

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.<br>St. Marks, Florida |

### B. Applicable Regulations, Emissions Limit, and Monitoring Requirements

|                          |  |
|--------------------------|--|
| Regulation:              | Florida Air Permit                               |
| Emission limit:          |  |
| VOC:                     | 32 lb/hr hourly<br>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 volatilize and remove the IPA. IPA and air exit the coater and are delivered to the scrubbers.

The air stream is first scrubbed with the venturi 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                               | Indicator No. 1  | Indicator No. 2  |
|---|--|--|
| Measurement approach                    | Venturi scrubber spray water flow<br>The venturi scrubber spray water flow is measured with a rotameter.   | Packed bed scrubber spray water flow<br>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                    | 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 $\pm 5\%$ 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 $\pm 5\%$ of full scale and the range is 2 to 20 gpm |
| Data Representativeness                 | Annual calibration and cleaning of the rotameter. Acceptance criteria: $\pm 5\%$ full scale  | Annual calibration and cleaning of the rotameter. Acceptance criteria: $\pm 5\%$ of full scale   |
| Quality Assurance and Control Practices | 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.   |
| Monitoring Frequency                    | The venturi scrubber spray water flow rate is recorded hourly.   | The packed bed scrubber spray water flow rate is recorded hourly.  |
| Data Collection Procedures              | None   | None   |
| 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                         | <p>(1) <u>Normal operating range</u>. The normal operating range is <math>15.1 \text{ in WC} \leq \text{dP} \leq 17.1 \text{ in WC}</math>. 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).</p> <p>(2) <u>Extended operating range</u>. If during routine operation the differential pressure is found to abnormally high (<math>17.1 \text{ in WC} &lt; \text{dP} \leq 18.1 \text{ in WC}</math>) or abnormally low (<math>14.1 \text{ in WC} \leq \text{dP} &lt; 15.1 \text{ in WC}</math>) 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).</p> <p>(3) An excursion is defined as any operating condition where the combined differential pressure is outside the total operating range of <math>14.1 \text{ in WC} &lt; \text{dP} &lt; 18.1 \text{ in WC}</math>. An excursion will trigger system shut down, an investigation of the occurrence, corrective action, and reporting.</p> |
| Performance Criteria                    | 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 $\pm 5\%$ of full scale. The range is 0 to 20 in WC.  |
| Data Representativeness                 |   |
| Quality Assurance and Control Practices | Annual calibration and cleaning of the transmitter. Acceptance criteria: $\pm 5\%$ 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  |

4

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 volatilize 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.

**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.<br>St. Marks, Florida |

**B. Applicable Regulations, Emissions Limit, and Monitoring Requirements**

|                          |  |
|--------------------------|--|
| Regulation:              | Florida Air Permit                               |
| Emission limit:          |  |
| VOC:                     | 32 lb/hr hourly<br>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 volatilize and remove the IPA. IPA and air exit the coater and are delivered to the scrubbers.

The air stream is first scrubbed with the venturi 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 Coaster

| Indicator                               | Indicator No. 1   | Indicator No. 2  |
|---|---|--|
| Measurement approach                    | Venturi scrubber spray water flow<br>The venturi scrubber spray water flow is measured with an integral orifice flow transmitter.   | Packed bed scrubber spray water flow<br>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                    | 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 $\pm 5\%$ 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 $\pm 5\%$ of full scale. The range is 0 to 24 gpm. |
| Data Representativeness                 | Annual calibration and cleaning of the integral orifice flow transmitter. Acceptance criteria: $\pm 5\%$ full scale   | Annual calibration and cleaning of the integral orifice flow transmitter. Acceptance criteria: $\pm 5\%$ of full scale   |
| Quality Assurance and Control Practices | 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.   |
| Monitoring Frequency                    | The venturi scrubber spray water flow rate is recorded hourly.  | The packed bed scrubber spray water flow rate is recorded hourly.  |
| Data Collection Procedures              | None  | None   |
| 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                         | <p>(1) The normal operating range is 5.0 in WC <math>\leq</math> dP <math>\leq</math> 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).</p> <p>(2) If during routine operation the differential pressure is found to abnormally high (7.0 in WC &lt; dP <math>\leq</math> 8.0 in WC) or abnormally low (4.0 in WC <math>\leq</math> dP &lt; 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).</p> <p>(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 &lt; dP &lt; 8.0 in WC. An excursion will trigger system shut down, an investigation of the occurrence, corrective action, and reporting.</p> |
| Performance Criteria                    | 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 $\pm 5\%$ of full scale. The range is 0 to 20 in WC.   |
| Data Representativeness                 | Annual calibration and cleaning of the transmitter. Acceptance criteria: $\pm 5\%$ of full scale.   |
| Quality Assurance and Control Practices |   |
| 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  |

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