DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: On-site Inspection

N539160799

FACILITY: Orchid Orthopedic Solutions Plants A and B		**SRN / ID:** N5391
LOCATION: 1489 CEDAR ST, HOLT		**DISTRICT:** Lansing
CITY: HOLT		**COUNTY:** INGHAM
CONTACT: Jason Barrett , EHS Specialist		**ACTIVITY DATE:** 11/10/2021
STAFF: Michelle Luplow	**COMPLIANCE STATUS:** Compliance	**SOURCE CLASS:** MINOR
SUBJECT: Scheduled, onsite inspection to determine compliance with PTI's 361-08 and 428-94.		
RESOLVED COMPLAINTS:		

Personnel Present: Jason Barrett, EHS Specialist (jason.barrett@orchid-ortho.com)

Purpose

Conduct an unannounced, onsite compliance inspection to determine compliance with Orchid Orthopedic Solutions' (Orchid) Permits to Install (PTI) Nos. 428-94 and 361-08 for two wet dust collectors and an acid etching process.

Facility Background/Regulatory Overview

Orchid is a contract manufacturer of hip and knee replacement medical equipment. Operations involve forging of metal billets (titanium, cobalt, zirconium and stainless steel) to construct the hip and knee replacement parts. Orchid is a true minor source of criteria pollutants and HAPs.

The facility is comprised of Buildings A and B. Building B is where the metal billets are cut into shape and size before they are sent to Building A for forging. The forging process involves heating the billet in a furnace and then pressed in a dye. J. Barrett said the production is currently up due to demand.

J. Barrett said that Orchid operates 3 8-hour shifts, in addition to an occasional small group of staff that work 12-hr shifts. Typical operations are Monday through Friday, with an occasional Saturday.

The facility was last inspected in November 2016.

Inspection

This was an unannounced compliance inspection. At approximately 9:10 a.m. on November 10, 2021, I met with Jason Barrett, EHS Specialist at Building B/Administrative Building. We discussed briefly Orchid's plans to operate several pieces of equipment under exemptions, as well as the removal of the permitted dust collectors. I provided J. Barrett with an electronic copy of AQD's Permit to Install Exemptions handbook, with the caveat that it would benefit the company to review this handbook prior to making any changes or installations at the facility in the future.

Table 1 contains a list of all emission units, permitted and exempt, at the facility. I confirmed that there are no boilers, generators, or parts washers at this facility.

Based on the information gathered during the inspection, PTI's 428-94 and 361-08 will be voided. There are no other PTI's for equipment at this facility at this time.

Table 1. Emission Units

Bldg. ID	Emission Unit ID	Emission Unit Description	PTI/Exemption
B	6 Electrical Discharge Machining (EDM) machines	Metal working processes sharing a common Smog Hog, which exhausts indoors.	Rule 285(2)(l)(vi)(B)
B	7 Computer Numerical Controlled (CNC) machines	Metal working processes which are enclosed, with no exhaust to the outdoors.	Rule 285(2)(l)(vi)(B)
B	5 graphite cutting machines	Metal working processes controlled by 2 dust collectors: 3 machines are controlled by 1 Donaldson dust collector and 2 machines are controlled by the other Donaldson dust collector. All exhaust indoors.	Rule 285(2)(l)(vi)(B)
B	Maintenance booth for welding and plasma cutting	Welding and plasma cutting has been removed from this building. This type of work is contracted out to H & H.	NA
A	Cutting and Tack Welding	Minor cutting and tack welding. Most is typically just contracted out to H & H.	Rule 285(2)(i)
A	EU-ACIDCLEAN	"Clean Etch" hydrofluoric acid process, controlled by a scrubber, which exhausts outdoors.	PTI No. 428-94
A	EU-120H-WW		PTI No. 361-08

		This wet dust collector, “Big Blue,” has been removed from the facility and replaced with a Dual Draw HEPA filter which exhausts to the in-plant environment. All equipment that was exhausted to the “Big Blue” collector is now exhausted to the Dual Draw. Equipment vented to the Dual Draw includes hand and belt grinders, buffers, and small blast-cleaners.	
A	EU-50MCD-WW	This wet dust collector, “Little Blue,” has been removed from the facility and replaced with a Dual Draw HEPA filter which exhausts to the in-plant environment. All equipment that was exhausted to the “Little Blue” collector is now exhausted to the Dual Draw. Equipment vented to the Dual Draw includes hand and belt grinders, buffers, and small blast-cleaners.	PTI No. 361-08
A	12 presses	12 installed presses to form parts from metal billets. Presses vent to in-plant environment.	Rule 285(2)(l)(i)
A	Blanchard grinder	Polishes billets smooth. Vents to outdoor environment, controlled with filters.	Rule 285(2)(l)(vi)(C)
A	3 sandblasters and 2 shotblasters	2 sandblasters and 3 tumbleblasters. All vented to the in-plant environment after air is filtered through a filter housing unit	Rule 285(2)(l)(vi)(B)
A	"Electropolish" acid process	"Electropolish" orthophosphoric acid process, controlled by a scrubber, which exhausts outdoors.	Rule 290

Building A

PTI No. 428-94 and its revision – EUACIDCLEAN

EUACIDCLEAN consists of several tanks used for QA/QC. Formed parts are etched in these tanks, which allows staff to see fissures or cracks in the part. Grinders are then used to grind out the cracks and fissures. This unit is permitted to use both nitric acid and hydrofluoric acid; however, at this time only hydrofluoric acid (HF) is being used.

The unit consists of 2 acid tanks and 3 water rinse tanks. The 2 acid tanks, according to J. Barrett, contain 49% HF. This unit was being operated during the inspection.

Emission Limits, Process/Operational Restrictions, & Testing/Sampling

HF emissions are limited to 4 mg/m^3. Orchid's consultants stated that the design information for this unit indicates an exhaust flow of 2,700 cfm and a control efficiency of 98% on the scrubber, although the consultants did state that they cannot confirm the flow rate and the scrubber efficiency are still operating at those rates.

Utilizing the Permits Section's "Acid Emissions Calculator," provided by Andy Drury, a control efficiency of 98%, a 2,700 cfm flow rate, and the surface area of the two acids tanks (9.90 ft^2), as well as the concentration of HF in the tanks, the emission rate from this process is 0.167 mg/m^3 HF, falling within the limits of the permit.

It is my professional judgment that a 98% control efficiency can only be claimed if Orchid is complying with the requirement to ensure the scrubber is installed and operating properly, which includes maintaining the unit properly. The scrubber is a tower spray-style wet scrubber. I was provided with the preventative maintenance records for maintenance conducted on the scrubber (attached). Records indicate that scrubber spray nozzles and blower motor are inspected once per quarter to ensure the spray nozzles are not clogged and the blower motor is properly oiled. At this time, quarterly preventative maintenance on the scrubber appears to be adequate for ensuring proper operation of the scrubber, thus a 98% control efficiency is likely an acceptable value to use for the purposes of emission calculations.

Verification of HF emission rates are required upon request of the Department. At this time it is my professional judgment that emissions testing is unnecessary, as preventative maintenance on the scrubber appears to be consistently conducted.

Stack/Vent Restrictions & Emission Limits

Visible emissions from the stack are required to be 5% opacity or less. Additionally, the stack is required to be no less than 36 feet above ground level. J. Barrett and I went outside so that I could observe emissions from the stack, as well as use AQD's Nikon Forestry Pro II Rangefinder to verify EUACIDCLEAN's stack height. The rangefinder calculated a stack height of 26.7' from ground level. Orchid conducted their own measurements using a tape measure and determined the stack height to be 29' from ground level. Both measurements indicate non-compliance with the stack height requirement. While outside to take measurements on the stack I verified that there was no opacity being emitted from the stack

Rule 291 Exemption Demonstration

During submittal of required records Orchid also provided a Rule 291 demonstration for EUACIDCLEAN, as well as a request to void PTI 428-94. AQD conducted a review of this demonstration (see attached) and determined that potential emissions of HF from EUACIDCLEAN were below the 5 tpy threshold (3.79 tpy as reported by the company) provided in Table 23 of Exemption Rule 291. I also conducted my review via calculations that were conducted using AQD's spreadsheet to calculate emissions from acid tanks, which also indicated that the Rule 291 limits were being met. It appears that EUACIDCLEAN can meet the requirements under Rule 291, and as such, a

request will be submitted to AQD's Permit Section on Orchid's behalf to void PTI 428-94. The resolution to the stack height violation is to operate EUACIDCLEAN under the exemption, which contains no stack height minimum requirements.

PTI No. 361-08 – FG-WETCOLL

PTI 361-08 was written for FG-WETCOLL, 2 dust collectors, the "Big Blue" and the "Little Blue," which are used to control emissions from grinders, buffers and blast cleaners. During the inspection, J. Barrett and I confirmed that the "Big Blue" and "Little Blue" have been removed from the facility. These two units were replaced by one unit, a Dual Draw HEPA filter system, which vents to the in-plant environment.

Orchid posits that the replacement of the Big Blue and Little Blue dust collectors with the installation Dual Draw is an exempt change under Rule 285(2)(l)(vi)(B). Based on the information provided by the company, that the emissions are vented to the in-plant environment (confirmed onsite during the inspection) it appears that this installation would meet the requirements of this exemption rule. A request will be submitted to AQD's Permits Section to void PTI 361-08 because the permitted equipment has been removed.

Exemption Demonstration: Rule 291 Orthophosphoric Acid Tanks

There is an orthophosphoric acid tank room comprised of 2 orthophosphoric acid dip tanks. One tank is in use, the other is empty. The unused tank is a self-cleaning unit that Orchid plans to use to replace the tank that is currently in operation. According to the SDS provided by the company, attached, orthophosphoric acid consists of a maximum of 30% sulfuric acid and a maximum of 100% phosphoric acid. The tank is controlled by a mist eliminator system before venting to atmosphere.

Phosphoric acid has an annual ITSL of 10 µg/m^3 and sulfuric acid has an annual ITSL of 1 µg/m^3. According to Rule 291, sulfuric acid is therefore limited to a potential to emit of 0.12 tons per year and phosphoric acid is limited to a potential to emit of 5 tpy. The Rule 291 demonstration, attached, indicates that potential emissions of both toxic air contaminants meet these two limits. I also conducted my review via calculations that were conducted using AQD's spreadsheet to calculate emissions from acid tanks, which also indicated that the Rule 291 limits were being met.

Compliance Statement: Orchid Orthopedic Solutions appears to be in compliance with all PTI's and applicable exemptions at this time, pending the voiding of PTI 428-94. Voiding of PTI 428-94 will bring Orchid Orthopedic Solutions into compliance with Michigan Air Pollution Control rules.

Image 1(Orthophosphoric #1) : Plate describing range within which proper operation occurs on the mist eliminator of the orthophosphoric acid tank exempt under Rule 291

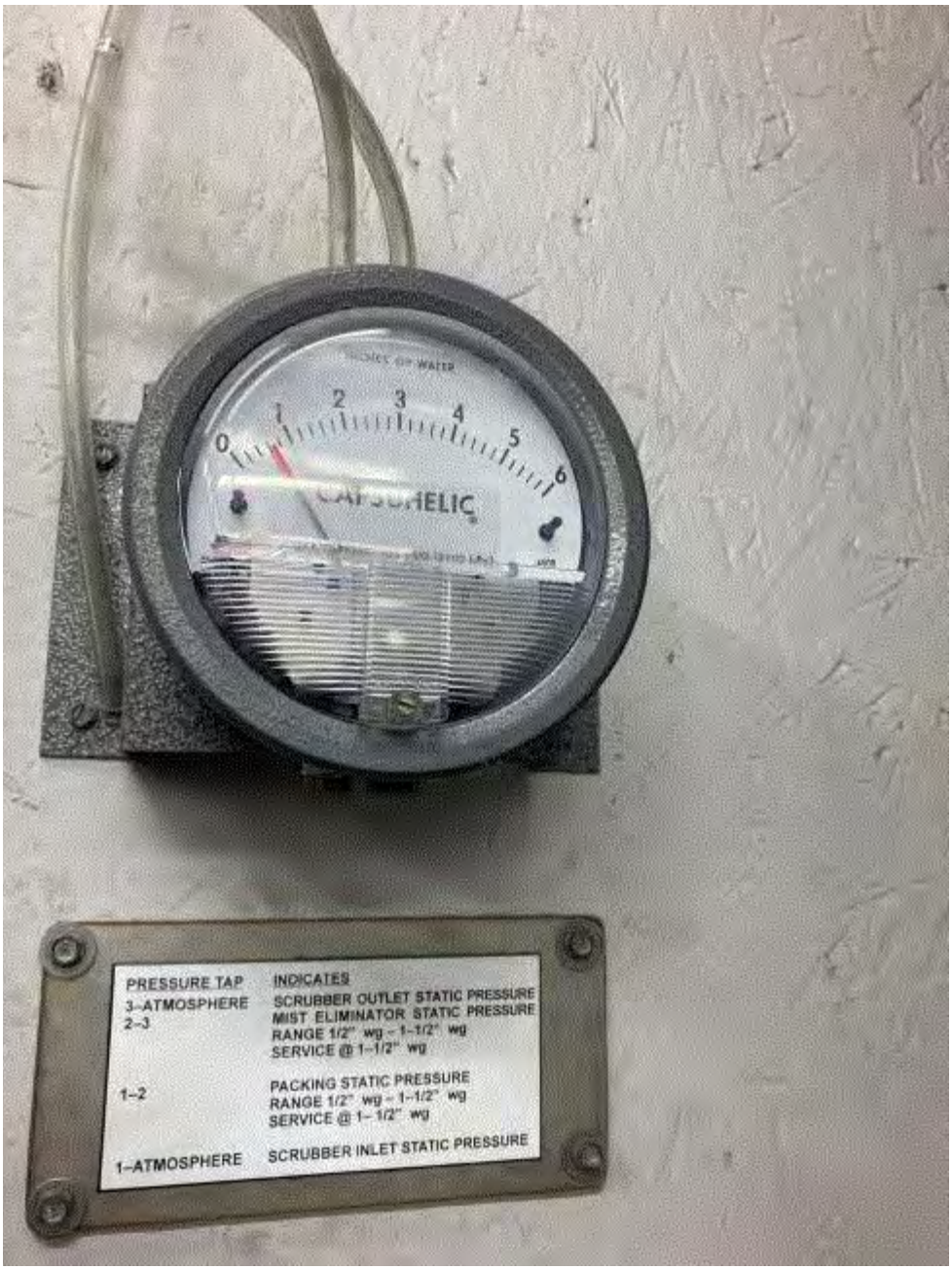

Image 2(Orthophos gauge) : Pressure drop gauge indicating the mist eliminator for the orthophosphoric acid tank is being operated properly.

Image 3(Orthophos tank) : Orthophosphoric Acid Tank

NAME Michelle Luplow DATE 12-7-21 SUPERVISOR BM

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Mike - PM Instructions Exportable

Asset ID	Asset Description	Brief Description	Detailed Description
10-000090	Chemical Mill 01	Monthly PM	1. Check the pumps, scrubber and exhaust hood for proper functioning. 2. Assure the timers and chillers are functional.
10-000090	Chemical Mill 01	Quarterly PM	1. Remove the exhaust hood front panel and assist the operator with the cleaning out the debris. 2. Inspect scrubber (outside of building) to assure the spray nozzle is not clogged. 3. Grease (standard #2 grease) scrubber blower motor (outside of building) - 2 shots per bearing is adequate. 4. Inspect outside scrubber unit for leaks. Leaks should be fixed if present.

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Mike - Completed PM Work Orders per Assets in a Date Range

WO No.	Contact ID	WO Type	Asset ID	Asset Description	Brief Description	Open / History	WO Date	Due Date	Completed Date
46606	DONHEA99	PM	10-000090	Chemical Mill 01	Monthly PM	H	04/19/2021	04/29/2021	04/19/2021
46849	MICHAE95	PM	10-000090	Chemical Mill 01	Quarterly PM	H	04/26/2021	05/26/2021	04/26/2021
47737	JACOBJ99	PM	10-000090	Chemical Mill 01	Monthly PM	H	05/19/2021	05/29/2021	05/19/2021
48892	MICHAE95	PM	10-000090	Chemical Mill 01	Monthly PM	H	06/21/2021	07/01/2021	06/22/2021
50004	DONHEA99	PM	10-000090	Chemical Mill 01	Monthly PM	H	07/21/2021	07/31/2021	07/23/2021
50156	MICHAE95	PM	10-000090	Chemical Mill 01	Quarterly PM	H	07/26/2021	08/25/2021	08/10/2021
51210	MICHAE95	PM	10-000090	Chemical Mill 01	Monthly PM	H	08/23/2021	09/02/2021	09/01/2021
52373	JOHNJA99	PM	10-000090	Chemical Mill 01	Monthly PM	H	09/23/2021	10/03/2021	09/26/2021
53509	DONHEA99	PM	10-000090	Chemical Mill 01	Monthly PM	H	10/25/2021	11/04/2021	10/30/2021
53564	JACOBJ99	PM	10-000090	Chemical Mill 01	Quarterly PM	H	10/26/2021	11/25/2021	11/20/2021

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SECTION 1. IDENTIFICATION

Product name	:	Hydrofluoric acid 49 %
Number	:	000000001555
Product Use Description	:	Metal Pickling, Glass Etching, Chemical derivatives, Semiconductor etching
Note	:	Synonyms: HF, Anhydrous HF, AHF, Hydrogen Fluoride, HF Acid For additional information, please visit http://www.HFacid.com (available 24 hours/day, 7days/week).
Manufacturer or supplier's details	:	Honeywell International Inc. 115 Tabor Road Morris Plains, NJ 07950-2546
For more information call	:	1-833-543-5059 +1-509-252-2200(Monday-Friday, 9:00am-5:00pm)
In case of emergency call	:	**Medical: 1-800-498-5701 or +1-303-389-1414**
	:	**Transportation (CHEMTREC): 1-800-424-9300 or +1-703-527-3887**
	:	
	:	(24 hours/day, 7 days/week)

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	:	liquid
Color	:	colourless
Odor	:	stinging

Classification of the substance or mixture

Classification of the substance or mixture	:	Corrosive to metals, Category 1 Acute toxicity, Category 2, Oral Acute toxicity, Category 2, Inhalation Acute toxicity, Category 1, Dermal Skin corrosion, Category 1A

Serious eye damage, Category 1

GHS Label elements, including precautionary statements

Symbol(s) :

Signal word : Danger

Hazard statements : May be corrosive to metals.
Fatal if swallowed, in contact with skin or if inhaled.
Causes severe skin burns and eye damage.

Precautionary statements : **Prevention:**
Keep only in original container.
Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
Do not get in eyes, on skin, or on clothing.
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/ protective clothing.
Wear eye protection/ face protection.
Wear respiratory protection.

Response:
IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTER/ doctor.
Remove/ Take off immediately all contaminated clothing.
Wash contaminated clothing before reuse.
Absorb spillage to prevent material damage.

Storage:
Store in a well-ventilated place. Keep container tightly closed.
Store locked up.
Keep only in original container.

Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Hazards not otherwise classified : Causes severe burns which may not be immediately painful or visible.
May cause hypocalcemia (depletion of calcium in the body) which may be fatal.
Specialized medical treatment is required for all exposures.

Carcinogenicity

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP, IARC, or OSHA.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Mixture

Chemical name	CAS-No.	Concentration
Water	7732-18-5	51.00 %
Hydrofluoric acid	7664-39-3	49.00 %

SECTION 4. FIRST AID MEASURES

Inhalation : Remove to fresh air. Keep patient warm and at rest. Get competent medical attention immediately. If breathing has stopped, start artificial respiration at once. An authorized person should administer oxygen to a victim who is having difficulty breathing, until the victim is able to breathe easily by himself. Calcium gluconate, 2.5% in normal saline may be given by nebulizer with oxygen. Do not give stimulants unless instructed to do so by a physician. Victim should be examined by a physician and held under observation for at least 24 hours.

Skin contact	:	Remove the victim from the contaminated area and immediately wash the burned area with plenty of water for a minimum of 15 minutes. Limit washing to 5 minutes if treatment specific for HF exposure is available. Remove all contaminated clothing while washing continuously. After thorough washing for at least 5 minutes, the burned area should be immersed in a solution of 0.13% iced aqueous Benzalkonium Chloride until pain is relieved. As an alternate first aid treatment, 2.5% calcium gluconate gel may be continuously massaged into the burn area until the pain is relieved. For burns not responsive to topical treatment (as measured by pain being present for longer than 30 minutes) a physician may inject 2.5% - 5% aqueous calcium gluconate beneath, around and in the burned area. Use of local anesthetics is not recommended, as reduction in pain is an indicator of effectiveness of treatment.
Eye contact	:	Immediately flush the eyes for at least 15 minutes with large amounts of gently flowing water. Hold the eyelids open and away from the eye during irrigation to allow thorough flushing of the eyes. Do not use the benzalkonium chloride (Zephiran) solutions described for skin treatment. If the person is wearing contact lenses, the lenses should be removed, if possible. However, flushing with water should not be interrupted, and the lenses should be removed by a person who is qualified to do so. If sterile 1% calcium gluconate solution is available, water washing may be limited to 5 minutes, after which the 1% calcium gluconate solution should be used to irrigate the eye using a syringe or a continuous irrigation device. Take the victim to a doctor, preferably an eye specialist, as soon as possible. Ice water compresses may be applied to the eyes while transporting the victim to the doctor. If a physician is not immediately available, apply one or two drops of 0.5% tetracaine hydrochloride, 0.5% proparacaine, or other aqueous, topical ophthalmic anesthetic and continue irrigation. Use no other medications unless instructed to do so by a physician. Rubbing of the eyes is to be avoided.
Ingestion	:	Have the victim drink several large glasses of water or milk to dilute the acid. Do not induce vomiting. Do not give emetics or baking soda. Never give anything by mouth to an unconscious person. Give several glasses of milk or several ounces of milk of magnesia, any calcium containing antacid or grind up and administer up to 30 antacid tablets with water. The calcium or magnesium in these compounds may act as an antidote; however this has not been supported in the literature. Get immediate medical attention. Ingestion of HF is a life-

threatening emergency.

Notes to physician

Indication of immediate medical attention and special treatment needed, if necessary	:	For large skin area burns (totaling greater than 25 square inches), for ingestion and for significant inhalation exposure, severe systemic effects may occur. Monitor and correct for hypocalcemia, cardiac arrhythmias, hypomagnesemia and hyperkalemia. In some cases hemodialysis may be indicated. For certain burns, especially of the digits, use of intra-arterial calcium gluconate may be indicated. For inhalation exposures, treat as chemical pneumonia. Monitor for hypocalcemia. 2.5% calcium gluconate in normal saline by nebulizer or by intermittent positive pressure breathing with 100% oxygen may decrease pulmonary damage. Bronchodilators may also be administered. A booklet titled “Recommended Medical Treatment for Hydrofluoric Acid Exposure” is available from the Honeywell HF website: http://www.HFacid.com.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Water spray Foam Carbon dioxide (CO2) Dry chemical On dilution or dissolving in water, considerable heating always occurs. Contact with a relatively small quantity of water creates violent reaction generating much heat and spattering of hot acid If use of water is necessary use copious amounts
Specific hazards during firefighting	:	Fire or intense heat may cause violent rupture of packages. Use a water spray to cool fully closed containers. Reacts violently with water. Do not direct water spray at the point of leakage. Contact with metals liberates hydrogen gas. Hydrogen gas is flammable and may form an explosive atmosphere. Diking with silicon materials is to be avoided. May form Silicon tetrafluoride gas.
Special protective equipment for firefighters	:	Personal protection through wearing a tightly closed chemical protection suit and a self-contained breathing apparatus. No unprotected exposed skin areas.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Immediately evacuate personnel to safe areas. Immediately contact emergency personnel. Ensure all affected individuals are in a safe environment. Wear personal protective equipment. Unprotected persons must be kept away. Keep people away from and upwind of spill/leak. Personal protection through wearing a tightly closed chemical protection suit and a self-contained breathing apparatus. Ensure all equipment (including Personal Protective Equipment (PPE)) is compatible with Hydrofluoric acid (HF).
Environmental precautions	:	Prevent further leakage or spillage if safe to do so. Discharge into the environment must be avoided. Do not flush into surface water or sanitary sewer system. Do not allow run-off from fire fighting to enter drains or water courses. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent spreading over a wide area (e.g. by containment or oil barriers). Diking with silicon materials is to be avoided. May form Silicon tetrafluoride gas. Suppress (knock down) gases/vapours/mists with a water spray (fog). Do not direct water spray at the point of leakage. Use water spray cautiously and in large quantities. With acids neutralization takes place under development of heat. Do not pick up with the help of saw-dust or other combustible substances. Neutralize acidity with an appropriate alkaline material. Neutralize with caustics, lime, soda ash, baking soda or other appropriate alkaline material. Pay attention to the incompatibility statements in Section 10 when effecting neutralization.

SECTION 7. HANDLING AND STORAGE

Handling

Precautions for safe handling	:	Wear personal protective equipment. Exhaust ventilation at the object is necessary. Ensure all equipment (including Personal Protective Equipment (PPE)) is compatible with Hydrofluoric acid (HF). Perform filling operations only at stations with exhaust ventilation facilities. Specialized medical treatment is required for all exposures. Plan first aid action before beginning work with this product. When diluting, add acids to water, never the other way around. Do not swallow. Do not breathe vapours or spray mist. Do not get in eyes, on skin, or on clothing.
Advice on protection against fire and explosion	:	No special precautions required.

Storage

Conditions for safe storage, including any incompatibilities	:	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep locked up or in an area accessible only to qualified or authorised persons. Prevent unauthorized access. Protect from physical damage. Store away from incompatible substances.
Other data	:	The pressure in sealed containers can increase under the influence of heat.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective measures	:	Ensure that eyewash stations and safety showers are close to the workstation location. Plan first aid action before beginning work with this product. Ensure all equipment (including Personal Protective Equipment (PPE)) is compatible with Hydrofluoric acid (HF).
Engineering measures	:	Use with local exhaust ventilation. Apply technical measures to comply with the occupational exposure limits.
Eye protection	:	Wear as appropriate: Goggles or face shield, giving complete protection to eyes

Hand protection	:	Protective gloves Gloves must be inspected prior to use. Replace when worn.
Skin and body protection	:	Wear suitable protective equipment. complete suit protecting against chemicals
Respiratory protection	:	In case of insufficient ventilation wear suitable respiratory equipment. Use NIOSH approved respiratory protection. Have available emergency self-contained breathing apparatus or full-face airline respirator when using this chemical.
Hygiene measures	:	When using, do not eat, drink or smoke. Provide adequate ventilation. Keep working clothes separately. Contaminated work clothing should not be allowed out of the workplace. Do not swallow. Do not breathe vapours or spray mist. Do not get in eyes, on skin, or on clothing. This material has an established AIHA ERPG exposure limit. The current list of ERPG exposure limits can be found at http://www.aiha.org/insideaiha/GuidelineDevelopment/ERPG/Documents/2011erpgweelhandbook_table-only.pdf.

Exposure Guidelines

Components	CAS-No.	Value	Control parameters	Update	Basis
Hydrofluoric acid	7664-39-3	TWA : Time weighted average	(0.5 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values, as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	SKIN_DES : Skin designation:	Can be absorbed through the skin.	2008	ACGIH:US. ACGIH Threshold Limit Values, as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	Ceiling : Ceiling Limit Value:	(2 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values, as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	Conc : Concentration:	(30 ppm) NIOSH IDLH (Immediately Dangerous to Life or Health Concentrations)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards, as amended

Hydrofluoric acid	7664-39-3	REL : Recommended exposure limit (REL):	2.5 mg/m3 (3 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards, as amended

Hydrofluoric acid	7664-39-3	Ceil_Time : Ceiling Limit Value and Time Period (if specified) :	5 mg/m3 (6 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards, as amended

Hydrofluoric acid	7664-39-3	PEL : Permissible exposure limit	2.5 mg/m3	02 2006	OSHA_TRANS:US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000), as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	TWA : Time weighted average	(3 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000), as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	STEL : Short term exposure limit	(6 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000), as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	TWA : Time weighted average	(3 ppm)	02 2006	OSHA/Z2:US. OSHA Table Z-2 (29 CFR 1910.1000), as amended

Hydrofluoric acid	7664-39-3	TWA : Time weighted average	(0.5 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values, as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	Ceiling : Ceiling Limit Value:	(2 ppm)	2008	ACGIH:US. ACGIH Threshold Limit Values, as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	SKIN_DES : Skin designation:	Danger of cutaneous absorption	03 2019	ACGIH:US. ACGIH Threshold Limit Values, as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	Ceil_Time : Ceiling Limit Value and Time Period (if specified) :	5 mg/m3 (6 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards, as amended

Hydrofluoric acid	7664-39-3	REL : Recommended exposure limit (REL):	2.5 mg/m3 (3 ppm)	2005	NIOSH/GUIDE:US. NIOSH: Pocket Guide to Chemical Hazards, as amended

Hydrofluoric acid	7664-39-3	PEL : Permissible exposure limit	2.5 mg/m3	02 2006	OSHA_TRANS:US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000), as amended
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Hydrofluoric acid	7664-39-3	STEL : Short term exposure limit	(6 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000), as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	TWA : Time weighted average	(3 ppm)	1989	Z1A:US. OSHA Table Z-1-A (29 CFR 1910.1000), as amended
Further information	:	Expressed as : as F			

Hydrofluoric acid	7664-39-3	TWA : Time weighted average	(3 ppm)	02 2006	OSHA/Z2:US. OSHA Table Z-2 (29 CFR 1910.1000), as amended

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	:	liquid
Color	:	colourless
Odor	:	stinging
pH	:	Note: acidic
Melting point/range	:	ca. -35 °C
Boiling point/boiling range	:	ca. 105 °C at 1,013 hPa
Flash point	:	Note: Not applicable
Flammability	:	Not applicable
Lower explosion limit	:	Note: Not applicable
Upper explosion limit	:	Note: Not applicable
Vapor pressure	:	101 hPa at 50 °C(122 °F)
Density	:	ca. 1.170 g/cm3 at 20 °C
Water solubility	:	Note: completely miscible

Partition coefficient: n-octanol/water	:	Note: no data available
Ignition temperature	:	Note: Not applicable
Auto-ignition temperature	:	Note: not auto-flammable
Decomposition temperature	:	Note: Fire or intense heat may cause violent rupture of packages.
Bulk density	:	Note: Not applicable
Corrosivity	:	Note: Corrosive to metals

SECTION 10. STABILITY AND REACTIVITY

Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	Hazardous polymerisation does not occur.
Incompatible materials	:	Glass and silicate-containing materials are attacked. HF contact with glass, concrete and other silicon bearing materials will yield silicon tetrafluoride gas. Pressure buildup from this process has been known to rupture glass containers. HF contact with carbonates, sulfides and cyanides yield toxic gases such as carbon dioxide, hydrogen sulfide and hydrogen cyanide. Contact with alkalies and some oxides cause strong violent exothermic reactions. Contact with metals will yield hydrogen gas, a fire and explosive reactive hazard. On dilution or dissolving in water, considerable heating always occurs. When diluting, add acids to water, never the other way around.
Hazardous decomposition products	:	No hazardous decomposition products are known.

SECTION 11. TOXICOLOGICAL INFORMATION

Skin irritation : Note: Causes severe burns.

Eye irritation : Note: Extremely corrosive and destructive to tissue.

Sensitisation : Note: no data available

SECTION 12. ECOLOGICAL INFORMATION

Toxicity to fish
Hydrofluoric acid : LC50: 107.5 mg/l
Exposure time: 96 h
Species: Oncorhynchus mykiss (rainbow trout)
Test substance: Fluoride ion

LC50: 925 mg/l
Exposure time: 96 h
Species: Gambusia affinis (Mosquito fish)
Test substance: Fluoride ion

Toxicity to daphnia and other aquatic invertebrates
Hydrofluoric acid : EC50: 270 mg/l
Exposure time: 48 h
Species: Daphnia (water flea)
Test substance: Sodium fluoride

Further information on ecology

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods : Observe all Federal, State, and Local Environmental

regulations.

SECTION 14. TRANSPORT INFORMATION

DOT	UN/ID No.	:	UN 1790
	Proper shipping name	:	Hydrofluoric acid
	Class		8
	Packing group		II
	Hazard Labels		8 (6.1)
IATA	UN/ID No.	:	UN 1790
	Description of the goods	:	Hydrofluoric acid
	Class	:	8
	Packaging group	:	II
	Hazard Labels	:	8 (6.1)
	Packing instruction (cargo aircraft)	:	855
	Packing instruction (passenger aircraft)	:	851
	Packing instruction (passenger aircraft)	:	Y840
IMDG	UN/ID No.	:	UN 1790
	Description of the goods	:	Hydrofluoric acid
	Class	:	8
	Packaging group	:	II
	Hazard Labels	:	8 (6.1)
	EmS Number	:	F-A, S-B
	Marine pollutant	:	no
	IMDG Code segregation group		1 – ACIDS,

SECTION 15. REGULATORY INFORMATION

Inventories

US. Toxic Substances Control Act	:	On TSCA Inventory
Australia. Industrial Chemical (Notification and Assessment) Act	:	On the inventory, or in compliance with the inventory
Canada. Canadian	:	All components of this product are on the Canadian DSL

Environmental Protection Act (CEPA). Domestic Substances List (DSL)		
Japan. Kashin-Hou Law List	:	On the inventory, or in compliance with the inventory
Korea. Existing Chemicals Inventory (KECI)	:	On the inventory, or in compliance with the inventory
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	:	On the inventory, or in compliance with the inventory
China. Inventory of Existing Chemical Substances (IECSC)	:	On the inventory, or in compliance with the inventory
New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand	:	On the inventory, or in compliance with the inventory

National regulatory information

US. EPA CERCLA Hazardous Substances (40 CFR 302)	:	The following component(s) of this product is/are subject to release reporting under 40 CFR 302 when release exceeds the Reportable Quantity (RQ):
		Reportable quantity: 100 lbs
	:	Hydrofluoric acid 7664-39-3
SARA 302 Components	:	The following components are subject to reporting levels established by SARA Title III, Section 302:
	:	Hydrofluoric acid 7664-39-3
SARA 313 Components	:	The following components are subject to reporting levels established by SARA Title III, Section 313:
	:	Hydrofluoric acid 7664-39-3
SARA 311/312 Hazards	:	Acute Health Hazard Chronic Health Hazard
CERCLA Reportable Quantity	:	204 lbs

California Prop. 65	:	This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.	
Massachusetts RTK	:	Hydrofluoric acid	7664-39-3
New Jersey RTK	:	Hydrofluoric acid	7664-39-3
Pennsylvania RTK	:	Hydrofluoric acid	7664-39-3

SECTION 16. OTHER INFORMATION

		HMIS III	NFPA
Health hazard	:	4*	4
Flammability	:	0	0
Physical Hazard	:	1	
Instability	:		1

* - Chronic health hazard
Hazard rating and rating systems (e.g. HMIS® III, NFPA): This information is intended solely for the use of individuals trained in the particular system.

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user. This information should not constitute a guarantee for any specific product properties.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.
Previous Issue Date: 04/11/2016
Prepared by Honeywell Performance Materials and Technologies Product Stewardship Group

Conforms to HCS 2012 - United States

SAFETY DATA SHEET

Power kleen 500 (charged/uncharged)

Section 1. Identification

GHS product identifier : Power Kleen 500 (charged/uncharged)

Product code : Not available.

Other means of identification : Orthophosphoric acid

Product type : Liquid.

Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Metal finishing.

Supplier's details : Molectrics
4008 East 89th St.
Cleveland, OH. 44105 Tel:
216-641-0090
Toll Free: 1-800-245-9339
Fax: 216-641-1337
Email: platerman@msn.com
www.molectrics.com

Emergency telephone number (with hours of operation) : 1-800-633-8253
msdssubmit@pers-er.com
24/7

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SKIN CORROSION/IRRITATION - Category 1A
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
CARCINOGENICITY - Category 1A

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : H314 - Causes severe skin burns and eye damage.
H350 - May cause cancer.

Precautionary statements

Prevention : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P280 - Wear protective gloves. Wear eye or face protection. Wear protective clothing.
P264 - Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : P308 + P313 - IF exposed or concerned: Get medical attention.
P304 + P340 + P310 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician.
P301 + P310 + P330 + P331 - IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353 + P363 + P310 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician.
P305 + P351 + P338 + P310 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : P405 - Store locked up.

Disposal : P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Orthophosphoric acid

Ingredient name	%	CAS number
Phosphoric acid Sulfuric acid	>60 - <100 >10 - < 30	7664-38-2 7664-93-9

The exact percentage (concentration) in the composition has been withheld as a trade secret in accordance with paragraph (i) of §1910.1200.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Section 4. First aid measures

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes severe burns.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : No known significant effects or critical hazards.

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Section 5. Fire-fighting measures

Specific hazards arising from the chemical : No specific fire or explosion hazard.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
sulfur oxides
phosphorus oxides
Hydrogen gassing

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. See also Section 8 for additional information on hygiene measures.

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Phosphoric acid	**ACGIH TLV (United States, 3/2017).** TWA: 1 mg/m³ 8 hours. STEL: 3 mg/m³ 15 minutes. **NIOSH REL (United States, 10/2016).** TWA: 1 mg/m³ 10 hours. STEL: 3 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 1 mg/m³ 8 hours.
Sulfuric acid	**NIOSH REL (United States, 10/2016).** TWA: 1 mg/m³ 10 hours. **OSHA PEL (United States, 6/2016).** TWA: 1 mg/m³ 8 hours. **ACGIH TLV (United States, 3/2017).** TWA: 0.2 mg/m³ 8 hours. Form: thoracic fraction

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Section 8. Exposure controls/personal protection

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid. [Clear.]

Color : Green [Light]

Odor : Not available.

Odor threshold : Not available.

pH : <1 [Conc. (% w/w): 1%]

Melting point : Not available.

Boiling point : 500°C (932°F)

Flash point : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : 0.001 to 0.03 [Air = 1]

Relative density : Not available.

Solubility : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not available.

Flow time (ISO 2431) : Not available.

Section 10. Stability and reactivity

Reactivity : May react with aluminum causing hydrogen gassing.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Section 10. Stability and reactivity

Incompatible materials : Highly reactive or incompatible with the following materials: alkalis.
Reactive or incompatible with the following materials: reducing materials and metals

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Sulfuric acid	LD50 Oral	Rat	2140 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Sulfuric acid	Eyes - Severe irritant Eyes - Severe irritant	Rabbit Rabbit	- -	250 µg 0.5 minutes 5 mg	- -

Sensitization

There is no data available.

Mutagenicity

There is no data available.

Carcinogenicity

Classification

Product/ingredient name	OSHA	IARC	NTP
Sulfuric acid	-	1	Known to be a human carcinogen.

Reproductive toxicity

There is no data available.

Teratogenicity

There is no data available.

Specific target organ toxicity (single exposure)

There is no data available.

Specific target organ toxicity (repeated exposure)

There is no data available.

Aspiration hazard

There is no data available.

Information on the likely routes of exposure : Dermal contact. Eye contact. Ingestion.

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes severe burns.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Section 11. Toxicological information

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : No known significant effects or critical hazards.

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Ingestion : Adverse symptoms may include the following:
stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : No known significant effects or critical hazards.

Potential delayed effects : No known significant effects or critical hazards.

Long term exposure

Potential immediate effects : No known significant effects or critical hazards.

Potential delayed effects : No known significant effects or critical hazards.

Potential chronic health effects

General : No known significant effects or critical hazards.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	10700 mg/kg

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Sulfuric acid	Acute LC50 42500 µg/L Marine water Acute LC50 36 ul/L Marine water	Crustaceans - Pandalus montagui - Adult Fish - Agonus cataphractus	48 hours 96 hours

Persistence and degradability

There is no data available.

Bioaccumulative potential

There is no data available.

Section 12. Ecological information

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	UN1760	UN1760	UN1760
UN proper shipping name	CORROSIVE LIQUID, N.O.S. (Phosphoric acid, Sulfuric acid)	CORROSIVE LIQUID, N.O.S. (Phosphoric acid, Sulfuric acid)	CORROSIVE LIQUID, N.O.S. (Phosphoric acid, Sulfuric acid)
Transport hazard class(es)	8 	8 	8 
Packing group	III	III	III
Environmental hazards	No.	No.	No.

AERG : 154

DOT-RQ Details : Sulfuric acid 1000 lbs / 454 kg [66.262 gal / 250.83 L]
Phosphoric acid 5000 lbs / 2270 kg [315.62 gal / 1194.7 L]

Additional information

DOT Classification : **Reportable quantity** 5000 lbs / 2270 kg [371.31 gal / 1405.6 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

IMDG : **Emergency schedules** F-A, S-B

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 15. Regulatory information

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.
Clean Water Act (CWA) 311: Phosphoric acid; Sulfuric acid

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Listed

SARA 302/304

Composition/information on ingredients

Name	EHS	SARA 302 TPQ		SARA 304 RQ	
		(lbs)	(gallons)	(lbs)	(gallons)
Sulfuric acid	Yes.	1000	66.3	1000	66.3

SARA 304 RQ : 5000 lbs / 2270 kg [371.3 gal / 1405.6 L]

SARA 311/312

Classification : SKIN CORROSION/IRRITATION - Category 1A
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
CARCINOGENICITY - Category 1A

Composition/information on ingredients

Name	Classification
Phosphoric acid	SKIN CORROSION/IRRITATION - Category 1B SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
Sulfuric acid	SKIN CORROSION/IRRITATION - Category 1A SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1 CARCINOGENICITY - Category 1A

SARA 313

	Product name	CAS number
Form R - Reporting requirements	Sulfuric acid	7664-93-9
Supplier notification	Sulfuric acid	7664-93-9

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: Phosphoric acid; Sulfuric acid

New York : The following components are listed: Phosphoric acid; Sulfuric acid

New Jersey : The following components are listed: Phosphoric acid; Sulfuric acid

Pennsylvania : The following components are listed: Phosphoric acid; Sulfuric acid

California Prop. 65

WARNING: This product can expose you to Strong inorganic acid mists containing sulfuric acid, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Section 16. Other information

Procedure used to derive the classification

Classification	Justification
SKIN CORROSION/IRRITATION - Category 1A SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1 CARCINOGENICITY - Category 1A	Calculation method Calculation method Calculation method

History

Date of issue mm/dd/yyyy : 02/15/2019

Date of previous issue : 11/15/2013

Version : 2

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Acid Emissions Estimates - Rule 291 Calculations

Emissions estimates were derived from formulae presented in EPA 450/2-78-029, using an air sweep.

Building A HF Acid Tanks (2)

69	gallons
28.3	C (83F)
8.5	solution density (lb/gal)
21.6	Sum of the products of vapor pressures and mole fractions for each constituent
422	Air Exhaust Rate (ft3/min)*
26,040	Total Gas Displaced (ft3/hr)

*ambient airflow assumed to be approximately 1 mile per hour. Convert mph to ft/min and multiply by the surface area of the tank to get volumetric exhaust rate.

Constituent	Weight Fraction	Molecular Weight	Density (lb/gal)	Vapor Pressure (mm Hg)	# of lbmoles in Tank	Mole Fraction in Liquid mix	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (lb/yr)
Hydrofluoric Acid (1)	12.3%	20	9.6	4.46	3.58	11.21%	0.87	7,578
Water (2)	87.7%	18	8.3	23.76	28.37	88.79%	32.85	

Building C HF Acid Tank (1)

25	gallons
28.3	C (83F)
8.477	solution density (lb/gal)
22.093	Sum of the products of vapor pressures and mole fractions for each constituent
198	Air Exhaust Rate (ft3/min)*
12,236	Total Gas Displaced (ft3/hr)

*ambient airflow assumed to be approximately 1 mile per hour. Convert mph to ft/min and multiply by the surface area of the tank to get volumetric exhaust rate.

Constituent	Weight Fraction	Molecular Weight	Density (lb/gal)	Vapor Pressure (mm Hg)	# of Moles in Tank	Mole Fraction in Liquid mix	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (lb/yr)
Hydrofluoric Acid (1)	12.3%	20	9.6	8.92	1.32	11.21%	0.81	7,122
Water (2)	87.7%	18	8.3	23.76	10.43	88.79%	0.25	

Orthophosphoric Acid Tank (Building A)

141	gallons
36	C (96F)
11.011	solution density (lb/gal)
0.023	Sum of the products of vapor pressures and mole fractions for each constituent
585	Air Exhaust Rate (ft3/min)*
35,091	Total Gas Displaced (ft3/hr)

*ambient airflow assumed to be approximately 1 mile per hour. Convert mph to ft/min and multiply by the surface area of the tank to get volumetric exhaust rate.

Constituent	Weight Fraction	Molecular Weight	Density (lb/gal)	Vapor Pressure (mm Hg)	# of lbmoles in Tank	Mole Fraction in Liquid mix	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (lb/yr)
Sulfuric Acid (3)	30.0%	98	15.4	5.57E-08	4.75	23.08%	1.43E-07	1.26E-03
Phosphoric Acid (4)	100.0%	98	14.0	3.00E-02	15.83	76.92%	2.58E-01	2.26E+03

(1) Per Honeywell Specialty Chemicals Hydrofluoric Acid Properties Volume 1.1 January 2002, the partial pressure of 12.3% HF at 80F is near 0 mmHg, so an approximation of 0.5mmHg is assumed. The vapor pressure was then calculated based on a partial pressure (in bar, converted to mmHg) and the mole fraction, i.e. partial pressure divided by the mole fraction equals vapor pressure. (http://www3.imperial.ac.uk/pls/portallive/docs/1/7276108.PDF)

(2) The vapor pressure of water at 25C is 23.756 mmHg. (https://www.wolframalpha.com/)

(3) The vapor pressure of sulfuric acid was calculated based on a partial pressure (in bar, converted to mmHg) and the mole fraction, i.e. partial pressure divided by the mole fraction equals vapor pressure.
Partial pressure from Perry's Chemical Engineer's Handbook 6th Edition, Table 3+14b.

(4) The vapor pressure of phosphoric acid at 20C is 0.03 mmHg. (NIOSH, 2016)

Exemption Demonstration Continued

Emissions Totals

Acid	Uncontrolled Emissions (lb/yr)	Uncontrolled Emissions (lb/mo)	Uncontrolled Emissions (tpy)	291 Limit (tpy)	Meets Limit?	291 Reference	Exempt / Permit
Hydrofluoric Acid (Bldg A)	7,578	632	3.79	5.00	PASS	Table 23: Total toxic air contaminants not listed in table 23 with any screening level	Permit 428-94
Phosphoric Acid	2,256	188	1.13	5.00	PASS	Table 23: Total toxic air contaminants not listed in table 23 with any screening level	Exempt
Sulfuric Acid	0.0013	0.0001	0.000001	0.12	PASS	291(2)(a) and 291(2)(f) Table 23: Sulfuric acid mist	Exempt

Screening levels as of 12/19/2018:

Hydrofluoric Acid	ITSL 14 ug/m3, annual; 240 ug/m3 1 hr
Phosphoric acid	ITSL 10 ug/m3, annual
Sulfuric acid	ITSLs 1 ug/m3, annual; 120 ug/m3 1 hr