COMPLIANCE ASSURANCE MONITORING PLAN
UPDATES MADE IN 2009
ARMSTRONG WORLD INDUSTRIES, INC.

The initial CAM Plan was submitted with the Title V permit renewal application in October 2003. Subsequent upgrades and improvements that were in progress were made to the plant monitoring system and submitted to the FDEP. The CAM Plan was approved in February 2005 and incorporated into the Title V Air Operating Permit No. 0330006-011-AV.

The complete CAM Plan that was approved by FDEP is attached, with the following minor updates for the 2009 renewal application:

1. All references to EU065 (Baghouse No. 1) have been removed. Baghouse No. 1 was part of the Travertone Line which has been permanently removed from service.
2. Emission Unit descriptions have been updated on pages 2-14.
3. A description of enhancements to the water strainer system has been added on pages 21-22, and an updated drawing of the water system is included.

No changes have been made to monitoring approaches or parameter ranges.

Tables E.3 and E.4 (pages 17 and 18) replace the previous Tables E.3 and E.4 to update the allowable excursion duration as requested by letter dated February 23, 2010. Table E.3 was updated for a second time to accommodate the relocation of the pressure transmitter reading point to ground level and establishing an equivalent operating range (requested by letter dated March 26, 2010).

Table E.5 (page 19) replaces the previous table E.5 due to removal of the Travertone Line.

No changes are necessary for Tables E.1 or E.2 from the previous permit.

COMPLIANCE ASSURANCE MONITORING FOR EU003
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from the board mill dry saw sample planer, board mill dry saw stackers, dry saw sample table saw, and dry broke pulper weigh conveyor. See drawings in Attachment A.
Identification:	Scrubber No. 3, EU003
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility ID No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	4.0 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure
C. Control Technology	Ducon Dynamic, Type UW-4 Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.1. The selected indicator of performance is the scrubber water supply pressure. Water flow rate appears to be the critical parameter for scrubber cleaning efficiency. Scrubber water supply pressure directly correlates to water flow based on the size of the scrubber nozzles. Air inlet static pressure was found to be an indicator of vacuum for dust removal from the process and not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU009
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from the FMS Line operations and saw shop. See drawings in Attachment A.
Identification:	Scrubber No. 4, EU009
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility ID No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	2.0 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure
C. Control Technology	Ducon Dynamic Type UW-4 Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.1. The selected indicator of performance is the scrubber water supply pressure. Scrubber water supply pressure directly correlates to water flow based on the size of the scrubber nozzles. Air inlet static pressure was found to be an indicator of vacuum for dust removal from the process and not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU010
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from multiple PIF Line sources at the plant. See drawings in Attachment A.
Identification:	Scrubber No. 6, EU010
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	2.0 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure
C. Control Technology	Ducon Dynamic Type UW-4 Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.1. The selected indicator of performance is the scrubber water supply pressure. Scrubber water supply pressure directly correlates to water flow based on the size of the scrubber nozzles. Air inlet static pressure was found to be an indicator of vacuum for dust removal from the process and not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU011
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from the Mylar Line Equalizer, Salvage Equalizer and PIF Line Equalizers. See drawings in Attachment A.
Identification:	Scrubber No. 2, EU011
Facility:	Armstrong World Industries Pensacola Plant, Facility ID No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	3.0 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure
C. Control Technology	Ducon Dynamic Type UW-4 Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.2. The selected indicator of performance is the scrubber water flow rate. Air inlet static pressure was found to be an indicator of vacuum for dust removal from the process and not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU012
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from the PIF Line 2 pass tenoners. See drawings in Attachment A.
Identification:	Scrubber No. 7, EU012
Facility:	Armstrong World Industries Pensacola Plant, Facility ID No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	4.5 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure
C. Control Technology	Ducon Dynamic Type UW-4 Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.1. The selected indicator of performance is the scrubber water supply pressure. Scrubber water supply directly correlates to water flow based on the size of the scrubber nozzles. Air inlet static pressure was found to be an indicator of vacuum for dust removal from the process and not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU014
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from the Kiln Line Feeder and FMS tenoners (2). See drawings in Attachment A.
Identification:	Scrubber No. 5, EU014
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility ID No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	3.5 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure
C. Control Technology	Ducon Dynamic Type UW-4 Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.2. The selected indicator of performance is the scrubber water flow rate. Scrubber water supply pressure directly correlates to water flow based on the size of the scrubber nozzles. Air inlet static pressure was found to be an indicator of vacuum for dust removal from the process and not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU050 (SCRUBBER)
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from the North Board Dryer Exhaust Stack. See drawings in Attachment A.
Identification:	Scrubber No. 53, EU050
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility ID No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	11.0 pounds per hour (for north and south dryer stacks and wet end seal combined)
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure
C. Control Technology	Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.3. The selected indicator of performance is the scrubber water inlet pressure. Water flow appears to be a critical parameter for scrubber cleaning efficiency. Scrubber water supply pressure directly correlates to water flow. Air inlet static pressure is an indicator of airflow from the process and is not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU050 (MULTICYCLONE)
MULTICYCLONE NO. 54 FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This multicyclone controls dust from the South Board Dryer Exhaust Stack. See drawings in Attachment A.
Identification:	Multicyclone No. 54, EU050
Facility:	Armstrong World Industries Pensacola Plant, Facility I.D. No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	11.0 pounds per hour (for north and south dryer stacks and wet end seal combined)
Pre-CAM Monitoring Requirements:	Process rates, and air flow differential pressure.

C. Control Technology — Ducon Model 6 UP Multicyclone

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.4. The selected indicator of performance is the static air pressure. It is continuously monitored via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU054
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from the PIF line slice feeders, dry saw trim breakers, dry saw trim conveyors, and dry saw first and second pass saws. See drawings in Attachment A.
Identification:	Scrubber No. 9, EU054
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility ID No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	3.0 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure

C. Control Technology — Ducon Dynamic Type UW-4 Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.1. The selected indicator of performance is the scrubber water supply pressure. Water flow appears to be a critical parameter for scrubber cleaning efficiency. Scrubber water supply pressure directly correlates to water flow based on the size of the scrubber nozzles. Air inlet static pressure was found to be an indicator of vacuum for dust removal from the process and not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU055
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from the plant's two Perlite Expanders and the boardmill south starch storage tank. See drawings in Attachment A.
Identification:	Perlite Scrubber, EU055
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility I.D. No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	9.0 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure
C. Control Technology	Ducon Dynamic Type UW-4 Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.2. The selected indicator of performance is the scrubber water flow. Water flow appears to be a critical parameter for scrubber cleaning efficiency. Scrubber water supply pressure directly correlates to water flow based on the size of the scrubber nozzles. Air inlet static pressure was found to be an indicator of airflow for conveying Perlite from the process and is not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU056
WET SCRUBBERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This scrubber controls dust from the plant's Paint Mix operations and the #3 finish paint line dust brush and air knife. See drawings in Attachment A.
Identification:	Scrubber No. 8, EU056
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility I.D. No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	3.0 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates Scrubber water flow rates Air flow differential pressure
C. Control Technology	Ducon Dynamic Type UW-4 Wet Scrubber

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.1. The selected indicator of performance is the scrubber water supply pressure. Water flow appears to be a critical parameter for scrubber cleaning efficiency. Scrubber water supply pressure directly correlates to water flow based on the size of the scrubber nozzles. Air inlet static pressure was found to be an indicator of vacuum for dust removal from the process and not a critical variable for scrubber cleaning performance. Data is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU080
BAGHOUSE FILTERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This baghouse filter controls dust from the PIF Line Sander operations. See drawings in Attachment A.
Identification:	Baghouse No. 21, EU080
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	0.75 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates and baghouse air flow differential pressure.

C. Control Technology — Baghouse Filter

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.5. The selected indicator of performance is the pressure drop across the baghouse. It is monitored continuously via the plant's Data Historian system.

COMPLIANCE ASSURANCE MONITORING FOR EU081
BAGHOUSE FILTERS FOR PM CONTROL
ARMSTRONG WORLD INDUSTRIES, INC.

I. Background

A. Emissions Unit

Description:	This baghouse controls dust from the PIF Line Flipper and Wheelabrator operations. See drawings in Attachment A.
Identification:	Baghouse No. 22, EU081
Facility:	Armstrong World Industries, Inc. Pensacola Plant, Facility I.D. No. 0330006

B. Applicable Regulation, Emissions Limit, and Monitoring Requirements

Regulation:	Permit 0330006-010-AV
PM Emissions Limit:	0.75 pounds per hour
Pre-CAM Monitoring Requirements:	Process rates and baghouse air flow differential pressure.

C. Control Technology — Baghouse Filter

II. Proposed Monitoring Approach

The key elements of the monitoring approach for PM are presented in Table E.5. The selected indicator of performance is the pressure drop across the baghouse. It is monitored continuously via the plant's Data Historian system.

TABLE E.1
MONITORING APPROACH FOR:
EU003, EU009, EU010, EU012, EU054 and EU056
SCRUBBERS 3, 4, 6, 7, 8, & 9

I. Indicator	Scrubber water inlet pressure.
Measurement Approach	The scrubber water pressure is monitored continuously using a pressure transmitter connected to the plant's Data Historian system.
II. Indicator Range	While the scrubber is operating, an excursion is defined as water pressure outside the range specified below for a continuous period of 2 hours. (Note: If the fan shuts down, the process line shuts down immediately. This is not considered an excursion). An excursion will trigger an investigation of the occurrence and corrective action. Scrubber No. 3: 15 psi to 35 psi Scrubber No. 4: 15 psi to 35 psi Scrubber No. 6: 15 psi to 35 psi Scrubber No. 7: 15 psi to 35 psi Scrubber No. 8: 15 psi to 35 psi Scrubber No. 9: 15 psi to 35 psi
III. Performance Criteria	
A. Data Representativeness	The pressure transmitter is located at the water inlet to the scrubber.
B. Verification of Operational Status	NA
C. Quality Assurance and Control Practices	Install, calibrate, maintain and operate pressure transmitters following manufacturer's specifications.
D. Monitoring Frequency	Water pressure is continuously monitored via the plant's Data Historian system.
Data Collection Procedures	The plant's Data Historian system collects and retains an instantaneous data point every 15 minutes. This data is stored electronically and archived for 5 years.
Averaging Period	None

TABLE E.2
MONITORING APPROACH FOR:
EU011, EU014, and EU 055
SCRUBBER 2, SCRUBBER 5 & PERLITE SCRUBBER

I. Indicator	Scrubber water flow.
Measurement Approach	The scrubber water flow is monitored continuously using a flow meter connected to the plant's Data Historian system.
II. Indicator Range	While the scrubber is operating, an excursion is defined as water flow less than those specified below for a continuous period of 2 hours. (Note: If the fan shuts down, the process line shuts down immediately. This is not considered an excursion). An excursion will trigger an investigation of the occurrence and corrective action. Scrubber No. 2: 165 gpm minimum Scrubber No. 5: 80 gpm minimum Perlite Scrubber: 165 gpm minimum
III. Performance Criteria	
A. Data Representativeness	The flow meter is located at the water inlet to the scrubber.
B. Verification of Operational Status	NA
C. Quality Assurance and Control Practices	Install, calibrate, maintain and operate flow meters following manufacturer's specifications.
D. Monitoring Frequency	Water flow is continuously monitored via the plant's Data Historian system.
Data Collection Procedures	The plant's Data Historian system collects and retains an instantaneous data point every 15 minutes. This data is stored electronically and archived for 5 years.
Averaging Period	None

TABLE E.3
MONITORING APPROACH FOR:
EU050 – SCRUBBER NO. 53

I. Indicator	Scrubber water inlet pressure.
Measurement Approach	The scrubber water pressure is monitored continuously using a pressure transmitter connected to the plant's Data Historian system.
II. Indicator Range	While the scrubber is operating, an excursion is defined as a scrubber water inlet pressure less than 21 psi for a continuous period of 4.5 hours. (Note: This allowable period of 4.5 hours is contingent on Armstrong ceasing feed of boards to the board mill dryer within 2 hours). An excursion will trigger an investigation of the occurrence and corrective action.
III. Performance Criteria	
A. Data Representativeness	The water pressure is monitored using a pressure transmitter. The pressure transmitter is located in the water inlet line.
B. Verification of Operational Status	NA
C. Quality Assurance and Control Practices	Maintain and operate transmitters following manufacturer's specifications.
D. Monitoring Frequency	The scrubber water inlet pressure is continuously monitored via the plant's Data Historian system.
Data Collection Procedures	The plant's Data Historian system collects and retains an instantaneous data point every 15 minutes. This data is stored electronically and archived for 5 years.
Averaging Period	None

TABLE E.4
MONITORING APPROACH FOR:
EU050 – MULTICYCLONE NO. 54

I. Indicator	Static air pressure.
Measurement Approach	The static air pressure is monitored continuously using a pressure transmitter connected to the plant's Data Historian system
II. Indicator Range	While the multicyclone is operating, an excursion is defined as static air pressure which falls outside the range of 5 to 15 inches water column for a continuous period of 4.5 hours. (Note: This allowable period of 4.5 hours is contingent on Armstrong ceasing feed of boards to the board mill dryer within 2 hours). An excursion will trigger an investigation of the occurrence and corrective action.
III. Performance Criteria	
A. Data Representativeness	The static air pressure is measured using a pressure transmitter. The pressure transmitter is located at the Multicyclone inlet.
B. Verification of Operational Status	NA
C. Quality Assurance and Control Practices	Maintain and operate transmitter following manufacturer's specifications.
D. Monitoring Frequency	The static air pressure is continuously monitored via the plant's Data Historian system.
Data Collection Procedures	The plant's Data Historian system collects and retains an instantaneous data point every 15 minutes. This data is stored electronically and archived for 5 years.
Averaging Period	None

TABLE E.5
MONITORING APPROACH FOR:
EU080 and EU081
BAGHOUSES 21 and 22

I. Indicator	Static pressure across the baghouse.
Measurement Approach	The static air pressure is measured using a pressure transmitter.
II. Indicator Range	While the baghouse is operating, an excursion is defined as static pressure outside the range specified below for a continuous period of 2 hours. (Note: If the fan shuts down, the process line shuts down immediately. This is not considered an excursion). An excursion will trigger an investigation of the occurrence and corrective action. Baghouse 21: between 2.8 and 8 inches water column Baghouse 22: between 2 and 8 inches water column
III. Performance Criteria A. Data Representativeness	The pressure transmitter measures the static pressure across the baghouse.
B. Verification of Operational Status	NA
C. Quality Assurance and Control Practices	Maintain and operate transmitter following manufacturer's specifications.
D. Monitoring Frequency	Pressure is continuously monitored via the plant's Data Historian system.
Data Collection Procedures	The plant's Data Historian system collects and retains an instantaneous data point every 15 minutes. This data is stored electronically and archived for 5 years.
Averaging Period	None

MONITORING APPROACH JUSTIFICATION FOR
EU003, EU009, EU010, EU011, EU012, EU014, EU054, EU055 and EU056

I. Background

Activities associated with these scrubbers (except for EU055) include various dust sources associated with the manufacture of ceiling tile. These sources include feeders, stackers, conveyors, equalizers, tenoners, saws and sanders. Process flow diagrams are included in Attachment A. Fume hoods collect dust from the process equipment and a fan pulls the vapors through vent lines and into the scrubber.

For EU 055, raw perlite is expanded with natural gas fired perlite expanders. Expanded perlite is separated from the flue gases in cyclones, and particulate and combustion by-product emissions are controlled by a Ducon Dynamic Gas Scrubber, Type UW-4 (EU 055).

Each of the nine Scrubbers is a Ducon Dynamic Gas Scrubber, Type UW-4. A detailed description of the scrubbers is included in the permit application forms and in Attachment H.

II. Rationale for Selection of Performance Indicators

In February 2004, the Armstrong plant commenced an extensive Six Sigma Greenbelt engineering project to evaluate certain operational aspects of the plant's Ducon wet scrubbers, optimize overall scrubber performance, and determine performance indicators and their respective operating ranges. The ultimate goal of the project was to maintain stable operating conditions to ensure scrubber efficiency, maintain compliance with the plant's Title V air operating permit, ensure that the emission control devices are operating in accordance with manufacturer specifications, and validate maintenance procedures for the scrubbers to ensure compliance with applicable permit limits.

Considerable progress and improvements have been made as a result of the Six Sigma project. All nine of the scrubbers have been outfitted with new instrumentation and monitoring devices, and tied into the plant's Data Historian system, which will continuously monitor the required performance indicators. This is a substantial improvement over the previous monitoring method of manually recording the data once each eight-hour shift. The scope of the recent Six Sigma engineering project provided that Scrubbers No. 2 and 5 were equipped with flow meters and monitored for water flow rate. The remaining wet scrubbers are monitored for water supply pressure which is a direct indicator of flow rate.

One of the findings of the study was that air inlet static pressure is a good indicator of vacuum for dust removal from the process, but not a critical variable in scrubber cleaning performance. Ducon Technologies' technical engineer, Mr. Thomas Kelleher, further validated this finding by stating that while air inlet static pressure is a good measure of performance for a Venturi and other types of scrubbers, it is not for the Dynamic Scrubbers, Type UW-4 which are used at the Pensacola Plant. He stated that neither pressure drop nor static pressure is a good indicator of scrubber performance for this type of scrubber. Based on these findings, Armstrong is proposing water pressure or water flow rate as the sole CAM performance indicator for the scrubbers. By monitoring one relevant indicator continuously, we expect to collect more meaningful performance data than by the previous monitoring scheme whereby two questionably relevant parameters were monitored every eight hours.

III. Rationale for Selection of Indicator Levels

Performance indicator ranges included in this plan were established by a combination of manufacturer's recommendations, engineering studies, and historical data. The indicator ranges are supported by the 2004 compliance test results, which are summarized in Tables E.6 through E.14. Operating parameters associated with compliance tests prior to 2004 are not included in the table. They are not relevant to the current operation because of the extensive changes to the scrubber monitoring system in 2004.

The manufacturer of all nine of the Dynamic Type UW-4 wet scrubbers is Ducon Technologies. The manufacturer's design liquid flow rate is165 gpm.

For Scrubber No. 2, the manufacturer's design liquid flow rate of 165 gpm was used.

The minimum water flow rate for Scrubber No. 5 was based on compliance test data, and the 2004 Six Sigma engineering study. The data is shown in Table E.11.

The proposed CAM range for the perlite scrubber is supported by historical operating data. According to the Data Historian monitoring system, the water flow rate fluctuates between 165 and 190 gpm during normal operation. As shown in Table E.14, the compliance test results for 2004 show that the emissions were less than half of the permitted limit. The perlite scrubber has tested well below its compliance limit for the past 5 years. The manufacturer's design liquid flow rate is 165 gpm.

An engineering study was performed on Scrubber No. 3 to determine the correlation between scrubber water flow rate and scrubber water pressure. A flow rate of 150 gpm was measured at 13 psi water pressure. It was determined that a flow rate of 165 gpm would correspond to 15 psi water pressure. This information was generalized to the other scrubbers, and used as the basis for the minimum CAM indicator on Scrubbers 3, 4, 6, 7, 8, and 9.

The maximum CAM indicator for Scrubbers 3, 4, 6, 7, 8, and 9 is a scrubber water pressure of 35 psi. Based on the design of the system, a back pressure of 35 psi is expected when the spray nozzles are plugged. The Ducon Dynamic Type UW-4 Scrubbers are outfitted with two ¾" nozzles in the top section, and two to four ½" nozzles in the bottom section. In accordance with the plant's scrubber maintenance plan, a nozzle inspection is scheduled every six weeks. In addition, the possibility of clogged spray nozzles has been greatly reduced by the installation of a new strainer at the plant's wastewater treatment plant on November 26, 2004 (see attached drawing of the water cleaning process). Because the perforations in the strainer are smaller than the orifice size of the scrubber nozzles, the water, which is recycled back to the wet scrubbers, is less likely to contain particles that could possibly plug the spray nozzles.

Prior to 2009, the strainer at the plant's wastewater treatment plant required manual cleaning of debris that was caught in the strainer. To improve the functionality of the recycled water strainer system, Armstrong has installed a more robust, self-cleaning straining system that senses when the strainer needs to be cleaned and automatically

performs that function. This system utilizes pressure indicator feedback which allows the plant to monitor pressure drop across the strainer as an indicator of solids removal from the recycled water supply. The new system is integrated into the plant's Data Historian and monitored continuously. These additional measures further minimize the likelihood of partially plugged spray nozzles.

TABLE E.6
COMPLIANCE TEST DATA FOR
EU003

Scrubber No. 3	2004 test data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	0.755 lb/hr	4.0 lb/hr
Board Mill Stacker	44 ft/min	75 ft/min
Dry Broke Pulp	2.7 TPH	2.9 Tons Per Hour (TPH)
Scrubber water pressure	23 psi	Between 15 and 35 psi

Note: CAM range based on manufacturer's information, and engineering studies

TABLE E.7
COMPLIANCE TEST DATA FOR
EU009

Scrubber No. 4	2004 test data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	1.15 lb/hr	2.0 lb/hr
FMS Line	15.2 BPM	120 ft/min = 20 boards per minute
Scrubber water pressure	28 psi	Between 15 and 35 psi

Note: CAM range based on manufacturer's information, and engineering studies

TABLE E.8
COMPLIANCE TEST DATA FOR
EU010

Scrubber No. 6	2004 test data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	0.505 lb/hr	2.0 lb/hr
PIF Line	25 BPM	198 ft/min = 33 boards per minute (BPM)
Scrubber water pressure	22 psi	Between 15 and 35 psi

Note: CAM range based on manufacturer's information, and engineering studies

TABLE E.9
COMPLIANCE TEST DATA FOR
EU011

Scrubber No. 2	2004 test data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	1.88 lb/hr	3.0 lb/hr
PIF Line	25 BPM	198 ft/min = 33 boards per minute (BPM)
Equalizer	800 sq.ft/hr	974 sq.ft/hr
Mylar Line	4.67 BPM	28 ft/min = 4.7 boards per minute
Scrubber Flow Rate	200 gpm	above 165 gpm

Note: CAM range based on manufacturer's information

TABLE E.10
COMPLIANCE TEST DATA FOR
EU012

Scrubber No. 7	2004 test data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	1.45 lb/hr	4.5 lb/hr
PIF Line	25 BPM	198 ft/min = 33 boards per minute (BPM)
Scrubber water pressure	20 psi	Between 15 and 35 psi

Note: CAM range based on manufacturer's information, and engineering studies

TABLE E.11
COMPLIANCE TEST DATA FOR
EU014

Scrubber No. 5	2004 compliance test data	2004 Six Sigma data	2004 Six Sigma data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	1.73 lb/hr	0.98 lb/hr	1.46 lb/hr	3.5 lb/hr
Kiln	3.0 BPM	3.0 BPM	3.0 BPM	16 ft/min = 3.0 boards per minute (BPM)
FMS Line	15.2 BPM	15.2 BPM	15.2 BPM	120 ft/min = 20 boards per minute (BPM)
Scrubber Flow Rate	100 gpm	90 gpm	80gpm	above 80 gpm

TABLE E.12
COMPLIANCE TEST DATA FOR
EU054

Scrubber No. 9	2004 test data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	0.425 lb/hr	3.0 lb/hr
PIF Line	26.2 BPM	198 ft/min = 33 boards per minute (BPM)
Dry Saw	44 ft/min	75 ft/min
Scrubber water pressure	24 psi	Between 15 and 35 psi

Note: CAM range based on manufacturer's information, and engineering studies

TABLE E.13
COMPLIANCE TEST DATA FOR
EU056

Scrubber No. 8	2009 test data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	0.2 lb/hr	3.0 lb/hr
#3 Finish Paint Line and various sources associated with the paint mix line	27 boards/min	33 boards/min (#3 Finish Paint Line) Paint Mix line – not limited
Scrubber water pressure	26.1 psi	Between 15 and 35 psia

Note: CAM range based on manufacturer's information, engineering studies, and compliance history

TABLE E.14
COMPLIANCE TEST DATA FOR
EU055

Perlite Scrubber	2000 test data	2001 test data	2002 test data	2003 test data	2004 test data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	2.74 lb/hr	4.3 lb/hr	3.43 lb/hr	5.08 lb/hr	3.7 lb/hr	9.0 lb/hr
Perlite	-	-	-	-	6.0 tons/hr	6.75 tons/hr
Scrubber water flow	N/A	N/A	N/A	N/A	190 gpm	Above 165 gpm

Note: CAM range based on historical data (165-190 gpm), and compliance history

MONITORING APPROACH JUSTIFICATION FOR
EU050

I. Background

Formed pulp boards are dried in a 112.35 MMBtu/hr natural gas fired board dryer. Emissions from the board dryer north exhaust are controlled by Scrubber 53. Scrubber 53 is a W.W. Sly Impinjet Wet Scrubber, Model 3140. Emissions from the board dryer south exhaust are controlled by Multicyclone 54. The multicyclone is a Ducon, Model 6UP. The remaining fugitive emissions from circulation are captured by a Wet End Seal (as permitted on 12/1/08 in permit 0330006-014-AC). A detailed description of the two control devices is included in the permit application forms and in Attachment H.

II. Rationale for Selection of Performance Indicators

Scrubber No. 53 has one water tray, where the air bubbles up through the tray. To ensure efficient operation, and to comply with the applicable emission limit, adequate water flow must be supplied to the scrubber. The current Title V permit requires monitoring scrubber water flow rate and air flow differential pressure. During a recent engineering study, air inlet static pressure was found to be an indicator of vacuum for dust removal from the process and not a critical variable for scrubber cleaning performance. Therefore, water pressure at the scrubber is used as the CAM performance indicator.

Multicyclone No. 54: To ensure efficient operation of the multicyclone, and to comply with the applicable emission limit, adequate airflow must be supplied to the multicyclone. Control efficiency is a function of inlet velocity, and changes in velocity result in changes in pressure drop across the device. If inlet velocity exceeds a specific value, turbulence becomes excessive and control efficiency decreases. Therefore, static air pressure is the CAM performance indicator, and is monitored at the Multicyclone inlet as an indicator of air flow.

III. Rationale for Selection of Indicator Level

The indicator ranges are supported by historical emissions test data. Table E.15 summarizes the relevant compliance test results.

TABLE E.15
COMPLIANCE TEST DATA FOR
EU050

Board Dryers	2002 test data	2003 test data	2004 test data	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	5.7 lb/hr	6.24 lb/hr	4.8 lb/hr	11.0 lb/hr
Operating rate	45 ft/min	43 ft/min	43 ft/min	75 ft/min
Hot Water Scrubber (North Board Dryer)	12 psi	12 psi	10 psi	10 psi minimum
Multiclone (South Board Dryer)	5 in WC	5 in WC	5 in WC	Between 5 and 15 inches WC

MONITOR APPROACH JUSTIFICATION FOR
EU080 and EU081

I. Background

Activities associated with Baghouses 21 and 22 include various dust sources associated with the operation of the PIF line. These sources include a line sander, flipper, and wheelabrator. Process flow diagrams are included in Attachment A. Baghouse No. 21 (EU080), is a Fuller Jet Pulse Model 272 C10 baghouse. Baghouse No. 22 (EU081), is a Fuller Jet Pulse Model 168 C10 baghouse. A detailed description of the baghouses is included in the permit application forms and Attachment H.

II. Rationale for Selection of Performance Indicators

The current Title V permit requires monitoring airflow differential pressure across the baghouse. It is used as the CAM performance indicator, and is monitored continuously via the plant's Data Historian system.

III. Rationale for Selection of Indicator Level

The CAM indicator levels for the baghouses were based on a combination of particulate matter tests, visible emission tests, and manufacturer's recommended specifications. Particulate matter tests were performed on Baghouse No. 21 and No. 22 in 2001, although annual PM testing is not required by the Title V permit.

For Baghouse No. 21 and No. 22, the minimum pressure drop was chosen based on the minimum pressure drop observed during recent VE tests. The observed pressure drop is not a strong function of the bag cleaning cycle, as the bag cleaning pulses are every 25 seconds.

Relevant test results are summarized in Tables E.17 through E.18

TABLE E.17
COMPLIANCE TEST DATA FOR
EU080

Baghouse No. 21	2001 PM test	2000 VE test	2001 VE test	2002 VE test	2003 VE test	2004 VE test	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	0.25 lb/hr	VE passed	VE passed	VE passed	VE passed	VE passed	0.75 lb/hr
PIF line Sander	26.2 BPM	26.2 BPM	26.2 BPM	25 BPM	26.2 BPM	26.2 BPM	33 boards/min
Pressure drop across baghouse	5 in WC	4.0 in WC	2.8 in WC	6 in WC	5 in WC	6.5 in WC	Between 2.8 and 8 inches water column (inches WC)

Notes: A PM10 test was conducted in 2001. Annual PM testing is not required. The 2001 PM test and the 2001 VE test were done at different times during the year.

TABLE E.18
COMPLIANCE TEST DATA FOR
EU081

Baghouse No. 22	2001 VE test	2002 VE test	2003 VE test	2004 VE test	2004 VE test	Allowable emissions and operating rate, and proposed CAM ranges
Particulate Emissions	VE passed	VE passed	VE passed	VE passed	VE passed	0.75 lb/hr
PIF line flipper and Wheelabrator	25 BPM	25 BPM	25 BPM	25 BPM	25 BPM	33 boards/min
Pressure drop across baghouse	3.0 in WC	5 in WC	4 in WC	7.8 in WC	2.8	Between 2 and 8 inches water column (in WC)

Notes: A PM10 test was conducted in 2001. Annual PM testing is not required. VE only. A VE test was performed by Sanders Engineering & Analytical Services, Inc. on 2/10/05. During the VE test, the water column reading fluctuated from 1 inch to 2.8 inches in the thirty-minute period. The readings were recorded in the plant's Data Historian. During the test, the highest opacity reading observed was 0 percent. The plant was operating normally at 25 boards per minute.

WHITE WATER CLEANING PROCESS MAP