ACETONE

PRODUCT STEWARDSHIP MANUAL

Table of Contents

Introduction

Acetone (also known as dimethyl ketone and 2-propanone) is a clear, colorless, low-boiling, flammable, volatile liquid, characterized by rapid evaporation and a faintly aromatic, sweetish odor. It is readily miscible in most organic solvents and completely miscible, in all proportions, in water.

Acetone is both the simplest and most important of the aliphatic ketones. It is an excellent solvent for a wide range of gums, resins, waxes, fats, greases, oils, dyestuffs and cellulosics.

It is widely used as a chemical intermediate in the production of methyl isobutyl ketone and other solvents, and in the production of such important chemicals as bisphenol A and methyl methacrylate. It is also used in the manufacture of a wide variety of coatings and plastics.

Product Stewardship

Olin and its employees have a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our Product Stewardship philosophy by which we assess the health and environmental information on our products and take appropriate steps to protect employee and public health and our environment. Our Product Stewardship program rests with each and every individual involved with Olin products, from initial concept and research to the manufacture, sale, distribution, use, and recycling or disposal of each product.

Responsible Care®

Olin has a long-standing policy to ensure that its operations do not have an adverse impact on the community or the environment. To uphold this policy, Olin is committed to the guiding principles of Responsible Care®, a continuing effort by the chemical industry to improve the responsible management of chemicals.

Under Responsible Care®, Olin follows the 10 Guiding Principles and Codes of Management Practices that cover all aspects of research, development, manufacture, distribution, transportation, use, and disposal of products. These principles also extend to prompt reporting, customer counseling, community awareness, support of external research, participation with government and others, and promotion of Responsible Care worldwide.

Olin recognizes that no single entity can protect the quality of all of our air and water. However, by working together on a global basis, the public, industry, and government can make the future brighter and safer.

There are joint European Chemical Industry Council (CEFIC)/the European Association of Chemical Distributors (FECC) Responsible Care guidelines available via CEFIC's web page, www.cefic.org, and on www.responsiblecare.org.

Customer Notice

Olin strongly encourages its customers to review both their manufacturing processes and their applications of Olin products from the standpoint of human health and environmental quality. To help ensure that Olin products are not used in ways for which they are not intended or tested, Olin personnel are prepared to assist customers in dealing with ecological and product safety considerations. Your Olin representative can arrange the proper contacts. Also, Olin product literature, including Safety Data Sheets (SDS), should be consulted prior to use of Olin products. For copies, contact your Olin representative or the Olin location nearest you.

Olin believes the information and suggestions contained in this manual to be accurate and reliable as of publication date. However, since any assistance furnished by Olin with reference to the proper use and disposal of its products is provided without charge, and since use conditions and disposal are not within its control, Olin assumes no obligation or liability for such assistance and does not guarantee results from use of such products or other information herein; no warranty, express or implied, is given nor is freedom from any patent owned by Olin or others to be inferred.

Information herein concerning laws and regulations is based on U.S. federal laws and regulations, except when specific reference is made to those of other jurisdictions. Since use conditions and governmental regulations may differ from one location to another and may change with time, it is the customer's responsibility to determine whether Olin's products are appropriate for the customer's use, and to assure that the customer's workplace and disposal practices are in compliance with laws, regulations, ordinances, and other governmental enactments applicable in the jurisdiction(s) having authority over the customer's operations.

Uses

As a Solvent

Surface Coatings, Films and Adhesives

As a solvent, acetone is frequently incorporated in solvent systems or "blends," especially as the low-boiling component of "high-low" blends. Many of these acetone-solvent blends are used in the formulation of "high-solids" cellulose ester lacquers for automotive and furniture finishes. They are also used in acrylic automotive lacquers, particularly when the acrylics are modified with nitrocellulose. Acetone, which has a dilution ratio of 4.5, may be used to reduce the viscosity of lacquer solutions.

Significant amounts of acetone are used in the manufacture of cellulose acetate films and in the casting of photographic films and plates. Acetone is used as a solvent for vinylidene chloride-acrylontrile coating resins, permitting barrier coatings as thin as 0.1 mil to be applied with ease to various films and foils. The high volatility and consequent cooling effect of this solvent are especially desirable if the substrate is heat sensitive. Acetone is widely used as a solvent in the polyester resin industry, as both a resin thinner and for clean up operations. It is also used frequently in paper coatings and as a solvent for inks.

Acetone is included in the solvent systems of general purpose nitrocellulose cements and neoprene industrial adhesives. It is used as the basic solvent for nitrocellulose heat-seal coatings, as the primary solvent in vinyl-type grease resistant heat-seal coatings, and in pressure-sensitive chlorinated rubber adhesives. Acetone-based cements may be used to provide an effective bond for cellulose ethers.

Cleaning Fluids

Acetone is widely used in the textile industry for degreasing wool and degumming silk. Also, large quantities are used in paint, lacquer, and varnish stripping compounds, and in nail polish removers. In addition, acetone is used as an efficient degreasing agent.

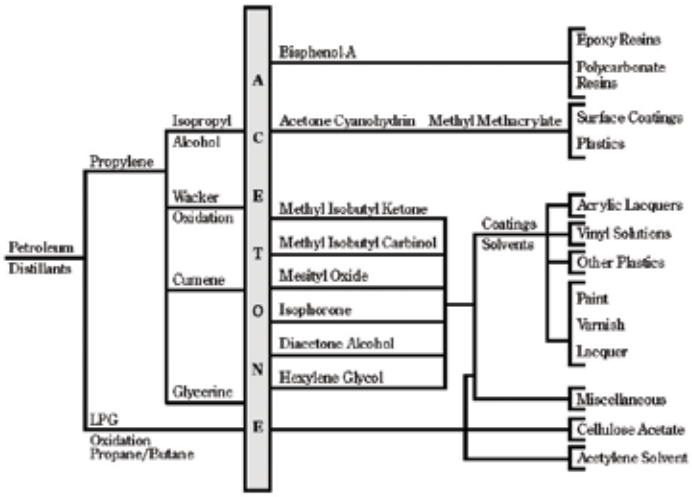
Other Solvent Uses

Other solvent uses include preparation of explosives, manufacture of cellulose acetate fibers, and formulation of denatured alcohol. Since acetone absorbs many times its own volume of acetylene gas, it is possible to ship acetylene safely in cylinders by using acetone as the solvent. Acetone also finds many applications as a drying agent, as an extracting or purifying agent, and as a foam-blowing agent, replacing halocarbons for some industrial applications.

As a Chemical Intermediate

The amount of acetone used annually in the production of other chemicals is increasing. For example, the production of derivative solvents now accounts for approximately one-third of total acetone usage. Large amounts are also used in the production of methacrylates and bisphenol A, and in the production of acetone amines, which serve as antioxidants for rubber, ketone, and various cosmetic products.

Figure 1: Acetone Flow Chart



Properties of Acetone

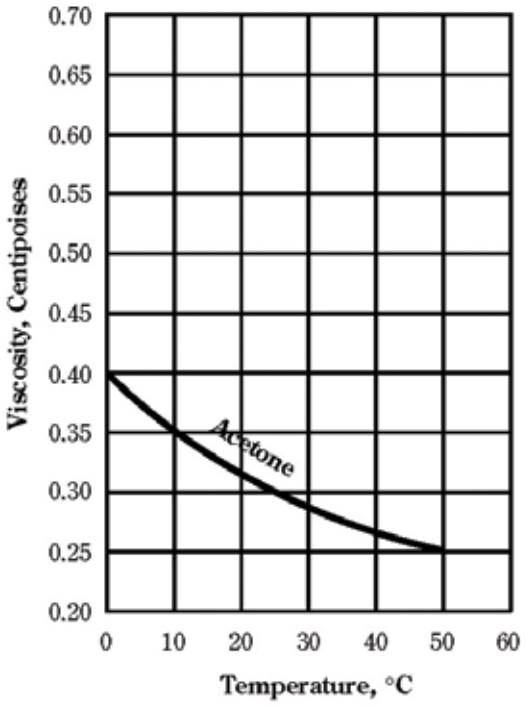
Typical Properties of Acetone

Table 1: Typical Properties of Acetone

Properties	Value
Structural Formula	O II CH_3 - C - CH_3
Molecular Weight	58.079
Appearance	Colorless Liquid
Odor	Pleasant, Faintly Aromatic, Sweetish
Specific Gravity at 25/25°	0.7880
Melting Point, °C	-94.6
Boiling Point at 760 mm Hg, °C	56.13
Vapor Pressure at 20°C, mm Hg	181.7
Density at 20°C, g/ml lb/gal	0.7898 6.59
Refractive index n20/D	1.359
Heat of Vaporization, Kcal/mole at 760 mm and 56.1°C	7.092
Viscosity at 25°C, cps	0.3075
Flash Point (closed cup), °C, (approx)	-20.0
Flash Point (open cup), °C, (approx)	-9.0
Autoignition Temperature, °C	465
Flammable Limits at 25°C, vol. %	2.6 - 12.8
Electrical Conductivity, 25°C, ohm^1cm^1	5.5×10^8
Heat of Combustion, Kcal/mole	427

Note: These are typical properties; not to be construed as specifications.

Figure 2: Viscosity of Acetone as A Function of Temperature



Properties of Acetone

Figure 3: Vapor Pressure of Acetone as a Function of Temperature

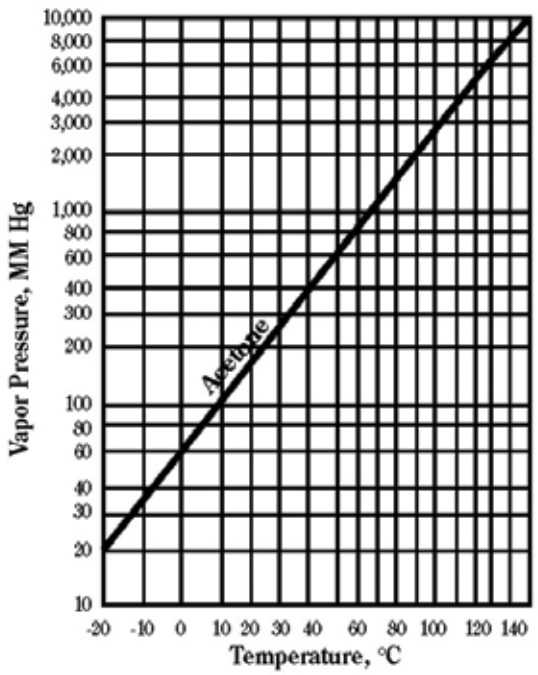


Table 2: ASTM D 329 Requirements, Acetone

Test Items	Limits
Specific Gravity @ 20/20°C	0.7910-0.7930
Color (Pt-Co Scale), Max	5
Distillation Range at 760 mm Hg	Within 1.0°C Including the Temperature 56.1°C
Nonvolatile Matter, Max	0.005 g/100 ml
Odor	Characteristic, Non-residual
Water (by Weight), Max	0.5% *(Ensures Miscibility within 19 Volumes 99% Heptane at 20°C, without Turbidity)*
Acidity (Free Acid as Acetic, by Weight), Max	0.002% *(Eq of 0.019 mg KOH/g)*
Water Solubility	Miscible with Distilled Water in all Proportions
Alkalinity (as Ammonia, by wt.), Max	0.001%
Permanganate Test (added $KMnO_4$) Min	Retain Color 30 min. at 25°C in the Dark
Note: These are typical properties; not to be construed as specifications.	

Typical Solvent Systems With Acetone

1. **Nitrocellulose Lacquer – Automotive**

   a. 30% Butyl Acetate
   10% N-butyl Alcohol
   60% Toluene

   b. 25% Methyl Isobutyl Ketone
   5% Higher Boiling Ketone
   10% Methyl Isobutyl Carbinol
   60% Toluene

2. **Nitrocellulose Lacquer – House Furniture**

   a. Conventional Lacquer
   15% Acetone
   15% Methyl Ethyl Ketone
   6% Isopropyl Alcohol
   6% Butyl Alcohol
   58% Toluene or Xylene

   b. Warm Spray
   5% Methyl Ethyl Ketone
   10% Acetone
   15% Methyl Isobutyl Ketone
   10% Butanol
   60% Toluene

   c. Kitchen Cabinet Type
   10% Methyl Ethyl Ketone
   15% Methyl Isobutyl Ketone
   5% Methyl Isoamyl Ketone
   20% Butyl Alcohol
   10% Methyl Isobutyl Carbinol
   40% Toluene

   d. TV Cabinet Type
   30% Acetone
   10% Methyl Ethyl Ketone
   15% Methyl Isobutyl Carbinol
   45% Toluene

3. **Enamels – Automobile**

   5% Isopropyl Alcohol
   17% Butanol
   78% Xylene

4. **Polyvinyl Chloride – Automotive**

   a. 75% Methyl Isobutyl Ketone
   25% Toluene

   b. (Industrial Maintenance)
   13% Methyl Ethyl Ketone
   37% Methyl Isobutyl Ketone
   50% Toluene

5. **Thermoplastic Acrylic – Automotive**

   20% Acetone
   30% Other Ketones
   10% Latent Solvent
   20% Toluene
   20% Xylene

6. **Thermosetting Acrylic – Automotive**

   5% Ketone
   45% Aliphatic Hydrocarbons
   50% Aromatic Hydrocarbons

Properties of Acetone

Typical Materials Dissolved by Acetone

Gums, Waxes and Natural Resins

Colophony
Coumarone
Coumarone-Indene
Dammar (dewaxed)
Elemi
Manila
Pontianac
Rosin
Sandarac

Rubbers and Polymers

Alkyd, Non-drying Type
Alkyd, Maleic Modified
Alkyd, Maleic–Rosin Modified Cellulose Acetate
Cellulose Acetate Butyrate (Low Butyryl)
Cellulose Acetate Butyrate (High Butyryl)
Cellulose Acetate Propionate (Low Propionyl)
Cellulose Acetate Propionate (High Propionyl)
Chlorinated Diphenyl
Epoxy
Ethyl Cellulose
Methyl Methacrylate
Nitrocellulose
Phenolic
Polyurethane
Polyvinyl Acetate
Urea-Formaldehyde
Vinyl Chloride-Vinyl Acetate Copolymer
Vinyl Chloride-Vinyl Acetate Copolymer, Maleic Modified
Vinyl Chloride-Vinyl Acetate Copolymer, Vinyl Alcohol Modified
Vinyl Chloride-Vinylidene Chloride Copolymer
Vinylidene Chloride-Acrylonitrile Copolymer

Synthetic Resins

Acrylonitrile-Butadiene (NBR)

Oils

Almond
Castor
Chinawood (Tung)
Coconut
Cottonseed
Fish
Linseed
Mineral
Pine
Rapeseed
Soybean

Figure 4: Specific Gravity of Acetone

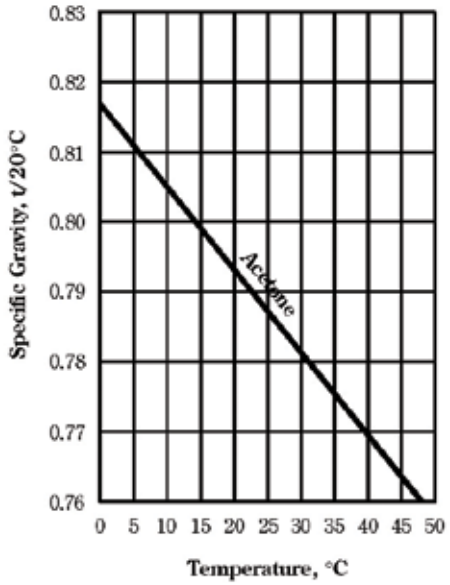


Figure 5: Surface Tension of Acetone

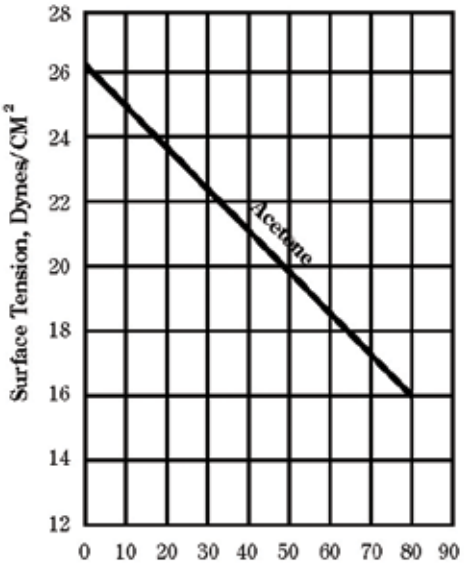


Table 3: Solvent Properties
The following properties of acetone are pertinent to the formulation of coatings.

Pounds per Gallon, 20°C (68°F)	6.594
Gallons per 100 Pounds 20°C (68°F)	15.15
Relative Evaporation Rate (n-butyl acetate = 100)	1,160
Flash Point, Tag Open Cup, °F	15
Blush Resistance, Percent Relative Humidity at 80ºF	30
Toluene Dilution Ratio	4.5
Naptha Dilution Ratio	0.7

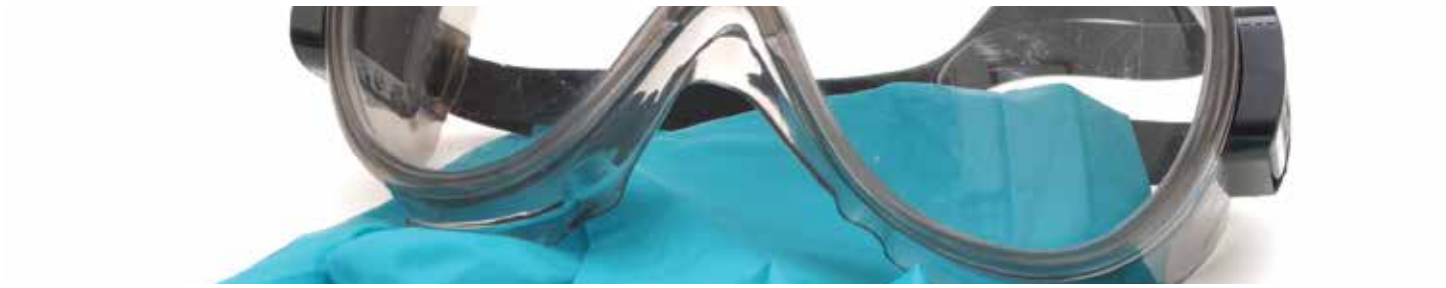
Properties of Acetone

Acetone at Various Temperatures

Table 4: Pounds of Acetone per U.S. Gallon at Various Temperatures

°F	Lbs.	°F	Lbs.	°F	Lbs.	°F	Lbs.	°F	Lbs.
-20.0	7.044	10.4	6.888	41.0	6.732	71.6	6.575	102.0	6.420
-19.0	7.039	11.0	6.885	42.0	6.727	72.0	6.573	102.2	6.419
-18.4	7.036	12.0	6.880	42.8	6.723	73.0	6.568	103.0	6.415
-18.0	7.034	12.2	6.879	43.0	6.722	73.4	6.566	104.0	6.410
-17.0	7.029	13.0	6.875	44.0	6.717	74.0	6.563	105.0	6.405
-16.6	7.026	14.0	6.870	44.6	6.713	75.0	6.558	105.8	6.400
-16.0	7.023	15.0	6.865	45.0	6.711	75.2	6.557	106.0	6.399
-15.0	7.018	15.8	6.861	46.0	6.706	76.0	6.553	107.0	6.394
-14.8	7.017	16.0	6.860	46.4	6.704	77.0	6.548	107.6	6.391
-14.0	7.013	17.0	6.855	47.0	6.701	78.0	6.543	108.0	6.389
-13.0	7.008	17.6	6.852	48.0	6.696	78.8	6.539	109.0	6.384
-12.0	7.003	18.0	6.850	48.2	6.695	79.0	6.538	109.4	6.382
-11.2	6.999	19.0	6.844	49.0	6.691	80.0	6.532	110.0	6.379
-11.0	6.998	19.4	6.842	50.0	6.686	80.6	6.529	111.0	6.374
-10.0	6.993	20.0	6.839	51.0	6.681	81.0	6.527	111.2	6.373
-9.4	6.990	21.0	6.834	51.8	6.677	82.0	6.522	112.0	6.369
-9.0	6.988	21.2	6.833	52.0	6.676	82.4	6.520	113.0	6.364
-8.0	6.982	22.0	6.829	53.0	6.671	83.0	6.517	114.0	6.359
-7.6	6.980	23.0	6.824	53.6	6.667	84.0	6.512	114.8	6.354
-7.0	6.977	24.0	6.819	54.0	6.665	84.2	6.511	115.0	6.353
-6.0	6.972	24.8	6.815	55.0	6.660	85.0	6.507	116.0	6.348
-5.8	6.971	25.0	6.814	55.4	6.658	86.0	6.502	116.6	6.345
-5.0	6.967	26.0	6.809	56.0	6.655	87.0	6.497	117.0	6.343
-4.0	6.962	26.6	6.806	57.0	6.650	87.8	6.493	118.0	6.338
-3.0	6.957	27.0	6.803	57.2	6.649	88.0	6.492	118.4	6.336
-2.2	6.953	28.0	6.798	58.0	6.645	89.0	6.486	119.0	6.333
-2.0	6.952	28.4	6.796	59.0	6.640	89.6	6.483	120.0	6.328
-1.0	6.947	29.0	6.793	60.0	6.635	90.0	6.481	120.2	6.327
-0.4	6.944	30.0	6.788	60.8	6.631	91.0	6.476	121.0	6.323
0	6.942	30.2	6.787	61.0	6.630	91.4	6.474	122.0	6.318
1.0	6.936	31.0	6.783	62.0	6.624	92.0	6.471	123.0	6.313
1.4	6.934	32.0	6.778	62.6	6.621	93.0	6.466	123.8	6.308
2.0	6.931	33.0	6.773	63.0	6.619	93.2	6.465	124.0	6.307
3.0	6.926	33.8	6.769	64.0	6.614	94.0	6.461	125.0	6.302
3.2	6.925	34.0	6.768	64.4	6.612	95.0	6.456	125.6	6.299
4.0	6.921	35.0	6.763	65.0	6.609	96.0	6.451	126.0	6.297
5.0	6.916	35.6	6.760	66.0	6.604	96.8	6.447	127.0	6.292
6.0	6.911	36.0	6.757	66.2	6.603	97.0	6.445	127.4	6.290
6.8	6.907	37.0	6.752	67.0	6.599	98.0	6.440	128.0	6.287
7.0	6.906	37.4	6.750	68.0	6.594	98.6	6.437	129.0	6.282
8.0	6.901	38.0	6.747	69.0	6.589	99.0	6.435	129.2	6.281
8.6	6.898	39.0	6.742	69.8	6.585	100.0	6.430	130.0	6.277
9.0	6.896	39.2	6.741	70.0	6.584	100.4	6.428		
10.0	6.890	40.0	6.737	71.0	6.578	101.0	6.425		

Health Hazards



Olin publishes and regularly updates a safety data sheet (SDS) for acetone. The SDS is designed to help customers and others who handle acetone to meet both their own safe handling and disposal needs and those regulations and requirements promulgated by various governmental agencies, including the U.S. Occupational Safety and Health Administration (OSHA). Olin publishes a specific SDS in the local language for each jurisdiction where the product is sold.

A current copy of the SDS should be obtained and carefully read **before** Olin Acetone is handled, used, stored, shipped, or disposed of. The SDS should also be consulted for information and instruction on containing and cleaning up spills and leaks, personal protective equipment and clothing, and administering first aid. For current copies of your local SDSs, contact your Olin representative.

Potential Health Effects

Odor Threshold and Warning Properties

Acetone is a clear colorless liquid with an aromatic odor. It is volatile and highly flammable. The odor threshold is reported to be from 13 – 100 ppm.

Note: The odor of acetone has been variously described as aromatic, strong, uncomfortable, pleasant, fruity, fragrant, faintly aromatic, or like wood smoke. Regardless, odor should not be relied upon as a warning against possible overexposure.

Acute Toxicity

In the context of the "dose-time relationship," "acute" toxicity is the ability of a substance to cause harmful effects after only a single exposure – usually to a relatively high level or concentration of the substance in question. Acetone is generally considered to demonstrate low acute toxicity, in particular with no confirmed reports that prolonged inhalation of low vapor concentrations results in any chronic effects in people.

Contact Effects

All direct contact with acetone should be avoided. The following effects of acetone on the skin and eyes should be carefully noted by all individuals working with this material.

Skin Contact

Prolonged skin exposure to acetone is not likely to cause significant skin irritation; however, it may cause drying or flaking of skin. Acetone did not cause an allergic skin reaction when tested on Guinea pigs or mice. A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. The reported dermal LD50[1] values in rabbits range from 20 g/kg bw to >25 g/kg bw.

[1]LC/LD50: estimated Lethal Concentration/Dose for fifty percent of animals exposed for specific time frame, or at a specific dose, typically during a two-week post-exposure observation time.

Eye Contact

All contact with eye should be avoided. Acetone may cause severe eye irritation, which may be slow to heal. Eye contact may cause moderate corneal injury and vapors may irritate eyes.

Ingestion

Single dose oral toxicity of acetone is considered to be extremely low. No hazards are anticipated from ingestion incidental to normal handling operations. Reported oral LD50 values in rats are very high, ranging from 5.8 to 13.7 g/kg bw.

Inhalation

A single brief (minutes) inhalation exposure to acetone is not likely to cause adverse effects. The 4-h LC50 reported for rats was 76 mg/L (32,000 ppm). Excessive exposure may cause respiratory irritation and central nervous system depression. Signs and symptoms of central nervous system depression, in order of increasing exposure, include headache, dizziness, drowsiness, and incoordination.

Chronic Toxicity – Systemic Effects (Other Target Organ)

"Chronic" toxicity describes the ability of a substance to cause harmful effects only after many repeated exposures over an extended period of time – usually to a lower level or concentration of the substance in question.

In considering the potential of acetone to induce chronic toxicity, it must be pointed out that acetone is ubiquitously present endogenously in mammals, as a normal product of intermediary metabolism; in particular, higher levels of acetone form in humans under conditions of fasting/starvation, uncontrolled diabetes, and with exertion as a means of supplying glucose to tissues that are incapable of metabolizing fatty acids.

Signs and symptoms of excessive exposure may be anesthetic or narcotic effects. Repeated excessive exposures to smaller amounts may cause irritation to eyes and respiratory tract. In animals, acetone has been shown to cause kidney effects, and has been shown to cause liver, blood, and testicular effects only at very high doses.

Health Hazards

Mutagenicity and Cancer Information

Many *in vitro* mutagenicity tests have been conducted with acetone, with some mixed results of negative and positive; however, *in vivo* mutagenicity tests have been negative, thus acetone is not classified for mutagenicity.

Acetone was used as vehicle control in a number of long-term skin painting carcinogenicity studies; it did not cause cancer in any of these long-term animal studies.

Teratology (Birth Defects) and Reproductive Effects

Birth defects are unlikely from acetone exposure because acetone was tested for developmental toxicity in mice and rats and did not result in any treatment-related effects at exposure levels that did not cause maternal toxicity. Thus exposures having no effect on the mother should have no effect on the fetus.

Acetone has been tested in non-standard animal studies, and has been shown not to interfere with reproduction. Results from a study on 5% acetone in drinking water did not show effects on reproductive function in rats.

Exposure

Key regional Occupation Exposure Limits (OELs) are shown in Table 5. The Occupational Safety and Health Administration (OSHA) PEL (Permissible Exposure Limit) for acetone is 1000 ppm, set in 1971. The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended a threshold limit valve (TLV) of 250 ppm acetone in air based on a time-weighted average (TWA) of an eight-hour workday, and 500 ppm (1,187 mg/m^3) for 15-minute short term exposure limit (STEL). An internal industrial hygiene guide (IHG) value was set at 200 ppm to minimize the potential for upper respiratory tract and eye irritation, as well as central nervous system impairment; this is an 8-hr TWA value designed to protect workers. The IHG value for a 15-minute short-term exposure limit (STEL) is 350 ppm. The Derived-No-Effect-Level (DNEL) for acetone, described in the European Chemicals Agency (ECHA) IUCLID, developed under the EU Registration, Evaluation, and Authorization of Chemicals (REACH) regulation, is 1210 mg/m^3 (500 ppm), set to protect workers against potential long-term systemic effects. Also, while acetone has a noticeable odor, the odor threshold is not clearly defined, and olfactory detection of the presence of acetone is not adequate to protect against overexposure.

Precautions for Safe Handling and Use

Since the individual circumstances under which acetone may be used are beyond the control of Olin, the following recommendations for safe handling and use of this material are necessarily general in nature.

For more information on the safe handling and use of this product, please contact Olin Customer Care (see contact information on the back cover of this brochure). Also, assistance in evaluating particular plant conditions may be obtained from consulting laboratories and from state departments of health or labor, many of which offer industrial hygiene services. Ultimately it is the responsibility of the owner and/or the operator of each facility to ensure proper, safe handling of the acetone.

Table 5: Key Regional/Country Occupational Exposure Level (OEL) Values for Acetone

Country/ Region	OEL	Units	Comments
US OSHA PEL	1,000	ppm	2375 mg/m^3 TWA (8-hr work day; 40-hrs/week)
ACGIH	250 (594)	ppm (mg/m^3)	TLV-TWA (8-hr); A4 (Not classifiable as a human carcinogen) ACGIH, 2015
	500 (1,187)	ppm (mg/m^3)	TLV-STEL for 15 minute short term exposure limit
Internal IHG	200	ppm	Internal guidance value set in 2013 as 8-hr TWA
	350	ppm	IHG-STEL for 15 minute short term exposure limit
*DNEL	1,210	mg/m^3	500 ppm; protective for occupational exposure against systemic long-term and local effects

*DNEL: Derived-No-Effect-Level: level of exposure to the substance above which humans should not be exposed; risk to humans is considered to be adequately controlled if the exposure levels do not exceed the appropriate DNEL.

Personal Protection

1. Maintain a current Safety Data Sheet (SDS) on acetone. We, as producers, have a regulatory obligation under OSHA Hazard Communication Standard to provide a SDS at the time of order and an up-to-date SDS with each subsequent shipment. Distributors are obligated to pass on the SDS. Consult it for up-to-date information on physical properties, toxicity, and handling recommendations.
2. Read and follow carefully all current label directions and precautions.
3. Keep atmospheric concentrations at or below those listed under "Guidelines for Vapor Control" above, and on the SDS.

   Note: Where engineering methods for controlling exposure levels are not feasible, wear a NIOSH-approved respirator. For emergencies where the airborne concentration is unknown, wear a NIOSH-approved self-contained positive-pressure breathing apparatus.

4. Avoid direct contact with the liquid. If repeated skin contact is unavoidable, an apron and neoprene rubber gloves (which are temporarily impermeable to acetone) should be worn.
5. Use chemical goggles to help prevent direct eye contact. If vapor causes eye discomfort, use a full-face respirator.

   Note: Do not use acetone with certain active chlorine compounds without special regard for the possible formation of toxic chloroketones.

Environmental Information

Acetone is readily biodegradable, which suggests that any traces will be removed from water and soil environments by biological action, including biological wastewater treatment facilities. Acetone is completely miscible with water. Because it evaporates readily, acetone is not expected to persist in aquatic or terrestrial environments. Due to the volatile nature of acetone, it is not expected to accumulate in the food chain, thus acetone has a low bioconcentration potential, and it is practically non-toxic to fish and other aquatic organisms on an acute basis.

FIRST AID

The chance of exposure to acetone can be minimized by careful attention to industrial hygiene and adherence to safe work practices. However, plant personnel should be prepared to give effective first aid in the event of accidental spills or exposure.

Inhalation

- Remove the affected person immediately from the contaminated area to fresh air. Keep person warm and quiet.
- If breathing stops give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel.

Skin Contact

- Exposure to acetone is not likely to cause significant skin irritation, however it may cause drying or flaking of skin. Wash skin thoroughly with plenty of water for at least 15 minutes, while removing all contaminated clothing. Wash clothing before reuse.
- If skin irritation or injury develops, seek medical attention.

Eye Contact

- Flush the eyes immediately and continuously with plenty of flowing water for at least 15 minutes. Remove contact lenses, if present, after first 5 minutes, and then continue flushing.
- Seek medical attention immediately.

Ingestion

- Call a physician at once. Do not induce vomiting unless directed by medical personnel. **Never give fluids or induce vomiting if patient is unconscious or having convulsions.**
-

Physician Notes

- Maintain adequate ventilation and oxygenation of the patient.
- The decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.
- Skin contact may aggravate preexisting dermatitis.
- Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

Safe Handling, Unloading and Storage

Spills and Disposal

Wear appropriate safety equipment (see "Precautions for Safe Handling and Use," page 9). Keep spills away from heat, sparks or flames. Contain spilled material if possible. Use non-sparking tools in cleanup operations. Ground and bond all containers and handling equipment. Collect in suitable and properly labeled containers. Pump with explosion-proof equipment. If available, use foam to smother or suppress. Absorb with materials such as sand.

In disposal of any wastes, be certain all applicable federal, state/provincial and local regulations are met.

Note: Although acetone is noncorrosive to metals, it will dissolve many plastics.

Fire and Explosion

Since acetone is a flammable liquid, with closed cup flashpoint of -20°C (-4°F), it must be kept away from heat, sparks or flames. It should be used with adequate ventilation and stored in closed containers. Fires may be controlled with carbon dioxide, dry chemical extinguishers or alcohol foam.

Water can be used to cool fire-exposed containers, to protect personnel, and to disperse vapors and spills. Fire fighters should wear protective clothing and a NIOSH-approved self-contained positive-pressure breathing apparatus.

The flammable limit at room temperature is between 2.6 and 12.8 volume percent acetone vapor in air. Acetone may react vigorously with certain oxidizing agents such as chromic acid and alkaline potassium permanganate.

Acetone concentrations as low as 1% in water can potentially produce a flammable headspace.

Note: Violent reaction with NAOH can cause high pressure and reaction products. Maintenance work should use LEL (Lower Explosive Limit) monitoring and non-sparking tools when opening or working on systems that contained acetone. Grounded metal buckets should be used if a system is being drained of residual material. Other grounding precautions, such as personnel grounding, should also be considered when it is believed acetone could be present.

Table 6

Type of Container	Net Weight (approx) lbs.
Rail 30,000 gallon carbon steel tank cars (lined)	190,000
Tank Trucks 7,000 gallon stainless steel	46,000
Barges	2,800,000

Shipping Information

Olin ships acetone in tank truck, tank car and barge quantities as shown in Table 6.

Acetone is classified as "Flammable Liquid" by the Department of Transportation and its shipment, including loading and unloading, is subject to DOT Hazardous Materials Regulations. Further, certain state, municipal and insurance company regulations also may apply to acetone shipping and handling operations.

Unloading Shipping Containers

Unloading personnel should be familiar with general tank car and tank truck equipment, thoroughly instructed as to the hazardous properties of acetone, and trained in the proper use of required protective equipment.

The acetone storage tank should have an inert gas (nitrogen) pad. This receiving tank should be vented back to the tank car or tank truck by means of a line from the top of the storage tank to the tank car or tank truck (see Storage). This closed loop system prevents exposure to personnel and the formation of potentially explosive mixtures.

Transfer of the acetone from the tank car or tank truck can then be accomplished by means of a pump (preferably the customer's pump). Both the tank car or tank truck and the transfer pump must be grounded.

Acetone Tank Truck Unloading Procedure

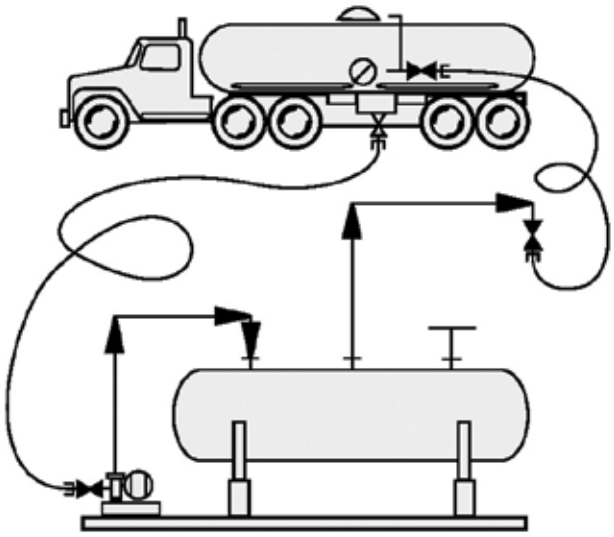
A written job procedure on unloading tank trucks of acetone should be provided to anyone performing this operation. The following procedure gives minimum requirements for unloading tank trucks of acetone.

1. Emergency respiratory equipment, a safety shower and eye bath, a fire extinguisher and the necessary personal protective equipment should be available to persons unloading tank trucks of acetone.
2. Visually check area for leaks and other hazards. Remove all obstructions.
3. Spot truck. Secure keys and/or placard wheel.
4. Check wheels and hook up ground cable.
5. Inspect truck. Check all truck openings for tight seal. Check all valves and gaskets in quick fits. Visually check trucks for other hazards. **CAUTION:** Do not walk or work on top of tank truck without platform and handrails or life line to prevent falls.
6. Through the loading hatch on top of the tank truck, collect a small sample and analyze to verify contents of the truck. Be sure to use safety equipment (neoprene rubber gloves, monogoggles, respirator, spark proof tools and sample tongs). Take sample from the dome of the truck.

After the sample is identified:

7. The acetone storage tank should have an inert gas pad. This receiving tank should be vented back to the tank truck by means of a line from the top of the tank to the tank truck.
8. Connect the unloading hoses.

Figure 6



Note: This completes the closed loop system. See figure 6.

9. Line up all valves at truck and tank.
10. Notify operations of transfer.
11. Obtain accurate tank readings. Check to make sure tank will hold truck contents, then start pumping. Limit the pumping rate of the plant pump or truck to a level which will prevent a vacuum from developing in the tank truck.
12. Double check lines, truck and tank for leaks and/or proper line up. One person must be within 25 feet of truck while unloading.
13. When truck is empty, shut off pump, isolate tank truck from storage tank and then close or open appropriate valves.
14. Transfer hose must be bled down before any attempt to disconnect. After pressure is bled off, disconnect hose and vent line.
15. Remove all wheel chocks, ground cable, and return key. Do not reverse placards.
16. Release truck.

Acetone Tank Car Unloading Procedure

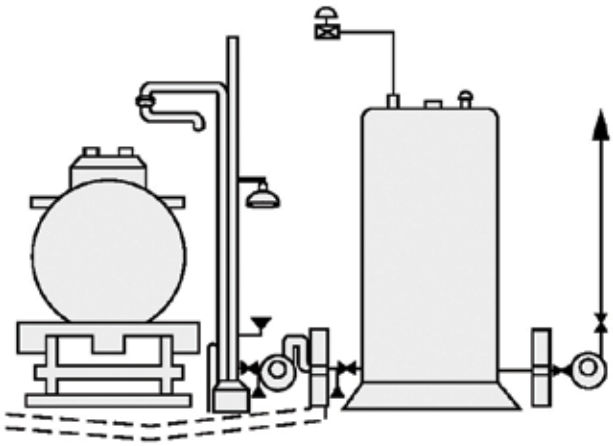
1. Spot tank car at unloading site. To guard the unloading operation, put up blue flag stop signs (use blue light after dark) and set derails. Prohibit all spark-producing, welding or open flame operations within 200 feet of unloading operation. Be sure tank car is grounded.
2. To prevent the car from possible drifting while loading is being performed, secure the wheels with chocks and set vehicle brake.
3. Check the outlet valve to see that it is closed and remove the plug. **CAUTION:** There may be product trapped between the valve and plug. Wear monogoggles, neoprene rubber gloves and neoprene rubber boots.
4. Secure material sample from car and analyze for *positive identification* of product prior to unloading. **CAUTION:** Monogoggles, neoprene rubber boots, neoprene rubber gloves, sample tongs and respirator should be used when sampling.
5. Check tank car loaded volume and verify that receiving tank will not be overfilled.
6. Connect unloading line to tank car outlet valve and line up piping system for transfer.
7. Connect inert gas (nitrogen recommended) pad to 1" vent valve on top of car. This is to keep air from entering car and to prevent a vacuum in car during unloading. Pad pressure should be controlled by regulator at a valve well below pressure rating of tank car - 25 psig maximum.
8. If material is to be pumped from car, an alternate method of venting is to connect the tank car vent outlet with an adequately sized line back to the receiving tank. In this case, no separate gas system is required.
9. Open tank car off-loading valve and start product transfer to receiving tank. Check entire system for leaks, particularly where connections were made. Tank car must be in sight of one person while unloading.
10. When tank car is empty, close off appropriate valves on liquid and inert gas pad to tank and record final level to allow calculations on amount received. Tank car pressure should be vented and dome opened to inspect car for product heels before releasing.
11. Disconnect all lines and fittings from tank car. Monogoggles, neoprene rubber gloves and neoprene rubber boots should be used and a respirator should be readily available. Replace screwed plugs in vent and product outlet valves.
12. Disconnect grounding lines, remove wheel chocks and release brake.
13. Make sure all ramps and lines are clear of tank car.
14. Take down blue flag stop signs and deactivate derails.

Safe Handling, Unloading and Storage

Storage

Carbon steel, 304L, 316L or duplex 2205 stainless steel tanks of welded construction, as specified in the API (American Petroleum Institute) Standard 650 (1977 Edition, Paragraphs 3.5.2e1, 3.5.2e3) are recommended for acetone service. The design should be positive-pressure, plus 6" water, minus 1/2 ounce.

Figure 7



Recommended gaskets include 316 stainless steel perforated tang reinforcement encapsulated in pure graphite sheet such as Durabla FGT 316 gasket laminates, Grafoil GH™E gasket laminates from UCAR Carbon Company Inc. or Graph-Lock 3125TC gasket laminates from Garlock. Gaskets made of PTFE may also be used.

Additional design considerations are regulated by the National Fire Prevention Association Code 30. These considerations include location, method of sizing, emergency relief valve system, type of drainage diking and additional fire protection considerations. Consult local fire codes for additional fire protection requirements, which might include combustible gas monitors, location of fire monitor nozzles, or foam and sprinkling systems.

It has been the experience of Olin Corporation that acetone can be stored satisfactorily in unlined carbon steel tanks. However, in cases where the purity of acetone is to be optimized, an inorganic zinc lining is recommended.

Acetone should be stored under an inert gas pad such as *nitrogen*. Carbon dioxide is *not recommended*. A blanketing or pad/depad system is recommended to maintain the inert atmosphere. The associated tank venting system is discussed in the section on accessory equipment.

Storage tanks containing acetone should be properly grounded. Pumps (See Accessory Equipment) utilized for both filling and removal of material from the tank should share a common ground with the tank. Locate these pumps outside the tank diking area.

To minimize the possibility of static charge build-up during filling of the tank, the following additional construction design is recommended.

The tank inlet nozzle should be at the bottom of the vessel with provisions to block and to drain piping. If the tank inlet nozzle is installed at the top of the tank side wall, a carbon steel tube located in the tank interior and directed to the tank bottom should be connected to the inlet nozzle. The carbon steel tube should then extend from the inlet nozzle to near the tank bottom, resting on supports on, but not welded to, the tank bottom. Acetone pumped into inlet nozzle will then flow through the interior tube and enter the tank contents at the tank bottom. A small hole should be drilled in the tube near the inlet nozzle to prevent a possible siphoning effect. The tank exterior should be painted a light, reflective color, such as white.

Carbon steel tanks should be lined with a liner such as Carbozinc™ CZ-11, to prevent acetone product quality issues. All tanks and piping should be grounded.

Local fire, pollution and any additional regulations affecting bulk handling and storage of acetone should be consulted.

Accessory Equipment

Pumps, motors and switch gear used for acetone service should conform to the specifications outlined in the National Electric Code, Class I, Division I, Group D, paragraphs 500 and 501.

The tank venting system should allow for compliance with local vapor emission standards and conform with National Fire Prevention Association recommendations. Sizing of pressure relief valves, vacuum relief valves, and emergency relief valves is outlined in the American Petroleum Institute Standard 2000 (1973 Edition). Factors such as “pumping-in” rate, thermal out-breathing, and potential “slug-in” of gas during tank loading should be considered in design of the relief valve. A flame arrester should be included in the venting system.

A mechanical or electronic tank leveling gauge is recommended.

Chemical Diversion And Trafficking Act

In 1988 the U.S. Congress enacted the Chemical Diversion and Trafficking Act to help prevent the diversion of certain chemicals that could be used in making illicit drugs. Under the Act, acetone is listed in the essential chemical category. The federal regulations impose certain record keeping and reporting requirements on companies that manufacture, sell, import or export the listed chemicals.

Olin Product Stewardship

Olin encourages its customers and potential users of Olin products to review their applications of such products from the standpoint of human health and environmental quality. To help ensure that Olin products are not used in ways for which they are not intended or tested, Olin personnel will assist customers in dealing with environmental and product safety considerations. An Olin sales representative can arrange the proper contacts. Olin product literature, including Safety Data Sheet (SDS), should be consulted prior to use of Olin products. These may be obtained by contacting the Olin Customer Care at 1-844-238-3445 in the U.S. (See back page for additional contact information).

Global Contact Information

Americas

USA: +1 844 238 3445
Argentina: +55 11 5188 4105
Brazil: +55 11 5188 4105
Canada: +1 877 304 4442
Mexico: +55 11 5188 4105

Info@olinbc.com

Asia

Chinese Mainland: +86 4006367896
Hong Kong: +852 58081886
Japan: +81 368608305
Singapore: +65 31632006
South Korea: +82 260221296

www.OlinEpoxy.com

Europe

France: +33 176361145
Germany: +49 41417693000
Italy: +39 0694805761
Russia: +7 4996092327
United Kingdom: +44 8000869047

Toll free service not available in all countries

Emergency Telephone Numbers (Chemical Incident Only)

USA: +1 800 424 93 00
Canada: +1 613 996 6666
Europe/Middle East/Africa/India: +32 3 575 55 55
Chinese Mainland: +86 532 83889090
Asia/Pacific: +65 6542 9595

Olin™

RESPONSIBLE CARE®
OUR COMMITMENT TO SUSTAINABILITY

Form No. 296-02158-0417PI