Product Safety Summary Sheet

DuPont™ Monomethylformamide
(N-methylformamide - MMF)

Chemical Identification, Product Identification or Common Name:

CAS number: 123-39-7
CAS name: formamide, N-methyl-
EINICS Number: 204-624-6
IUPAC name: N-methylformamide

Product Uses and Applications:
This chemical or product is generally used in the following manner:
- used as a reagent in various organic syntheses,
- used as an intermediate in the synthesis of pesticides,
- used in the manufacture of methyl isocyanate.

Physical Properties of the Chemical or Product:
N-methylformamide, also known as MMF, is a clear, colorless liquid with a boiling point of 198-199 degrees C. and a melting point of -4 degrees C. N-methylformamide is soluble in ethanol and acetone and miscible in water. Carbon monoxide may be present in the headspace of unopened containers.

Exposure Potential:

Workplace exposure: The substance is used in industrial settings only. Occupational exposure to N-methylformamide may occur through inhalation and dermal contact with this compound at workplaces where N-methylformamide is produced or used.
By utilizing closed processes with proper exposure controls, potential exposures to workers are minimized, and exposures to the environment (air, water) are relatively low.

Workers should follow the recommended safety measures contained within the (Material) Safety Data Sheet ((M)SDS) and on any product packaging. Employees should be trained in the appropriate work processes and safety equipment to limit exposure to chemical substances. Occupational use of this substance is considered to be safe provided the recommended safety measures given in the (M)SDS are followed.

**Consumer exposure:** The substance is used in industrial settings only. Therefore, no relevant consumer exposure is expected.

**Environmental exposure:** Available data indicates that N-methylformamide will volatilize from moist soil surfaces and is not expected to be an important fate process. Additionally, N-methylformamide is not expected to volatilize from dry soil surfaces. N-methylformamide has been shown to biodgrade by microorganism obtained through soil enrichment, suggesting that N-methylformamide may biodegrade in soil. Other data suggest that N-methylformamide may biodegrade in the aquatic environment.

**Health Information**

*Note: The information contained in this section may be useful to someone handling the pure undiluted substance such as a manufacturer or transporter. Consumers are not likely to come in contact with the pure substance. For more information on health hazards and recommended protective equipment, please refer to the (M)SDS.*

Exposures may affect human health as follows (from the US, European MSDS’s and the AEL):

<table>
<thead>
<tr>
<th>Effect Assessment</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Toxicity</td>
<td>Oral: considered slightly toxic. Dermal: Since the material is absorbed through the skin, it is considered moderately toxic. Inhalation: considered slightly toxic.</td>
</tr>
<tr>
<td>Irritation</td>
<td>May be harmful if in contact with skin. Causes eye irritation; may cause pain, tearing, swelling, redness or visual impairment.</td>
</tr>
<tr>
<td>Sensitization</td>
<td>Based on available data, not considered a sensitizer.</td>
</tr>
<tr>
<td>Mutagenicity</td>
<td>Based on available data, not considered mutagenic.</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Based on available data, not considered carcinogenic.</td>
</tr>
<tr>
<td>Toxicity after repeated exposure</td>
<td>Adverse effects from repeated inhalation exposure may include: altered blood chemistry, liver effects. Adverse effects from repeated dermal exposure may include: liver damage, fluid retention in lungs (pulmonary edema).</td>
</tr>
<tr>
<td>Toxicity for reproduction</td>
<td>Possible risk to the unborn child.</td>
</tr>
</tbody>
</table>
Environmental Information

*Note: The information contained in this section is intended to provide brief and general information of this substance’s environmental impact. The results in the table below refer to testing performed with the non formulated, undiluted substance. The data does not replace the data given in the (M)SDS. For more information and recommended protective measures please refer to the (M)SDS.*

<table>
<thead>
<tr>
<th>Effect Assessment</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Toxicity</td>
<td>Based on available data, the substance is not expected to be present in waterways at concentrations which could be toxic to aquatic life.</td>
</tr>
<tr>
<td>Persistence and degradability</td>
<td>Biodegradable.</td>
</tr>
<tr>
<td></td>
<td>No data available.</td>
</tr>
<tr>
<td>Bioaccumulation potential</td>
<td>No data available.</td>
</tr>
</tbody>
</table>

Risk Management

**Workplace Management:**
Risk management measures for industrial site use include containment through engineering controls and the use of personal protective equipment (PPE) as appropriate. Always refer to the (Material) Safety Data Sheet ((M)SDS) for guidance on the appropriate personal protective equipment to be used and on the safe handling of this material.

**Consumer Risk Management:**
Because N-methylformamide is used in closed industrial settings, consumer exposure is not expected.

**Regulatory Information:**
Always refer to the (Material) Safety Data Sheet ((M)SDS) for guidance on regulatory restrictions that may govern the manufacture, sale, transportation, use and/or disposal of this chemical or product. Regulations may vary by region, country, state, county, city, or local government. Consult with environmental regulatory agencies for guidance on acceptable disposal practices.

**First Aid Information:**
For all First Aid or Emergency information, consult the (Material) Safety Data Sheet ((M)SDS).

**Information Sources:**
Data is compiled from a variety of sources, including publicly available documents, internal data and other sources such as, but not limited to, Chemical Safety Reports and (Material) Safety Data Sheets ((M)SDS).