TSCA Section 5(a)(3) Determination for Premanufacture Notice (PMN) P-18-0009

Number: P-18-0009
TSCA Section 5(a)(3) Determination: The chemical substance is not likely to present an unreasonable risk (5(a)(3)(C))

Chemical Name:
Generic: Phosphonic acid, dimethyl ester, polymer with alkyl diols

Conditions of Use (intended, known, or reasonably foreseen)[1]:
Intended conditions of use (generic): Manufacture for use as a lubricant additive, consistent with the manufacturing, processing, use, distribution, and disposal information described in the PMN.
Known conditions of use: Applying such factors as described in footnote 1, EPA evaluated whether there are known conditions of use and found none.
Reasonably foreseen conditions of use: Applying such factors as described in footnote 1, EPA evaluated whether there are reasonably foreseen conditions of use and found none.

Summary: The chemical substance is not likely to present an unreasonable risk of injury to health or the environment, without consideration of costs or other nonrisk factors, including an unreasonable risk to a potentially exposed or susceptible subpopulation identified as relevant by the Administrator under the conditions of use, based on the risk assessment presented below. EPA estimated that the new chemical substance could have limited persistence and a low potential for bioaccumulation, such that repeated exposures are not expected to cause food-chain effects via accumulation in exposed organisms. Although EPA estimated that the hydrolysis product could be persistent, the substance has a low potential for bioaccumulation, such that repeated exposures are not expected to cause food-chain effects via accumulation in exposed organisms. Based on EPA's TSCA New Chemicals Program Chemical Category for Esters[2] and

[1] Under TSCA § 3(4), the term "conditions of use" means "the circumstances, as determined by the Administrator, under which a chemical substance is intended, known, or reasonably foreseen to be manufactured, processed, distributed in commerce, used, or disposed of." In general, EPA considers the intended conditions of use of a new chemical substance to be those identified in the section 5(a) notification. Known conditions of use include activities within the United States that result from manufacture that is exempt from PMN submission requirements. Reasonably foreseen conditions of use are future circumstances, distinct from known or intended conditions of use, under which the Administrator expects the chemical substance to be manufactured, processed, distributed, used, or disposed of. The identification of "reasonably foreseen" conditions of use will necessarily be a case-by-case determination and will be highly fact-specific. Reasonably foreseen conditions of use will not be based on hypotheticals or conjecture. EPA's identification of conditions of use includes the expectation of compliance with federal and state laws, such as worker protection standards or disposal restrictions, unless case-specific facts indicate otherwise. Accordingly, EPA will apply its professional judgment, experience, and discretion when considering such factors as evidence of current use of the new chemical substance outside the United States, evidence that the PMN substance is sufficiently likely to be used for the same purposes as existing chemical substances that are structurally analogous to the new chemical substance, and conditions of use identified in an initial PMN submission that the submitter omits in a revised PMN. The sources EPA uses to identify reasonably foreseen conditions of use include searches of internal confidential EPA PMN databases (containing use information on analogue chemicals), other U.S. government public sources, the National Library of Medicine's Hazardous Substances Data Bank (HSDB), the Chemical Abstract Service STN Platform, REACH Dossiers, technical encyclopedias (e.g., Kirk-Othmer and Ullmann), and Internet searches.

[2] TSCA New Chemicals Program (NCP) Chemical Categories. https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/chemical-categories-used-review-new.

test data on the new chemical substance and analogues, EPA estimates that the chemical substance has moderate environmental hazard and potential for the following human health hazards: kidney and GI effects and reproductive/developmental toxicity. EPA concludes that the new chemical substance is not likely to present an unreasonable risk under the conditions of use.

Fate: Environmental fate is the determination of which environmental compartment(s) a chemical moves to, the expected residence time in the environmental compartment(s) and removal and degradation processes. Environmental fate is an important factor in determining exposure and thus in determining whether a chemical may present an unreasonable risk. EPA estimated physical/chemical and fate properties of the new chemical substance using data for analogues (reactive polymers) and of the hydrolysis product using data submitted for the new chemical substance and EPI (Estimation Program Interface) Suite™ (http://www.epa.gov/tsca-screening-tools/epi-suitetm-estimation-programinterface). In wastewater treatment, the new chemical substance is expected to be removed with an efficiency of 90% to 99% due to rapid hydrolysis and the hydrolysis product is expected to be removed with an efficiency of 0% to 90% due to possible biodegradation. Removal of the hydrolysis product by biodegradation is unknown and destruction (mineralization) of the hydrolysis product by biodegradation is possible. Sorption of the hydrolysis product to sludge is expected to be low and to soil and sediment is expected to be moderate. Migration of the new chemical substance to groundwater is expected to be negligible due to rapid hydrolysis and migration of the hydrolysis product to groundwater is expected to be moderate due to moderate sorption to soil and sediment. Due to low estimated vapor pressure and Henry's law constant, the new chemical substance and the hydrolysis product are expected to undergo negligible volatilization to air. Overall, these estimates indicate that the new chemical substance has low potential to volatilize to air or migrate to groundwater; and that the hydrolysis product has low potential to volatilize to air and has moderate potential to migrate to groundwater.

Persistence[3]: Persistence is relevant to whether a new chemical substance is likely to present an unreasonable risk because chemicals that are not degraded in the environment at rates that prevent substantial buildup in the environment, and thus increase potential for exposure, may present a risk if the substance presents a hazard to human health or the environment. EPA estimated degradation half-lives of the new chemical substance using data for analogues (reactive polymers) and of the hydrolysis product using data submitted for the new chemical substance and EPI Suite™. EPA estimated that the new chemical substance's hydrolysis half-life is minutes to hours; and that the hydrolysis product's aerobic and anaerobic biodegradation half-lives are 2 to 6 months. These estimates indicate that the new chemical substance may have limited persistence in aerobic environments (e.g., surface water) and anaerobic environments (e.g., sediments) due to hydrolysis. Further, these estimates indicate that the hydrolysis product may be persistent in aerobic environments (e.g., surface water) and anaerobic environments (e.g., sediment).

[3] Persistence: A chemical substance is considered to have limited persistence if it has a half-life in water, soil or sediment of less than 2 months or there are equivalent or analogous data. A chemical substance is considered to be persistent if it has a half-life in water, soil or sediments of greater than 2 months but less than or equal to 6 months or if there are equivalent or analogous data. A chemical substance is considered to be very persistent if it has a half-life in water, soil or sediments of greater than 6 months or there are equivalent or analogous data. (64 FR 60194; November 4, 1999)

Bioaccumulation[4]: Bioaccumulation is relevant to whether a new chemical substance is likely to present an unreasonable risk because substances that bioaccumulate in aquatic and/or terrestrial species pose the potential for elevated exposures to humans and other organisms via food chains. EPA estimated the potential for the new chemical substance to bioaccumulate using data for analogues (reactive polymers) and of the hydrolysis product to bioaccumulate using EPI Suite™. EPA estimated that the new chemical substance has low bioaccumulation potential based on rapid hydrolysis and the hydrolysis product has low bioaccumulation potential based on BCFBAF model result < 1000 (hydrolysis product bioconcentration factor = 11 (estimated) and bioaccumulation factor = 10 (estimated)). EPA estimated that the new chemical substance could have limited persistence and a low potential for bioaccumulation, such that repeated exposures are not expected to cause food-chain effects via accumulation in exposed organisms. Although EPA estimated that the hydrolysis product could be persistent, the substance has a low potential for bioaccumulation, such that repeated exposures are not expected to cause food-chain effects via accumulation in exposed organisms.

Human Health Hazard[5]: Human health hazard is relevant to whether a new chemical substance is likely to present an unreasonable risk because the significance of the risk is dependent upon both the hazard (or toxicity) of the chemical substance and the extent of exposure to the substance. EPA estimated the human health hazard of this chemical substance based on its estimated physical/chemical properties and/or by comparing it to structurally analogous chemical substance for which there is information on human health hazard. Absorption of the low molecular weight fractions is moderate through the skin and GI tract and good through the lungs based on physical/chemical properties.

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[4] Bioaccumulation: A chemical substance is considered to have a low potential for bioaccumulation if there are bioconcentration factors (BCF) or bioaccumulation factors (BAF) of less than 1,000 or there are equivalent or analogous data. A chemical substance is considered to be bioaccumulative if there are BCFs or BAFs of 1,000 or greater and less than or equal to 5,000 or there are equivalent or analogous data. A chemical substance is considered to be very bioaccumulative if there are BCFs or BAFs of 5,000 or greater or there are equivalent or analogous data. (64 FR 60194; November 4 1999)

[5] A chemical substance is considered to have low human health hazard if effects are observed in animal studies with a No Observed Adverse Effect Level (NOAEL) equal to or greater than 1,000 mg/kg/day or if there are equivalent data on analogous chemical substances; a chemical substance is considered to have moderate human health hazard if effects are observed in animal studies with a NOAEL less than 1,000 mg/kg/day or if there are equivalent data on analogous chemical substances; a chemical substance is considered to have high human health hazard if there is evidence of adverse effects in humans or conclusive evidence of severe effects in animal studies with a NOAEL of less than or equal to 10 mg/kg/day or if there are equivalent data on analogous chemical substances. EPA may also use Benchmark Dose Levels (BMDL) derived from benchmark dose (BMD) modeling as points of departure for toxic effects. See https://www.epa.gov/bmds/what-benchmark-dose-software-bmds. Using this approach, a BMDL is associated with a benchmark response, for example a 5 or 10 % incidence of effect. The aforementioned characterizations of hazard (low, medium, high) would also apply to BMDLs. In the absence of animal data on a chemical or analogous chemical substance, EPA may use other data or information such as from in vitro assays, chemical categories (e.g., Organization for Economic Co-operation and Development, 2014 Guidance on Grouping of Chemicals, Second Edition. ENV/JM/MONO(2014)4. Series on Testing & Assessment No. 194. Environment Directorate, Organization for Economic Co-operation and Development, Paris, France. (http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono(2014)4&doclanguage=en)), structure-activity relationships, and/or structural alerts to support characterizing human health hazards.

For the new chemical substance, EPA identified developmental toxicity based on the release of methanol (estimated to be 13.1%) by hydrolysis and from potential chelation for the low molecular weight species and GI and kidney effects based on the submitted toxicity data for the new chemical substance. The submitted toxicity studies also reported that the new chemical substance is negative in Ames test, chromosome aberrations assay in human lymphocytes, and in mouse lymphoma cells assay. Acute studies include oral LD50 > 2000 mg/kg in female rats, dermal LD50 > 2000 mg/kg in rats, and negative for In vitro skin corrosion assay. In the submitted 28-day repeated dose study (OECD TG 407) of the new chemical substance, EPA identified a lowest-observed-adverse-effect-level (LOAEL) of 175 mg/kg-day based on GI and kidney effects. Due to methanol release, EPA identified an RfD of 2 mg/kg-day based on developmental effects and an RfC of 20 mg/m^3 based on neurodevelopmental effects. These data were used to derive the route- and population-specific points of departure (POD) for quantitative risk assessment as described below.

Environmental Hazard[6]: Environmental hazard is relevant to whether a new chemical substance is likely to present unreasonable risk because the significance of the risk is dependent upon both the hazard (or toxicity) of the chemical substance and the extent of exposure to the substance. EPA estimated environmental hazard of this new chemical substance based on acute toxicity data submitted for the new chemical substance and using the Ecological Structure Activity Relationships (ECOSAR) Predictive Model (https://www.epa.gov/tsca-screening-tools/ecological-structure-activityrelationships-ecosar-predictive-model); specifically the QSAR for esters (representative structure of MW 206). This substance falls within the TSCA New Chemicals Category of Esters. Acute toxicity values estimated for fish, aquatic invertebrates, and algae are >87 mg/L (test data), 30 mg/L (test data), and >21 mg/L (ECOSAR), respectively. Chronic toxicity values estimated for fish, aquatic invertebrates, and algae are > 8.7 mg/L (ACR10; test data), 3.0 mg/L (ACR10; test data), and 5.6 mg/L (ECOSAR), respectively. These toxicity values indicate that the new chemical substance is expected to have moderate environmental hazard. Application of assessment factors of 4 and 10 to acute and chronic toxicity values, respectively, results in acute and chronic concentrations of concern of 5.25 mg/L (5250 ppb) and 0.3 mg/L (300 ppb), respectively.

Exposure: The exposure to a new chemical substance is potentially relevant to whether a new chemical substance is likely to present unreasonable risks because the significance of the risk is dependent upon both the hazard (or toxicity) of the chemical substance and the extent of exposure to the substance.

[6] A chemical substance is considered to have low ecotoxicity hazard if the Fish, Daphnid and Algae LC50 values are greater than 100 mg/L, or if the Fish and Daphnid chronic values (ChVs) are greater than 10.0 mg/L, or there are not effects at saturation (occurs when water solubility of a chemical substance is lower than an effect concentration), or the log Kow value exceeds QSAR cut-offs. A chemical substance is considered to have moderate ecotoxicity hazard if the lowest of the Fish, Daphnid or Algae LC50s is greater than 1 mg/L and less than 100 mg/L, or where the Fish or Daphnid ChVs are greater than 0.1 mg/L and less than 10.0 mg/L. A chemical substance is considered to have high ecotoxicity hazard, or if either the Fish, Daphnid or Algae LC50s are less than 1 mg/L, or any Fish or Daphnid ChVs is less than 0.1 mg/L (Sustainable Futures https://www.epa.gov/sustainable-futures/sustainable-futures-p2-framework-manual).

EPA estimates occupational exposure and environmental release of the new chemical substance under the intended conditions of use described in the PMN using ChemSTEER (Chemical Screening Tool for Exposures and Environmental Releases; https://www.epa.gov/tsca-screening-tools/chemsteer-chemical-screening-tool-exposures-and-environmental-releases). EPA uses EFAST (the Exposure and Fate Assessment Screening Tool; https://www.epa.gov/tsca-screening-tools/e-fast-exposure-and-fate-assessment-screening-tool-version-2014) to estimate general population, consumer, and environmental exposures.

EPA considers workers to be a potentially exposed or susceptible subpopulation (PESS) on the basis of greater exposure potential compared to the general population. EPA also considers PESS in conducting general population drinking water exposures by evaluating risks associated with water intake rates for multiple age groups, ranging from infants to adults. EPA considers consumers of specific products to be a potentially exposed or susceptible subpopulation on the basis of greater exposure potential compared to the general population who do not use specific products.

For this new chemical assessment, EPA assessed exposure to workers via the dermal route, and inhalation exposure to workers is not expected. Releases to water, air, and landfill were estimated. Exposure to the general population was assessed via water, air, and landfill. Exposure to consumers was assessed via the dermal route, and inhalation exposure is not expected.

Risk Characterization: EPA applies a margin of exposure approach to calculate potential human health risks of new chemicals. A benchmark (acceptable) margin of exposure is derived by applying uncertainty factors for the following types of extrapolations: intra-species extrapolation (UF_H = 10 to account for variation in sensitivity among the human population), inter-species extrapolation (UF_A = 10 to account for extrapolating from experimental animals to humans) and LOAEL-to-NOAEL extrapolation (UF_L = 10 to account for using a LOAEL when a NOAEL is not available). Hence, in the New Chemicals Program, a benchmark MOE is typically 100 and 1,000 when NOAELs and LOAELs, respectively, are used to identify hazard. When allometric scaling or pharmacokinetic modeling is used to derive an effect level, the UF_H may be reduced to 3, for a benchmark MOE of 30. The benchmark MOE is used to compare to the MOE calculated by comparing the toxicity NOAEL or LOAEL to the estimated exposure concentrations. When the calculated MOE is equal to or exceeds the benchmark MOE, the new chemical substance is not likely to present an unreasonable risk. EPA assesses risks to workers considering engineering controls described in the PMN but in the absence of personal protective equipment (PPE) such as gloves and respirators. If risks are preliminarily identified, EPA then considers whether the risks would be mitigated by the use of PPE (e.g., impervious gloves, respirator).

Risks to human health for the new chemical substances were evaluated using the route-specific effect levels (i.e., LOAEL, RfD, RfC) described above. Risks were not identified for workers for developmental effects via dermal route of exposure based on quantitative hazard data for the hydrolysis product, methanol (MOE = 1; Benchmark MOE = 1). Risks were identified for workers for effects on kidney and stomach via dermal route of exposure based on quantitative toxicity data for the new chemical substance (MOE = 11; Benchmark MOE = 1000). Risks will be mitigated if exposures are controlled by the use of appropriate PPE, including impervious gloves. EPA expects that employers will require and workers will use appropriate PPE (i.e.,

impervious gloves), consistent with the Safety Data Sheet prepared by the PMN submitter, in a manner adequate to protect them.

Risks were not identified for general population for effects on kidney and stomach via drinking water, fish ingestion, landfill, and stack air inhalation route based on quantitative hazard data for the new chemical substance (MOE_{Adult} = 55,261; MOE_{Infant} = 13,157; $MOE_{FishIngestion}$ = 2,980,448; $MOE_{Landfill}$ = 467,115; $MOE_{StackAir}$ = 229,106; Benchmark MOE = 1000). Risks were not identified for the general population for developmental effects via drinking water, fish ingestion, and landfill exposures based on quantitative hazard data for the hydrolysis product, methanol (MOE_{Adult} = 2,893; MOE_{Infant} = 689; $MOE_{FishIngestion}$ = 156,010; $MOE_{Landfill}$ = 24,400; Benchmark MOE = 1). Risks were not identified for the general population for developmental effects via inhalation exposure based on quantitative hazard data for the hydrolysis product, methanol ($MOE_{Inhalation}$ = 12,860; Benchmark MOE = 1).

Risks were not identified for consumers for effects on kidney and stomach via dermal route of exposure based on quantitative hazard data for the new chemical substance (MOE_{Dermal} = 12,920; Benchmark MOE = 1000). Risks were not identified for consumers for developmental via dermal route of exposure based on quantitative hazard data for the hydrolysis product, methanol (MOE_{Dermal} = 14; Benchmark MOE = 1).

Risks to the environment were evaluated by comparing estimated surface water concentrations with the acute and chronic concentrations of concern. Risks from acute and chronic exposures to the environment were not identified due to releases to water that did not exceed the acute or chronic COC.

Because worker exposures can be controlled by PPE and no unreasonable risks to the general population, consumers, or environment were identified, EPA has determined that the new chemical substance is not likely to present unreasonable risk to human health or the environment under the conditions of use.

7/31/2019 /s/

Date: Tala R. Henry, Ph.D.
Deputy Director for Programs
Office of Pollution Prevention and Toxics