MATERIAL SAFETY DATA SHEET

Pyridine

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier **Pyridine**

Synonyms: Azabenzene; Azine; Pyridine 1°; Pyridine ACS

Chemical Abstracts Registry No: 110-86-1

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

Manufacture of substances, formulation of preparations, use as processing aid, use as intermediate; use in laboratory, use in closed systems.

1.3. Details of the supplier of the safety data sheet

M/s Shakambari Aromatics Private Limited
Village: Dudiya-Matewa, Tehsil: Gunderdehi
District: Balod, Chhattisgarh: 491225, India
Ph: +91 95893 77899

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

(According to Regulation (EC) No 1272/2008, 29 CFR 1910.1200 and the Globally Harmonized System)

Flammable Liquids Category 2
Skin Corrosion/Irritation Category 2
Serious Eye Irritation Category 2
Acute Toxicity Inhalation Vapour Category 4
Acute Toxicity Dermal Category 4
Acute Toxicity Oral Category 4

SAFETY DATASHEET

2.2. Label elements

Hazard Symbols (Pictogram):

Signal Word: Danger

Hazard Precautions:
H225 - Highly flammable liquid and vapour.
H302+H312+H332 - Harmful if swallowed, in contact with skin or if inhaled.
H315 - Causes skin irritation.
H319 - Causes serious eye irritation.

Prevention Precautionary Statements:
P210 - Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
P240 - Ground/bond container and receiving equipment.
P241 - Use explosion-proof electrical/ventilating/lighting/telecommunication/computer/ equipment.
P242 - Use only non-sparking tools.
P243 - Take precautionary measures against static discharge.
P270 - Do not eat, drink or smoke when using this product.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P233 - Keep container tightly closed.

First Aid Precautionary Statements:
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 - Call a POISON CENTER or doctor/physician if you feel unwell.
P302+P352 - IF ON SKIN: Wash with plenty of soap and water.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P362 - Take off contaminated clothing and wash before reuse.

2.3. Other hazards

Other Hazards: Olfactory fatigue may occur, therefore odor is an unreliable guide to concentration in the air.

SECTION 3: Composition/information on ingredients

3.1. Substances or 3.2. Mixtures

Ingredient	CAS Number	Concentration (weight %)	EC Number	CLP Inventory/ Annex VI	EU CLP Classification (1272/2008)
Pyridine	110-86-1	~ 100	203-809-9	613-002-00-7	Acute Tox. 4; H312 Acute Tox. 4; H302 Acute Tox. 4; H332 Eye Irrit. 2; H319 Flam. Liq. 2; H225 Skin Irrit. 2; H315

NOTE: See Section 8 for exposure limit data for these ingredients. See Section 15 for trade secret information (where applicable). See Section 16 for the full text of the R-phrases above.

SAFETY DATA SHEET

SECTION 4: First aid measures

4.1. Description of first aid measures

Skin Contact: Wash exposed area twice with soap and water. The exposed area should be examined by medical personnel if irritation or pain persists after the area has been washed.

Eye Contact: Rinse eyes immediately with large amounts of water for at least 15 minutes, occasionally lifting the eyelids. GET MEDICAL ATTENTION.

Inhalation: Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Keep affected person warm and at rest. GET MEDICAL ATTENTION.

Ingestion: If swallowed, contact physician or poison control center immediately. Give oxygen if respiration is shallow. GET MEDICAL ATTENTION. Do not give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration.

4.2 Most important symptoms and effects, both acute and delayed

Acute: Pyridine is moderately to severely irritating to skin, eyes and mucous membranes. Vapors may be irritating to the respiratory tract. Pyridine is readily absorbed through the skin. Extended exposure (e.g. from saturated clothing) may lead to systemic poisoning. Symptoms may include headache, dizziness, drowsiness, nausea, and other effects. Symptoms seen after inhalation overexposures are expected to be essentially the same as those listed previously. Ingestion of several ounces of pyridine has resulted in severe vomiting, diarrhea, high fever, delirium and death. Ingestion is not likely to be a primary route of exposure.

Delayed Effects: None known.

4.3. Indication of any immediate medical attention and special treatment needed

Note to Physician: No specific indications. Treatment should be based on the judgment of the physician in response to the reactions of the patient.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Appropriate Extinguishing Media: Alcohol foam, Carbon dioxide, Dry chemical, Use water to cool and dilute from as far a distance as possible.

5.2. Special hazards arising from the substance or mixture

Hazardous Products of Combustion: Toxic vapors may be released upon thermal decomposition (cyanides, nitrogen oxides, carbon monoxide).

Potential for Dust Explosion: Not applicable.

Special Flammability Hazards: Severe explosion hazard in the form of vapor (within flammability limits) when exposed to heat, flame or static discharge.

5.3. Advice for firefighters

Basic Fire Fighting Guidance: Wear self-contained breathing apparatus and full protective clothing (i.e., Bunker gear). Skin and eye contact should be avoided. Normal fire fighting procedures may be used.

SAFETY DATA SHEET

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuation Procedures: Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Special Instructions: See Section 8 for personal protective equipment recommendations. Remove all contaminated clothing to prevent further absorption. Decontaminate affected personnel using the first aid procedures in Section 4. Leather shoes that have been saturated must be discarded. US NIOSH has established an "Immediately Dangerous to Life and Health" level of 1000 ppm for Pyridine.

6.2. Environmental precautions

Prevent releases to soils, drains, sewers and waterways.

6.3. Methods and material for containment and cleaning up

Remove all ignition sources. Ventilate the area of spill or leak. Wear protective equipment during clean-up. For small spills, use suitable absorbent material and collect for later disposal. For large spills, the area may require diking to contain the spill. Material can then be collected (eg., suction) for later disposal. After collection of material, flush area with water. Dispose of the material in accordance with standard practice for disposal of potentially hazardous materials as required by applicable federal, state or local laws.

6.4. Reference to other sections

Refer to section 8 for information on selecting personal protective equipment. Refer to section 13 for information on spilled product, absorbent and clean up material disposal instructions.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for Unique Hazards: Not applicable.

Practices to Minimize Risk: Wear appropriate protective equipment when performing maintenance on contaminated equipment. Wash hands thoroughly before eating or smoking after handling this material. Do not eat, drink or smoke in work areas. Prevent contact with incompatible materials. Avoid spills and keep away from drains. Handle in a manner to prevent generation of aerosols, vapors or dust clouds.

Special Handling Equipment: Not applicable.

7.2. Conditions for safe storage, including any incompatibilities

Storage Precautions & Recommendations: Maintain dry, ventilated conditions for storage. Protect containers against physical damage. Outside or detached storage is preferable. Inside storage should be in standard flammable liquids storage room or cabinet.

Dangerous Incompatibility Reactions: Avoid contact with strong acids and oxidizing agents.

Incompatibilities with Materials of Construction: May cause some forms of plastics and rubbers to deteriorate.

7.3. Specific end use(s)

If a chemical safety assessment has been completed an exposure scenario is attached as an annex to this Safety Data Sheet. Refer to this annex for the specific exposure scenario control parameters for uses identified in subsection 1.2.

SAFETY DATA SHEET

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Country	Occupational Exposure Limit
Australia, Canada - Quebec, New Zealand, Singapore	5 ppm (16 mg/m^3) as 8 hour limit value
Denmark, France, Ireland, Switzerland	5 ppm (15 mg/m^3) as 8 hour limit value; 10 ppm (30 mg/m^3) as 15 minute limit value
European Union, Latvia, USA - NIOSH, USA - OSHA PEL	5 ppm (15 mg/m^3) as 8 hour limit value
Belgium, Canada - Ontario, Spain, USA - ACGIH TLV	1 ppm (3.3 mg/m^3) as 8 hour limit value
Austria	5 ppm (15 mg/m^3) as 8 hour limit value; 20 ppm (60 mg/m^3) as 15-minute short-term limit
Hungary	15 mg/m^3 as 8 hour limit value; 30 mg/m^3 as 15 minute limit value
China	4 mg/m^3 as 8 hour limit value
Poland	5 mg/m^3 as 8 hour limit value
South Korea	2 ppm (6 mg/m^3) as 8 hour limit value
Sweden	2 ppm (7 mg/m^3) as 8 hour limit value; 10 ppm (30 mg/m^3) as 15 minute limit value
Netherlands	0.9 mg/m^3 as 8 hour limit value
United Kingdom	5 ppm (16 mg/m^3) as 8 hour limit value; 10 ppm (30 mg/m^3) as 15 minute short term limit

Air Monitoring Method: Collection media: Charcoal; Analysis Method: GC/FID

Derived No Effect Levels (DNELs) – Workers:

Route	DNEL
Acute - systemic effects (dermal)	0.42 mg/kg bw/day
Acute - systemic effects (inhalation)	22.8 mg/m^3
Long-term - systemic effects (dermal)	0.14 mg/kg bw/day
Long-term - systemic effects (inhalation)	7.6 mg/m^3
Acute and long-term - local effects (dermal, inhalation)	Qualitative assessment - skin / eye irritant

Derived No Effect Levels (DNELs) – General Population:

Route	DNEL
Acute - systemic effects (oral, dermal, inhalation)	No applications involving general population
Long-term - systemic effects (dermal)	0.07 mg/kg bw/day
Long-term - systemic effects (inhalation)	1.9 mg/m^3
Long-term - systemic effects (oral)	0.07 mg/kg bw/day
Acute and long-term - local effects (dermal, inhalation)	No applications involving general population

Predicted No Effect Concentrations (PNECs):

Route	PNEC
PNEC aqua (freshwater)	0.3 mg/L
PNEC aqua (marine water)	0.03 mg/L
PNEC aqua (intermittent releases)	3 mg/L
PNEC aqua (STP)	2 mg/L
PNEC sediment (freshwater)	3.2 mg/kg sediment dw
PNEC sediment (marine water)	0.32 mg/kg sediment dw
PNEC soil	0.46 mg/kg soil dw
PNEC oral (wildlife exposures)	Derivation waived - no potential for bioaccumulation

8.2. Exposure controls

Also see the annex to this SDS (if applicable) for specific exposure scenario controls.

Intermediate Status: Where the substance has been registered as an isolated intermediate (on-site or transported), this safety data sheet is consistent with the specific conditions relied on to justify the registration in accordance with Article 17 or 18 of regulation (EC) No 1907/2006.

Other Engineering Controls: All operations should be conducted in well-ventilated conditions. Local exhaust ventilation should be provided.

Personal Protective Equipment: Use NIOSH approved chemical cartridge-respirator or supplied air breathing equipment. Chemical goggles should be worn at all times; use face shields as conditions warrant. Neoprene, nitrile or PVC-coated gloves (Standard EN 374). Safety glasses or chemical goggles (Standard EN166). Chemical resistant clothing (Standard EN368). Impervious clothing and boots.

Respirator Caution: Observe OSHA regulations for respirator use (29 CFR 1910.134). Air-purifying respirators must not be used in oxygen-deficient atmospheres.

Thermal Hazards: Not applicable.

Environmental Exposure Controls: The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance, State & Odor (ambient temperature): Colorless to yellow liquid with a strong, unpleasant fish-like odor.

Molecular Formula:	C_5H_5N	**Molecular Weight:**	79.10
Vapor Pressure:	20 mm Hg @ 25°C	**Evaporation Rate:**	No data available.
Specific Gravity or Density:	0.982 @ 20°C	**Vapor Density (air = 1):**	2.72
Boiling Point:	115.2 °C @ 1.013 kPa	**Freezing / Melting Point:**	-41.6 °C

Solubility in Water:	1000 g/L @ 20°C	**Octanol / Water Coefficient:**	0.64 @ 20°C
pH:	pKa = 5.2	**Odor Threshold:**	< 1 ppm
Viscosity:	0.879 mPa • s	**Autoignition Temperature:**	900°F
Flash Point and Method:	66°F (20°C) Tag Closed Cup	**Flammable Limits:**	1.8 (LEL) – 12.4% (UEL)
Flammability (solid, gas):	Not applicable.	**Decomposition Temperature:**	Not applicable
Explosive Properties:	Not explosive.	**Oxidizing Properties:**	Not an oxidizer.

SECTION 10: Stability and reactivity

10.1. Reactivity Not classified as dangerously reactive.

10.2. Chemical stability Stable

10.3. Possibility of hazardous reactions Will not occur.

10.4. Conditions to avoid Uncontrolled exposure to high temperatures. Static discharge or any ignition source

10.5. Incompatible materials Avoid contact with strong acids and oxidizing agents.

10.6. Hazardous decomposition products Toxic vapors may be released upon thermal decomposition (cyanides, nitrogen oxides, carbon monoxide).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute Oral LD_{50}:	800 - 1600 mg/kg (rat) 1500 mg/kg (rat) 891 mg/kg (rat)	Clayton & Clayton 1994 [KEY] Buhler 1990 Trochimowitz 1994
Acute Dermal LD_{50}:	1000 - 2000 mg/kg (rabbit)	Pullin 1973 [KEY]
Acute Inhalation LC_{50}:	4900 - 6000 ppm (rat, 4 hours) 9010 - 9020 ppm (rat, 1 hour)	Kinney 1984 [KEY] Vernot 1977

Skin Irritation: This substance is judged by a weight of evidence to be irritating to the skin. (Costello 1983 - KEY)

Eye Irritation: Highly irritating to eyes. (Clayton and Clayton 1994)

Skin Sensitization: Not sensitizing (Weight of evidence)

Mutagenicity: Genotoxic activity was absent (i.e., DNA lesions were not induced and mutagenic activity was not induced) when tested using the following tests: DNA single-strand breaks measurement in V79 cells, HGPRT gene mutation assay in V79 cells, and Salmonella/microsome test. The only exception was a positive response in one of nine Ames assays which was conducted using a single, unusual strain of Salmonella. Pyridine's lack of mutagenic effect is supported by a number of in vivo mutagenicity assays, such as chromosomal aberration, mouse micronucleus, unscheduled DNA synthesis, and sex-linked recessive lethal mutation assays. (Vleminckx 1993a, b, c)

Reproductive / Developmental Toxicity: Pyridine was investigated in an OECD 421 study using oral gavage as the route of administration of doses 12, 25, and 50 mg/kg/ bw/d in rats. Generalized toxicity was observed at all doses, as noted by

mild elevations in liver weights. There were no adverse effects on epididymides and testes of the males, nor of ovaries or uterus in the females, nor were there obvious effects of treatment on mating performance, fertility or duration of gestation. The NOAEL was > 50 mg/kg bw/d, the highest dose tested. This study indicates that there is no adverse reproductive toxicity at doses several-fold higher than doses causing generalized toxicity in the adults. (Yuill 2008)

Carcinogenicity: In a two-year drinking water study in mice, pyridine was reported to increase the incidence of hepatocellular carcinomas and hepatoblastomas. In male Fischer 344 rats, pyridine was reported to increase the incidence of renal tubule adenomas, but this was not observed in male Wistar rats. (NOTE: These studies were audited for data quality and several major concerns have been noted. Tumor incidence rates in control rats reached 76 to 84%. There is also evidence that normal metabolic pathways were saturated, leading to results of questionable biological significance.)
No increase in tumor incidence at any site was observed in rats following subcutaneous injection of pyridine for one year. (NTP 1997) Two studies conducted with genetically modified mice showed no treatment-related increase in tumors. No scientific study supports an association between pyridine and cancer in humans. IARC reviewed all of the available carcinogenicity data and concluded that pyridine is not classifiable as to its carcinogenicity in humans (Group 3). (IARC 2000) Pyridine has NOT been listed in the NTP's Report on Carcinogens.

Target Organs: Several repeated dose toxicity tests have been performed in mice and rats, both as gavage and drinking water studies. Most tests showed evidence of adverse liver effects after subchronic/chronic oral exposures; there were isolated reports of kidney, cardiac, blood and reproductive effects, but these endpoints were not as reproducibly observed as liver effects. NOAEL levels ranged from 1 to 15 mg/kg/day in gavage and drinking water studies conducted from 13 weeks to 2 years in duration. A single subchronic inhalation study showed development of olfactory lesions in rats exposed to levels exceeding regulatory exposure limits over a 4-day period.

Aspiration Hazard: No data available.

Primary Route(s) of Exposure: Skin contact and absorption, eye contact, and inhalation. Ingestion is not likely to be a primary route of exposure.

Most important symptoms and effects, both acute and delayed Pyridine is moderately to severely irritating to skin, eyes and mucous membranes. Vapors may be irritating to the respiratory tract. Pyridine is readily absorbed through the skin. Extended exposure (e.g. from saturated clothing) may lead to systemic poisoning. Symptoms may include headache, dizziness, drowsiness, nausea, and other effects. Symptoms seen after inhalation overexposures are expected to be essentially the same as those listed previously. Ingestion of several ounces of pyridine has resulted in severe vomiting, diarrhea, high fever, delirium and death. Ingestion is not likely to be a primary route of exposure. Delayed Effects: None known.

Additive or Synergistic effects: None known.

SECTION 12: Ecological information

12.1. Toxicity

LC_{50} *Pimephales promelas* (fathead minnow) = 99 mg/L/96 h	Broderius 1995
EC_{50} *Brachdanio rerio* (Zebra fish) = 560 - 1000 mg/L/96 h	Weytjens 1991a (on 3-Methylpyridine) [KEY]
NOEC *Brachdanio rerio* (Zebra fish) = 560 mg/L	(mortality) Weytjens 1991a (on 3-Methylpyridine)
NOEC *Brachdanio rerio* (Zebra fish) = 320 mg/L	(behavioral) Weytjens 1991a (on 3-Methylpyridine)
EC_{50} *Daphnia magna* = 180 - 320 mg/L/24 h	Weytjens 1991b (on 3-Methylpyridine) [KEY]
EC_{50} *Daphnia magna* = 320 mg/L/48 h	Weytjens 1991b (on 3-Methylpyridine)
NOEC *Daphnia magna* = 180 mg/L	(mobility) Weytjens 1991b (on 3-Methylpyridine)
EC_{50} *Selenastrum capricornutum* (algae) = 320 mg/L/72 h	(growth rate) Weytjens 1991C (on 3-Methylpyridine) [KEY]

12.2. Persistence and degradability Pyridine was tested in several guideline biodegradability protocols, along with many other chemical substances in a comparison of the effectiveness of the protocols to simulate biodegradation situations.

Pyridine displayed over 97% biodegradation rates in the Coupled Units (OECD 303A), Sturm (OECD 301B) and Zahn-Wellens (OECD 302B) tests. Some biodegradation (15%) was found in the MITI (OECD 301C) test, but the value was below the "pass" criteria. No biodegradation was observed in the OECD 301A and 301D (screening) tests. The conclusion is that pyridine is biodegradable in some but not all guideline test protocols. [Gerike and Fischer 1979]

12.3. Bioaccumulative potential The Bioconcentration Factor (BCF) for pyridine was estimated as 3.162 L/kg wet weight (log BCF = 0.500), and indicates that this substance has a low potential for bioaccumulation in both aquatic and terrestrial habitats.

12.4. Mobility in soil The adsorbability of pyridine was 0.095 g/g activated charcoal. [Verschueren 1983] The estimated Koc for pyridine was 71.72 L/kg (equivalent to log Koc = 1.8557).

12.5. Results of PBT and vPvB assessment This substance is not a PBT or vPvB.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

US EPA Waste Number: U196, D038, D001

Waste Classification: (per US regulations) Ignitable. The waste may be a characteristic hazardous waste.

Waste Disposal: NOTE: Generator is responsible for proper waste characterization. State hazardous waste regulations may differ substantially from federal regulations. Dispose of this material responsibly, and in accordance with standard practice for disposal of potentially hazardous materials as required by applicable international, national, regional, state or local laws, and environmental protection duty of care principles. Do NOT dump into any sewers, on the ground, or into any body of water. For disposal within the EC, the appropriate classification code according to the European Community List of Wastes should be used. Note that disposal regulations may also apply to empty containers and equipment rinsates.

SECTION 14: Transport information

The following information applies to all shipping modes (DOT/IATA/ICAO/IMDG/ADR/RID/ADN), unless otherwise indicated:

14.1. UN number	UN1282	**14.2. UN proper shipping name**	Pyridine
14.3. Transport hazard class(es)	3	**14.4. Packing group**	PG II
14.5. Environmental hazards	Not applicable		
14.6. Special precautions for user	Not applicable.		
NA Emergency Guidebook Numbers:	129	**IMDG EMS:**	S-D; F-E
14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code			Pollution Category Y; Ship Type 2

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Chemical Inventory Lists:	**Status:**		
USA TSCA:	Listed	**EINECS:**	203-809-9
Canada(DSL/NDSL):	DSL	**Japan:**	5-710
Korea:	KE-29929	**Australia:**	Listed

SAFETY DATA SHEET

China:	Listed	**Philippines:**	Listed
Taiwan:	Listed	**New Zealand:**	Listed

WHMIS Classification: Class B, Division 2: Flammable Liquid.
Class D, Division 2, Subdivision B: Irritant.

German Water Hazard Classification: ID Number 179, hazard class 2 - hazard to waters *(Pyridin)*

SARA 313: Pyridine = 1.0 percent de minimis concentration

Reportable Quantities: 1000 lbs. (121.5 gallons)

State Regulations:

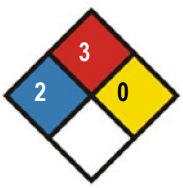
- Pyridine is listed on California's Proposition 65 list, requiring this warning: This chemical is known to the State of California to cause cancer. However, this listing was made based on an automatic regulatory listing, triggered solely by the publication of an NTP Technical Report. California did not undertake any risk analysis of pyridine, nor evaluate data quality of the report, before listing pyridine on Prop 65. As mentioned earlier in the Carcinogenicity section (Section 11), significant concerns have been raised regarding the relevance of the results of this study. Please contact Vertellus Agriculture & Nutrition Specialties LLC. for further information regarding our concerns with the NTP Technical Report and the California listing process.
- This product contains chemicals listed on the Massachusetts Substance List for Right-to-Know Law.
- This product contains chemicals listed on the Minnesota Hazardous Substances List.
- This product contains chemicals listed on the New Jersey Department of Health Hazard Right-to-Know Program Hazardous Substance List.
- This product contains chemicals listed on the New York State List of Hazardous Substances.
- This product contains chemicals listed on the Pennsylvania Department of Labor and Industry Hazardous Substance List.
- This product contains chemicals listed on the Rhode Island Hazardous Substance List.

Other Regulatory Listings:

- Canada: National Pollutant Release Inventory, 2011. Including salts. Part 1A substance.
- Hong Kong: Hazardous Chemicals Control Ordinance - Dangerous Goods List, 2007. Category 5, Cl. 1, Div. 2; Exempt quantity: 20 L; Label: B1
- Japan: Law for PRTR and Promotion of Chemical Management (Kakan-Ho), 2009. Class I Designated Chemical Substance.
- Mexico: Registry of Industrial Pollution and Transfer (RETC), Aug 2006.
- Pakistan: List of Prescribed Hazardous Chemicals, 2003.
- India: List of Hazardous Chemicals, 2000.
- Taiwan: Taiwan Toxic Chemical Substances List, 2013. Class I toxic chemical, regulated threshold quantity = 50 kg. minimum control level = 1% by weight.
- European Union: Listed in Register of Flavouring Substances pursuant to Article 3(1) of EC 2232/96. FL No: 14.008; FEMA No.: 2966; CoE No.: 604; Chemical Group 28.
- European Union: Directive 98/8/EC, Article 16(2), included in Annex I as existing active substance in biocidal products, in accordance with Article 3(1) or 5(2) of Reg EC 1896/2000.
- European Union: Directive 94/55/EC, Listed Name: Pyridine; Substance Ident No: 1282; Hazard Ident No.: 33; Label: 3; Class and Item No.: 3,3°(b)
- Listed as a Volatile Organic Compound (VOC) by USEPA; see 40 CFR 60.
- Listed on Land Disposal Restrictions Universal Treatment Standards; see 40 CFR 268.

HMIS:

NFPA:



15.2. Chemical safety assessment

A chemical safety assessment has been prepared for this product.

SECTION 16: Other information

Full text of R phrases in Section 3:

R20/21/22: Harmful by inhalation, in contact with skin and if swallowed.
R11: Highly Flammable.

Key Data Sources:

- Broderius SJ, et al., *Environ Toxicol Chem*, **1995**, *14*(9):1591-1605.
- Buhler DR and Reed DJ, **1990**, *Nitrogen and Phosphorus Solvents* in *Ethel Browning's Toxicity and Metabolism of Industrial Solvents*, Vol. II, 2nd edition. Elsevier, New York, NY, USA.
- Clayton G. D and F. E. Clayton (eds.), **1994**, *Patty's Industrial Hygiene and Toxicology*, 4th ed. New York, NY: John Wiley & Sons Inc.
- Costello B., **1983**, *DOT Skin Corrosion Study*, Testing laboratory: Biosearch Inc., Philadelphia, PA, USA, Report no.: 83-3680A, Reilly Tar and Chemical Corporation, Report date: 1983-06-24, unpublished data.
- Gerike P and Fischer WK, *Ecotoxicol. Environ. Saf.*, **1979**, *3*:159-173.
- International Agency for Research on Cancer (IARC), **2000**, *Pyridine: IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, 77*:503-528.
- Jori A, et al, *Ecotoxicol Environ Safety*, **1983**, *7*:251-275.
- National Toxicology Program (NTP), **1997,** *NTP Technical Report on the Toxicology and Carcinogenesis Studies of Pyridine (CAS RN 110-86-1) in F344/N Rats, Wistar Rats and B6C3F1 Mice (Drinking Water Studies),* NIH, Testing laboratory: U. S. Department of Health and Human Services, Public Health Service, National Institute of Health, Washington, DC, Report no.: TR470: NIH publication NO. 98-3960.
- Pullin TG, et al., **1973**, *Acute Percutaneous Absorption and Inhalation Toxicity of Pyridine with Cover Letter*, USEPA, Testing laboratory: Dow Chemical Company, Midland, MI, US, Report no.: EPA Document Number 87821120, unpublished data.
- Singh BB & Chandra R, **2005**, *Bull Environ Contam Toxicol*, *75*:482-9.
- Trochimowicz, HL, **1994**, *Heterocyclic and Miscellaneous Nitrogen Compounds* in *Patty's Industrial Hygiene and Toxicology*, 4th Ed. (GD Clayton and FE Clayton, eds), New York, John Wiley and Sons.
- Vernot, EH, et al, **1977**, *Toxicol. Appl. Pharmacol. 42*:417-423.
- Verschueren, K, **1983**, *Handbook of Environmental Data on Organic Chemicals,* 2nd Edition, New York, John Wiley and Sons.
- Vleminckx, C, et al, **1993**, *Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. A Salmonella/Microsome Test*, Testing laboratory: Institute of Hygiene and Epidemiology, Brussels, Belgium. Report no.: IHE-TOX-1003, Owner company: Reilly Industries, Report date: 1993-03-08, unpublished data.
- Vleminckx, C, et al, **1993**, *Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. HGPRT gene mutation test in V79 cells,* Testing laboratory: Institute of Hygiene and Epidemiology, Brussels, Belgium, Report no.: IHE-TOX-1003b, Owner company: Reilly Industries, Report date: 1993-03-08, unpublished data.
- Vleminckx, C, et al, **1993,** *Evaluation of the Genotoxic Potential of Pyridine and Methylated Pyridines. DNA single strand breaks measurement in mammalian cells in vitro,* Testing laboratory: Institute of Hygiene and Epidemiology, Brussels, Belgium, Report no.: IHE-TOX-1003c, Owner company: Reilly Industries, Report date: 1993-03-08, unpublished data.
- Weytjens, D, **1991**, *The Acute Toxicity Of B-Picoline (3-methyl pyridine) In The Zebra Fish (Brachydanio rerio)*, Testing laboratory: Janssen Pharmaceutica, Report no.: AFBr/0010, Owner company: Reilly Chemicals SA, Report date: 1991-12-11, unpublished data.

- Weytjens, D, **1991**, *The Acute Toxicity of B-Picoline (3-methyl pyridine) In the Water-Flea (Daphnia magna)*, Testing laboratory: Janssen Pharmaceutica, Report no.: ADK6/0012, Owner company: Reilly Chemicals SA, Report date: 1991-12-1, unpublished data.
- Weytjens, D, **1991**, *The Effect of B-Picoline (3-methyl pyridine) On The Green Alga Selenastrum capricornutum*, Testing laboratory: Janssen Pharmaceutica, Report no.: AASc/0002, Owner company: Reilly Chemicals SA, Report date: 1991-12-1, unpublished data.
- Yuill, L, **2008**, *Reproduction/Developmental Toxicity Screening Test in Rats*, Testing Laboratory: Charles River Laboratories, Tranent, Edinburgh, UK. Report no.: 28038. Owner company: Pyridine Group of American Chemistry Council (Vertellus Specialties Inc.), Study number: 494646, Report date: 2008-08-29, unpublished data.

Classification Method: On basis of test data

Training Advice: According to the risk assessment conducted for REACH registration, for operations involving batch processing or product transfers, workers shall be trained in proper use of gloves.

Legend of Abbreviations:

ACGIH = American Conference on Governmental Industrial Hygienists.
CAS = Chemical Abstracts Service.
CFR = Code of Federal Regulations.
DSL/NDSL = Domestic Substances List/Non-Domestic Substances List.
EC = European Community.
EINECS = European Inventory of Existing Commercial Chemical Substances.
ELINCS = European List of Notified Chemical Substances.
EU = European Union.
GHS = Globally Harmonized System.
LC = Lethal Concentration.
LD = Lethal Dose.
NFPA = National Fire Protection Association.
NIOSH = National Institute of Occupational Safety and Health.
NTP = National Toxicology Program.
OSHA = Occupational Safety and Health Administration
PEL = Permissible Exposure Limit.
RQ = Reportable Quantity.
SARA = Superfund Amendments and Reauthorization Act of 1986.
TLV = Threshold Limit Value.
WHMIS = Workplace Hazardous Materials Information System.

Important Note: Please note that the information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. The information contained herein may change without prior notice. THIS SAFETY DATA SHEET SUPERSEDES ALL PREVIOUS EDITIONS.

SAFETY DATA SHEET

ANNEX
Pyridine - Summary of Uses

ES Number	Name	SU	ERC	PROC	PC
1	Formulation of preparations	3/10	2	1, 2, 3, 4, 5, 8a, 8b, 9, 15	20, 21
2	Use as processing aid	3/9	4	1, 2, 3, 4, 8a, 8b, 9, 15	19, 20, 21, 27, 29
3	Use as intermediate	3/1	6a	1, 2, 3, 4, 8a, 8b, 9, 15	19
4	Use in closed systems	3/9	7	2, 3, 8b, 9	19, 20, 21
5	Manufacture of Substances	3/8; 3/9	1	1, 2, 3, 4, 8a, 8b, 9, 15	19, 20, 21, 27, 29
6	Waste Processing	3/23	7	1, 8b, 16	Not applicable
7	Use in laboratory	22/24	8a	9, 15	21

Pyridine Exposure Scenario

Title: Use in Chemical Synthesis, Formulation and Analytical Laboratories.

Exposure scenario covering the following sectors of use:

- **SU3: Industrial uses: Uses of substances as such or in preparations at industrial sites**
  - SU1: Agriculture, forestry, fishery
  - SU8: Manufacture of bulk, large scale chemicals
  - SU9: Manufacture of fine chemicals
  - SU10: Formulation [mixing] of preparations and/or re-packaging (excluding alloys)
- **SU22: Professional uses: Public domain (administration, education, entertainment, services, craftsmen)**
  - SU24: Scientific research and development

Processes, tasks, activities covered: See Table 1.

1. Control of Worker Exposure

Product characteristic

- The concentration ranges from <1% to 100%.
- The material exists only in the liquid form.

Amounts used

- Not relevant for human health risk assessment.

Frequency and duration of use/exposure

- Worker exposure is assumed to be up to 8 hours per day / 5 days per week

Human factors not influenced by risk management

- Outdoor work is assumed to involve wearing of hard hats; indoor work may have increased exposure potential to head/neck due to absence of hard hat.

Other given operational conditions affecting workers exposure

- The work is performed indoors with local exhaust ventilation except for PROC 16 – use of material as fuel source that is done outdoors.
- Keep away from heat, sparks and flame.

Technical conditions and measures at process level (source) to prevent release

- Use carbon dioxide, dry chemical, alcohol foam, water mist or fog as extinguishing media.
- Processing in area of good ventilation or closed condition.
- Applicable storage tank controls, i.e., gauging, pressure relief venting.

- Bonded and grounded equipment, tanks, lines and vessels.
- Protect against physical damage.
- Store in a cool, dry, well-ventilated location, away from any area where the fire hazard may be acute.
- Keep away from heat as toxic fumes may be released upon thermal decomposition (cyanides, nitrogen oxides, carbon monoxide).
- Outside or detached storage is preferred. Inside storage should be in standard flammable liquids storage room or cabinet.
- Containers to be bonded and grounded for transfers to avoid static sparks.
- Use non-sparking type tools and equipment.
- Electrical equipment with explosion proof rating.

Technical conditions and measures to control dispersion from source towards the worker

- Local exhaust ventilation systems. Not required for PROC 1 based on ECETOC TRA assessment and PROC 16 that is done outdoors.
- Ensure that eyewash and safety showers are close to the work station.
- Store in cool, dry and ventilated place away from heat, flame and sparks.
- Keep away from heat as toxic fumes may be released upon thermal decomposition.
- Protect against electrostatic charge, high temperature and incompatible substances (acids and oxidizing agents)
- Keep container closed.
- Keep away from heat, sparks and flame (thermal decomposition may form cyanides, nitrogen oxides, carbon monoxide).

Organisational measures to prevent /limit releases, dispersion and exposure

- Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition.
- Substance-specific training including proper selection and use of personal protective equipment.
- Implementation of formal hot work procedure.
- Monitoring of substance vapor concentrations prior to activities such as equipment maintenance.
- Do not breathe vapors. Avoid contact with skin, eyes and mucous membranes.
- Wash thoroughly after handling.
- Store in cool, dry and ventilated place away from heat, flame and sparks.
- Keep container closed.
- Store in an area designed for storage of flammable liquids.
- Emptied containers should be handled in the same manner as when they were full
- For small spills, use suitable absorbent material and collect for later disposal. For large spills, the area may require diking to contain the spill.

Conditions and measures related to personal protection, hygiene and health evaluation

- Practice good personal hygiene after using this material such as washing hands thoroughly before eating or smoking after handling this substance.
- Safety glasses/goggles/optional face shield.
- NIOSH approved chemical cartridge-respirator or supplied air breathing equipment with at least 90% efficiency, except for PROC 15.
- Protective clothing with long sleeves and boots.
- Impervious gloves such as neoprene, nitrile or PVC-coated gloves.

2. Control of Environmental Exposure

Product characteristics

- The substance is a liquid.

Amounts used

- The amounts used in specific situations should be below or equal to the M-Safe figures (Table 2) for the respective ERCs. If local emission fractions differ from those of the respective ERC, M-Safe can be re-calculated (see Table 2 footnote).

Frequency and duration of use

- Continuous and intermittent release possible (Table 2). Release on an intermittent basis requires higher efficiencies.

Environment factors not influenced by risk management

- Default values of 18,000 m^3/d for receiving waters are assumed

Other given operational conditions affecting environmental exposure

ECETOC TRA default release rate used in assessment (see Table 2) except for ERC 7 (waste processing) where spERC ESVOC 28 default values were used, and ERC 8a (wide dispersive use of processing aids in open systems – used as a laboratory reagent) where ESVOC 39 default values were used.

- Professional use in laboratory.
- Indoors, with local exhaust ventilation.
- Protect from temperature extremes and sunlight.
- Protect against; static discharge or any ignition source.
- Production is in closed and open systems.
- Do not discharge to drains.

Technical conditions and measures at process level (source) to prevent release

- Store in a cool, dry, well-ventilated location.
- Keep away from heat sources, static discharge or any ignition source.
- Separate from incompatibles such as acids and oxidizing agents.
- Protect containers against physical damage.
- Isolation of drainage to prevent drainage to soil.
- Use appropriate container to avoid environmental contamination.
- Impervious secondary containment to be greater than the largest vessel.
- Use alcohol foam, carbon dioxide, or dry chemical as extinguishing media.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Water

- Onsite waste water treatment plant where needed as shown in Table 2 was used prior to discharge to STP.
- Compliance with local water discharge regulations.

Air

- Onsite collection of air emissions and treatment where needed as shown in Table 2.
- Compliance with local air discharge regulations.

Soil

- No release to soil was assumed in the ECETOC TRA assessment.

Organizational measures to prevent/limit release from site

- Do not allow to directly enter sewer system, the ground, drains or into any body of water.
- Dispose of this material and its container at hazardous or special waste collection point.
- Observe all regional, state and local environmental regulations.
- For small spills, use suitable absorbent material and collect for later disposal. For large spills, the area may require diking to contain the spill. Material can then be collected (e.g., suction) for later disposal. After collection of material, flush area with water.

Conditions and measures related to municipal sewage treatment plant disposal

- The default STP value of 2000 m^3/d was used.
- The STP efficiency is 77%

Conditions and measures related to external treatment of waste for disposal

- Onsite WWTP sludge sent offsite for disposal (see Table 2; EU waste code 06 05 02).
- Empty raw material packaging containers (EU waste code: 15 01 10).
- Residual in shipping containers assumed to be <0.1%.
- Clean/dispose packaging container at approved facility.
- Do not empty into drains, dispose of this material and its container at hazardous or special waste collection point.
- Observe all regional, state and local environmental regulations.

Conditions and measures related to external recovery of waste

- There is no recovery at an external waste treatment site.

3. Exposure Estimation and Reference to Its Source

The human health risk assessment and the environmental risk assessment were performed using ECETOC TRA v2.0.

4. Guidance to DU - Operational Conditions and Risk Management Measures

Worker

The following activities result in an acceptable exposure if individually performed by an industrial/professional worker, and considering the operational conditions and the risk management measures (Tables 1 and 2).

Table 1. Worker – Operational Conditions Used in Assessment

PROC	Frequency and Duration of work (hours)	LEV Efficiency (%)	Respirator Efficiency (%)	Gloves
PROC 1: Use in closed process, no likelihood of exposure, Industrial setting	Daily, > 4	NA	90	Chemically resistant gloves (Level B)
PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. sampling), Industrial setting	Daily, > 4	90	90	Chemically resistant gloves (Level B)
PROC 3: Use in closed batch process (synthesis or formulation), Industrial setting	Daily, > 4	90	90	Chemically resistant gloves (Level B)
PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises	Daily, > 4	90	90	Chemically resistant gloves with basic training (Level C)
PROC 5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)	Daily, > 4	90	90	Chemically resistant gloves (Level B)
PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities	Daily, > 4	90	90	Chemically resistant gloves (Level B)
PROC 8b:-Transfer of chemicals from/to vessels/ large containers at dedicated facilities	Daily, > 4	90	90	Chemically resistant gloves with basic training (Level C)
PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	Daily, > 4	90	90	Chemically resistant gloves with basic training (Level C)
PROC 15: Use a laboratory reagent, Non-industrial setting	Daily, > 4	90	NA*	Chemically resistant gloves (Level B)
PROC 16: Using material as fuel sources, limited exposure to unburned product to be expected	Daily, < 4	90	90	Chemically resistant gloves with basic training (Level C)

* Not Applicable except when obtaining samples

Environment

The following activities result in a controlled exposure to the environment taking into consideration the operational conditions and the risk management measures provided in this exposure scenario. Daily use of the substance is driven by the ability to control water and air discharge (see Table 2).

Table 2. M-Safe Results of ERCs with Operational Conditions*

ES No	ERC	Release Days/year	STP**	Default Release to air [%]	Default Release to water from process [%]	Air Scrubber Efficiency (%)	WWTP*** Efficiency - Continuous release (%)	WWTP*** Efficiency - Intermittent release (%)	Continuous release to water (kg/day)	Intermittent release to water (kg/day)	M-Safe (kg/day)****
1	ERC 2 - Formulation of preparations	350	Yes	2.5	2	NA	60	75	4.94	3.09	1191
2	ERC 4 - Industrial use of processing aids not becoming part of articles	350	Yes	100	100	95	99.5	99.5	3.09	3.09	1197
3	ERC 6a - Industrial use resulting in manufacture of another substance (use of intermediates)	350	Yes	5	2	NA	60	75	4.94	3.09	1208
4	ERC 7 - Industrial use of substances in closed systems	350	No	5	5	NA	NA	NA	1.43	1.43	120
5	ERC 1 - Manufacture of substances	350	Yes	5	6	NA	85	90	5.5	3.70	1003
6	ERC 7 (ESVOC 28) Waste Processing	300	No	0.25	0.001	NA	NA	NA	0.01	0.01	541,416
7	ERC 8a (ESVOC 39) Professional Use in Laboratory	365	No	50	50	NA	100	NA	0	0	10

* No release to Soil

** STP effluent discharge = 2000 m3/day; Flow rate of effluent receiving river = 18,000 m^3/day

*** Onsite Waste Water Treatment Plant

**** M-Safe describes the amount of substance that can be daily used under the conditions displayed