

Docket ID Number: EPA-HQ-OPPT-2016-0743

**Comments to the U.S. Environmental Protection Agency (EPA)
on the Scope of its Risk Evaluation for the TSCA Work Plan Chemical:**

**N-METHYLPYRROLIDONE (NMP)
CAS Reg. No. 872-50-4**

Submitted on March 15, 2017 by

**Safer Chemicals, Healthy Families
Environmental Health Strategy Center
Healthy Building Network**

I. INTRODUCTION

The Toxic Substances Control Act (TSCA), as amended in June 2016, requires the U.S. Environmental Protection Agency (EPA) to determine whether existing chemical substances pose an unreasonable risk to human health and the environment, both generally and for vulnerable subpopulations, without consideration of costs or other non-risk factors. When unreasonable risk is found, EPA must enact restrictions on the production (including both domestic manufacture and import), processing, distribution in commerce, use and/or disposal of that chemical, and/or materials and articles that contain that chemical, that are sufficient to extinguish such unreasonable risk.

Congress directed EPA to launch the risk evaluation process expeditiously. Accordingly, in section 6(b)(2)(A) of TSCA, it directed EPA to assure that evaluations are initiated within six months of the law's enactment on 10 substances drawn from the 2014 TSCA Work Plan list. EPA designated these 10 substances on December 19, 2016, and is now developing scoping documents for its evaluations. EPA's initial risk evaluations will provide an early test of the effectiveness of new law. It is therefore critical that they reflect the best information available on hazard and exposure, are based on a comprehensive understanding of the chemicals' conditions of use, and employ sound, precautionary methodologies that fully capture the risks they pose to human health and the environment.

Toward those ultimate environmental public health objectives, these comments provide information and recommendations to EPA on the scope its risk evaluation for one of the first ten Work Plan chemicals subject to the new TSCA requirements. These comments are jointly submitted as a collaborative work product by three not-for-profit organizations:

[Safer Chemicals, Healthy Families \(SCHF\)](#), a coalition of 450 national, state and local organizations committed to ensuring the safety of chemicals used in our homes,

workplaces and in the many products to which our families and children are exposed each day.

[Environmental Health Strategy Center](#) works at the state and national levels to ensure that all people are healthy and thriving in a healthy economy, through affordable access to safer food, water, and products; and investments that create and retain good, green jobs; and

[Healthy Building Network](#) transforms the market for building materials to advance the best environmental, health and social outcomes, including reduced use of hazardous chemicals in building products as a means of improving human health and the environment.

SCHF and its partners took a leadership role during the legislative process that led to the passage into law of the Frank R. Lautenberg Chemical Safety for the 21st Century Act, advocating the most health protective and effective policy on toxic chemicals in use today;

Our comments consists of three parts:

1. **Summary Comment**– This overview provides general comments on the scope of EPA’s risk evaluation, summarizes key findings from our attached technical report, and makes recommendations to EPA for related actions needed to meet TSCA requirements;
2. **Technical Appendix** – This technical report provides information on the production, trade, use, recycling, and disposal of this chemical, citing authoritative sources (with web links), emphasizing information not included in EPA’s chemical use profile; and
3. **Consumer Appendix** – This document profiles specific consumer product uses of the chemical as reported by retailers, distributors, and/or product manufacturers.

II. GENERAL COMMENTS

As discussed in detail in our separate submission, “General Comments of Safer Chemicals Healthy Families on Risk Evaluation Scoping Efforts for Ten Chemical Substances under the Toxic Substances Control Act,” in order to properly scope its risk evaluation to determine whether this chemical poses an unreasonable risk to human health and the environment:

- EPA must evaluate the complete life cycle of the chemical, including production and imports, *all* uses, and its fate at the end of its useful life;
- EPA must evaluate exposure to *all* vulnerable groups, including communities of

color and low-income people who may be disproportionately exposed;

- If EPA finds that data on any chemical use, hazard or exposure are insufficient to support risk evaluation, EPA must require industry to produce such data;
- EPA must assess the aggregate exposure to the most vulnerable groups and the general population for this chemical;
- EPA should assess cumulative exposure and risk, whenever practicable, for this chemical in combination with other risk factors;
- EPA should abandon its presumed safety threshold model for non-cancer effects, as recommended in the expert “Science and Decisions” report.

III. METHODS and SOURCES

We accessed and analyzed several sources of information in an effort to identify manufacturers, importers, and uses of NMP that were not included or not fully characterized in EPA’s recent chemical use profile.¹ These sources included:

- [Panjiva](#) – the trade data authority. Panjiva offers an extensive database of U.S. imports and exports of goods, including chemicals, and materials or articles containing chemicals. EPA should access these data for a modest subscription fee;
- European, United Nations and other non-domestic agency sources;
- Chemical industry sources – from web sites, trade reports and other documentation;
- U.S. EPA data sources – the Toxics Release Inventory (TRI) database, Chemical Data Reporting (CDR) submissions (including 2016 submissions obtained through a Freedom of Information Act request), and other EPA sources.
- [Pharos Chemical and Material Library](#) – a user-friendly hazard database available free for a 14-day trial.
- The [U.S. International Trade Commission \(ITC\) Interactive Tariff and Trade DataWeb](#) was also useful in characterizing imports of NMP.

IV. SPECIFIC COMMENTS

These findings and recommendations that follow are specific to NMP, CASRN 872-50-4.

The specific comments below provide an executive summary of our technical analysis. Please refer to the attached technical report for details, methods, additional information,

¹ U.S. EPA, Preliminary Information on Manufacturing, Processing, Distribution, Use and Disposal: N-Methylpyrrolidone (NMP), EPA-HQ-OPPT-2016-0743-0003, February 2017.
<https://www.regulations.gov/document?D=EPA-HQ-OPPT-2016-0743-0003>

and citations to authoritative sources that provide the factual support for all comments.

A. Chemical Production and Trade

FINDING 1: A developmental and reproductive toxicant, NMP was a regrettable substitute for chlorinated and ozone depleting solvents, e.g. TCA

FINDING 2: Although total U.S. production of NMP has been fairly flat for the last five years, imports have increased four-fold with 90% from China in 2016

NMP was marketed as an alternative to 1,1,1-trichloroethane (TCA), an ozone depleting substance, and other chlorinated solvents with rising toxicity concerns. For example, one of the U.S. manufacturers, Lyondell Chemical Company, says on their website that NMP “also has application in the electronic industry as a photoresist stripper and it can be a replacement for 1,1,1-trichloroethane, an ozone-depleting substance, in demanding applications, including the cleaning of metal parts.” BASF, a leading NMP manufacturer, stated that: “Due to health and safety, toxicological and environmental pressures since the 1980s, restrictions have grown in the use of certain solvents. This has led to an even wider use of NMP in existing market segments, as well as the introduction of NMP into new areas.”

As early as 2001, the State of California designated NMP as known to cause developmental toxicity, triggering warning requirements for significant exposures. Ten years later, the European Chemicals Agency added NMP to the Candidate List for Authorization as a Substance of Very High Concern citing the chemical for being toxic for reproduction.

The CDR submissions data for 2011 through 2015, inclusive, report an average annual U.S. production (domestic manufacture plus imports) of 170 millions pounds per year, with a range from 160 to 187 million pounds. During this same time period, imports from China rose sharply to four million pounds, more than 2% of total U.S. production.

B. Chemical Use

FINDING 3: There is widespread industrial use of NMP, with strongly rising demand projected in the petrochemicals, electronics, and pharmaceutical sectors

FINDING 4: We found several consumer and commercial products containing NMP that were not included in EPA’s preliminary chemical use profile or CDR

FINDING 5: NMP was recently used in the inner layer of aluminum aerosol cans for hair spray and air fresheners, with six billion sold worldwide annually

The global market for NMP is projected to grow strongly through 2021, driven by rising

demand, especially for use in the petrochemical industry, for electronics manufacturing (including in automobiles), for pharmaceuticals, among others.²

We've identified several additional products that were not included in EPA's preliminary profile of NMP production and use. They are detailed in the Technical Appendix and the Consumer Appendix, with specific trade names and percent NMP content, and with sources cited. These NMP-products include:

- Wood floor finish
- Non-skid coating
- Acrylic latex coating for new wood or manufactured siding
- Dog flea and tick pesticide
- Cleaning solvent
- Pharmaceutical solvent
- Polyisocyanate for coatings (automotive and others)
- Stainless steel appliance paint kit
- Automotive vinyl and fabric cleaner
- Vinyl siding and shutter treatment
- Paints and coatings (several specific products)

An additional NMP use was reported for the inner layer of aluminum cans used for aerosol sprays such as hair sprays and air fresheners. A company was testing NMP-free alternative technology in 2014. Six billion aluminum aerosol cans are sold every year, worldwide.

V. RECOMMENDATIONS

Based on our research and findings above, we urge EPA to take the following actions in parallel during the scoping and conduct of the risk evaluation for N-Methylpyrrolidone.

A. EPA should include all uses and exposures within the scope of risk evaluation

The scope of the risk evaluation for NMP should include, but not necessarily be limited to:

1. An aggregate assessment of all exposures (occupational, fence-line-community, consumer, and general population) from industrial and product uses of NMP;

² Grand View Research, N-Methyl-2-Pyrrolidone (NMP) Market Analysis By Application (Oil & gas [Butadiene Recovery, BTX Extraction], Pharmaceuticals [Solvent, Penetration Enhancer], Electronics, Paints & Coatings, Agrochemicals), By Region, And Segment Forecasts, 2013 - 2025, December 2016.
<http://www.grandviewresearch.com/industry-analysis/n-methyl-2-pyrrolidone-nmp-market>

B. EPA should assess *all* potentially exposed or susceptible subpopulations

1. Women workers of reproductive age and pregnant women, especially in the electronics industry (where elevated rates of miscarriages have been reported)³, but also in other manufacturing and industrial use work environments, including nearby occupational bystanders and fence-line community residents;
2. Women of reproductive age and pregnant women who use products containing NMP in the home, schools, day care facilities, and other institutional settings; and
3. A determination as to whether any workers of color, communities of color, or people of lower socioeconomic status, and their local community environments, are disproportionately exposed to NMP and thus constitute a “potentially exposed or susceptible subpopulation”, based on Census Bureau data, geocoded locations of industrial facilities and disposal sites, and modeled or measured exposures.

C. EPA should require industry to develop new information to close data gaps

In parallel to the scoping and conduct of the risk evaluation, EPA should require chemical manufacturers and processors to fill data gaps whenever information is insufficient to support a determination of unreasonable risk. If so determined by EPA, candidates for additional data gathering under TSCA include but are not limited to the following:

1. Hazards of NMP associated with male reproductive health, including male preconception exposure effects on pregnancy outcomes and fetal health; and
2. Exposures to NMP in specific occupations or from specific product categories.

D. EPA should require notification of *all* new uses, including in imported articles

In order to ensure the completeness of the risk evaluation to support an unreasonable risk determination, EPA needs to establish with some certainty which uses in the United States are truly historic or never took place in this country, and also ensure that such uses are not encouraged or take place again in the future without EPA's knowledge. Therefore:

1. EPA should propose a Significant New Use Rule (SNUR) for NMP, and for imported articles that contain NMP.

By proposing a SNUR soon, i.e. during the risk evaluation of NMP, EPA would allow industry to step forward and assert with clear evidence whether any such uses are in fact

³ See, for example: Kim I, Kim M-H, Lim S (2015) Reproductive Hazards Still Persist in the Microelectronics Industry: Increased Risk of Spontaneous Abortion and Menstrual Aberration among Female Workers in the Microelectronics Industry in South Korea. PLoS ONE 10(5): e0123679. doi:10.1371/journal.pone.0123679

existing uses that continue rather than historic uses that would trigger notification if later reintroduced as new uses. This mechanism would provide EPA with more complete information on which to base its risk evaluation and unreasonable risk determination.

VI. CONCLUSION

We urge EPA to use its full authority under TSCA to support an expansive scope for the risk evaluation of N-Methylpyrrolidone, as recommended above. NMP has long been recognized as a developmental and reproductive toxicant, and as such is a candidate for being phased out in the European Union. With 60 million women of reproductive age in the United States, and the high-volume use of NMP otherwise projected to steadily increase, we urge EPA to establish the evidentiary basis for concluding that NMP poses an unreasonable risk to human health whenever women may be exposed on the job, in their homes or elsewhere.

Technical Appendix

N-Methylpyrrolidone (NMP)

Technical Report on production, imports, use, end of life, and associated environmental and human health hazards.

Healthy Building Network

in collaboration with Safer Chemicals Healthy Families

and Environmental Health Strategy Center

March 15, 2017

Outline

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Technical Appendix

N-Methylpyrrolidone (NMP)

1. Identifying Information

CAS Nos.: 872-50-4 and 51013-18-4¹

UN Shipping Code: US 1993²

Harmonized Tariff Schedule No.: 2933792000

Synonyms³: 1-methyl-2-pyrrolidone, NMP, methyl pyrrolidone, N-Methyl-2-Pyrrolidone, N-Methyl-Pyrrolidone, -Methyl-2-pyrrolidone, monomer

Trade names⁴: M-Pyrol, Pharmasolve, Micropure EG

TSCA Docket: EPA-HQ-OPPT-2016-0743 <https://www.regulations.gov/docket?D=EPA-HQ-OPPT-2016-0743>

¹ This CAS number is not in the EPA Preliminary Information report (Feb. 2017) for n-Methylpyrrolidone.

² <https://cameochemicals.noaa.gov/chemical/8857> (This covers a wide range of chemicals: <https://cameochemicals.noaa.gov/unna/1993>)

³ <https://pharosproject.net/material/show/2004939>;
<http://www.sigmaaldrich.com/catalog/product/sigma/m6762?lang=en®ion=US>;
<http://www.dupont.com/content/dam/assets/corporate-functions/our-approach/sustainability/commitments/product-stewardship-regulator/articles/product-stewardship/documents/N-Methyl-Pyrrolidone%20Product%20Safety%20Summary.pdf>

⁴ <http://www.ashland.com/industries/paints-and-coatings/specialty-and-industrial-coatings/m-pyrol-solvent>;
<http://www.ashland.com/industries/pharmaceutical/oral-solid-dose/pharmasolve-n-methyl-2-pyrrolidone>

2. Research Methods

In collaboration with Safer Chemicals Healthy Families and the Environmental Health Strategy Center, the Healthy Building Network research team reviewed the Chemical Data Reporting forms submitted for N-Methylpyrrolidone (NMP) and the EPA Preliminary Information on Manufacturing, Processing, Distribution, Use, and Disposal (released in February 2017). It also reviewed Toxics Release Inventory data, a variety of national, European and United Nations reports, chemical industry literature, and a shipping database (Panjiva) with the goal of identifying potentially missing producers, importers, and uses of NMP. Chemical hazard information is drawn from the Pharos Chemical and Material Library, available to any user for 14 days, after which a subscription is required.

Findings that are not included in the EPA Preliminary Information document, or were not publicly reported in CDRs, are highlighted in yellow.

3. Production/Trade

In recent years, driven by cheap energy that makes their feedstocks globally competitive, and cheap labor overseas that has offshored downstream productions, many U.S. chemical factories have become increasingly export-oriented. This appears to be the case with NMP. We estimate that exports from the U.S. outpace imports by 20:1, and represent about one-quarter of U.S. production.

U.S. chemical plants account for half or more of the world's NMP production. In 2007, OECD estimated that the U.S.' three production sites had the capacity to produce 60,000 to 80,000 tons of NMP per year, out of 100,000 to 150,000 tons of worldwide capacity.⁵ U.S. production remained in that range, according to CDR forms submitted to EPA for NMP. These forms recorded around 75,000 tons of NMP production per year.

In the last three years, according to records in the Panjiva database, there have been over 1,800 shipments of NMP out of the U.S., largely from Ashland and BASF, mostly destined for Belgium, Japan, South Korea, and Taiwan.

⁵ <http://webnet.oecd.org/HPV/UI/handler.axd?id=84daa4ac-feb7-4b5a-9839-206d17914e42>

Table 1. N-Methylpyrrolidone trade and production (kg per year)						
	2012	2013	2014	2015	2016	2017
Production + Imports (CDR)	74,687,202	76,448,907	77,770,555	73,099,117	n/a	n/a
Imports (ITC) ⁶	447,227	730,010	1,197,429	1,399,291	n/a	n/a
Est. Domestic Production (CDR-ITC)	74,239,975	75,718,897	76,573,126	71,699,826	n/a	n/a
Est. Exports (Panjiva)	n/a	n/a	19,400,000 (a)	16,930,662	19,942,343	17,401,746 (b)
Est. Domestic Consumption	n/a	n/a	57,200,000	54,800,000	n/a	n/a

(a) Projected annual rate based on April to December data.

(b) Projected annual rate based on January/February data.

n/a = Not available.

While small compared to exports, imports tripled between 2012 and 2015, which may signal a tightening supply chain due to increasing domestic and global demand.

BASF, one of the world's leading NMP producers, noted its growing use as other solvents came under regulatory pressure. BASF has been pushing it into new markets for decades. "Due to health and safety, toxicological and environmental pressures since the 1980s, restrictions have grown in the use of certain solvents," reads a BASF brochure from 1998. "This has led to an even wider use of NMP in existing market segments, as well as the introduction of NMP into new areas."⁷

⁶ The ITC data is for both N-methylpyrrolidone and 2-pyrrolidone.

⁷

http://worldaccount.basf.com/wa/NAFTA/Catalog/ChemicalsNAFTA/doc4/BASF/PRD/30036605/.pdf?asset_type=pdf&language=EN&urn=urn:documentum:eCommerce_sol_EU:09007bb280020792.pdf

- **DOMESTIC PRODUCTION**

The current rate of NMP production (around 75 million kilograms a year) is 2.5 times higher than what the International Trade Commission reported in 1992 (29,132,000 kilograms). The 1992 ITC report listed four producers: ARCO Chemical (now LyondellBasell), BASF (in Parsippany, NJ), ISP Chemicals Inc. (now Ashland), and J.T. Baker Chemical (now a brand of Avantor, which has discontinued NMP from its catalog⁸).

There currently appear to be four companies producing NMP in the United States according to CDR and other data: Ashland (in Texas City, TX), BASF (Geismar, LA), Eastman (Fieldale, VA), Lyondell (Channelview, TX). CDR data from three other companies were ambiguous on whether the companies produced NMP domestically or imported it from other sources (Solvay, Solvchem, and Tedia).

Ashland, BASF, and Lyondell Chemical are the three members of the N-Methylpyrrolidone Producers Group.⁹

No additional virgin production was identified. Companies that recycle NMP waste into new products are described in the Recycling discussion below.

- **DOMESTIC PRODUCERS WITH CDRs**

- [Ashland, Inc - ISP Technologies \(Texas City, TX\)](#)

Ashland's CDR submission lists this as a production site. The use is listed primarily as solvents which become part of a product formulation or mixture (95%) with a smaller portion listed as solvents for cleaning and degreasing (5%). Production quantities are redacted.

Ashland's website lists several NMP-based products:

- M-Pyrol™ Solvent: "an excellent polymer solvent, paint and photoresist stripper, paint coalescent, industrial cleaner, and extraction solvent. Its N-Methyl 2 pyrrolidone structure is extremely resistant to hydrolysis from pH 2-10, even at elevated temperatures."¹⁰

⁸ <https://www.avantormaterials.com/commerce/product.aspx?id=4294969620>

⁹ <http://www.nmpgroup.com/>

¹⁰ <http://www.ashland.com/industries/paints-and-coatings/specialty-and-industrial-coatings/m-pyrol-solvent>

- Pharmasolve™ is “used as a drug solubilizer and penetration enhancer in **human topical dosage forms**, and for the same purposes in parenteral and topical veterinary products.”¹¹
- Micropure™ is a “solvent for processing binders on the cathode” of lithium ion batteries.¹²

Ashland also sells NMP as a chemical intermediate.¹³

ISP (the prior owner) was manufacturing NMP in 1992 per the International Trade Commission.

- BASF Corporation (Geismar, LA)
-

BASF’s CDR lists its Geismar, LA plant as an NMP production site. Quantities are redacted. BASF lists uses for its NMP as a processing aid in computer and electronic product manufacturing, pesticide, in fertilizer and other agricultural chemical manufacturing, and in petrochemical manufacturing. It is also listed as a reactant in pharmaceutical manufacturing and plastic and resin manufacturing.

In other documents, BASF lists more uses of NMP, such as “formulation of plant protection products”, “formulation of degreasers and industrial cleaners”, “removal of cured and non-cured coatings”, “overhauling of engines and generators.”¹⁴ It is also used for polyurethane dispersions, “for cleaning of metals, glasses and plastics, for pretreating of plastics”, “for plastic coatings, for water-borne coatings and for electro insulation coatings.”¹⁵

BASF also reported imports of NMP to their Florham Park, NJ site via CDR. The use was stated as paint and coating additives for transportation equipment manufacturing.

- Lyondell Chemical Company (Channelview, TX)

The CDR for Lyondell does not disclose whether the product is produced or imported or both, but Lyondell is listed as a U.S. manufacturer on the website for the NMP Producers Group.¹⁶ Its predecessor, ARCO Chemicals, was one of four U.S. producers in 1992.¹⁷

¹¹ <http://www.ashland.com/industries/pharmaceutical/oral-solid-dose/pharmasolve-n-methyl-2-pyrrolidone>

¹² http://s1055916.instanturl.net/lib/pdf/product-data/PDS_4927_Micropure_EG_solvent.pdf

¹³ <http://www.ashland.com/about/business-units/chemical-intermediates-and-solvents>

¹⁴

¹⁵ http://worldaccount.basf.com/wa/NAFTA/Catalog/ChemicalsNAFTA/doc4/BASF/PRD/30036605/.pdf?asset_type=pi/pdf&language=EN&urn=urn:documentum:eCommerce_sol_EU:09007bb280020792.pdf

¹⁶ <https://www.ulprospector.com/en/na/Coatings/Detail/3821/109119/N-Methylpyrrolidone--NMP>

¹⁷ <http://www.nmpgroup.com/>

¹⁷ <https://www.avantormaterials.com/commerce/product.aspx?id=4294969620>

Quantities are redacted on the CDR. A search in Panjiva did not reveal any imports under the Lyondell name, but there were several exports from the U.S.

Uses listed in Lyondell's CDR are basic organic chemical manufacturing (61%), processing aid for petrochemical manufacturing (1%), solvent for cleaning and degreasing in electrical equipment, appliance and component manufacturing (21%), wholesale (14%), and solvents that become part of a formulation for pesticide, fertilizer or other agricultural chemical manufacturing (3%).

According to Lyondell's website, "NMP, known for its solvent power and exceptional performance, has become the product of choice for paint strippers, agricultural chemicals and process solvent applications. As a cosolvent, NMP can improve the gloss of floor polishes. Because of its high solvency and low volatility, NMP is used in automotive and industrial cleaners with solvents, including hydrocarbons, terpenes, propylene carbonate, and propylene glycol ethers. It also has application in the electronic industry as a photoresist stripper and it can be a replacement for 1,1,1-trichloroethane, an ozone-depleting substance, in demanding applications, including the cleaning of metal parts." These applications are prohibited: "cosmetics, toiletries, personal care products", "carrier solvent (or excipient) in veterinary medicines/drugs (unless approved by Lyondellbasell)", and "pharmaceutical excipient".¹⁸

- **CDR REPORTING COMPANIES - UNCLEAR WHETHER DOMESTIC PRODUCER OR IMPORTER**

- Solvay (Greenville, SC, and Borger, TX)

CDR for Solvay (Princeton, NJ) claims manufacture/import information and quantities as CBI. Its form provides no information on use. It is likely an importer, not a producer.

Solvay reported the country's largest NMP releases from its Greenville, SC, and Borger, TX, facilities (Solvay Specialty Polymers). It may use NMP as a solvent in production of the specialty polymers. NMP is listed as a solvent for creating coatings or films from the powdered polyamide-imide polymers Solvay produces and sells.¹⁹ The data sheets for these polymers list a variety of applications including electrical uses (protective coatings for printed circuit boards and magnet wire insulation), high temperature decorative coatings, corrosion prevention

¹⁸ <https://www.lyondellbasell.com/en/chemicals/p/N-METHYL-PYRROLIDONE-ELECTRONIC/cbe3cca1-0857-4e07-8496-a4d201082779>

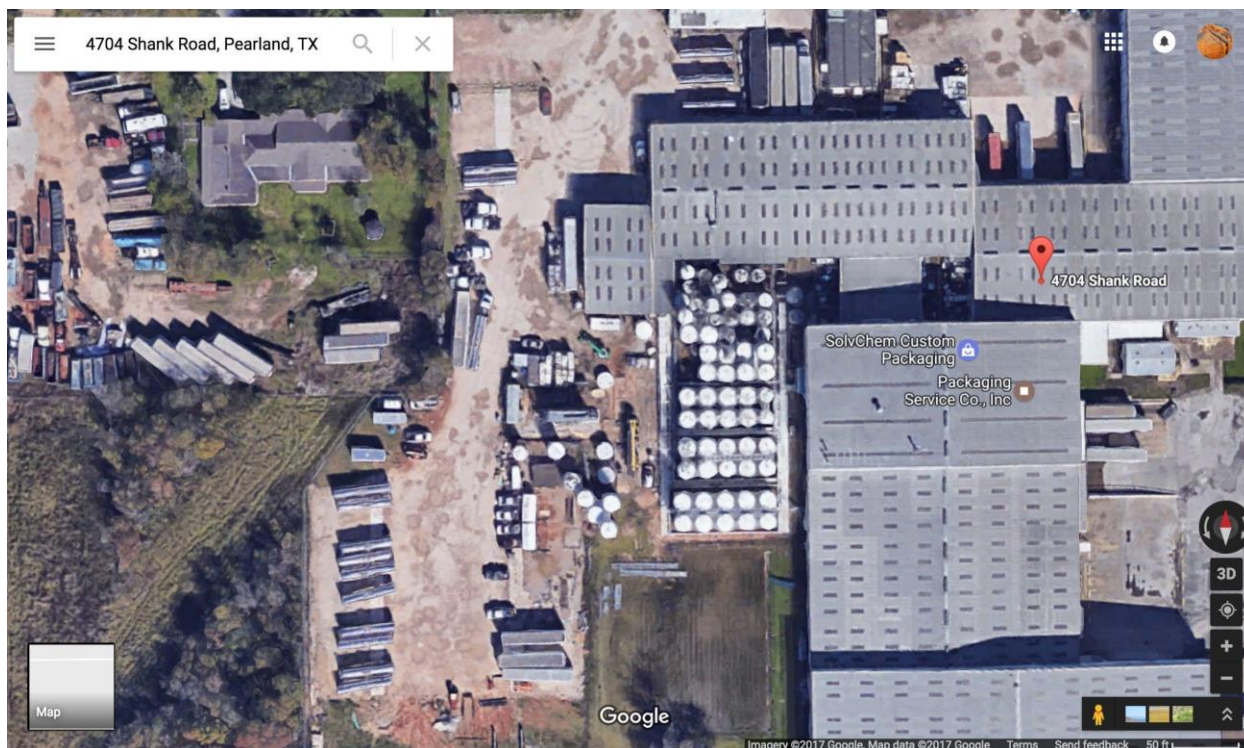
¹⁹ http://www.solvay.com/en/binaries/Torlon-Al-10-for-Coatings_EN-228133.pdf;
<http://catalog.ides.com/datasheet.aspx?l=42041&FMT=PDF&E=135276>

coatings, primers and decorative topcoats for cookware, appliances and housewares, and adhesives.

- Solvchem, Inc - Solvents & Chemicals (Pearland, TX)

Solvchem lists itself as a manufacturer in its CDR. The company reported a dramatic increase in production from 2014 (18,302 lbs) to 2015 (1,854,563 lbs), most of which is said to be processed on site. The uses are vaguely listed as solvents which become part of product formulation or mixture.

The chemical is not included in a shortened product list posted on Solvchem's website.²⁰ The site listed on the CDR does not appear to be a manufacturing plant, but more of a formulator, as viewed in Google Earth. There are no TRI reports for this location.



- Tedia Company Inc (Fairfield, OH)

Tedia's CDR lists itself as both a domestic producer and importer of NMP. It claims production/import of 72,661 pounds in 2012, 79,174 pounds in 2013, 66,071 pounds in 2014, and 30,991 pounds in 2015. Tedia lists the uses as functional fluids (closed systems) for pharmaceutical manufacturing, wholesale chemicals and laboratory chemicals.

²⁰ http://www.solvchem.com/files/2813/9645/2610/Product_List_by_Class.pdf

Its website also lists NMP as a solvent “for biotechnology applications, including peptide and oligonucleotide synthesis.”²¹ Tedia have SDS’s for several other product grades: Anhydrosolv, ACS, and HPLC/Spectro which are listed to be for laboratory and manufacturing uses.²²

There are no TRI reports for this location.

- **IMPORTERS (and related FOREIGN PRODUCERS)**

Imports are a small fraction of overall production, generally less than 2% of total consumption. But led by manufacturers in China, imports have risen sharply in recent years.

Country	Weight
China	1,580,515 kg
India	135,645 kg
Canada	16,679 kg
Germany	16,302 kg
Japan	15,700 kg
Others	9,879 kg
Total	1,774,720 kg

Data source: International Trade Commission Dataweb report for HTS - 29337920: N-Methyl-2-pyrrolidone; and 2-pyrrolidone

- **IMPORTERS WITH CDRs**

- Foreign Producer → ????

A company with redacted information imports NMP where the quantities and use are CBI.

- Balaji Amines Ltd. (India) → Allchem Industries (Gainesville, FL)

²¹ <http://www.tedia.com/product.aspx?ID=2234078>

²² <http://www.tedia.com/msds.aspx>

Allchem Industries submitted CDR data stating imports of 246,960 pounds in 2012, 176,400 pounds in 2013, 608,566 pounds in 2014, and 321,923 pounds in 2015. The chemical is listed as used for commercial paints and coatings.

Its website lists NMP within the Refinery and Petrochemical group.²³

Import records found using Panjiva list the supplier as Balaji Amines of India, which has operated chemical plants in Maharashtra and Hyderabad. Balaji Amines advertises its NMP as follows:

“Used as a solvent in pharmaceutical synthesis because of its broad solvency.

“OIL REFINING: Solvent for selective extraction of aromatic compound mixers and co-solvent for water resolution. **Decoloring agent for oils & waxes**. Extraction solvent in lube oil processing and in Natural and Synthetic Gas purification.

“OTHERS: Solvent for paint stripping and resins. Metal finishing and **PCB manufacturing**. Pigment dispersant and disperser for paints and varnishes.”²⁴

No corresponding TRI records identified for Allchem Industries.

- Foreign Producer → BYK (member of Altana Group)²⁵

BYK Chemie imports NMP per their CDR. Quantities are redacted. The largest use (91%) is listed as an additive for paint and coating manufacturing. Minor uses are listed as **rheology additive in abrasives manufacturing**, plastic additive for plastic material and resin manufacturing as well as for manufacturing plastic products, additive for oil and gas drilling/extraction, adhesive manufacturing, and an additive in printing ink manufacturing.

BYK advertises NMP as a solvent in a modified urea rheology additive, BYK-420, which is used in aqueous coatings.²⁶ It markets another rheology additive, BYK-410, for solvent-based and solvent-free coatings, **PVC plastisols**, and ambient-curing resin systems, including food contact applications.²⁷ This may cover the paint and coating additive application listed in the CDR.

²³ <http://www.allchem.com/divisions/petroleum-products.htm>

²⁴ [http://www.balajiamines.com/prodapp_view.asp?pcode=10&pname=N-Methyl%20Pyrrolidone%20\(NMP\)](http://www.balajiamines.com/prodapp_view.asp?pcode=10&pname=N-Methyl%20Pyrrolidone%20(NMP))

²⁵ <http://www.altana.com/>

²⁶ https://www.byk.com/fileadmin/byk/additives/highlights/aqueous_systems/BYK_L-G6_Aqueous_EN.pdf

²⁷ http://www.additives-downloads.de/output/ag_download.aspx?file=TDS_BYK-410_EN.pdf

BYK Chemie has developed some NMP-free wax additives for pigments used in solvent-based coatings.²⁸ They have also developed rheology additives free of NMP.²⁹

The parent company, Altana Group, reports, “NMP – N-Methyl-2-Pyrrolidone – is a **component of coatings that serve as inner layers of aluminum spray cans**. More than six billion of these cans are sold worldwide every year, among other things, for hairspray and air freshener. Since 2011, NMP has been a substance of very high concern, and users are seeking alternatives. ACTEGA Rhenacoat has developed a new coating formulation devoid of NMP based on polyesterimide (PEI) and has already tested the first applications in cooperation with French customers. World-wide tests are planned for 2014.”³⁰

No corresponding Panjiva records identified.

BYK reported three (3) lbs. of NMP air stack releases from its Wallingford, CT plant in 2015, but no other NMP production waste between 2012 and 2015.³¹

- Foreign Producer → Elantas Pdg Inc (member of Altana Group)³²

The CDR for Elantas Pdg lists imports for 2015. The use is as a solvent (which becomes part of product formulation or mixture) for electrical equipment, appliance and component manufacturing.

The company develops “impregnating resins, compounds and wire enamel technologies.”³³

No corresponding Panjiva records were identified for 2014 or 2015, but several were identified for 2016.

Elantas Pdg generated 797.9 pounds of NMP waste from 2012 through 2015, including 209.5 pounds of air releases.³⁴

- Foreign Producer/Source A → Hubbard-Hall Inc

²⁸ <http://www.byk.com/en/additives/new-additives.html>

²⁹ <http://www.altana.com.es/sustainability/highlights-and-lowlights.html>

³⁰ https://www.altana.com/uploads/tx_tproducts/datasheet/ALTANA_NHB_2013_EN_01.pdf

³¹ https://oaspub.epa.gov/enviro/tris_control_v2.tris_print?tris_id=06492BYKCH524SO&pPrev=1

³² <http://www.altana.com/>

³³ <http://www.elantas.com/pdg/about-us.html>

³⁴ https://oaspub.epa.gov/enviro/tris_control_v2.tris_print?tris_id=63147PDGRG5200N&pPrev=1

The CDR lists plating and surface treating agents for fabricated metal product manufacturing as the use. NMP makes up 50% of Aquastrip AL, a paint stripper for industrial applications (removing powder coat and acrylic coating from metal).³⁵

No corresponding Panjiva records identified.

- Foreign Producer/Source A → PPG Industries

PPG reports import of NMP in its CDR. The use is listed as solvents which become part of a product formulation or mixture for paint and coating manufacturing.

Machinecoat Plus, containing NMP,³⁶ is a machine-applied acrylic latex coating for new wood or manufactured siding. It can be used for touch up/trim as well.³⁷

They have new coatings that are “N-Methyl-2-pyrrolidone-free for monobloc internal liners.”³⁸ This is likely for aerosol can packaging as discussed above.

No corresponding Panjiva records identified.

- Foreign Producer/Source A → Silver Fern Chemical

Silver Fern does not list any use information on its CDR. Its website says “commonly used as a solvent for resins and acetylene, a pigment dispersant, in petroleum, microelectronics, plastics, textiles, agrochemicals, and pharmaceuticals.”³⁹

No corresponding Panjiva records identified.

- Foreign Producer/Source A → Superior Oil Company (Indianapolis, IN)

Superior Oil is an importer of NMP, per their CDR. It lists a wide range of uses. In section B of the Processing and Use information, they list “anti-freeze and de-icing products.” The quantity of NMP used for this function is likely very small since it is listed as zero percent of production volume. This use does not seem to currently be covered by EPA’s list of uses.

- Foreign Producer/Source A → Toyota Industries Compressor Parts (Pendergrass, GA)

³⁵ <http://www.hubbardhall.com/assets/25720021.pdf>; <http://www.hubbardhall.com/assets/2572002.pdf>

³⁶ <http://www.ppgmachineappliedcoatings.com/getattachment/abca7d4d-e8c8-42e5-9b36-ba286135654b/walnut.pdf>

³⁷ <https://www.ppgpaints.com/products/machinecoat-plus>

³⁸ <http://corporate.ppg.com/Media/Newsroom/2016/PPG-to-display-coatings.-present-about-alternative>

³⁹ <http://www.silverfernchemical.com/products/n-methylpyrrolidone/>

Toyota Industries Compressor Parts facility is an importer of NMP. They list the industrial function of **lubricants and lubricant additives** for the machinery manufacturing industry. This use does not seem to currently be covered by EPA's list of uses.

- **IMPORTS WITHOUT CDRs**

Most NMP import records in the Panjiva database are linked to companies that report CDR data. There are at least two common mixtures imported with high concentrations of NMP.

- Bayer Healthcare (Germany) → Bayer Healthcare

Bayer Healthcare imports K9 Advantix II, a topical flea and tick treatment for dogs, which according to the shipping records contains permethrin, imidacloprid, and NMP. The percentage of inactive ingredients is 46.76%.⁴⁰

Shipment records in Panjiva (# of ampoules and volume per ampoule) revealed 3,309 L of K9 Advantix II was sent to the US in 2015. The density of the product is 9.5 lb/gal.⁴¹ NMP is likely the amine derivative mentioned in the SDS at a minimum 30%. Using the range of 30-46.76% NMP in the product, the quantity of NMP in the 2015 shipments was between about 2,717 and 4,235 lbs.

- Foreign Producer/Source A → Covestro (Formerly Bayer Material Science)

There is no CDR, but imports of products containing NMP were found using Panjiva. The quantity of NMP in these formulations could not be determined.

Bayhydur® VP LS 2310 is an "Aliphatic, blocked polyisocyanate. Used in automotive OEM systems (impact-resistant primers, primer surfacers, top coats) and high-quality stoving industrial coatings for, e.g. electrical equipment, small components and automotive components. Offers improved flexibility, impact strength and adhesion."⁴² Imports are shown into 2016, with NMP listed within the description, but this product is not listed on Covestro's website.⁴³

Desmodur® BL 3272 MPA is a "Blocked aliphatic HDI-polyisocyanate. With Desmophen® grades to formulate lightfast one-component stoving polyurethane coatings; as an additive to improve

⁴⁰ <http://ppis.ceris.purdue.edu/product.aspx>

⁴¹ http://www.kellysolutions.com/erenewals/documentsubmit/KellyData/OK/pesticide/MSDS/11556/11556-143/11556-143_K9_Advantix_II_Large_Dog_8_13_2010_4_41_07_PM.pdf

⁴² <http://coatings.specialchem.com/product/r-bayer-materialscience-bayhydur-vp-ls-2310>

⁴³ <http://www.coatings.covestro.com/en/Products/Bayhydur/ProductListBayhydur.aspx>

reactivity, flexibility and adhesion.”⁴⁴ Imports are shown in 2016, with NMP listed within the description.

- **Companies with large production-related NMP releases reported in TRI**

Eight companies that did not file CDR reports generate high volumes of NMP releases: over a million pounds per year.

- Eastman (Fieldale, VA)

Eastman is listed as a producer in a 2017 Global NMP market report.⁴⁵ The report excerpt does not indicate where this manufacturing takes place. Eastman reported some of the country’s largest NMP releases from their Fieldale, VA facility, also called CPFILMS - PLANT II.

Uses of NMP, per its website, include:

“Petrochemical processing:

NMP is used as extraction medium in several industrial processes because of its affinity for unsaturated hydrocarbons and aromatics, for example butadiene recovery, BTX extraction, lube oil purification, ...

Electronics:

NMP is used as photoresist stripper, for defluxing, degreasing and cleaning.

NMP is a solvent for the production of FCCL, polyamide/polyimide wire enamels, epoxy and polyurethane coatings, ...

Pharmaceuticals:

NMP can be used as solvent, extraction medium, ...

Industrial and household cleaning:

NMP is used for paint stripping, in graffiti removers, oven cleaners, in automotive and industrial cleaner formulations, ...

Agrochemicals:

NMP can be used as solvent during synthesis or as a formulation agent.”⁴⁶

⁴⁴ <http://www.coatings.covestro.com/en/Products/Desmodur/ProductListDesmodur/201503030528/Desmodur-BL-3272-MPA>

⁴⁵ <https://web.archive.org/web/20170207121329/http://investdailynews.com/global-n-methyl-pyrrolidone-nmp-cas-872-50-4-market/>

⁴⁶ <http://www.eastman.com/Products/Pages/ProductHome.aspx?Product=71103627>

- Avago Technologies - now Broadcom (Fort Collins, CO)

Avago Technologies, now Broadcom, manufactures semiconductors at its Fort Collins, CO facility.⁴⁷ This is consistent with the use of NMP in the electronics industry.

- Clean Harbors Recycling Services (Chicago, IL)

Clean Harbors is a waste disposal and recycling company. It lists chemical solvent recycling as one of its services.⁴⁸ Clean Harbors shipped 356,230 pounds of NMP from Chicago to Eastman's plant in 2013, according to its TRI record.⁴⁹

- Dow Chemical (Pittsburg, CA)

Dow Chemical's Pittsburg facility "produces a methyl ester intermediate, which is an intermediate for the herbicide Starane...N-methyl pyrrolidone (NMP) is used as a solvent...Emissions include methyl chloride, methyl chloroacetate, N-methyl-pyrrolidone, methanol, and ammonia." ⁵⁰

- Eden Custom Processing (Eden, NC)

Eden Custom Processing recycles solvents, including NMP, using distillation and other separation techniques.⁵¹

- Fortron Industries (Wilmington, NC)

Fortron Industries is a joint venture of Ticona (the engineering polymers business of Celanese Corporation) and Kureha Corporation. The facility manufactures polyphenylene sulfide, which is used in "electrical and electronics, automotive, and industrial applications." Specific applications are listed as:

"Automotive — fuel systems, transmission components, water management, air management and electronics

Electrical/Electronics — sensors, connectors, plugs, switches, sockets, transformers, bobbins and circuit boards

Aerospace — structural and non-structural aircraft composite components

Fluid Handling — enhanced oil and gas recovery, pumps and valves, and potable water valves and fittings"⁵²

⁴⁷ https://docs.broadcom.com/docs/ccn_021402at1

⁴⁸ <http://www.cleanharbors.com/industries/chemical-specialty-chemical>

⁴⁹ TRI ID: 60609SFTYK1445W

⁵⁰ http://www.baaqmd.gov/~media/files/engineering/title-v-permits/a0031/a0031_2015_11_renewal_proposed_sob_app-18262_04.pdf

⁵¹ <http://ecpchem.com/>

⁵² <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0ahUKEwjE8Inc-bXSAhVKyoMKHf5dC94QFggmMAI&url=https%3A%2F%2Fwww.celanese.com%2F-%2Fmedia%2Fengineered%2520materials%2FFiles%2Fnews->

NMP is used in the reaction process to create polyphenylene sulfide.⁵³

- TSE Industries (Clearwater, FL)

TSE Industries is a manufacturer of “custom molded, injected and extruded rubber parts, plastic fabrication,” “contract manufacturing of specialty chemicals & PURs,” “polyurethane composite resins, elastomers & biobased rigid foam.”⁵⁴

This company appears to use NMP for cleaning processes.⁵⁵

- Veolia ES Technical Solutions (Azusa, CA and Henderson, NV)

Veolia ES Technical Solutions “provides hazardous and non-hazardous waste disposal services to industrial and municipal customers in the United States.” This includes solvent recovery.⁵⁶

4. Use

The U.S. NMP Producers Group states that “NMP is widely used in the petrochemical industry, and in the manufacturing of various compounds, including pigments, cosmetics, insecticides, herbicides, and fungicides. NMP increasingly is used as a substitute for chlorinated hydrocarbons.” Product uses of NMP derivatives are microelectronics fabrication industry, petrochemical industry, pigments, herbicides, fungicides, cosmetics, drugs, and insecticides.⁵⁷

The EPA preliminary information document includes an overview of NMP processing table based on 2012 CDR data. The sectors, functions and type of processing don’t seem to match up with those from the 2015 CDRs and have less specificity. ***See CDR Uses Appendix for information compiled from 2015 CDRs.***

- **Specific products with NMP not in EPA TSCA docket**

[releases%2F2012_en%2F07022012Ticona%2520Announces%2520FortronR%2520PPS.ashx&usq=AFQjCNFyMiz7INy984HFVkdaw6t2fSb3GQ&sig2=WSL0gkq6Kv53PPY-7tMhow&bvm=bv.148441817,d.amc&cad=rja](https://www.epa.gov/chemical-safety/chemical-safety-data-releases%2F2012_en%2F07022012Ticona%2520Announces%2520FortronR%2520PPS.ashx&usq=AFQjCNFyMiz7INy984HFVkdaw6t2fSb3GQ&sig2=WSL0gkq6Kv53PPY-7tMhow&bvm=bv.148441817,d.amc&cad=rja)

⁵³ <http://onlinelibrary.wiley.com/doi/10.1002/0471238961.1615122507050902.a01/full?compoundBrowser=false>

⁵⁴ <http://www.tse-industries.com/>

⁵⁵ <http://www.tse-industries.com/products/contract-manufacturing-specialty-chemicals/reactive-hot-melt-adhesives;http://arm-permit2k.dep.state.fl.us/psd/1030207/0000E897.pdf>

⁵⁶ <http://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=4239300>

⁵⁷ <http://www.nmpgroup.com/ProductInfo.htm>

Table 3. List of Products

Trade name	Use of the product	% by weight of chemical	Link to references
Coating/Resin/Paint/Rust Inhibitor/Wood Finisher/Sealant			
StreetShoe Gloss	Wood floor finish	5-7%	https://pharosproject.net/uploads/files/sources/1936/StreetShoe%20Gloss%20MSDS.pdf
Eco-Tuff Rubberized Non Skid	Non-skid coating	0.25-0.50%	https://pharosproject.net/uploads/files/sources/513/1362690596.pdf
California® Clear Cote® Clear Acrylic Polyurethane Floor Finish	Floor finish	<4%	https://pharosproject.net/uploads/files/sources/656/1332749224.pdf
Duro-Design Water Base Varnish	Wood floor finish	8-12%	https://pharosproject.net/uploads/files/sources/2135/1334179867.pdf
Pro Finisher Water-Base Polyurethane Gloss	Wood floor finish	1-2.5%	http://www.rustoleum.com/MSDS/ENGLISH/258688.pdf
Machinecoat Plus	Acrylic latex coating for new wood or manufactured siding	0.3-1%	http://www.ppgmachineappliedcoatings.com/getattachment/abca7d4d-e8c8-42e5-9b36-ba286135654b/walnut.pdf
Pesticides			
K9 Advantix II	Dog flea and tick	30-47%	Import records
Cleaner/Remover/Solvent			

M-Pyrol™	Solvent	~100%	http://www.ashland.com/industries/paints-and-coatings/specialty-and-industrial-coatings/m-pyrol-solvent
Pharmasolve™	Solvent (pharmaceuticals)	~100%	http://www.ashland.com/industries/pharmaceutical/oral-solid-dose/pharmasolve-n-methyl-2-pyrrolidone
Miscellaneous			
Bayhydur® VP LS 2310	Polyisocyanate (many uses, see Covestro section above)	Not specified	Import records
Desmodur® BL 3272 MPA	Polyisocyanate (many uses, see Covestro section above)	Not specified	Import records
Paint Stripper/Graffiti Remover			
Aquastrip AL	Industrial paint stripper	~50%	http://www.hubbardhall.com/assets/25720021.pdf

Recent changes in use patterns:

A few manufacturers are shifting away from the use of NMP. Examples found include:

- BYK Chemie has developed some NMP-free wax additives for pigments used in solvent-based coatings.⁵⁸ They have also developed rheology additives free of NMP.⁵⁹
- “NMP – N-Methyl-2-Pyrrolidone – is a component of coatings that serve as inner layers of aluminum spray cans. More than six billion of these cans are sold worldwide every year, among other things, for hairspray and air freshener. Since 2011, NMP has been a substance of very high concern, and users are seeking alternatives. ACTEGA Rhenacoat

⁵⁸ <http://www.byk.com/en/additives/new-additives.html>

⁵⁹ <http://www.altana.com.es/sustainability/highlights-and-lowlights.html>

has developed a new coating formulation devoid of NMP based on polyesterimide (PEI) and has already tested the first applications in cooperation with French customers. World-wide tests are planned for 2014.”⁶⁰

- PPG has new coatings that are “N-Methyl-2-pyrrolidone-free for monobloc internal liners.”⁶¹ This is likely for aerosol can packaging as discussed above.

There may also be shifts away from NMP in certain uses.

- Lyondell says that these applications are prohibited: “cosmetics, toiletries, personal care products”, “carrier solvent (or excipient) in veterinary medicines/drugs (unless approved by Lyondellbasell),” and “pharmaceutical excipient.”⁶²
- The NMP Producers Group recommends against the use of NMP in cosmetics, toiletries, and personal care products: “NMP is readily absorbed across all body surfaces. Due to its low vapor pressure, however, absorption through the skin represents the most likely and potentially the most significant route of exposure to NMP under most known consumer use conditions. This is particularly true with the use of NMP in cosmetics, toiletries, and other personal care products. Consequently, the member companies of the NMP Producers Group have independently developed policies regarding the use of NMP in personal care products. NMP manufacturers should be consulted before considering such an application.”⁶³

CURRENT USES (not covered by EPA)

- “Drug solubilizer and penetration enhancer in human topical dosage forms,” listed as a potential use by Ashland.⁶⁴
- NMP is noted as a potential solvent for coatings of polyamide-imide polymers - the polymers can be use for primers and decorative topcoats for cookware, appliances and housewares.⁶⁵
- Biotech applications such as peptide and oligonucleotide synthesis.⁶⁶
- NMP is used in a rheology additive that can be used for PVC plastisols.⁶⁷
- NMP is used in the reaction process to create polyphenylene sulfide.⁶⁸

⁶⁰ https://www.altana.com/uploads/tx_ttproducts/datasheet/ALTANA_NHB_2013_EN_01.pdf

⁶¹ <http://corporate.ppg.com/Media/Newsroom/2016/PPG-to-display-coatings.-present-about-alternative>

⁶²

https://www.altana.com/uploads/tx_ttproducts/datasheet/ALTANA_NHB_2013_EN_01.pdf<https://www.lyondellbasell.com/en/chemicals/p/N-METHYL-PYRROLIDONE-ELECTRONIC/cbe3cca1-0857-4e07-8496-a4d201082779>

⁶³ “Cosmetics, toiletries, and personal care products are broadly defined to include those which are deliberately applied to the body but to exclude pharmaceuticals.” <http://www.nmpgroup.com/pdf/00079937.PDF>

⁶⁴ <http://www.ashland.com/industries/pharmaceutical/oral-solid-dose/pharmasolve-n-methyl-2-pyrrolidone>

⁶⁵ http://www.solvay.com/en/binaries/Torlon-AI-10-for-Coatings_EN-228133.pdf;

⁶⁶ <http://www.tedia.com/product.aspx?ID=2213505>

⁶⁷ http://www.additives-downloads.de/output/ag_download.aspx?file=TDS_BYK-410_EN.pdf

⁶⁸ <http://onlinelibrary.wiley.com/doi/10.1002/0471238961.1615122507050902.a01/full?compoundBrowser=false>

- BYK's CDR lists the function of rheology additive for abrasives manufacturing as a minor use.
- Superior Oil Company's CDR lists anti-freeze and de-icing products as a minor commercial use.
- Toyota Industries Compressor Parts lists the function lubricants and lubricant additives for the machinery manufacturing industry in their CDR.

HISTORICAL USES (not covered by EPA)

- NMP is used as a component of the coatings used for the inner layer of aluminum spray cans (ex. cans for hairspray or air freshener). This may be a historical use, as it seems to be at least in the process of phase-out.⁶⁹
- PCB Manufacture. An Indian manufacturer identifies PCB manufacturing as an application for NMP.⁷⁰

5. End of Life

The production and use of NMP generates considerable hazardous releases. Some are emitted into the air during production and use. The industry recycles some of the NMP it generates, but there are releases associated with recycling processes, too, that should be considered.

Here's one example using TRI data: During the CDR reporting period (2012 to 2015), several NMP consumers transferred NMP waste to Veolia ES Technical Solutions, a solvent recycling company. Avago transferred 655,538 pounds of NMP to Veolia for "energy recovery," and another 3.7 million pounds to Veolia for "solvents/organics recovery." Dow transferred 3.1 million pounds to Veolia for "solvents/organics recovery." Overall, Veolia reported recycling 14.6 million pounds on-site in its Azusa, CA and Henderson, CO facilities.

But not all of that went back into the NMP production chain. Some was released into the air directly from Veolia's operations. In the CDR reporting period, Veolia reported 7,875 pounds of fugitive air emissions and 501 pounds of stack emissions from its facilities in California and Colorado. And it transferred 5.7 million pounds to cement kilns in Kansas and Missouri, where the NMP is burned for fuel. Based on these data, Veolia's actual recovery rate from incoming NMP was around 61%, with the rest released into the air or burned in kilns.

⁶⁹ https://www.altana.com/uploads/tx_ttproducts/datasheet/ALTANA_NHB_2013_EN_01.pdf

⁷⁰ [http://www.balajiamines.com/prodapp_view.asp?pcode=10&pname=N-Methyl%20Pyrrolidone%20\(NMP\)](http://www.balajiamines.com/prodapp_view.asp?pcode=10&pname=N-Methyl%20Pyrrolidone%20(NMP))

- Fates of NMP wastes

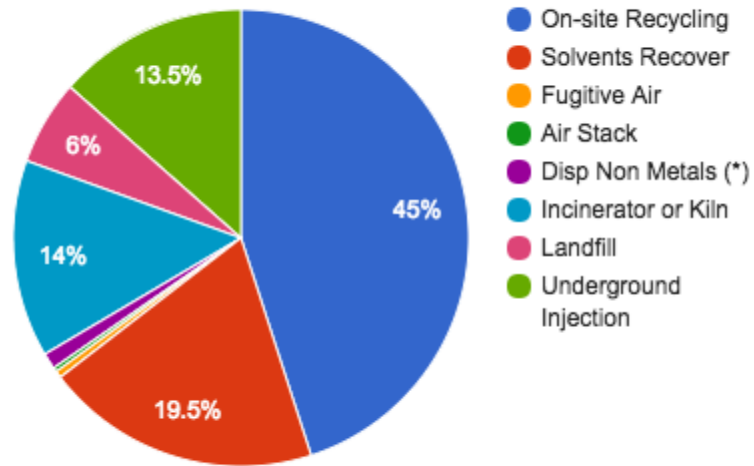
NMP generated at these facilities can be wasted on site in production plants, through air emissions, or down the road through inefficient recycling processes, landfilling, burning in cement kilns, underground injection or even discharge into a river⁷¹ and inefficient recycling practices.

HBN examined TRI data for the leading generators of NMP waste. The findings are summarized in Table 4,

Table 4. Fate of N-Methylpyrrolidone Releases			
Type	Total pounds (2012-2015, cumulative)	Leading Facility	Total pounds (2012-2015, cumulative)
On-site Recycling	43,716,982	Eden Custom Processing (Eden NC)	18,705,061
Solvents Recover	18,983,379	Solvay (Greenville SC)	8,410,356
All Recycling	62,700,361		
Fugitive Air	469,728	Eastman (Fieldale VA)	375,550
Air Stack	302,938	Avago Technologies (Fort Collins CO)	142,799
Disp Non Metals (*)	1,111,219	Eden Custom Processing (Eden NC)	936,481
Incinerator or Kiln	13,573,265	Veolia (Azusa CA)	3,642,046
Landfill	5,835,085	Fortron (North Wilmington NC)	5,772,348
Underground Injection	13,117,267	Texas Molecular (Deer Park TX)	6,350,006
All Disposal	34,409,502		

⁷¹ Fortron Industries (N. Wilmington NC) discharged 33,187 pounds of NMP into the Cape Fear River during the 2012-2016 period.

NMP Releases by Fate, 2012-2015



6. Health and Environmental Hazards Associated with N-Methylpyrrolidone

Hazards taken from Pharos CML, February 24, 2017

Hazards associated with CAS: 872-50-4 (CAS 51013-18-4 is listed as a synonym in Pharos - it has no additional hazards or lists beyond those captured for 872-50-4)

Purple hazards are of urgent concern to avoid; Red are very high concern to avoid; Orange are high concern to avoid. More details on hazards and hazard levels [here](#).

Hazard and Level	Sources
Human Health Hazards	
Developmental	<ul style="list-style-type: none"> ➤ EU - R-phrases - R61 - May cause harm to the unborn child ➤ CA EPA - Prop 65 - Developmental toxicity ➤ EU - GHS (H-Statements) - H360D - May damage the unborn child ➤ Australia - GHS - H360D - May damage the unborn child
Developmental	<ul style="list-style-type: none"> ➤ MAK - Pregnancy Risk Group C
Reproductive	<ul style="list-style-type: none"> ➤ EU - REACH Annex XVII CMRs - Toxic to Reproduction Category 2 - Substances which should be regarded as if they impair fertility or cause Developmental Toxicity in humans ➤ EU - SVHC Authorisation List - Toxic to reproduction - Candidate list ➤ New Zealand - GHS - 6.8A - Known or presumed human reproductive or developmental toxicants ➤ US EPA - PPT Chemical Action Plans - Reproductive toxicity - TSCA Criteria met ➤ EU - Annex VI CMRs - Reproductive Toxicity - Category 1B ➤ Korea - GHS - Reproductive toxicity - Category 1 [H360 - May damage fertility or the unborn child] ➤ Japan - GHS - Toxic to reproduction - Category 1B
Reproductive	<ul style="list-style-type: none"> ➤ Japan - GHS - Toxic to reproduction - Category 2
Eye Irritation	<ul style="list-style-type: none"> ➤ Korea - GHS - Serious eye damage/irritation - Category 2 [H319 - Causes serious eye irritation] ➤ Japan - GHS - Serious eye damage / eye irritation - Category 2A
Skin Irritation	<ul style="list-style-type: none"> ➤ Japan - GHS - Skin corrosion / irritation - Category 2
Organ Toxicant	<ul style="list-style-type: none"> ➤ Japan - GHS - Specific target organs/systemic toxicity following repeated exposure - Category 1

Consumer Appendix

Consumer Products Containing N-Methylpyrrolidone

Introduction. Below is a list of products sold on retail websites, and thus available for purchase by consumers, that have been verified to contain N-Methylpyrrolidone (NMP) (CASRN 872-50-4) from Material Safety Data Sheets (MSDSs) or Safety Data Sheets (SDSs). Note that this list does not include paint and coating removers, since EPA has already proposed a rule to address the unreasonable risks to human health presented by that use of NMP.

Methodology. To find these products, Safer Chemicals, Healthy Families staff searched on Google for MSDSs referring to “872-50-4,” including key words for certain relevant product types, and then confirmed the products described in the MSDSs are sold on major retailer websites such as www.amazon.com or www.walmart.com. We also conducted an advanced search via Google for these terms on The Home Depot’s website. An asterisk means the item is included in the “List of Products” in EPA’s February 2017 “Preliminary Information on Manufacturing, Processing, Distribution, Use, and Disposal” for NMP.

Notes. The product descriptions quoted below are from the seller’s website, unless otherwise noted. Safer Chemicals, Healthy Families has not verified the accuracy of the product descriptions.

CLEANERS

➤ *Barnes CR-10 Rifle and Hand Gun Bore Cleaning Solvent**



Product Description:

“ . . . effectively removes copper, powder and lead fouling from all of your firearms. Designed for rifles and hand guns this aggressive bore cleaner quickly loosens and lifts heavy copper deposits left by jacketed bullets as they pass through the bore

- “Non-corrosive and harmless to rifle barrels”

Sold At: <http://www.basspro.com/Barnes-CR10-Rifle-and-Hand-Gun-Bore-Cleaning-Solvent/product/120829053312401/>

Contains 5-10% NMP, according to the 2015 SDS:

<http://www.barnesbullets.com/files/2017/01/Barnes-Bullets-CR-10.pdf>

➤ ***Mothers Leather Cleaner****



Product Description:

“The perfect, smooth leather cleaner . . . Our chemists created Mothers Leather Cleaner, a pH balanced formula that safely lifts impregnated dirt, grime and stains from your precious leather interior.”

Sold At: <http://www.homedepot.com/p/Mothers-12-oz-Leather-Cleaner-Case-of-6-06412/205543090>

Contains <1% NMP by weight, according to the SDS:

<http://www.homedepot.com/catalog/pdfImages/fd/fd715fc1-0055-48cb-9fd6-29609b78185b.pdf>

PAINT OR PROTECTIVE COATINGS

➤ ***Giani Liquid Stainless Steel Appliance Paint Kit***



Product Description:

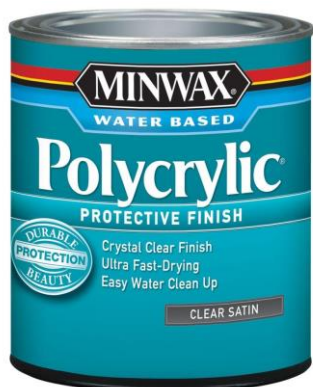
“The Kit will update both gas and electric ranges and any make and model of dishwasher. Liquid Stainless has low odor and cleans up easily with soap and water.”

Sold At: <http://www.homedepot.com/p/Giani-Liquid-Stainless-Steel-12-oz-Stainless-Steel-Appliance-Paint-Kit-FG-RDKIT-19-SQ-FT/204384591>

Contains 5-10% NMP by weight, according to the MSDS:

<http://www.homedepot.com/catalog/pdfImages/e2/e248053c-5856-4a6b-9f33-19d49164dfbc.pdf>

➤ **Minwax Polycrylic Protective Finish, Satin* (EPA lists a variant)**



Product Description:

“... a protective top-coat for use on interior wood surfaces including furniture, trim, doors and cabinets. It can be used over bare wood and both oil-based and water-based stains.”

Sold Via: <http://www.homedepot.com/p/Minwax-1-qt-Satin-Polycrylic-Protective-Finish-63333444/202061476>

Contains 1.6% NMP by weight, according to the SDS:

<http://www.homedepot.com/catalog/pdfImages/90/9098368e-beed-4b2b-967d-effd84e4d73d.pdf>

➤ **Rust-Oleum Automotive Vinyl and Fabric Sponge Applicator: Flexible Coating, Sand**



Product Overview:

“Restore color to faded or worn seats, dashboards, door panels, carpets and more with Rust-Oleum easy to use sponge applicator.”

Sold Via: <http://www.homedepot.com/p/Rust-Oleum-Automotive-4-oz-Sand-Vinyl-and-Fabric-Sponge-Applicator-279327/205755658>; also available in [black](#) (Limited shipping)

Contains 2.5-10% NMP by weight, according to page 1 of the SDS:

<http://www.homedepot.com/catalog/pdfImages/35/3516da57-3dd1-4bbe-8fcc-644f2f82f9f0.pdf>

➤ **Rust-Oleum Parks Water-Based Floor Polyurethane, Clear Gloss**



Product Description:

“... offers superior protection for all types of wood finishing. This fast-drying formula provides professional-grade quality and a crystal clear gloss finish...”

Sold At: <http://www.homedepot.com/p/Rust-Oleum-Parks-1-gal-Clear-Gloss-Water-Based-Polyurethane-258688/202521766>

Contains 1-2.5% NMP by weight, according to page 1 of the SDS:

<http://www.homedepot.com/catalog/pdfImages/8a/8a41dde2-4d0d-4ffa-a005-4672ab20af35.pdf>

➤ ***Rust-Oleum Peel Coat Peelable Primer Spray Paint***



Product Description:

“... a removable coating impervious to solvent aerosol penetration. Makes any Rust-Oleum Spray Paint a peelable coating for endless customization, color and finish updates.”

Sold At: <http://www.homedepot.com/p/Rust-Oleum-12-oz-Peel-Coat-Peelable-Primer-Spray-Paint-6-Pack-304611/300587652>

Contains 1-2.5% NMP by weight, according to the SDS:

<http://www.homedepot.com/catalog/pdfImages/0f/0fdf7a4e-ccdb-4e22-b03b-bc7389aeb766.pdf>

➤ ***Rust-Oleum Restore Cedar Solid Deck Stain with NeverWet***



Product Description:

“... requires only 1-coat for total coverage. NeverWet Properties in the formula extend the life of the deck by providing hydrophobic water beading and superior water repellency.”

Sold At: <http://www.homedepot.com/p/Rust-Oleum-Restore-1-gal-2X-Cedar-Solid-Deck-Stain-with-NeverWet-291353/205852701>

Contains 0.1-1% NMP by weight, according to the SDS:

<http://www.homedepot.com/catalog/pdfImages/0b/0b27c2d8-bf45-4a59-8dff-119e97d72178.pdf>

➤ ***Rust-Oleum Stops Rust LeakSeal Clear Spray***



Product Description:

“... an easy to use, rubberized protective utility coating designed to fill and seal leaks and cracks. It provides a water-tight, flexible seal that prevents moisture penetration, rust and corrosion.”

Sold At: <http://www.homedepot.com/p/Rust-Oleum-Stops-Rust-11-oz-LeakSeal-Clear-Spray-265495/203165633>

Contains 0.1-1% NMP by weight, according to the SDS:

<http://www.homedepot.com/catalog/pdfImages/59/5939d1de-740c-4341-829d-541ed1801dee.pdf>

➤ ***Rust-Oleum Stops Rust Multi-Colored Textured Caribbean Sand Protective Enamel Spray Paint***



Product Description:

“... instantly adds color and dimension. Whatever look you’re after from rugged to elegant to earthy you’ll find a color combination to fit your vision. Create a weather-resistant look that lasts and lasts.”

Sold At: <http://www.homedepot.com/p/Rust-Oleum-Stops-Rust-12-oz-Multi-Colored-Textured-Caribbean-Sand-Protective-Enamel-Spray-Paint-6-Pack-239121/202058556>

Contains 0.1-1% NMP by weight, according to the SDS:

<http://www.homedepot.com/catalog/pdfImages/5d/5d8a0670-f34f-492a-8bd3-e92e3082ac18.pdf>

➤ ***Seal-Krete Clear-Seal Low-Gloss Sealer***



Product Description:

“... designed to help protect bare and painted concrete floors in indoor and outdoor spaces. This product offers resistance to stains, chemicals and UV damage ...”

Sold At: <http://www.homedepot.com/p/Seal-Krete-1-gal-Clear-Seal-Low-Gloss-Sealer-365001/202563941>

Contains 0.1-1% NMP by weight, according to the SDS:

<http://www.homedepot.com/catalog/pdfImages/04/042ba658-26d9-4873-aabb-c9798e4f6e55.pdf>

➤ ***Shutter ReNu (sold as part of a kit)***



From the title:

“Get Beautiful Shutters Easily. Restores Original Factory Color To Faded Shutters. Immediate Results. No Toxic Odors. Looks Great And Protects Shutters For 10 Years.”

Sold At: <https://www.amazon.com/Shutter-Renu-Beautiful-Shutters-Immediate/dp/B00I81QK3E/>

Contains 1-3% NMP by weight, according the 2007 MSDS (a newer one was not publicly available but [can be requested from mfr.](#)):

<http://www.shuttercontractor.com/Documents/MSDS/oso-shutter-renu-msds.pdf>

➤ **Varathane Interior Polyurethane, Gloss, Amber**



Product Description:

“... the most durable finish for protecting wood surfaces and outperforms traditional Oil-based polyurethanes.”

Sold At: <http://www.homedepot.com/p/Varathane-1-2-pt-Gloss-Amber-Polyurethane-266239/203326117>; see also satin and semi-gloss finishes sold [here](#) and [here](#)

Contains 1-2.5% NMP by weight, according to the SDS: <http://www.homedepot.com/catalog/pdfimages/4f/4f6a0409-64f3-40e3-8c28-72766a99b3d5.pdf>

➤ **Varathane Water-Based Floor Polyurethane, Clear Gloss**



Product Description:

“Low odor, self-leveling formula provides superior scuff, scratch and stain resistance.”

Sold At: <http://www.homedepot.com/p/Varathane-1-gal-Clear-Gloss-Water-Based-Floor-Polyurethane-Case-of-2-230031/202057139>

Contains 2.5-10% NMP by weight, according to the SDS: <http://www.homedepot.com/catalog/pdfimages/c6/c69bc513-b3d1-4c89-9d5b-1c1f8db9781e.pdf>

➤ **Vinyl ReNu (sold as part of a kit)**



From the [MSDS](#): “A water-based architectural protective coating, for vinyl siding.”

Sold At: <https://www.amazon.com/Vinyl-Renu-1-Gallon-Kit/dp/B01H5SSLX2/>

Contains 1-3% NMP by weight, according the 2007 MSDS (a newer one was not publicly available but [can be requested from mfr.](#)): <http://www.shuttercontractor.com/Documents/MSDS/oso-vinyl-renu-msds.pdf>

Glue Remover

➤ *Goof Off Super Glue Remover**



Product Description:

“ . . . perfect for the home, garage, toolbox, workshop and the workplace. The exclusive formula quickly cuts through the toughest cured adhesives and glues.”

Sold At: <http://www.homedepot.com/p/Goof-Off-4-oz-Super-Glue-Remover-FG677/204055736>

Contains 10-20% NMP, according to the SDS:

<http://www.homedepot.com/catalog/pdfimages/77/773c22f7-aecd-4500-ba6f-52c99d6a16f5.pdf>

CDR Uses Appendix

CDR Company	Industrial sector	Industrial function	Type of process or use	%
Superior Oil Company (Indianapolis, IN)	IS10 Printing and related support activities	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	61
Superior Oil Company (Indianapolis, IN)	IS10 Printing and related support activities	U005 Anti-adhesive agents	PF Processing—incorporation into formulation, mixture, or reaction product	1
Superior Oil Company (Indianapolis, IN)	IS10 Printing and related support activities	U029 Solvents (for cleaning and degreasing)	PF Processing—incorporation into formulation, mixture, or reaction product	21
Lyondell Chemical Company (Channel View, TX)	IS15 Petrochemical manufacturing	U025 Processing aids, specific to petroleum production	U Use—non-incorporative activities	14
BASF Corporation (Geismar, LA)	IS15 Petrochemical manufacturing	U025 Processing aids, specific to petroleum production	U Use—non-incorporative activities	3
BYK - Chemie USA (Wallingford, CT)	IS2 Oil and gas drilling, extraction, and support activities	U999 Additive	PF Processing—incorporation into formulation, mixture, or reaction product	100
Lyondell Chemical Company (Channel View, TX)	IS21 All other basic organic chemical manufacturing	NKRA	NKRA	5
BYK - Chemie USA (Wallingford, CT)	IS22 Plastic material and resin manufacturing	U999 Plastic additive	PF Processing—incorporation into formulation, mixture, or reaction product	3
Fujifilm Hunt Chemicals USA (Dayton, TN)	IS22 Plastic material and resin manufacturing	U026 Processing aids, not otherwise listed	PF Processing—incorporation into formulation, mixture, or reaction product	0
BASF Corporation (Geismar, LA)	IS22 Plastic material and resin manufacturing	U015 Intermediates	PC Processing as a reactant	91
Univar USA (Redmond, WA)	IS22 Plastic material and resin manufacturing	U029 Solvents (for cleaning and degreasing)	PF Processing—incorporation into formulation, mixture, or reaction product	0
Lyondell Chemical Company (Channel View, TX)	IS25 Pesticide, fertilizer, and other agricultural chemical manufacturing	U030 Solvents (which become part of product formulation or mixture)	U Use—non-incorporative activities	0
BASF Corporation (Geismar, LA)	IS25 Pesticide, fertilizer, and other agricultural chemical manufacturing	U026 Processing aids, not otherwise listed	U Use—non-incorporative activities	0
Univar USA (Redmond, WA)	IS25 Pesticide, fertilizer, and other agricultural chemical manufacturing	NKRA	NKRA	100
Prochimie International (Windsor, CT)	IS26 Pharmaceutical and medicine manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	95
BASF Corporation (Geismar, LA)	IS26 Pharmaceutical and medicine manufacturing	U015 Intermediates	PC Processing as a reactant	5
Tedia Company Inc (Fairfield, OH)	IS26 Pharmaceutical and medicine manufacturing	U013 Functional fluids (closed systems)	NKRA	100
BYK - Chemie USA (Wallingford, CT)	IS27 Paint and coating manufacturing	U034 Paint additives and coating additives not described by other categories	PF Processing—incorporation into formulation, mixture, or reaction product	NKRA
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS27 Paint and coating manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	100
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS27 Paint and coating manufacturing	U034 Paint additives and coating additives not described by other categories	U Use—non-incorporative activities	100
MC International LLC (Miami, FL)	IS27 Paint and coating manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	100
PPG Industries - Packaging Warehouse (Belle Vernon, PA)	IS27 Paint and coating manufacturing	U030 Solvents (which become part of product formulation or mixture)	U Use—non-incorporative activities	
BYK - Chemie USA (Wallingford, CT)	IS28 Adhesive manufacturing	U002 Adhesives and sealant chemicals	PF Processing—incorporation into formulation, mixture, or reaction product	100
Wego Chemical & Mineral Corp	IS29 Soap, cleaning compound, and toilet preparation manufacturing	U031 Surface active agents	PF Processing—incorporation into formulation, mixture, or reaction product	60
Univar USA (Redmond, WA)	IS29 Soap, cleaning compound, and toilet preparation manufacturing	U029 Solvents (for cleaning and degreasing)	PF Processing—incorporation into formulation, mixture, or reaction product	40
Univar USA (Redmond, WA)	IS29 Soap, cleaning compound, and toilet preparation manufacturing	NKRA	NKRA	100
GreenChem - parent redacted (West Palm Beach, FL)	IS29 Soap, cleaning compound, and toilet preparation manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	60
BYK - Chemie USA (Wallingford, CT)	IS30 Printing ink manufacturing	U034 Paint additives and coating additives not described by other categories	PF Processing—incorporation into formulation, mixture, or reaction product	30
Ashland, Inc - ISP Technologies (Texas City, TX)	IS34 All other chemical product and preparation manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	0
Ashland, Inc - ISP Technologies (Texas City, TX)	IS34 All other chemical product and preparation manufacturing	U029 Solvents (for cleaning and degreasing)	PF Processing—incorporation into formulation, mixture, or reaction product	0
Cadence Chemical Corporation (Stamford, CT)	IS34 All other chemical product and preparation manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	0
Norman Fox & Co (Industry, CA)	IS34 All other chemical product and preparation manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	0
Solvchem, Inc - Solvents & Chemicals (Pearland, TX)	IS34 All other chemical product and preparation manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	0
Univar USA (Redmond, WA)	IS34 All other chemical product and preparation manufacturing	NKRA	NKRA	0
BYK - Chemie USA (Wallingford, CT)	IS35 Plastics product manufacturing	U999 Plastic additive	PA Processing—incorporation into article	100
Superior Oil Company (Indianapolis, IN)	IS37 Nonmetallic mineral product manufacturing (includes clay, glass, cement)	U029 Solvents (for cleaning and degreasing)	PF Processing—incorporation into formulation, mixture, or reaction product	100
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS38 Primary metal manufacturing	U034 Paint additives and coating additives not described by other categories	U Use—non-incorporative activities	
Univar USA (Redmond, WA)	IS38 Primary metal manufacturing	U029 Solvents (for cleaning and degreasing)	PF Processing—incorporation into formulation, mixture, or reaction product	100
Hubbard-Hall Inc (Waterbury, CT)	IS39 Fabricated metal product manufacturing	U023 Plating agents and surface treating agents	PF Processing—incorporation into formulation, mixture, or reaction product	100
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS39 Fabricated metal product manufacturing	U034 Paint additives and coating additives not described by other categories	U Use—non-incorporative activities	100
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS40 Machinery manufacturing	U034 Paint additives and coating additives not described by other categories	U Use—non-incorporative activities	redacted
Superior Oil Company (Indianapolis, IN)	IS40 Machinery manufacturing	U029 Solvents (for cleaning and degreasing)	PF Processing—incorporation into formulation, mixture, or reaction product	redacted
Toyota Industries Compressor Parts (Pendergrass, GA)	IS40 Machinery manufacturing	U017 Lubricants and lubricant additives	PA Processing—incorporation into article	redacted
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS41 Computer and electronic product manufacturing	U034 Paint additives and coating additives not described by other categories	U Use—non-incorporative activities	redacted
BASF Corporation (Geismar, LA)	IS41 Computer and electronic product manufacturing	U026 Processing aids, not otherwise listed	U Use—non-incorporative activities	redacted
Lyondell Chemical Company (Channel View, TX)	IS42 Electrical equipment, appliance, and component manufacturing	U029 Solvents (for cleaning and degreasing)	U Use—non-incorporative activities	redacted
Elantans Pdg Inc (St Louis, MO)	IS42 Electrical equipment, appliance, and component manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	49
BASF Corporation (Florham Park, NJ)	IS43 Transportation equipment manufacturing	U034 Paint additives and coating additives not described by other categories	PA Processing—incorporation into article	redacted
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS43 Transportation equipment manufacturing	U034 Paint additives and coating additives not described by other categories	U Use—non-incorporative activities	16
Superior Oil Company (Indianapolis, IN)	IS43 Transportation equipment manufacturing	U029 Solvents (for cleaning and degreasing)	PF Processing—incorporation into formulation, mixture, or reaction product	8
Univar USA (Redmond, WA)	IS43 Transportation equipment manufacturing	U030 Solvents (which become part of product formulation or mixture)	PF Processing—incorporation into formulation, mixture, or reaction product	6
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS45 Miscellaneous manufacturing	U034 Paint additives and coating additives not described by other categories	U Use—non-incorporative activities	4

Univar USA (Redmond, WA)	IS45	Miscellaneous manufacturing	NKRA		NKRA		3
XALT Energy LLC (Midland, MI)	IS45	Miscellaneous manufacturing	U030	Solvents (which become part of product formulation or mixture)	PF	Processing—incorporation into formulation, mixture, or reaction product	3
Lyondell Chemical Company (Channel View, TX)	IS46	Wholesale and retail trade	NKRA		NKRA		2
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS46	Wholesale and retail trade	U034	Paint additives and coating additives not described by other categories	U	Use—non-incorporative activities	1
BASF Corporation (Geismar, LA)	IS46	Wholesale and retail trade	NKRA		PK	Processing—repackaging	1
Superior Oil Company (Indianapolis, IN)	IS46	Wholesale and retail trade	U030	Solvents (which become part of product formulation or mixture)	PF	Processing—incorporation into formulation, mixture, or reaction product	
Superior Oil Company (Indianapolis, IN)	IS46	Wholesale and retail trade	U029	Solvents (for cleaning and degreasing)	PF	Processing—incorporation into formulation, mixture, or reaction product	100
Univar USA (Redmond, WA)	IS46	Wholesale and Retail Trade	NKRA		NKRA		100
Tedia Company Inc (Fairfield, OH)	IS46	Wholesale and retail trade	U033	Laboratory chemicals	NKRA		100
Superior Oil Company (Indianapolis, IN)	IS47	Services	U029	Solvents (for cleaning and degreasing)	PF	Processing—incorporation into formulation, mixture, or reaction product	25
Superior Oil Company (Indianapolis, IN)	IS47	Services	U999	Other (Chemical recovery)	PF	Processing—incorporation into formulation, mixture, or reaction product	18
Tedia Company Inc (Fairfield, OH)	IS47	Services	U033	Laboratory chemicals	NKRA		9
BYK - Chemie USA (Wallingford, CT)	IS48	Other (Abrasives manufacturing)	U999	Additive - rheology	PA	Processing—incorporation into article	13
Whitford Worldwide - Whitford Corp (Elverson, PA)	IS5	Construction	U034	Paint additives and coating additives not described by other categories	U	Use—non-incorporative activities	7
Stahi - Permuthane Division (Peabody, MA)	IS7	Textiles, apparel, and leather manufacturing	U030	Solvents (which become part of product formulation or mixture)	PA	Processing—incorporation into article	10
Silver Fern Chemical (Seattle, WA)	NKRA		NKRA		NKRA		5
Brenntag Pacific (Sante Fe Springs, CA)	NKRA		NKRA		NKRA		5
MC International LLC (Miami, FL)	NKRA		U030	Solvents (which become part of product formulation or mixture)	PA	Processing—incorporation into article	8
TRInternational - parent redacted (Seattle, WA)	NKRA		NKRA		NKRA		NKRA
GreenChem - parent redacted (West Palm Beach, FL)	NKRA		NKRA		NKRA		50
Brenntag Mid-South Inc (Henderson, KY)							100
Solvay USA Inc (Princeton, NJ)							100
Allchem Industries (Gainesville, FL)							100
Compiled by Healthy Building Network, based on CDR reports (2012-2015) filed with EPA.							