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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R14-0012G
Plant ID No.: 003-00042
Applicant: Quad/Graphics, Inc. (Q/G)
Facility Name: Martinsburg Plant
Location: Berkeley County
SIC Code: 2754, 2752, 2893
Application Type: Class II Administrative Update
Received Date: March 4, 2016
Engineer Assigned: Joe Kessler
Fee Amount: \$300
Date Received: March 4, 2016
Complete Date: April 13, 2016
Due Date: June 12, 2016
Applicant Ad Date: March 9, 2016
Newspaper: *The Journal*
UTM's: Easting: 247.0 km Northing: 4,377.0 km Zone: 17
Latitude/Longitude: 39.50926/-77.95182
Description: Class II Administrative Update to change the size and model of two (2) previously permitted heatset web offset lithographic printing presses (S-28 and S-29).

The Q/G Martinsburg Plant has undergone several modifications and has been the subject of various permitting actions since construction. To place the current application in context, the following will summarize each permitting action to provide a background for this permitting action. They are presented in a generally chronological order.

R14-0012

On September 14, 1995, the Prevention of Significant Deterioration (PSD) Permit Number R14-0012 was issued to Q/G for the construction of a new printing and publishing facility in Martinsburg, WV. Included in the permit were twelve (12) publication rotogravure (R/G) presses, one (1) proof press, two (2) chrome plating operations, two (2) boilers, and ten (10) ink storage tanks. The only pollutant that underwent PSD review during this permitting action was Volatile Organic Compounds (VOCs). Other pollutants were emitted, or limited to, less than significant thresholds.

R13-2189

On April 16, 1999, Permit Number R13-2189 was issued for the installation of three (3) heatset web offset lithographic (O/S) presses at the Martinsburg Plant. It was issued as a synthetic minor and limited VOC emissions to less than 39.4 TPY. No pollutants were in excess of the significance thresholds in 45CSR14 and the action did not undergo PSD review.

R13-2189A

On September 1, 1999, Permit Number R13-2189A was issued as an Administrative Update (A/U) to R13-2189. The update was instigated by permit determination PD99-162 and resulted from a change in Fountain Solutions within the O/S presses. VOC emissions slightly decreased as a result of this A/U.

R13-2160

On February 28, 2000, Permit Number R13-2360 was issued to Q/G for the installation of an ink blending operation at the Martinsburg Plant. This operation contained eleven (11) permanent storage tanks, seven (7) permanent mixing tanks, and three (3) portable totes. The tanks range in volume from 5,000 to 30,000 gallons (nominal capacity) and the totes range in volume from 350 to 554 gallons (nominal capacity). Q/G uses the facility to blend inks for use in their R/G printing lines. No pollutants were in excess of the significance thresholds in 45CSR14 and the action did not undergo PSD review.

R14-0012A

On December 5, 2000, permit R14-0012A was issued to Q/G to address the reorganization of the boiler operating parameters. The permit was an administrative update to the original PSD permit R14-0012, and reorganized the limits on the two boilers permitted under R14-0012 and the back-up boiler constructed under Consent Corder CO-R13-C-2000-18(A) to allow for the operation of all three simultaneously but with no increase in annual Oxides of Nitrogen (NO_x) or VOC emissions.

R14-0012B

Permit R14-0012B was issued as a major modification (subject to PSD review) on August 30, 2001 and consisted of the addition of six (6) publication rotogravure presses, nine (9) heatset lithographic web offset presses, one (1) chrome plating operation, three (3) natural gas fired boilers, and five (5) storage tanks. The permit also consolidated all of the above permits (including R13-2189A and R13-2160) into one permit. The pollutants NO_x and VOC underwent PSD review as part of this permitting action.

R14-0012C

Permit R14-0012C was issued on April 7, 2008 and authorized installation of an ink manufacturing plant at the facility and associated loadout emissions. The permit was issued as a minor modification to a major source.

R14-0012D

Permit R14-0012D was issued on December 22, 2010 and authorized an increase in the permitted throughput of the existing storage tanks T-11 through T-15 (using them now for ink manufacturing instead of rotogravure ink storage) and R2, and an increase in the throughput of manufactured ink loadout operations. No new equipment was proposed for this modification. As noted above, the ink manufacturing operations were added under R14-0012C issued in 2008.

R14-0012E

On February 15, 2011, a Class II A/U was issued to Q/G to replaced a fire-destroyed rotogravure press (G-20) with a new rotogravure press (G-28). A PSD Netting Analysis was included in permit application.

R14-0012F

On December 18, 2014, a Class II A/U was issued to Q/G to increase the allowable VOC emissions of the Rennzman Cylinder Washing Unit.

DESCRIPTION OF PROCESS/MODIFICATIONS

Existing Facility Description

Q/G operates a printing and publishing facility in Martinsburg, WV. The facility is located in the Cumbo Yard Industrial Park adjacent to I-81 and is north of downtown Martinsburg. The plant prints catalogs, magazines, and inserts for periodicals. It utilizes web-fed publication rotogravure printing and heatset web offset lithographic printing presses to achieve this end. Also present at the plant are an ink blending and manufacturing facility, ink storage tanks, natural-gas boilers, chrome plating operations, a solvent recovery system, label making ink-jet printers, and a cylinder washer that are supportive parts of the Martinsburg Plant.

Heatset Web Offset Lithographic Printing

In lithographic printing the image area of the cylinder is ink receptive and water repellent, while the nonimage area is chemically ink repellent. The fountain solution is used to dampen the plate. In offset lithography, the image is applied to a rubber-covered "blanket" cylinder and then transferred onto the substrate (e.g. "offset"). If a continuous roll of paper is used as the substrate, this is known as a "web." "Heatset" refers to heat drying of inks in an offset process. Hot air or direct flame may be used in the dryer. After exiting the dryer, the web passes over chill rolls before such post-press operations as folding and cutting.

Imaging Operations

Imaging operations include composition (arrangement of art and text) and typesetting, and producing a photographic negative or positive. Once the desired format and images are assembled,

they are photographed to produce transparencies. The printing industry photographic process uses input materials very similar to those used in other fields of photography. The purpose of this step is to produce a photographic negative (for lithography and letterpress) or a positive (for gravure, screen printing, and other lithographic processes). Input materials for the process include paper, plastic film, or a glass base covered with a light-sensitive coating called a photographic emulsion. This emulsion is usually composed of silver halide salts and gelatin. The desired image is projected onto the film to produce a film negative or a film positive. When the exposed photographic emulsion is developed, the silver halide in the emulsion is converted to metallic silver, in proportion to the amount of exposure it has received. In automatic film processors, developers with a high sodium sulfite concentration reduce film fogging which occurs when high developer temperatures are used. The developing action is stopped by immersing the film in a fixing bath, which is mainly composed of sodium thiosulfate ("hypo"). The fixed photographic emulsion is then rinsed. If an image is to be printed as a color reproduction, several transparencies are made. Multi-color printing is done by passing the same substrate through several single-color printing operations.

Platemaking and Printing

In lithography, a planographic plate is used where the image areas and the non-image areas are on the same plane (they are neither raised nor depressed) and are defined by differences in their physicochemical properties. There are several different types of lithographic printing, but they all use a planographic plate and they all rely on the fact that oil and water do not mix. A metal printing plate is coated with a light-sensitive chemical which becomes ink receptive when exposed to light. Through the photographic negative, the coating is exposed to light and it changes chemically in the exposed areas, making the image areas ink receptive. The non-image areas remain water-receptive, therefore, a water-based chemical, called the fountain solution, is applied to enable the non-image areas to repel ink. Using inking rollers, ink is applied to the plate and it adheres only in the image areas. The image is transferred from the plate to a rubber roller (the blanket), which then transfers the image to the substrate being printed. Fountain solutions usually contain 5 to 10 percent isopropyl alcohol. Most lithographic inks are solvent-based or ultraviolet (UV) curable. In the heatset process, the ink is dried by evaporating the ink oil with indirect hot air dryers. This process is potentially the most significant source of VOC emissions in lithography. 'Offset' lithography refers to the use of a rubber blanket to transfer the image from the plate to the substrate. Web-fed offset lithography is commonly used for high speed production of magazines, catalogs, and other periodicals, newspapers, magazines and catalogs.

Post-press Operations

Post-press processes include cutting, folding, collating, binding, perforating, drilling, and many others. Liquid glue used for binding is typically a water-based latex that becomes impervious to water when it dries.

Heatset Web Offset Printing at the Martinsburg Plant

Currently, the Q/G Martinsburg facility is permitted to construct and operate nine (9) heatset web offset lithographic printing presses:

Table 1: Permitted Offset Presses

Source ID No.	Source Description	Control Device ID No.	Control Device Description	Emission Point ID No.
OP-01	Heidelberg Harris M3000 8-unit, 4 color, heatset, Offset Web Printing Press	F-01	Thermal Oxidizer	S-28
OP-02	Heidelberg Harris M3000 8-unit, 4 color, heatset, Offset Web Printing Press	F-02	Thermal Oxidizer	S-29
OP-03	Heidelberg Harris M1000 8-unit, 4 color, heatset, Offset Web Printing Press	F-03	Catalytic Oxidizer	S-30
OP-04	Man Roland, Rotoman SS, 8-unit, 4 color, heatset, Offset Web Printing Press	F-04	Thermal Oxidizer	S-31
OP-05	Man Roland, Rotoman SS, 8-unit, 4 color, heatset, Offset Web Printing Press	F-05	Thermal Oxidizer	S-32
OP-06	Heidelberg Harris M1000 8-unit, 4 color, heatset, Offset Web Printing Press	F-06	Thermal Oxidizer	S-33
OP-07	Heidelberg Harris M1000 8-unit, 4 color, heatset, Offset Web Printing Press	F-07	Thermal Oxidizer	S-34
OP-08	Heidelberg Harris M1000 8-unit, 4 color, heatset, Offset Web Printing Press	F-08	Thermal Oxidizer	S-35
OP-09	Heidelberg Harris M3000 8-unit, 4 color, heatset, Offset Web Printing Press	F-09	Thermal Oxidizer	S-36
OP-10	Heidelberg Harris M3000 8-unit, 4 color, heatset, Offset Web Printing Press	F-10	Thermal Oxidizer	S-37
OP-11	Heidelberg Harris M3000 8-unit, 4 color, heatset, Offset Web Printing Press	F-11	Thermal Oxidizer	S-38
OP-12	Heidelberg Harris M3000 8-unit, 4 color, heatset, Offset Web Printing Press	F-12	Thermal Oxidizer	S-39

Proposed Modifications

Q/G is now proposing to change the size and model of two (2) previously permitted (but not installed) heatset web offset lithographic printing presses (S-28 and S-29) from those noted above to Gross International C700E 4-unit, 4 color, heatset, offset presses. The new presses will have a total dryer Maximum Design Heat Input of 7.00 mmBtu/hr (as opposed to 16 mmBtu/hr in the currently permitted model) and will utilize thermal drying (with a minimum DRE of 97.5%) to control VOC/HAP emissions.

SITE INSPECTION

Due to the nature of the proposed modification, the author did not perform a site inspection of the facility for this permitting action. The facility was last inspected by DAQ Compliance/Enforcement (C/E) Inspector Joseph Kreger of the Eastern Panhandle Regional Office on July 2, 2014. This inspection found the facility be "Status 30 - In Compliance."

AIR EMISSIONS AND CALCULATION METHODOLOGIES

Q/G included in Attachment N of the permit application emissions calculations for the new Gross International C700E 4-unit, 4 color, heatset, offset presses (OP-1 and OP-2). The maximum usage estimation of ink, washes, fountain solution, and clean-up solvents were provided by Q/G (as estimated by Q/G using data from other facilities with similar presses).

Capture efficiencies for the various compounds used on the heatset web offset presses were generally based on US EPA's draft September 1993 Guideline Series: Control of Volatile Organic Compound Emissions from Offset Lithographic Printing; and on an August 21, 1997 memo from Lloyd L. Eagan to "All Air Management Staff" at the State of Wisconsin's Air Management Office of the WI Department of Natural Resources regarding "Guidelines for Determining Emissions From Lithographic Printing Facilities." These values are required for the actual emissions calculating and reporting under Section 4.2.4(h) of the draft permit. It is important to note that Q/G used some variables in the calculations that deviated from the accepted values under 4.2.4(h). However, as compliance with the new press emission limits will be determined on an actual emissions reporting basis that will, according to 4.2.4, require the use of the permitted capture efficiencies under 4.2.4(h), the potential-to-emit (PTE) as calculated under Attachment N was used as the basis of the emission limits in the draft permit.

The PTE from printing operations were based on mass balance calculations taking into account the maximum expected material usages, the retention values and capture efficiencies as discussed above, and the control efficiency of the thermal oxidizer (DRE of 97.5%). The emissions from the combustion exhaust of natural gas in the dryers is based on the emission factors provided for natural gas combustion as given in AP-42 Section 1.4 (AP-42 is a database of emission factors maintained by USEPA).

Based on information in the permit application, the change in facility-wide PTE associated with the proposed changes evaluated herein is given in the following table:

Table 2: Change In Facility-Wide Annual PTE

Pollutant	Permitted Presses ⁽¹⁾	New Press Model	Change
	tons/year	tons/year	tons/year
CO	7.14	3.22	-3.92
NO _x	9.40	3.84	-5.56
PM _{2.5} /PM ₁₀ /PM	0.66	0.30	-0.36
SO ₂	0.14	0.02	-0.12
VOCs	31.92	23.54	-8.38
HAPs	0.16	0.70	0.54

(1) Emissions taken from R14-0012F permit limits.

REGULATORY APPLICABILITY

The following will discuss each rule or applicable or potentially applicable to the two (2) Gross International C700E 4-unit, 4 color, heatset, web offset lithographic printing presses.

45CSR13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation

The proposed changes to the size and model of two (2) previously permitted heatset web offset lithographic printing presses will decrease the PTE of all criteria pollutants at the Martinsburg Plant. However, the proposed change will increase the PTE of total HAPs, but by less than two (2) lbs/hour and five (5) TPY of HAPs that would, pursuant to §45-13-2.17, define the installation as a "modification" under 45CSR13. Therefore, pursuant to §45-13-4.2(b)(1), EQT is requesting a Class II Administrative Update to make a "[c]hange in a permit condition as necessary to allow changes in operating parameters, emission points, control equipment or any other aspect of a source which results in an increase . . . of any existing regulated air pollutant . . . "

As required under §45-13-8.3 ("Notice Level A"), Q/G placed a Class I legal advertisement in a "newspaper of *general circulation* in the area where the source is . . . located." The ad ran on March 9, 2016 in *The Journal* and the affidavit of publication for this legal advertisement was submitted on **October 1, 2014.**

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration

The Martinsburg Plant is an existing major stationary source under 45CSR14 and the proposed installation of two (2) Gross International C700E 4-unit, 4 color, heatset, offset presses is considered, pursuant to §45-14-2.40, a "*physical change* or a change in the method of operation." Therefore, to determine if the project is defined as a "major modification," pursuant to §45-14-3.4(a), the project is examined under a two-step applicability test: "[A] project is a major modification for a regulated NSR pollutant if it causes two types of emissions increases -- a significant emissions increase (as defined in subsection [§45-14-2.75]), and a significant net emissions increase (as defined in subsections [§45-14-2.46] and [§45-14-2.74]). The proposed project is not a major modification if it does not cause a significant emissions increase. If the proposed project causes a significant emissions increase, then the project is a major modification only if it also results in a significant net emissions increase."

Therefore, for the proposed changes to meet the definition of a major modification, the changes themselves must result in a significant emissions increase. The methodology for calculating the emissions increase under the first step is given under Sections §45-14-3.4(b), 3.4(c), 3.4(d) and 3.4(f). The substantive language relevant to the changes evaluated herein is given below:

[§45-14-3.4(b)]

The procedure for calculating (before beginning actual construction) whether a significant emissions increase (i.e., the first step of the process) will occur depends upon the type of emissions units being modified, according to subdivisions 3.4.c through 3.4.f.

[§45-14-3.4(d)]

Actual-to-potential test for projects that only involve construction of a new emissions unit(s). -- A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the difference between the potential to emit (as defined in subsection 2.58) from each new emissions unit following completion of the project and the baseline actual emissions (as defined in subdivision 2.8.c) of these units before the project equals or exceeds the significant amount for that pollutant (as defined in subsection 2.74).

To be conservative, for the purposes of the PSD applicability analysis only, Q/G has chosen to consider the changes in the size and model of two (2) previously permitted presses as construction of new emission units. Pursuant to §45-14-3.4(d), the aggregate PTE of the two C700E presses will be compared to the significant amount for that pollutant (as defined in subsection §45-14-2.74). Based on the aggregate PTE of the presses as given under Table 2 above, no PSD pollutant exceeds the significant threshold under 2.74 and, therefore, the proposed changes are not defined as a “major modification” under 45CSR14.

45CSR30: Requirements for Operating Permits

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The Martinsburg Plant, defined under Title V as a “major source,” was last issued a Title V permit on April 12, 2012. Proposed changes evaluated herein must also be incorporated into the facility's Title V operating permit. Commencement of the operations authorized by this permit shall be determined by the appropriate timing limitations associated with Title V permit revisions per 45CSR30.

40 CFR 63, Subpart KK: National Emission Standards for the Printing and Publishing Industry (Non-Applicability)

The printing and publishing MACT standards, published on May 30, 1996, and amended on May 24, 2006, impose control requirements on publication and product/package rotogravure presses and web-wide flexographic presses. It does not apply to heatset web offset lithographic printing presses.

TOXICITY ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the proposed presses and that are not classified as “criteria pollutants.” Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM₁₀), Particulate Matter less than 2.5 microns (PM_{2.5}), and Sulfur Dioxide (SO₂). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal and programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) limits promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Any potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The proposed presses have the potential to emit the following HAPs in substantive amounts: Hexane, Benzene, Toluene, Ethyl-benzene, and Xylene. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 3: Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
Ethyl-benzene	VOC	No	Category D - Not Classifiable
Glycol Ether EB	VOC	No	Not likely to be carcinogenic to humans.
Glycol Ether DB	VOC	n/a	Not in IRIS
Xylene	VOC	No	Inadequate Data

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals.* For a complete discussion of the known health effects of each compound refer to the IRIS database located at www.epa.gov/iris.

AIR QUALITY IMPACT ANALYSIS

The proposed modification does not meet the definition of a “major modification” pursuant to 45CSR14 and, therefore, an air quality impact (computer modeling) analysis was not required. Additionally, based on the nature of the proposed modification, modeling was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, RECORD-KEEPING, AND REPORTING REQUIREMENTS

No changes are being made in the monitoring, compliance demonstrations, record-keeping, and reporting requirements of the permit. The monitoring and compliance demonstration related to cylinder washing unit will remain on an “actual emissions reporting basis” as given under 4.2.4 of the permit.

TESTING OF OPERATIONS

No additional testing requirements were added as a part of this modification. Compliance with the emission limits is based on material balance equations and accepted web retention and evaporation factors.

CHANGES TO PERMIT R14-0012F

The substantive made changes to R14-0012F were limited to:

- Updating the type and parameters of presses S-28 and S-29 in the Emission Units Table 1.0 and Table 4.1.2(a);
- Adding the equipment ratings of the C700E presses to Table 4.1.2(g); and
- Adding separate emission limits for the C700E presses to Appendix B.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable state and federal air quality regulations will be achieved. Therefore, I recommend to the Director the issuance of Class II Administrative Update Permit Number R14-0012E to Quad/Graphics, Inc. for the above discussed changes to the Martinsburg Plant located in Martinsburg, Berkeley County, WV.



Joe Kessler, PE
Engineer

4-14-10

Date