

# FURFURAL

FFA

CAUTIONARY RESPONSE INFORMATION				4. FIRE HAZARDS	7. SHIPPING INFORMATION								
Common Synonyms Fural 2-Furaldehyde Fural/pyromucic aldehyde Furfuraldehyde Furfurole Pyromucic aldehyde Quakerol	Oily liquid  Sinks in water.	Colorless to reddish-brown	Almond odor	<p><b>4.1 Flash Point:</b> 153°F O.C. 140°F C.C.</p> <p><b>4.2 Flammable Limits in Air:</b> 2.1%-19.3%</p> <p><b>4.3 Fire Extinguishing Agents:</b> Water, foam, carbon dioxide, dry chemical or alcohol foam</p> <p><b>4.4 Fire Extinguishing Agents Not to Be Used:</b> Not pertinent</p> <p><b>4.5 Special Hazards of Combustion Products:</b> Irritating vapors are generated when heated</p> <p><b>4.6 Behavior in Fire:</b> Not pertinent</p> <p><b>4.7 Auto Ignition Temperature:</b> 739°F</p> <p><b>4.8 Electrical Hazards:</b> Not pertinent</p> <p><b>4.9 Burning Rate:</b> 2.6 mm/min.</p> <p><b>4.10 Adiabatic Flame Temperature:</b> Currently not available</p> <p><b>4.11 Stoichiometric Air to Fuel Ratio:</b> 28.6 (calc.)</p> <p><b>4.12 Flame Temperature:</b> Currently not available</p> <p><b>4.13 Combustion Molar Ratio (Reactant to Product):</b> 9.0 (calc.)</p> <p><b>4.14 Minimum Oxygen Concentration for Combustion (MOCC):</b> Not listed</p>	<p><b>7.1 Grades of Purity:</b> Commercial</p> <p><b>7.2 Storage Temperature:</b> Ambient</p> <p><b>7.3 Inert Atmosphere:</b> No requirement</p> <p><b>7.4 Venting:</b> Pressure-vacuum</p> <p><b>7.5 IMO Pollution Category:</b> C</p> <p><b>7.6 Ship Type:</b> 3</p> <p><b>7.7 Barge Hull Type:</b> 3</p>								
<p>Keep people away. Avoid contact with liquid.</p> <p>Avoid inhalation.</p> <p>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</p> <p>Call fire department.</p> <p>Notify local health and pollution control agencies.</p> <p>Protect water intakes.</p>				<p><b>8. HAZARD CLASSIFICATIONS</b></p> <p><b>8.1 49 CFR Category:</b> Flammable liquid</p> <p><b>8.2 49 CFR Class:</b> 3</p> <p><b>8.3 49 CFR Package Group:</b> III</p> <p><b>8.4 Marine Pollutant:</b> No</p> <p><b>8.5 NFPA Hazard Classification:</b></p> <table> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Instability (Yellow)</td> <td>1</td> </tr> </tbody> </table> <p><b>8.6 EPA Reportable Quantity:</b> 5000 pounds</p> <p><b>8.7 EPA Pollution Category:</b> D</p> <p><b>8.8 RCRA Waste Number:</b> U125</p> <p><b>8.9 EPA FWCRA List:</b> Yes</p>		Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Instability (Yellow)	1
Category	Classification												
Health Hazard (Blue)	1												
Flammability (Red)	2												
Instability (Yellow)	1												
<p><b>Fire</b> Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.</p> <p><b>Exposure</b> CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p> <p><b>Water Pollution</b> HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>				<p><b>5. CHEMICAL REACTIVITY</b></p> <p><b>5.1 Reactivity with Water:</b> No reaction</p> <p><b>5.2 Reactivity with Common Materials:</b> No reaction</p> <p><b>5.3 Stability During Transport:</b> Stable</p> <p><b>5.4 Neutralizing Agents for Acids and Caustics:</b> Not pertinent</p> <p><b>5.5 Polymerization:</b> Not pertinent</p> <p><b>5.6 Inhibitor of Polymerization:</b> Not pertinent</p> <p><b>6. WATER POLLUTION</b></p> <p><b>6.1 Aquatic Toxicity:</b> 24 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water 32 ppm/24 hr/sunfish/TL<sub>50</sub>/fresh water</p> <p><b>6.2 Waterfowl Toxicity:</b> Currently not available</p> <p><b>6.3 Biological Oxygen Demand (BOD):</b> 0.28-0.77 lb/lb, 5 days</p> <p><b>6.4 Food Chain Concentration Potential:</b> None</p> <p><b>6.5 GESAMP Hazard Profile:</b> Bioaccumulation: 0 Damage to living resources: 2 Human Oral hazard: 2 Human Contact hazard: II Reduction of amenities: XX</p>									
<p><b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Pump Clean shore line Salvage waterfowl</p> <p><b>2. CHEMICAL DESIGNATIONS</b></p> <p>2.1 CG Compatibility Group: 19; Aldehyde</p> <p>2.2 Formula: O-CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CHO</p> <p>2.3 IMO/UN Designation: 3.3/1199</p> <p>2.4 DOT ID No.: 1199</p> <p>2.5 CAS Registry No.: 98-01-1</p> <p>2.6 NAERG Guide No.: 132P</p> <p>2.7 Standard Industrial Trade Classification: 51622</p> <p><b>3. HEALTH HAZARDS</b></p> <p><b>3.1 Personal Protective Equipment:</b> Skin and eye protection.</p> <p><b>3.2 Symptoms Following Exposure:</b> Vapor may irritate eyes and respiratory system. Liquid irritates skin and may cause dermatitis.</p> <p><b>3.3 Treatment of Exposure:</b> INHALATION: general treatment for overexposure to vapors of toxic chemicals; keep airway open, give respiration and oxygen if necessary; observe for premonitory signs and symptoms of pulmonary edema. INGESTION: induce vomiting, then give gastric lavage and saline cathartics. SKIN AND MUCOUS MEMBRANES: flood affected tissues with water.</p> <p><b>3.4 TLV-TWA:</b> 2 ppm</p> <p><b>3.5 TLV-STEL:</b> Not listed.</p> <p><b>3.6 TLV-Ceiling:</b> Not listed.</p> <p><b>3.7 Toxicity by Ingestion:</b> Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg</p> <p><b>3.8 Toxicity by Inhalation:</b> Currently not available.</p> <p><b>3.9 Chronic Toxicity:</b> Causes liver damage in rats.</p> <p><b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.</p> <p><b>3.11 Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.</p> <p><b>3.12 Odor Threshold:</b> Currently not available</p> <p><b>3.13 IDLH Value:</b> 100 ppm</p> <p><b>3.14 OSHA PEL-TWA:</b> 5 ppm</p> <p><b>3.15 OSHA PEL-STEL:</b> Not listed.</p> <p><b>3.16 OSHA PEL-Ceiling:</b> Not listed.</p> <p><b>3.17 EPA A EGL:</b> Not listed</p>				<p><b>9. PHYSICAL &amp; CHEMICAL PROPERTIES</b></p> <p><b>9.1 Physical State at 15°C and 1 atm:</b> Liquid</p> <p><b>9.2 Molecular Weight:</b> 96.08</p> <p><b>9.3 Boiling Point at 1 atm:</b> 323.1°F = 161.7°C = 434.9°K</p> <p><b>9.4 Freezing Point:</b> -33.7°F = -36.5°C = 236.7°K</p> <p><b>9.5 Critical Temperature:</b> 746.6°F = 397°C = 670.2°K</p> <p><b>9.6 Critical Pressure:</b> 798 psia = 54.3 atm = 5.50 MN/m<sup>2</sup></p> <p><b>9.7 Specific Gravity:</b> 1.159 at 20°C (liquid)</p> <p><b>9.8 Liquid Surface Tension:</b> 43.5 dynes/cm = 0.0435 N/m at 20°C</p> <p><b>9.9 Liquid Water Interfacial Tension:</b> (est.) 30 dynes/cm = 0.03 N/m at 20°C</p> <p><b>9.10 Vapor (Gas) Specific Gravity:</b> Not pertinent</p> <p><b>9.11 Ratio of Specific Heats of Vapor (Gas):</b> Not pertinent</p> <p><b>9.12 Latent Heat of Vaporization:</b> 191 Btu/lb = 106 cal/g = 4.44 X 10<sup>3</sup> J/kg</p> <p><b>9.13 Heat of Combustion:</b> -10,490 Btu/lb = -5830 cal/g = -244.1 X 10<sup>3</sup> J/kg</p> <p><b>9.14 Heat of Decomposition:</b> Not pertinent</p> <p><b>9.15 Heat of Solution:</b> Not pertinent</p> <p><b>9.16 Heat of Polymerization:</b> Not pertinent</p> <p><b>9.17 Heat of Fusion:</b> Currently not available</p> <p><b>9.18 Limiting Value:</b> Currently not available</p> <p><b>9.19 Reid Vapor Pressure:</b> 0.1 psia</p>									
<p><b>NOTES</b></p>													

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	73.610	20	0.367		N	35	2.388
40	73.429	30	0.370		O	40	2.248
45	73.240	40	0.372		T	45	2.119
50	73.059	50	0.374			50	1.999
55	72.879	60	0.376		P	55	1.888
60	72.690	70	0.378		E	60	1.786
65	72.509	80	0.380		R	65	1.691
70	72.320	90	0.382		T	70	1.602
75	72.139	100	0.384		I	75	1.520
80	71.959	110	0.386		N	80	1.443
85	71.770	120	0.388		E	85	1.372
90	71.589	130	0.390		N	90	1.305
95	71.410	140	0.392		T	95	1.242
100	71.219	150	0.394				
105	71.040	160	0.396				
110	70.849	170	0.398				
115	70.669	180	0.400				
120	70.490	190	0.402				
125	70.299	200	0.404				
130	70.120	210	0.407				
135	69.929	220	0.409				
140	69.750	230	0.411				
145	69.570	240	0.413				
150	69.379						
155	69.200						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	8.155	60	0.024	60	0.00042		N
36	8.210	70	0.035	70	0.00059		O
38	8.266	80	0.049	80	0.00082		T
40	8.322	90	0.069	90	0.00113		
42	8.377	100	0.096	100	0.00154		P
44	8.433	110	0.132	110	0.00207		E
46	8.488	120	0.178	120	0.00275		R
48	8.544	130	0.239	130	0.00363		T
50	8.599	140	0.318	140	0.00474		I
52	8.655	150	0.418	150	0.00614		N
54	8.710	160	0.545	160	0.00788		O
56	8.766	170	0.705	170	0.01002		T
58	8.822	180	0.905	180	0.01266		
60	8.877	190	1.152	190	0.01587		P
62	8.933	200	1.456	200	0.01975		E
64	8.988	210	1.827	210	0.02441		R
66	9.044	220	2.277	220	0.02999		T
68	9.099	230	2.820	230	0.03660		I
70	9.155	240	3.472	240	0.04442		N
72	9.210	250	4.250	250	0.05360		O
74	9.266	260	5.172	260	0.06433		T
76	9.322	270	6.261	270	0.07680		
78	9.377	280	7.540	280	0.09124		P
80	9.433	290	9.035	290	0.10790		E
82	9.488	300	10.780	300	0.12700		R
84	9.544						T