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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2846
Plant ID No.:	019-00106
Applicant:	J.P.J., Inc.
Facility Name:	Oak Hill
Location:	Oak Hill,
SIC Code:	339900
Application Type:	Construction
Received Date:	June 24, 2010
Engineer Assigned:	Edward S. Andrews, P.E.
Fee Amount:	$1000.00
Date Received:	June 24, 2010
Completeness Date:	July 9, 2010
Due Date:	October 7, 2010
Newspaper:	*The Fayette Tribune*
Applicant Ad Date:	June 28, 2010
UTMs:	Easting: 487.5 km Northing: 4,206.4 km Zone: 17
Description:	This is application is for the nitric acid vats and abrasive blasting equipment at the facility.

DESCRIPTION OF PROCESS

J.P.J., Inc. is located in industrial park near Oak Hill, West Virginia. J.P.J's primary business focus is on the recycling used roof bolt bit for the mining industry. The Oak Hill facility consists of one process structure and separate office building.

J.P.J. receives unserviceable roof bolt bits from end users. These bits are first screened and sorted. This process step is required to remove foreign material (i.e. rocks, coal, metal, etc.) from the sorted out bits. Once screened and sorted, the bits are placed into basket. This basket of bits is lowered into a open top tank filled with nitric acid using a overhead crane.

Once the basket is immerse, the nitric acid attacks the solder holding the carbide tip cutter into the bit housing. The acid dissolves the solder, which allows the carbide tip to be removed later. This process step takes between 4 to 10 hours, which depends on the strength of the acid. Once the solder has been dissolved, the baskets is hoisted out of the acid vat and allowed to hang above the tank so any acid is allowed to drain back into the tank. After five minutes, the basket is moved over and lowered into a resin tank filled with cool water. Once the bits are cooled down, the basked is raised out the resin tank and allowed to hang above the resin tank. Before being moved, the bits are rinsed water again with a water hose and allowed to hang additional 10 – 15 minutes. Any acid residue is removed using rags.

Once the bits are dried, they are placed the shaker bin. The bits are slowly dumped into the shaker bin are a rate not to overrun the shaker belt. The shaker vibrates so that the carbide tips are separated from the housing. These tips and housing are dumped onto the bit table. From bit table, the housings are loaded into buckets to be sent to the bit manufacture where new cutting tips are soldered in the bits again.

For the carbide tips to be accepted by the caribide processer, the tips cannot any solder or other residue. Therefore, the carbide tips are loaded in basket and place in a nitric acid vat for hours. Then, the basket is removed from the acid vat and placed in the resin tank. Once any acid has been resin off the carbide, the carbide is placed on a drying table. The carbide tips are spread out on the table to allow the tips to complete dry out. An electric heater is place on table in speed up the drying process.

Once dry, the tips are loaded onto trays to be loaded into a abrasive blaster. The tips are loaded into the blaster machine in 200-pound batches. The machine is abrasive blaster machine design to remove any other foreign material on the carbide tips. Once cleaned, the carbide is removed and placed into drums. The carbide is shipped to another processor that turns the clean carbide back into carbide cutting tips.

SITE INSPECTION

The writer visited the facility on July 20, 2010. Mr. Gene Coccari of the DAQ Small Business Assistance Section was present during this visit. Mr. Samuel Jasper, President of J.P.J., Inc. and Jessica Chandler, employee of J.P.J., Inc. meet with the writer during this visit.

J.P.J. is located at the end of Industrial Drive in Oak Hill, which is part of a industrial park. Due to local vegetation, this writer was not able to estimate the distance to the nearest residential dwelling. Using Goggle Earth with imagery date of 6/7/2009, the nearest dwelling is located approximately 460 feet away, northwest of processing building.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions from the facility are mineral acids (nitric acid mist) and particulate matter. The mineral acids is generated when metals are dissolved by the nitric acid in acid vats. Particulate matter (PM), particulate matter less than ten micros (PM_{10}) and particulate matter less than 2.5 micros ($PM_{2.5}$) is generated from abrasive blasting activities.

Mineral Acids

This writer used a mass balance approach on an annual basis to determine the amount of nitric acid emitted from the acid vats. The applicant provided key information concerning the acid usage, waste disposal and controls. Assuming that one other source of acid discharge other than the shipping it for disposal was going to the atmosphere. This approach estimated that the facility has the potential to emit 23.4 tons of nitric acid (mineral acids) per year without controls.

J.P.J. has elected to use packed bed scrubbers with hoods that are manufactured by Vanaire to control acid vapors from each of the four tanks. There are two scrubbers with each scrubber controlling two acid vats. The capturer system on these tanks should effectively capture 90% of the vapors from the acid vats. Vanire claims that these scrubber should effectively remove 99% of nitric acid vapors from the exhaust steam before being emit to the atmosphere. With this level of control, the facility's potential nitric acid emissions would be reduce down to 1.63 tons per year which includes fugitives acid emissions

not captured by the hood system. Hourly discharge of nitric acid from the vats would be 5.08 pounds per hour, which fugitives from all four vats batches of bits immersed in them.

PM (To include PM_{10} and $PM_{2.5}$)

Not including the mineral acid emissions from the acid vats, the abrasive blasting activities is the only other source of emissions, which is PM. There is little to no published data on PM emissions from abrasive blasting activities. Thus, sources has to develop other means to determine the PM potential from such activities. J.P.J. elected to use a mass balance approach. J.P.J. measured the mass of the bits and cutting tips before being processed by the abrasive blasters and measured the mass of the dust, (PM) collected in the dust collector. The abrasive blasting machine (5S) were loaded with 2000 pounds of bits and operated for half hour. This yielded a mass in the dust collector of 0.77 pounds per 30 minutes or 1.53 pounds per hour. Assuming the dust collector has a collecting efficiency of 99% for PM, the abrasive blast (5S) has a potential to emit of 1.55.pounds per hour that equates to 6.8 tons per year (tpy).

J.P.J. performed the same mass balance method for the abrasive blaster that is used to clean the carbide tips (6S). However, for a measurable mass to cumulate in the dust collector, 3 tons of tips were cleaned over 8 hours. This equated to a potential to emit before controls of 0.026 pounds per hour that equates to 0.11 tpy. After controls, the combine total PM emissions from the abrasive blasters 5S and 6S are reduced to down 0.07 tpy after being filtered by the dust collector.

REGULATORY APPLICABILITY

The emission units at this facility are only subject emission limitations established in 45CSR7. The acid vat emits nitric acid mist and/or vapors which is classified as mineral acids under this rule. 45CSR§7-4.2. established allowable nitric acid vapor standards for manufacturing source operations. This rule set an allowable concentration of nitric acid vapors from manufacturing processes. Even though the goal of J.P.J.'s operation is to recycle or disassemble roof bolt bits, under this process meets the definition of a manufacturing process. Therefore, the acid vats have an allowable nitric acid concentration limitation of 70 milligrams per dry cubic meter.

When determining the nitric acid, the emissions data was in an annualized form. Therefore, additional operational data was required to covert the annual rate into a realistic concentration. It was

assumed that nitric acid vapor were released only when bits were in the vat (acid was dissolving the solder). J.P.J. anticipates that a vat acid (regardless of size) will last eight dipping of bits with a dipping lasting at least 8 hours. J.P.J. plans to change the acid in the smaller vats 4 times a year and 8 times for the larger vats, which equates to annual acid usage of 4,440 gallons per year. Thus, the annual hours of operating the vats turns out to be 2,560 hours. To determine worst-case concentration rates, it was determine to calculate the concentration with all four vats treating bits concurrently. The total concentration of nitric acid before controls was predicted to be 5,977 mg per cubic meter.

J.P.J. has installed two packed bed scrubber with collection systems to control vapors from the four vats. The collection system is design and manufacture in accordance with the industrial standard that should yield a collection efficiency of no less than 90%. These scrubber has a minimum collection efficiency of 99% for nitric acid. Appling the collection and removal efficiencies, the combined concentration of nitric acid from all four vat is predicted to be 60 mg/cubic meter, which is less than the allowable under 45 CSR §7-4.2. Typically, J.P.J. is only treating one batch at any given time. Thus, evaluating the mineral acid concentration was worst-case demonstration to see if additional limitation needed to ensure compliance with the standard.

The abrasive blasters are subject to the process weight standard under 45 CSR §7-4.1. This activity has a allowable of 3.4 pound of PM per hour. These two blaster has the potential to emit 0.02 pounds per hour of PM, which is significantly less than the allowable.

With the proposed controls in past, the nitric acid emissions from the vat and the particulate matter from the abrasive blaster should easily be capable of achieving compliance with the applicable emission limitations under Rule7 for this facility. Because this facility is classified as a minor source, therefore it is not subject to 45 CSR 30. Thus, the permittee will be required to obtain and maintain a "Certificate to Operate" under 45 CSR 22 as a "9M" source.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

Nitric acid is not classified as a hazardous air pollutant under the Clean Air Act. In addition, EPA's Integrated Risk Information System (IRIS) does not list nitric acid. The following information on nitric acid is based on the MSDS provide by the applicant.

Nitric acid can cause severe burns of the respiratory and digestive tracts.

Routes of exposure: Inhalation, Skin absorption, skin contact, eye contact, and Ingestion.

Eye Contact: Nitric acid can cause permanent eye injury. Symptoms may include stringing, tearing, redness and swelling of eyes. Can injury the cornea and cause blindness.

Skin Contact: Nitric acid can cause permanent skin damage. Symptoms may include redness, burning, and swelling of skin, burns, and other skin damage. Additional symptoms of skin contact may include: abnormal coloring of the skin.

Ingestion: Swallowing his material may be harmful or fatal. Symptoms may include severe stomach and intestinal irritation (nausea, vomiting, diarrhea, abdominal pain, and vomiting of blood. Swallowing this material may cause burns and destroy tissue in throat and digestive tract. Low blood pressure and shock may occur as a result of severe tissue injury.

Inhalation: Breathing of vapor or mist is possible. Breathing this material may be harmful or fatal. Symptoms may include severe irritation and burns to the nose, throat, and respiratory tract.

Aggravated Medical Conditions: Preexisting disorders of the following organs may be aggravated by exposure to this material: Skin, and Lungs

Carcinogenicity: Nitric acid is not listed as a carcinogen by the International Agency for Research on Cancer, the National Toxicology Program, or the Occupational Safety and Heath Administration.

AIR QUALITY IMPACTS ANALYSIS

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

MONITORING OF OPERATIONS

The area of concern from this facility concerning compliance is to ensure proper operation and maintenance of the scrubbers. J.P.J. has two pack bed scrubber using water as the scrubbing fluid. The following parameters with corresponding limits need to be monitored:

- Pressure drop across the scrubber not to exceed 1.5 inches of water column (in. W.C.).
- Scrubber liquid flow rate not to drop below 14 gallons per minute.
- Water level in the tank.
- Damper position on hood system.

In the past, J.P.J. has allegedly emitted excess emissions from the acid vats. J.P.J. claims that these discharges were advisory caused or tribute by their operations which are as follows:

- Not limiting number of bits per batch
- Understanding the specific grade steel of a bit housing
- Monitoring/controlling the temperature of acid in the vat

To better explain and understand these above-mentioned causes, one needs to understand more about the process used to more the carbide tips from the bit housing. J.P.J. uses the nitric acid to dissolves the solder that holds the carbide tip in the housing. The reason nitric acid is used is that steel used for the house and the carbide tip are passive to nitric acid at concentration of 67%. This means that there is not free iron on the surface for the acid to react too.

The main problem that causes these excess emissions from this acid vats lies with specific type of steel. Most of the steel housings (1" bits) are machined from AISI 4160 Steel. 4160 is steel that has under when heat treatment process (i.e. annealed), which changes the grain structure of the steel. This writer believes that this heat treatment process eliminate or lock-up any remaining free iron on the surface and makes it passive to nitric acid.

Most of the 1-3/8" bits and a few 1" bits are cold formed. Cold forming manufacturing techniques must use a differ grade of steel (i.e.1060). Steel using in cold forming must be soft and ductile

(plain carbon steel). This steel is active towards nitric acid. J.P.J. provided a few of these bits that were attacked by the nitric acid, which was dissolving the free iron on the surface of the bit.

This writer believes that when significant amount of these cold formed are immersed in the nitric acid bath that there is an increase in surface area that the acid can feed on, which increases heat that generated from the reactions. This increase of heat energy is transferred to the acid solution, which could be evaporating the water in the acid solution. Thus, changing the concentration of the acid to a fuming condition. Nitric Acid solutions with a concentration of 86% or greater are refer as fuming acid.

Once the acid becomes fuming, the capture system is no longer effectively in capturing the vapors. There has been a reddish-brown color haze associated with these events. This haze is to believe to be nitrogen monoxide (NO), which is a by-product of the reaction.

To prevent this adviser reaction from occurring, one needs to eliminate the bits that are active to the nitric acid (cold formed bit housing). Most 1-3/8" bits are cold formed. 1" bits have a very noticeable surface defect, which is unique from being cold formed. Limited the mass size of a batch would minimize the adverse reaction should the some of the bit housing react to the acid. The temperature of the acid is a key factor in whether water potion of the acid solution is evaporated or not. Batches should not be introduced into the vat if the vat temperature is already too high. Typical batches will raise the vat temperature by 15 to 20^0F. Monitoring the vat temperature before a batch is immersed must be considered.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates J.P.J., Inc. meets all the requirements of the applicable rules or regulations when all of the proposed control devices are functioning properly and the acid reactions are maintained under control. Therefore, impact on the surrounding area should be minimized and it is recommended that the J.P.J., Inc. should be granted a construction permit under 45CSR13 for the proposed roof bolt bit disassembling facility.

Edward S. Andrews, P.E.

Engineer

Date: February 10, 2011