPA (4) pg. 74). According the USDA, there are a total of 20.2 million farms in the United States (USDA (2) pg. 4). Rhode Island has a 0.006% of the total farms within the US. Therefore, the total benefit of ozone reduction for the state will be 0.006% of the \$637.475 million, which results in an annual benefit of \$38,248.50 in \$2018.

Other Benefits Not Monetized

There are many environmental benefits resulting from reduction in VOCs that should be considered in the analysis that cannot be monetized. Recreational value from Rhode Island forests, avoided biomass loss in forests, aesthetic value of ornamental species, loss of species diversity and many more. Each mentioned are all important factors that matter to the Rhode Island economy and public. These benefits, although do not yield a dollar value at this time, should all be considered a positive benefit in this analysis.

Discounting Present Value

All of the values found in this analysis were calculated into present value using the CPI Calculator by the Bureau of Labor Statistics. All values were converted to 2018\$.

Net Present Value Calculation

The figure below is the net present value calculation for this analysis. As shown, the project would yield a positive benefit of \$2,799,161.20 after three years.

Assumptions		Sensitivity Analysis					
Initial Cost	\$25,500.00						
Lifespan	3						
Total Benefit	\$2,799,161.20	Total Benefit (Year 2020)		\$68,165,000.00			
Annual Benefit	\$998,603.50	Annual Cost		\$45,300.00			
Discount Rate	3.00%						
		Year	Initial Cost	Annual Cost	Annual benefits	Annual Net Benefit	NPV
		0	\$25,500.00	\$ -	\$ -	(\$25,500.00)	(\$25,500.00)
		1	\$ -	\$ -	\$998,603.50	\$998,603.50	\$969,517.96
		2	\$ -	\$ -	\$998,603.50	\$998,603.50	\$941,279.57
		3	\$ -	\$ -	\$998,603.50	\$998,603.50	\$913,863.66
							\$2,799,161.20

The net present value equation used is $NPV = \text{Annual Benefit} \times (1/(1+\text{Discount Rate}))^{\text{Year}}$

Sensitivity Analysis

For the sensitivity analysis, the annual cost and benefit for year 2020 were changed. The annual cost of complying with the monomer VOC content option of the proposed regulation was calculated to cost \$45,300 per year (high estimate). This value was added to the calculation in year 1-3. The EPA analysis of ozone benefits explained in the report, yielded a benefit in the year 2020 of \$68,165,000. This value was added in year 2 of the net present value calculation (year 2020). Both assumptions did not make the project have a negative net present value in the result, concluding that the project is beneficial to implement. The figure below shows the results of the sensitivity analysis calculation. The final total value found in the sensitivity analysis was \$66,923,075.25 over a three year period.

Assumptions		Sensitivity Analysis Factors					
Initial Cost	\$25,500.00						
Lifespan	3						
Total Benefit	\$66,923,075.25		Total Benefit (Year 2020)	\$68,165,000.00			
Annual Benefit	\$998,603.50		Annual Cost	\$45,300.00			
Discount Rate	3.00%						
		Year	Initial Cost	Annual Cost	Annual benefits	Annual Net Benefit	NPV
		0	\$25,500.00	\$ -	\$ -	\$(25,500.00)	\$(25,500.00)
		2019	1 \$ -	\$45,300.00	\$998,603.50	\$953,303.50	\$925,537.38
		2020	2 \$ -	\$45,300.00	\$69,163,603.50	\$69,118,303.50	\$65,150,630.13
		2021	3 \$ -	\$45,300.00	\$998,603.50	\$953,303.50	\$872,407.75
							\$66,923,075.25

Recommendation

It is recommended that the proposed regulation be put into effect at the projected start date. The result of the analysis concluded that no negative cost would incur on businesses within Rhode Island that would be subject to the regulation.

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Appendix

A. Definitions

Unless otherwise expressly defined in this analysis, the terms used in this report shall be defined by reference to Part 0 – General Definitions Regulation, 250-RICR-120-05-0.

1. “Application equipment cleaning” means the process of flushing or removing resins and gel coats from the interior or exterior of equipment that is used to apply resin or gel coat in the manufacture of fiberglass parts.
2. “Assembly adhesives” means any chemical substance that is applied for the purpose of bonding two surfaces together other than by mechanical means.
3. “Atomized application method” means a resin application technology in which the resin leaves the application equipment and breaks into droplets or an aerosol as it travels from the application equipment to the surface of the part.

Atomized application methods include, but are not limited to, resin spray guns and resin chopper spray guns.

4. “Boat” means any type of vessel, other than a seaplane, that can be used for transportation on the water.
5. “Clear gel coat” means gel coats that are clear or translucent so that underlying colors are visible. Clear gel coats are used to manufacture parts for sale.
 - a. Clear gel coats do not include tooling gel coats used to build or repair molds.
6. “Closed molding” means any molding process in which pressure is used to distribute the resin through the reinforcing fabric placed between two mold surfaces to either saturate the fabric or fill the mold cavity. The pressure may be clamping pressure, fluid pressure, atmospheric pressure, or vacuum pressure used either alone or in combination. The mold surfaces may be rigid or flexible. Closed molding includes, but is not limited to, compression molding with sheet molding compound, infusion molding, resin injection molding (RIM), vacuum-assisted resin transfer molding (VARTM), resin transfer molding (RTM), and vacuum-assisted compression molding.
 - a. Processes in which a closed mold is used only to compact saturated fabric or remove air or excess resin from the fabric (such as in vacuum bagging), are not considered closed molding.
 - b. Open molding steps, such as application of a gel coat or skin coat layer by conventional open molding prior to a closed molding process, are not closed molding.
7. “Cured resin” or “cured gel coat” means resin or gel coat that has changed irreversibly from a liquid to a solid.
8. “Fiberglass boat” means a vessel in which either the hull or deck is built from a composite material consisting of a thermosetting resin matrix reinforced with fibers of glass, carbon, aramid, or other material.
9. “Filled resin” or “filled production resin” means a resin to which an inert material has been added to change viscosity, density, shrinkage, or other physical properties.
10. “Gel coat” means a polyester resin surface coating, either pigmented or clear, that provides a cosmetic enhancement and improves resistance to degradation from exposure to the elements.

11. “Mixing” means any operation in which resin or gel coat, including the mixing of putties or polyester resin putties, is combined with additives that include, but are not limited to, fillers, promoters, or catalysts.
12. “Monomer VOC” means a relatively low-molecular-weight organic compound such as styrene that combines with itself, or other similar compounds, by a cross-linking reaction to become a cured thermosetting resin.
13. “Monomer VOC content” means the weight of the monomer, divided by the weight of the polymer.
14. “Non-atomized application method” means any application technology in which the resin is not broken into droplets or an aerosol as it travels from the application equipment to the surface of the part. Non-atomized application methods include, but are not limited to, flowcoaters, chopper flowcoaters, pressure-fed resin rollers, resin impregnators, and hand application (for example, paint brush or paint roller).
15. “Open molding resin and gel coat operation” means any process in which the reinforcing fibers and resin are placed in the mold and are open to the surrounding air while the reinforcing fibers are saturated with resin. For the purposes of this regulation, open molding includes operations in which a vacuum bag or similar cover is used to compress an uncured laminate to remove air bubbles or excess resin, or to achieve a bond between a core material and a laminate.
16. “Pigmented gel coat” means opaque gel coats used to manufacture parts for sale.
 - a. Pigmented gel coats do not include tooling gel coats used to build or repair molds.
17. “Polyester resin materials” means unsaturated polyester resins, such as isophthalic, orthophthalic, halogenated, bisphenol A, vinyl ester, or furan resins; cross-linking agents; catalysts; gel coats; inhibitors; accelerators; promoters; and any other material containing VOC used in polyester resin operations.
18. “Production resin” means any resin used to manufacture parts for sale.
 - a. Production resins do not include tooling resins used to build or repair molds, or assembly adhesives as defined in § 51.5(A)(2) of this Part.
19. “Reasonably available control technology” or “RACT” means the lowest emissions limitation that a particular piece of equipment or pollutant emitting activity is capable of meeting by using measures that are reasonably available in terms of technological and economic feasibility.

20. “Repair” means that portion of the fabrication process that requires the addition of polyester resin materials to portions of a previously fabricated product in order to mend damage.
21. “Resin” means any thermosetting resin with or without pigment containing styrene or methyl methacrylate and used to encapsulate and bind together reinforcement fibers in the construction of fiberglass parts.
22. “Resin impregnator” means a mechanical non-atomizing composite materials application method in which fiber reinforcement is saturated with resins in a controlled ratio for each specific composite product.
23. “Tooling gel coat” means the gel coat used to build or repair molds (also known as tools) or prototypes (also known as plugs) from which molds will be made.
24. “Tooling resin” means the resin used to build or repair molds (also known as tools) or prototypes (also known as plugs) from which molds will be made.
25. “Touch-up” means that portion of the process that is necessary to cover minor imperfections.
26. “Vinylester resin” means a thermosetting resin containing esters of acrylic or methacrylic acids and having double-bond and ester linkage sites only at the ends of the resin molecules.
27. “Volatile organic compound” or “VOC” means any organic compound which participates in atmospheric photochemical reactions.

Appendix B – Ozone Benefits

Table S2.4: Summary of National Ozone Benefits by Standard Level with 95th percentile confidence intervals (in millions of 2006\$)^{A, B, C}

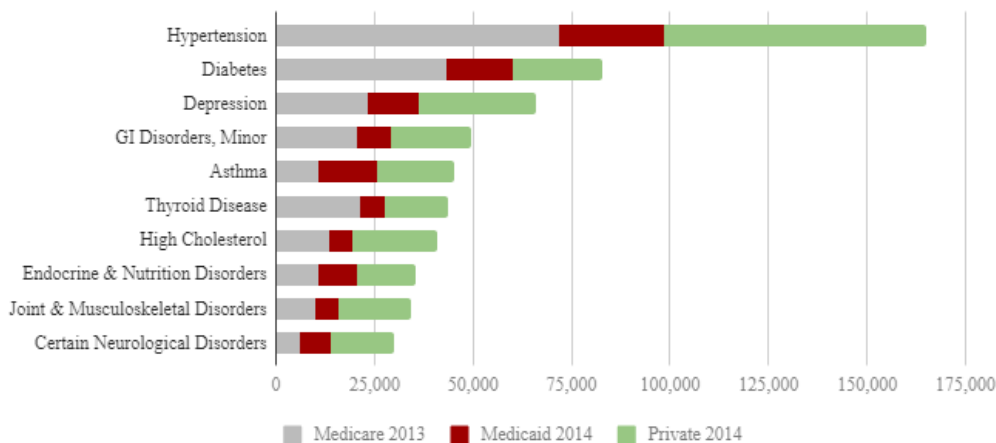
Endpoint Group	Author	0.075 ppm Valuation	0.075 ppm Incidence	0.070 ppm Valuation	0.070 ppm Incidence	0.065 ppm Valuation	0.065 ppm Incidence
Infant Hospital Admissions, Respiratory		\$11 (\$5.7 -- \$16)	550 (310 -- 830)	\$17 (\$8.5 -- \$25)	1,700 (960 -- 2,600)	\$30 (\$15 -- \$43)	3,000 (1,700 -- 4,500)
Emergency Room Visits, Respiratory		\$0.11 (-\$.21 -- \$.35)	290 (-310 -- 930)	\$0.36 (-\$.71 -- \$1.2)	990 (-890 -- 3,200)	\$0.66 (-\$.13 -- \$2.2)	1,800 (-1,600 -- 5,800)
School Loss Days		\$17 (\$7.5 -- \$24)	190,000 (93,000 -- 280,000)	\$53 (\$23 -- \$76)	600,000 (300,000 -- 880,000)	\$96 (\$42 -- \$140)	1,100,000 (550,000 -- 1,600,000)
Acute Respiratory Symptoms		\$30 (\$12 -- \$56)	510,000 (280,000 -- 790,000)	\$96 (\$37 -- \$180)	1,600,000 (910,000 -- 2,500,000)	\$170 (\$68 -- \$320)	2,900,000 (1,700,000 -- 4,500,000)
Hospital Admissions, Respiratory		\$13 (\$1.7 -- \$22)	550 (130 -- 980)	\$45 (\$5.6 -- \$77)	1,900 (550 -- 3,400)	\$81 (\$11 -- \$140)	3,400 (1,000 -- 6,100)
Mortality	Bell et al. 2004	\$660 (\$54 -- \$2,000)	74 (36 -- 120)	\$2,200 (\$180 -- \$6,600)	250 (130 -- 410)	\$4,000 (\$330 -- \$12,000)	450 (240 -- 730)
Mortality	Schwartz	\$1,000 (\$82 -- \$3,000)	110 (54 -- 190)	\$3,400 (\$270 -- \$10,000)	380 (190 -- 630)	\$6,200 (\$500 -- \$19,000)	700 (350 -- 1,100)
Mortality	Huang	\$1,100 (\$95 -- \$3,300)	130 (66 -- 200)	\$3,800 (\$320 -- \$11,000)	420 (230 -- 670)	\$6,800 (\$580 -- \$20,000)	770 (420 -- 1,200)
Mortality	Bell et al. 2005	\$2,000 (\$190 -- \$6,100)	240 (140 -- 350)	\$7,000 (\$630 -- \$21,000)	800 (490 -- 1,200)	\$10,000 (\$1,100 -- \$37,000)	1,500 (910 -- 2,200)
Mortality	Ito et al.	\$2,900 (\$280 -- \$8,200)	330 (230 -- 450)	\$9,900 (\$930 -- \$28,000)	1,100 (790 -- 1,500)	\$18,000 (\$1,700 -- \$50,000)	2,000 (1,400 -- 2,800)
Mortality	Levy et al.	\$3,000 (\$280 -- \$8,200)	340 (260 -- 430)	\$10,000 (\$930 -- \$28,000)	1,100 (870 -- 1,500)	\$18,000 (\$1,700 -- \$50,000)	2,100 (1,600 -- 2,600)

^A Does not reflect estimates for the San Joaquin and South Coast Air Basins^B Confidence intervals are not available for PM co-benefits because of methodological limitations when using benefit-per-ton estimates.^C All estimates rounded to two significant digitsSource: <https://www.nrc.gov/docs/ML1224/ML12240A237.pdf>

Appendix C – Rhode Island Common Chronic Conditions Chart – RIDOH

Top 10 Most Common Chronic Conditions in Rhode Island

Total Number of Insured Rhode Islanders with Each Condition

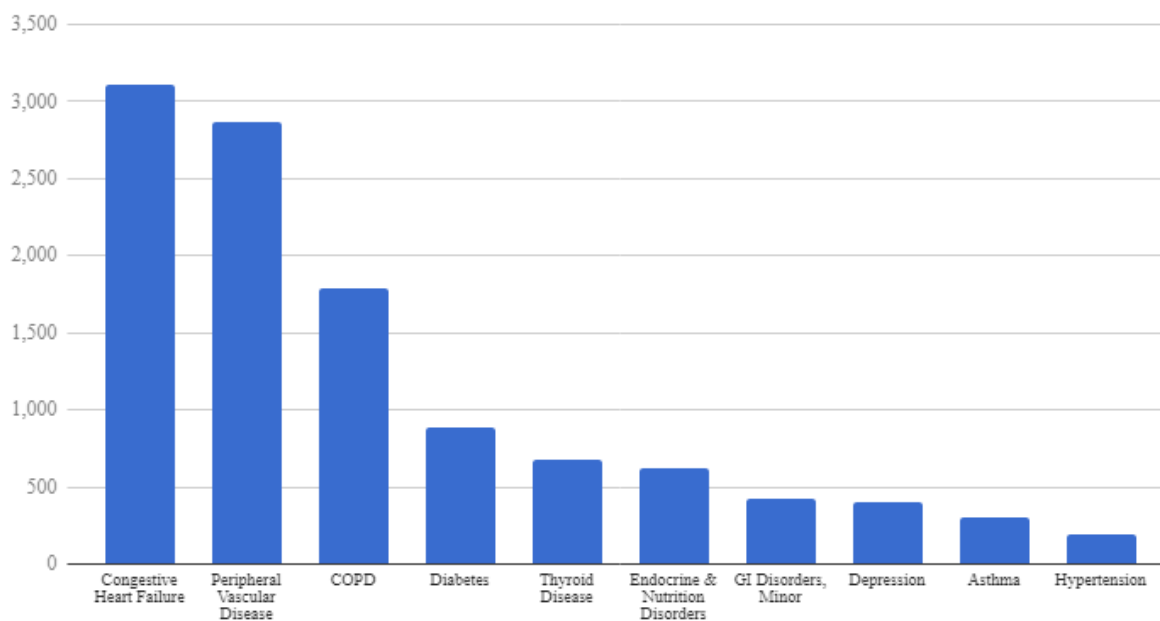


Source: <http://health.ri.gov/data/chronicconditions/>

Appendix D – Inpatient Admissions

The Impact of Chronic Conditions on Utilization

Inpatient Admissions (per 1,000 insured Rhode Islanders/Year) for Patients with High Spending Conditions



Source: <http://health.ri.gov/data/chronicconditions/>