Operations and Maintenance (O&M) Plan
Venturi Scrubber followed by a Packed Bed Scrubber for VOC Control
North Coater

I. Background

A. Emissions Unit

Emission Unit	012
Emission point	12-1
Description:	Propellant surface coating operation
Identification:	North Coater Scrubber 468-039
Facility:	St. Marks Powder, Inc. St. Marks, Florida

B. Applicable Regulations, Emissions Limit, and Monitoring Requirements

Regulation:	Florida Air Permit
Emission limit:	
VOC:	32 lb/hr hourly 18 ton/12 month rolling total
Monitoring requirements:	Differential pressure and scrubbing water flows

C. Control Technology

Venturi scrubber followed by packed bed scrubber with demister.

II. Monitoring Approach

This O&M plan addresses operation of the North Coater in VOC mode.

VOC mode occurs whenever the coater is used to apply surface coatings that are suspended or dissolved in isopropyl alcohol (IPA). In VOC mode, Propellant and coating solution is introduced into the feed end of the coater co-currently. Heated air is introduced into the coater counter-currently, to volatize and remove the IPA. IPA and air exit the coater and are delivered to the scrubbers.

The air stream is first scrubbed with the venture to remove solids carried over from the coating operation that might plug the packed bed scrubber. The air stream is then scrubbed in the packed bed scrubber to remove the IPA.

Water at or above a minimum flow rate is sent to the venturi scrubber and water at or above a minimum flow rate is sent to the packed bed scrubber.

VOC reduction has been demonstrated and the operating parameters, water flow and differential pressure, have been verified through compliance testing.

Operations and Maintenance (O&M) Plan
Venturi Scrubber followed by a Packed Bed Scrubber for VOC Control
North Coater

	Indicator No. 1	Indicator No. 2
Indicator	Venturi scrubber spray water flow	Packed bed scrubber spray water flow
Measurement approach	The venturi scrubber spray water flow is measured with a rotameter.	The packed bed scrubber spray water flow is measured with a rotameter.
Indicator range	An excursion is defined as any operating condition where the venturi scrubber spray water flow is less than 7.0 gpm. An excursion will trigger an investigation of the occurrence, corrective action, and reporting.	An excursion is defined as any operating condition where the packed bed scrubber spray water flow is less than 11.0 gpm. An excursion will trigger an investigation of the occurrence, corrective action, and reporting.
Performance Criteria		
Data Representativeness	The venturi scrubber spray water flow rate is measured using a variable area flow meter (rotameter) located in the venturi scrubber spray water inlet line. The minimum acceptable accuracy of the meter is ± 5 % of full scale and the range is 0 to 11.5 gpm	The packed bed scrubber spray water flow rate is measured using a variable area flow meter (rotameter) located in the spray water inlet line. The minimum acceptable accuracy of the meter is ± 5 % of full scale and the range is 2 to 20 gpm
Quality Assurance and Control Practices	Annual calibration and cleaning of the rotameter. Acceptance criteria: ± 5% full scale	Annual calibration and cleaning of the rotameter. Acceptance criteria: ± 5% of full scale
Monitoring Frequency	The venturi scrubber spray water flow rate is indicated continuously and recorded hourly.	The packed bed scrubber spray water flow rate is indicated continuously and recorded hourly.
Data Collection Procedures	The venturi scrubber spray water flow rate is recorded hourly.	The packed bed scrubber spray water flow rate is recorded hourly.
Averaging Period	None	None

	Indicator No. 3

Operations and Maintenance (O&M) Plan
Venturi Scrubber followed by a Packed Bed Scrubber for VOC Control
North Coater

Indicator	Scrubber differential pressure
Measurement approach	The combined venturi scrubber and packed bed scrubber differential pressure (dP) is measured with a differential pressure transmitter.
Indicator range	(1) Normal operating range. The normal operating range is 15.1 in WC ≦ dP ≦ 17.1 in WC. The normal operating range is derived from the average dP recorded during compliance testing plus allowance for ordinary gauge calibration accuracy and drift (5% scale). (2) Extended operating range. If during routine operation the differential pressure is found to abnormally high (17.1 in WC < dP ≦ 18.1 in WC) or abnormally low (14.1in WC ≦ dP < 15.1 in WC) the operator is required to determine the cause of the problem and take corrective action if possible. If immediate corrective action is not possible, repairs should be scheduled for the earliest opportunity. The extended operating range is derived from the average dP recorded during compliance testing plus allowance for gauge accuracy and drift (10% scale). (3) An excursion is defined as any operating condition where the combined differential pressure is outside the total operating range of 14.1 in WC < dP < 18.1 in WC. An excursion will trigger system shut down, an investigation of the occurrence, corrective action, and reporting.
Performance Criteria Data Representativeness	The combined differential pressure is measured using a differential pressure transmitter located across the venturi scrubber inlet and packed bed scrubber exhaust airlines. The minimum acceptable accuracy of the meter during calibration is ± 5 % of full scale. The range is 0 to 20 in WC.
Quality Assurance and Control Practices	Annual calibration and cleaning of the transmitter. Acceptance criteria: ± 5 % of full scale.
Monitoring Frequency	The combined differential pressure is indicated continuously and recorded hourly.
Data Collection Procedures	The combined differential pressure is recorded hourly.
Averaging Period	None

Operations and Maintenance (O&M) Plan
Venturi Scrubber followed by a Packed Bed Scrubber for VOC Control
North Coater

III. Monitoring Approach Justification

Background

The coating process consists of a continuous coater that receives propellant from a continuous dryer, several tanks with pumps to deliver VOC based coatings, a heated air supply that provides heat to volatize the VOC carrier, and feeders to apply dry agents such as graphite. The coater exhaust, plus any in-leaking fugitive air, is ducted to the combined scrubber unit and then to an exhaust blower and discharge stack. The emission point is the stack. The major VOC component is IPA.

The scrubbing section of the packed bed scrubber is 2 ft in diameter and has 6 feet of packing material and a demister. Single pass freshwater is introduced into the venturi scrubber and at the top of the packed bed scrubber.

Rationale for Selection of Performance Indicators and Ranges

During compliance testing the coating process was operated at capacity and the emission control system was operated at design. An average pressure drop across the combined venturi scrubber and packed bed scrubber was established at scrubber water flows recommended by the equipment suppliers. The water flows are considered minimum acceptable values. The differential pressure is expected to vary because of variation in processing air flow, variation in water flow, minor scale buildup, and gauge fluctuation. Variation of dP by +/- 5% of gauge range is normally expected. Variation of dP up through +/- 10% of gauge range is allowed as an overall operating range as described in the preceding table.

To comply with the emission limit for VOC, both the venturi scrubber and packed bed scrubber are operated whenever VOC based coatings are applied to the propellant. As demonstrated during compliance testing, 80% VOC removal (or more) can be expected at all allowed operating conditions.

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Compliance Assurance Monitoring (CAM) Plan
Venturi Scrubber followed by a Packed Bed Scrubber for VOC Control
South Coater

I. Background

A. Emissions Unit

Emission Unit	012
Emission point	12.2
Description:	Propellant surface coating operation
Identification:	South Coater Scrubber 464-019
Facility:	St. Marks Powder, Inc. St. Marks, Florida

B. Applicable Regulations, Emissions Limit, and Monitoring Requirements

Regulation:	Florida Air Permit
Emission limit:	
VOC:	32 lb/hr hourly 20 ton/12 month rolling total
Monitoring requirements:	Differential pressure and scrubbing water flows

C. Control Technology

Venturi scrubber followed by packed bed scrubber with demister

II. Monitoring Approach

This CAM plan addresses operation of the South Coater in VOC mode.

VOC mode occurs whenever the coater is used to apply surface coatings that are suspended or dissolved in isopropyl alcohol (IPA). In VOC mode, Propellant and coating solution is introduced into the feed end of the coater co-currently. Heated air is introduced into the coater counter-currently, to volatize and remove the IPA. IPA and air exit the coater and are delivered to the scrubbers.

The air stream is first scrubbed with the venture to remove solids carried over from the coating operation that might plug the packed bed scrubber. The air stream is then scrubbed in the packed bed scrubber to remove the IPA.

Water at or above a minimum flow rate is sent to the venturi scrubber and water at or above a minimum flow rate is sent to the packed bed scrubber.

VOC reduction has been demonstrated and the operating parameters, water flow and differential pressure, have been verified through compliance testing.

Compliance Assurance Monitoring (CAM) Plan
Venturi Scrubber followed by a Packed Bed Scrubber for VOC Control
South Coater

	Indicator No. 1	Indicator No. 2
Indicator	Venturi scrubber spray water flow	Packed bed scrubber spray water flow
Measurement approach	The venturi scrubber spray water flow is measured with an integral orifice flow transmitter.	The packed bed scrubber spray water flow is measured with an integral orifice flow transmitter.
Indicator range	An excursion is defined as any operating condition where the venturi scrubber spray water flow is less than 15 gpm. An excursion will trigger an investigation of the occurrence, corrective action, and reporting.	An excursion is defined as any operating condition where the packed bed scrubber spray water flow is less than 19 gpm. An excursion will trigger an investigation of the occurrence, corrective action, and reporting.
Performance Criteria		
Data Representativeness	The venturi scrubber spray water flow rate is measured using an integral orifice flow transmitter located in the spray water inlet line. The minimum acceptable accuracy of the meter is ±5% of full scale. The range is 0 to 24 gpm.	The packed bed scrubber spray water flow rate is measured using an integral orifice flow transmitter located in the spray water inlet line. The minimum acceptable accuracy of the meter is ±5% of full scale. The range is 0 to 24 gpm.
Quality Assurance and Control Practices	Annual calibration and cleaning of the integral orifice flow transmitter. Acceptance criteria: ±5% full scale	Annual calibration and cleaning of the integral orifice flow transmitter. Acceptance criteria: ±5% of full scale
Monitoring Frequency	The venturi scrubber spray water flow rate is indicated continuously and recorded hourly.	The packed bed scrubber spray water flow rate is indicated continuously and recorded hourly.
Data Collection Procedures	The venturi scrubber spray water flow rate is recorded hourly.	The packed bed scrubber spray water flow rate is recorded hourly.
Averaging Period	None	None

Compliance Assurance Monitoring (CAM) Plan
Venturi Scrubber followed by a Packed Bed Scrubber for VOC Control
South Coater

	Indicator No. 3
Indicator	Combined differential pressure
Measurement approach	The combined venturi and scrubber differential pressure (dP) is measured with a differential pressure transmitter.
Indicator range	(1) The normal operating range is 5.0 in WC ≦ dP ≦ 7.0 in WC. The normal operating range is derived from the average dP recorded during compliance testing plus allowance for ordinary gauge gauge accuracy and drift (5% scale). (2) If during routine operation the differential pressure is found to abnormally high (7.0 in WC < dP ≦ 8.0 in WC) or abnormally low (4.0 in WC ≦ dP < 5.0 in WC) the operator is required to determine the cause of the problem and take corrective action if possible. If immediate corrective action is not possible, repairs should be scheduled for the earliest opportunity. The extended operating range is derived from the average dP recorded during compliance testing plus allowance for gauge accuracy and drift (10% scale). (3) An excursion is defined as any operating condition where the combined differential pressure is outside the total operating range of 4.0 in WC < dP < 8.0 in WC. An excursion will trigger system shut down, an investigation of the occurrence, corrective action, and reporting.
Performance Criteria Data Representativeness	The combined differential pressure is measured using a differential pressure transmitter located across the venturi inlet and scrubber exhaust airlines. The minimum acceptable accuracy of the meter is ±5% of full scale. The range is 0 to 20 in WC.
Quality Assurance and Control Practices	Annual calibration and cleaning of the transmitter. Acceptance criteria: ±5% of full scale.
Monitoring Frequency	The combined differential pressure is indicated continuously and recorded hourly.
Data Collection Procedures	The combined differential pressure is recorded hourly.
Averaging Period	None

III. Monitoring Approach Justification

Background

The coating process consists of a continuous coater that receives propellant from a continuous dryer, several tanks with pumps to deliver VOC based coatings, a heated air supply that provides heat to volatize the VOC carrier, and feeders to apply dry agents such as graphite. The coater exhaust, plus any in-leaking fugitive air, is ducted to the combined scrubber unit and then to an exhaust blower and discharge stack. The emission point is the stack. The major VOC component is IPA.

The scrubbing section of the packed bed scrubber is 28 inches in diameter, and has 2 sections of packing and a demister. Single pass freshwater is introduced into the venturi scrubber and at the top of the packed bed scrubber.

Rationale for Selection of Performance Indicators and Ranges

During compliance testing the coating process was operated at capacity and the emission control system was operated at design. An average pressure drop across the combined venturi scrubber and packed bed scrubber was established at scrubber water flows recommended by the equipment suppliers. The water flows are considered minimum acceptable values. The differential pressure is expected to vary because of variation in processing air flow, variation in water flow, minor scale buildup, and gauge fluctuation. Variation of dP by +/- 5% of gauge range is normally expected. Variation of dP up through +/- 10% of gauge range is allowed as an overall operating range as described in the preceding table.

To comply with the emission limit for VOC, both the venturi scrubber and packed bed scrubber are operated whenever VOC based coatings are applied to the propellant. As demonstrated during compliance testing, 80% VOC removal (or more) can be expected at all allowed operating conditions.

St. Marks Powder, Inc.
Compliance Assurance Monitoring (CAM) Plan
Venturi Scrubber followed by a Packed Bed Scrubber for VOC Control
North Sweetie Barrel

I. Background

A. Emissions Unit

Emission Unit	012
Emission Unit Description	Propellant surface coating operation
Emission Point	12.3
Identification:	North Sweetie Barrel Scrubber 488-015
Facility:	St. Marks Powder, Inc. (SMP) St. Marks, Florida

B. Applicable Regulations, Emissions Limit, and Monitoring Requirements

Regulation:	Title V Air Permit
VOC Emission limit:	13.4 lb/hr maximum instantaneous 1.1 ton/12 month rolling total
Monitoring requirements:	Air flow differential pressure and scrubbing water flow rates

C. Control Technology

Venturi scrubber followed by packed bed scrubber with demister

II. Monitoring Approach

This CAM plan addresses operation of the North Sweetie Barrel in "VOC mode". The other operating mode, PM mode, is not regulated.

The key elements for the monitoring approach for VOC control, including the indicators and performance criteria are presented in the following table. In general:

- The operation is a remotely controlled batch operation although the loading at the start of the batch and unloading at the end of the batch are both performed locally and manually.
- The emission control parameters, total water flow and differential pressure, are remotely monitored.
- At the start of every batch cycle the emission control water flow distribution will be verified using the local manual gauges. These local gauges would be used for troubleshooting also.

	Indicator No. 1
Indicator	Total Venturi scrubber and packed bed scrubber spray water flow
Measurement approach	The combined venturi scrubber and packed bed scrubber spray water flow is measured with a flow transmitter. The reading is transmitted to the control area.
Indicator range	An excursion is defined as combined scrubber spray water flow less than 35 gpm. An excursion will trigger an investigation, corrective action, and reporting.
Performance Criteria	
Data Representativeness	The flow transmitter is located in the combined scrubber spray water inlet line. The minimum acceptable accuracy of the meter is ± 0.5% of full scale, 0 to 40 gpm (± 0.2 gpm).
Quality Assurance and Control Practices	Semi-annual calibration and cleaning of the flow transmitter. Acceptance criteria: ± 0.5% full scale
Monitoring Frequency	The combined scrubber spray water flow rate is indicated continuously.
Data Collection Procedures	The combined scrubber spray water flow rate is recorded at the start of every batch.
Averaging Period	None

	Indicator No. 2
Indicator	Combined venturi and packed-bed scrubber differential pressure
Measurement approach	The combined venturi scrubber and packed bed scrubber differential pressure (dP) is measured with a differential pressure transmitter.
Indicator range	(1) Normal operating range. The normal operating range is 6.0 in WC ≤ dP ≤ 8.0in WC. The normal operating range is derived from the average dP recorded during the compliance testing plus allowance for ordinary gauge accuracy (1 inch WC) and drift (5% scale). (2) Extended operating range. If during routine operation the differential pressure is found to abnormally high (8.0 in WC < dP ≤ 9.0 in WC) or abnormally low (5.0 in WC ≤ dP < 6.0 in WC) the operator is required to determine the cause of the problem and take corrective action if possible. If immediate corrective action is not possible, repairs should be scheduled for the earliest opportunity. The extended operating range is derived from the average dP recorded during compliance testing plus allowance for gauge accuracy and drift (10% scale). (3) An excursion is defined as any operating condition where the combined differential pressure is outside the total operating range of 5.0 in WC < dP < 9.0 in WC. An excursion will trigger system shut down, an investigation of the occurrence, corrective action, and reporting.
Performance Criteria Data Representativeness	The combined differential pressure is measured using a differential pressure transmitter located across the venturi scrubber inlet and packed bed scrubber exhaust airlines. The minimum acceptable accuracy of the meter during calibration is ± 5 % of full scale. The range is 0 to 20 in WC.
Quality Assurance and Control Practices	Annual calibration and cleaning of the transmitter. Acceptance criteria: ± 1 in WC.
Monitoring Frequency	The combined differential pressure is indicated continuously and recorded hourly.
Data Collection Procedures	The combined differential pressure is recorded at the start of every batch.
Averaging Period	None

III. Monitoring Approach Justification

Background

The North Sweetie Barrel operates in two modes, VOC mode and PM mode.

- Normally the North Sweetie Barrel operates in PM mode. In PM mode the Barrel is used to apply a dry, particulate, antistatic coating to propellant, to polish propellant, or to blend propellant with itself. Although the emission control equipment is operated while in PM mode, the control equipment is functioning to capture fugitive dust.
- In VOC mode the barrel is used to apply surface coatings that are suspended in isopropyl alcohol (IPA). The IPA is volatized and captured with a hood (cross air flow) as it exits the barrel mouth. At the end of the application cycle, an antistatic coating is applied to the powder.

The coating process machinery consists of:

- The North Sweetie Barrel.
- A small batch tank to hold one charge of coating suspension.
- A pump to deliver the suspension into the barrel.
- A hot water tank and pump to heat the barrel and contents.

In a typical operating cycle:

- Propellant is brought to the area and loaded into the barrel manually.
- The coating suspension is charged into the batch tank.
- Emission control monitoring parameters are recorded
- The barrel is started and heating is applied.
- The coating suspension is pumped into the barrel.
- Heat transfer is limiting therefore IPA volatization is approximately constant.
- After a prescribed period of time, an antistatic agent is applied to the propellant, and the barrel is cooled.
- The barrel is stopped.
- The propellant is dumped manually and removed from the area.

Control

- The barrel exhaust is captured by a hood that induces air flow across the mouth of the barrel.
- This air, plus any in-leaking fugitive air, is ducted to the combined scrubber unit
- The air stream is first scrubbed with the venturi to remove IPA and remove solids carried over from the coating operation that might interfere with the packed bed

scrubber. The air stream is then scrubbed in the packed bed scrubber to complete removal of the IPA.

- The combined scrubber unit exhausts to an exhaust blower and discharge stack.
- The emission point is the stack.

The scrubbing section of the packed bed scrubber is 32 inches in diameter and has a 12 inch brush pack and a 4 inch thick demister pad.

Single pass freshwater is used for the water sprays.

Rationale for Selection of Performance Indicators and Ranges

During process testing the coating process was operated at capacity and the emission control system was operated at design. An average pressure drop across the combined venturi scrubber and packed bed scrubber was established at total scrubber water flows recommended by the equipment supplier. The water flows are considered minimum acceptable values. The differential pressure is expected to vary because of variation in processing air flow, variation in water flow, minor scale buildup, and gauge fluctuation. Variation of dP by +/- 5% of gauge range is normally expected. Variation of dP up through +/- 10% of gauge range is allowed as an overall operating range as described in the preceding table.

To comply with the emission limit for VOC, both the venturi scrubber and packed bed scrubber are operated whenever VOC based coatings are applied to the propellant. As demonstrated during compliance testing, 80% VOC removal (or more) can be expected at all allowed operating conditions.