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ENGINEERING EVALUATION/FACT SHEET

B BACKGROUND INFORMATION

Application No.:	R13-3334
Plant ID No.:	057-00011
Applicant:	Alliant Techsystems Operations LLC (ATK)
Facility Name:	Allegany Ballistics Laboratory (ABL)
Location:	Rocket Center
NAICS Code:	336415
Application Type:	Modification
Received Date:	August 4, 2016
Engineer Assigned:	Richard A. Boehm, P.E.
Fee Amount:	\$4500.00
Date Received:	August 4, 2016
Complete Date:	February 24, 2017
Due Date:	May 25, 2017
Applicant Ad Date:	August 16, 2016
Newspaper:	<i>News Tribune</i>
UTM's:	Easting: 686.5 km Northing: 4,381.2 km Zone: 17
Description:	The application is for the installation of Guided Multiple Launch Rocket System (GMLRS) production line.

DESCRIPTION OF PROCESS

The principal operations at the Rocket Center facility consist of the fabrication of rocket motor and warhead cases; the production of propellants and explosives which are loaded into above cases; preparation of cases; and, examination of motors.

Proposed New Process - GMLRS

The Guided Multiple Launch Rocket System (GMLRS) is a filament wound, epoxy resin impregnated composite rocket motor casing. The process in Building 256 will encompass winding the cases, curing them in electric ovens, and then preparing the interior surface of the units so that they can later be filled with solid propellant.

The process begins with mandrel preparation (*Z-1S*), the application of a mold release coating (Frekote 700-NC) to the metal mandrel that is used as a mold for the composite filament winding. The mandrels are placed into the winding machines and the composite filament (Kevlar fiber) is coated with a two-part epoxy resin (an epichlorohydrin Bisphenol A copolymer with amine curatives) and the filament is wound around the mandrel in a specific computer programmed pattern to enhance strength of the cured material. None of the epoxy resin components contain regulated pollutants and the epoxy mixing, winding, and curing operations are not detailed in the emission source information for this application. The SDSs for the resin system are included in the SDS section of the application for information purposes only.

Once the winding process is completed, the mandrels proceed to the ovens where they will continue to rotate at ambient temperature for approximately 48 hours and then go through a several hour heated cure cycle (maximum temperature of 385°F). The cured composite tubes will then be removed from the mandrels. The composite tubes will then undergo a machining process to cut the tubes to length and drill holes for future bonding operations (*Z-15S*). The machined composite tubes then move to the adapter bonding operation.

Adapters are the metal ends of the rocket motor cases. Adapters to be bonded into the composite tubes must be degreased before further processing. Degreasing is a two-step process that begins with an initial wipe using Acetone followed by a second wipe using Isopropanol (IPA) (*Z-2S*). After degreasing, the adapters are moved to a spray hood where BR-127 Corrosion Inhibiting Primer is spray applied (*Z-3S*), then moved to an electric oven to cure (*Z-4S*).

The inside of the composite tubes are degreased with Acetone and IPA, the ends are honed (hand sanded), and the ends are degreased again with Acetone and IPA to prepare the tube for adapter bonding (*Z-16S*). The adapters are degreased with Acetone and IPA prior to bonding them into the tube. The adapters are then bonded to the composite tube with Scotch-Weld 2216 epoxy adhesive. A second bonding operation is conducted using EA 9396 adhesive. The bonding adhesives contain negligible quantities of regulated air pollutants. After adapter bonding, the inside of the tubes are degreased in a two-step process with an initial wipe using Acetone followed by a second wipe using (IPA) (*Z-5S*), these units are then allowed to dry ambient temperature.

Once tubes have been degreased and dried, Chemlok 205 Primer will be mixed (*Z-7S or Z-12S*) and applied to the interior surface of the tubes (*Z-8S, Z-9S, or Z-13S*). This primer will be allowed to dry at ambient conditions for an hour. The process will be repeated using Chemlok 234X NW Adhesive that is mixed (*Z-7S or Z-12S*) applied over the primer to the

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interior of the tube (*Z-8S, Z-9S, or Z-13S*). The units will then ambient dry for an hour. The adhesive is used to bond a sheet of rubber insulation inside the cases. After the rubber is installed the units are cured and then they will undergo hydroproof testing. Hydroproof is a test in which the units are filled with water and pressurized to make sure the units are sealed properly. After hydroproof testing the tubes undergo ultrasonic inspection of the tubes and bond joints. After testing, the cases are heat dried to ensure that no water remains in the case or insulation.

After ensuring that the units are dry, the interior has another two-step degreasing process using Acetone followed by IPA (*Z-10S*) and then they are moved to an electric oven to dry completely (*Z11S*).

The final steps are to mix BL-004 Bondliner (*Z-12S or Z-7S*) and spray apply the BL-004 to the interior of the tubes on the surface of the insulators (*Z-8S, Z-9S, or Z-13S*). After units are sprayed they are allowed to ambient dry. Following the Bondliner application, the units will be sealed for transportation to the mix/cast area. Construction of a mix/cast facility and final assembly facility for the units will be permitted in a separate permit application at a later date and the facility will be located in a different area of the plant.

The GMLRS program has the potential for orders of up to 6,000 units per year at maximum production which would be 2-3 years in the future. The permit application quantities are based on this maximum production rate.

The emission unit data sheets for the Chemlok and bondliner operations (*Z-8S, Z-9S, and Z-13S*) have accounted for the use of each material in each of the booths. The facility has requested that the hourly rate for each of the three application booths reflect spraying the highest emitting formulation in each. This is to allow operational flexibility should any of the three booths be off line for maintenance. All three application booths could operate concurrently, but each would spray a different formulation.

SITE INSPECTION

On August 14, 2016, Mr. Karl Dettinger, a Compliance Inspector assigned to the Compliance and Enforcement Section of the DAQ, conducted a part of his full-on- site inspection of the Allegany Ballistics Laboratory. At the time of this inspection, Mr. Dettinger did not discovered any non-compliance issues with the facility regarding the applicable rules and regulations outline in the facility's Title V Operating Permit and determined that the facility was operating in compliance.

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ESTIMATE OF EMISSION BY REVIEWING ENGINEER

Emissions from the proposed manufacturing process are mainly from volatile organic compounds (VOCs) being evaporated once degreasing solvents, surface coatings and adhesives are applied to a surface of the product. Particulate matter (PM) to include PM less than 10 microns (PM₁₀) and PM less than 2.5 microns are generated from applying surface coating and machining of cases.

The applicant has determined the emissions based on manufacturing process steps (i.e. degreasing, application of coating, curing, clean-up, etc.). The hourly and annual emissions are based on a specific number of units being completed in the specific process step over an hour or yearly basis. In the following table, process rate is based on completing the process step for a complete lot. A single lot consists of 24 units, and the facility projects a maximum yearly lot production of 260, which equates to 6,240 units per year.

Table 1 – Hourly Emissions by Process Step									
						Emissions Per Hour			
Emission Unit ID	Process Step	Emission Point ID	Material	Gallons Emitted per Lot	Hours Per Lot	lb VOC emitted	lb HAP VOC emitted	lb PM emitted*	lb HAP PM emitted*
Z-1S	Mandrel Release Coating	Fugitive	Frekote 700-NC	1.934	3	4.06	0.00	0.00	0.00
Z-2S	Adapter Degreasing Table	Fugitive	IPA	0.75	2	2.47	0.00	0.00	0.00
Z-2S	Adapter Degreasing Table	Fugitive	MEK	0.375	2	1.26	0.00	0.00	0.00
Z-3S	BR-127 Primer Booth	Z-3E	BR-127	1.06875	2	3.53	0.04	0.02	0.005
Z-4S	Adapter/BR-127 Oven	Z-4E	BR-127	0.05625	2	0.19	0.00	0.00	0.00
Z-5S	Interior Degreasing Exhaust & Drying (Chemlok)	Fugitive	IPA	2.85	2	9.87	0.00	0.00	0.00
Z-7S	Chemlok Mixing Hood	Z-7E	Chemlok 205 mix	0.0376	1	0.24	0.11	0.00	0.00
Z-7S	Chemlok Mixing Hood	Z-7E	Chemlok 234X mix	0.0468	1	0.33	0.33	0.00	0.00
Z-7S	Bondliner	Z-7E	BL-004	0.036	1	0.23	0.00	0.00	0.00
Z-8S	Chemlok/bondliner Application Booth	Z-8E	Chemlok 205 mix	0.893	2	2.95	1.65	0.027	0.00
Z-8S	Chemlok/bondliner Application Booth	Z-8E	Chemlok 234X mix	0.969	2	3.55	3.50	0.005	0.00
Z-8S	Bondliner	Z-8E	BL-004	1.27	2	3.98	0.00	0.00	0.00
Z-8S	Chemlok Application Booth (Cleanup)	Z-8E	MEK	0.5	1	3.36	0.00	0.00	0.00
Z-8S	Chemlok Application Booth (Cleanup)	Z-8E	Toluene	0.5	1	1.82	1.82	0.00	0.00
Z-9S	Chemlok/bondliner Application Booth	Z-9E	Chemlok 205 mix	0.893	2	2.95	1.65	0.027	0.00
Z-9S	Chemlok/bondliner Application Booth	Z-9E	Chemlok 234X mix	0.969	2	3.55	3.50	0.005	0.00

Table 1 – Hourly Emissions by Process Step									
						Emissions Per Hour			
Emission Unit ID	Process Step	Emission Point ID	Material	Gallons Emitted per Lot	Hours Per Lot	lb VOC emitted	lb HAP VOC emitted	lb PM emitted*	lb HAP PM emitted*
Z-9S	Bondliner	Z-9E	BL-004	1.27	2	3.98	0.00	0.00	0.00
Z-9S	Chemlok Application Booth (Cleanup)	Z-9E	MEK	0.5	1	3.36	0.00	0.00	0.00
Z-9S	Chemlok Application Booth (Cleanup)	Z-9E	Toluene	0.5	1	1.82	1.82	0.00	0.00
Z-10S	Insulator Prep Exhaust	Fugitive	IPA	2.85	2	9.38	0.00	0.00	0.00
Z-11S	Insulator Drying Oven	Z-11E	IPA	0.15	2	0.49	0.00	0.00	0.00
Z-12S	Bondliner Mixing Hood	Z-12E	Chemlok 205 mix	0.0376	1	0.24	0.11	0.00	0.00
Z-12S	Bondliner Mixing Hood	Z-12E	Chemlok 234X mix	0.0468	1	0.33	0.33	0.00	0.00
Z-12S	Bondliner	Z-12E	BL-004	0.036	1	0.23	0.00	0.00	0.00
Z-13S	Chemlok/bondliner Application Booth	Z-13E	Chemlok 205 mix	0.893	2	2.95	1.65	0.027	0.00
Z-13S	Chemlok/bondliner Application Booth	Z-13E	Chemlok 234X mix	0.969	2	3.55	3.50	0.005	0.00
Z-13S	Bondliner	Z-13E	BL-004	1.27	2	3.98	0.00	0.00	0.00
Z-13S	Chemlok Application Booth (Cleanup)	Z-13E	MEK	0.5	1	3.36	0.00	0.00	0.00
Z-13S	Chemlok Application Booth (Cleanup)	Z-13E	Toluene	0.5	1	1.82	1.82	0.00	0.00
Z-15S	Case Machining	Z-15E	PM		24	N/A	N/A	0.04	N/A
Z-16S	Exhaust for End Closure Adapter Wipe	Fugitive	IPA	0.75	2	2.47	0.00	0.00	0.00
Totals (lb/hr)						82.3	21.83	0.156	0.005

Table 2 – Annual Emissions by Process Step						Emissions Per Year			
Emission Unit ID	Process Step	Emission Point ID	Material	Max Lots Per Year	Gal Emitted per Max No. of Lots	lb VOC emitted	lb HAP VOC emitted	lb PM emitted*	lb HAP PM emitted*
Z-1S	Mandrel Release Coating	Fugitive	Frekote 700-NC	260.00	502.84	3163.56	0.00	0.00	0.00
Z-2S	Adapter Degreasing Table	Fugitive	IPA	260.00	195.00	1283.77	0.00	0.00	0.00
Z-2S	Adapter Degreasing Table	Fugitive	MEK	260.00	97.50	655.71	0.00	0.00	0.00
Z-3S	BR-127 Primer Booth	Z-3E	BR-127	260.00	277.88	1836.32	19.40	10.20	2.55
Z-4S	Adapter/BR-127 Oven	Z-4E	BR-127	260.00	14.63	96.65	1.14	0.00	0.00
Z-5S	Interior Degreasing Exhaust & Drying (Chemlok)	Fugitive	IPA	260.00	741.00	4878.31	0.00	0.00	0.00
Z-7S	Chemlok Mixing Hood	Z-7E	Chemlok 205 mix	260.00	9.78	61.43	28.39	0.00	0.00
Z-7S	Chemlok Mixing Hood	Z-7E	Chemlok 234X mix	260.00	12.17	84.59	84.59	0.00	0.00
Z-7S	Bondliner	Z-7E	BL-004	260.00	9.36	59.8	0.00	0.00	0.00
Z-8S	Chemlok/bondliner Application Booth	Z-8E	Chemlok 205 mix	260.00	232.18	1534.00	856.44	14.04	0.00
Z-8S	Chemlok/bondliner Application Booth	Z-8E	Chemlok 234X mix	260.00	251.94	1844.44	1820.52	2.60	0.00
Z-8S	Bondliner	Z-8E	BL-004	260.00	330.20	2069.08	0.00	0.00	0.00
Z-8S	Chemlok Application Booth (Cleanup)	Z-8E	MEK	260.00	130.00	874.28	0.00	0.00	0.00
Z-8S	Chemlok Application Booth (Cleanup)	Z-8E	Toluene	260.00	130.00	943.80	943.80	0.00	0.00
Z-9S	Chemlok/bondliner Application Booth	Z-9E	Chemlok 205 mix	260.00	232.18	1534.00	856.44	14.04	0.00

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Table 2 – Annual Emissions by Process Step						Emissions Per Year			
Emission Unit ID	Process Step	Emission Point ID	Material	Max Lots Per Year	Gal Emitted per Max No. of Lots	lb VOC emitted	lb HAP VOC emitted	lb PM emitted*	lb HAP PM emitted*
Z-9S	Chemlok/bondliner Application Booth	Z-9E	Chemlok 234X mix	260.00	251.94	1844.44	1820.52	2.60	0.00
Z-9S	Bondliner	Z-9E	BL-004	260.00	330.20	2069.08	0.00	0.00	0.00
Z-9S	Chemlok Application Booth (Cleanup)	Z-9E	MEK	260.00	130.00	874.28	0.00	0.00	0.00
Z-9S	Chemlok Application Booth (Cleanup)	Z-9E	Toluene	260.00	130.00	943.80	943.80	0.00	0.00
Z-10S	Insulator Prep Exhaust	Fugitive	IPA	260.00	741.00	4878.31	0.00	0.00	0.00
Z-11S	Insulator Drying Oven	Z-11E	IPA	260.00	39.00	256.75	0.00	0.00	0.00
Z-12S	Chemlok Mixing Hood	Z-12E	Chemlok 205 mix	260.00	9.78	61.43	28.39	0.00	0.00
Z-12S	Chemlok Mixing Hood		Chemlok 234X mix	260.00	12.17	84.59	84.59	0.00	0.00
Z-12S	Bondliner	Z-12E	BL-004	260.00	9.36	59.8	0.00	0.00	0.00
Z-13S	Chemlok/bondliner Application Booth	Z-13E	Chemlok 205 mix	260.00	232.18	1534.00	856.44	14.04	0.00
Z-13S	Chemlok/bondliner Application Booth	Z-13E	Chemlok 234X mix	260.00	251.94	1844.44	1820.52	2.60	0.00
Z-13S	Bondliner	Z-13E	BL-004	260.00	330.20	2069.08	0.00	0.00	0.00
Z-13S	Chemlok Application Booth (Cleanup)	Z-13E	MEK	260.00	130.00	874.28	0.00	0.00	0.00
Z-13S	Chemlok Application Booth (Cleanup)	Z-13E	Toluene	260.00	130.00	943.80	943.80	0.00	0.00
Z-15S	Case Machining	Z-15E	PM	260.00	0.00			244.61	
Z-16S	Exhaust for End Closure Adapter Wipe	Fugitive	IPA	260.00	195.00	1283.77	0.00	0.00	0.00

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Table 2 – Annual Emissions by Process Step						Emissions Per Year			
Emission Unit ID	Process Step	Emission Point ID	Material	Max Lots Per Year	Gal Emitted per Max No. of Lots	lb VOC emitted	lb HAP VOC emitted	lb PM emitted*	lb HAP PM emitted*
Total (lb/yr)						40,541.68	11,108.78	304.73	2.55
Total (tons per year)						20.27	5.55	0.15	0.0013

The individual HAPs emitting from the manufacturing of the GMLRS units are ethyl benzene, formaldehyde, methanol, methyl isobutyl ketone, toluene, xylene. Nearly 79% of the Volatile Organic HAPs is emitted from the Chemlok primer and adhesive coating which includes mixing, application, drying, and clean-up activities. Most of the HAPs are emitted from the Chemlok process, and include toluene at 4.36 tpy, xylene at 1.17 tpy, MIBK at 0.97 tpy, and ethyl benzene at 0.36 tpy. The other main source of HAPs comes for the cleanup activities associated with the Bondliner process, which uses toluene as a cleaning solvent. Of the HAPs emitted from the whole manufacturing process, toluene accounts for 79% of the total HAPs emitted, which is 4.43 tpy.

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REGULATORY APPLICABILITY

The Allegany Ballistics Laboratory is a major source under Title V (45CSR30) and currently possesses a valid Title V Operating Permit. The facility is currently classified as a major source under Prevention of Significant Deterioration (PSD) and for HAPs.

Major Modification Test of the Project

The first step in determining major modification applicability is to determine which pollutants that the project is major for, which is illustrated in the following table.

Pollutant	Increase in Potential from the proposed project (tpy)	Significance Threshold (tpy)	Significance Trigger (Yes/No)
PM	0.15	25	No
PM ₁₀	0.15	15	No
PM _{2.5} Direct	0.15	10	No
SO ₂	0.00	40	No
NO _x (precursor of Ozone and PM _{2.5})	0.00	40	No
CO	0.00	100	No
VOCs	20.27	40	No

This project does not represent a “significant emission increase” (45CSR§14-2.75) for any NSR pollutant. Thus, no further review is required.

STATE RULES

45CSR7 *“To Prevent and Control Particulate Matter Air Pollution From Manufacturing Processes and Associated Operations”*

The manufacturing process for the facility is subject to 45CSR7 because of the potential to emit particulate matter during routine manufacturing process operations and therefore 45CSR7 is applicable to the facility. Section 3.1.1. limits the emission of smoke and/or particulate matter into the open air from any process source operation which is greater than twenty (20) percent opacity. Section 4.1.1. limits the particulate matter emissions in Table 45-7A by source operations type. The proposed facility is a type ‘a’ emission source defined by 45CSR7-2.39.

The amount of proposed process material charged per hour in the Case Machining Emission Unit Booth is 40.48 lbs/hr (20.24lbs per case * 2 cases/hour). According to process knowledge, this machining results in an uncontrolled PM emission of 0.28 lbs of dust/case or 0.56 lb/hour of uncontrolled particulate matter as listed in the emission unit data sheet. The maximum extrapolated emission rate specified in Table 45-7a is 0.05 lbs/hr. The controlled total particulate matter emissions from the Case Machining operation is 0.04 lbs/hr, below the limit allowed under Rule 7, indicating compliance.

Promoting a healthy environment.

Section 5.1 requires a system to minimize the emissions of the fugitive particulate matter. The spray booth control systems consist of a single stage GFS Wave Filter with ¾” poly waves front mounted on a 1-1/4” poly backing. Air is pulled into the spray booth by the exhaust fans. The inlet air passes through the booth where it picks up pollutants from the spraying operation and exits the booth through the exhaust filter pads into the ductwork and exhaust fans. The proposed filter pads have an average tested minimum efficiency of 99.76% to control the particulate matter.

45CSR13 - *“Permits for construction, modification, relocation and operation of stationary sources of air pollutants, notification requirements, temporary permits, general permits, and procedures for evaluation.”*

The facility is subject to 45CSR13 because it meets the definition of a stationary source in 2.24b. It discharges or has the potential to discharge more than six (6) pounds per hour and ten (10) tons per year of any regulated air pollutant.

45CSR16 *“Standards of Performance for New Stationary Sources Pursuant to 40CFR Part 60”*

The facility is not subject to 45CSR16 because it is not subject to any of the New Source Performance Standards identified in 40CFR Part 60.

45CSR30 *“Requirements for Operating Permits”*

The facility is subject to 45CSR30 because it is a major source as defined in 2.26 and is subject to NSPS, NESHAP, or MACT.

45CSR34 *“Emission Standards for Hazardous Air Pollutants for Source Categories Pursuant to 40 CFR Part 63”*

The facility is subject to 45CSR34 because it is subject to 40 CFR Part 63.

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FEDERAL RULES

40CFR63 “National Emission Standards for Hazardous Air Pollutants for Source Categories”

Subpart GG “National Emission Standards for Aerospace Manufacturing and Rework”

The facility is subject to this subpart because it is engaged in part or in whole, in the manufacture or rework of military aerospace components and is a major source as defined in 63.2.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The proposed GMLRS units will not emit any pollutants that aren’t already being emitted by another emission source at the Allegany Ballistics Laboratory. Therefore, no information about the toxicity of the hazardous air pollutants (HAPs) is presented in this evaluation.

AIR QUALITY IMPACT ANALYSIS

The writer deemed that an air dispersion modeling study or analysis was not necessary, because the proposed modification does not meet the definition of a major modification of a major source as defined in 45CSR14.

MONITORING OF OPERATIONS

The following monitoring events are included in the monitoring section 4.2 of the permit:

- a. Visual inspection of the fabric filters [1C-5C] prior to each use of the equipment;
- b. Emission monitoring with the use of manometers to record the pressure drop across the filters[1C-5C] and employing an alarm system for indication of an inadequate pressure drop across the cyclone[4C].
- c. In addition, records will be maintained to monitor usage of the paint, primer, and solvents.

RECOMMENDATION TO DIRECTOR

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The information provided in the construction permit application R13-3334 indicates that compliance with all applicable regulations will be achieved. Therefore it is the recommendation of the writer that the Construction Permit R13-3334 for a new rocket motor chamber production line at the ATK facility located at Rocket Center, Mineral County, WV be granted.

Richard A. Boehm, P.E.
Engineer

August 3, 2017
Date

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