



MATERIAL SAFETY DATA SHEET

UREA FORMALDEHYDE CONCENTRATE (UF-85)

1. CHEMICAL PRODUCT and COMPANY IDENTIFICATION

- Product Name : UREA FORMALDEHYDE CONCENTRATE (UF-85)
- Company Details : Oman Formaldehyde Chemical Company LLC,
Plot No. : - 31 & 32
Sohar Industrial Port Area, Mina Sohar
P.O.Box No: 94, Postal Code: 327
Sultanate of Oman
- Emergency Phone Number : +968 - 92881210 (Control Room)
+968 - 92827040 (Deputy General Manager)
- Product Usage : As Anti-caking agent in Urea manufacturing industry, in
Manufacturing of Urea Formaldehyde moulding
powder, Urea Formaldehyde based resins etc.

2. COMPOSITION/INFORMATION on INGREDIENTS

COMPONENT	CAS NUMBER	
UREA	57 - 13 - 6	25%
FORMALDEHYDE	50 - 00 - 0	60%

3. HAZARDS IDENTIFICATION

The physiological properties of UF-85 Concentrate have not been fully investigated, but the high formaldehyde content naturally results in toxicity similar to that of 50% formaldehyde solutions. Urea itself is not considered toxic, but large amounts taken internally have been known to be dangerous. The toxicity of formaldehyde being the dominant factor in UF-85 Concentrate, inhalation of fumes and prolonged contact with UF-85 can produce irritation of the skin, eyes and respiratory passages. Conversely, any plant safely using formaldehyde/ para formaldehyde solutions can safely use Urea Formaldehyde Concentrates.

4. FIRST AID MEASURES

If UF-85 has been swallowed, or if overexposure to fumes has occurred, call a physician immediately, informing him of the exact nature of the case and where the patient may be found when he arrives. If UF-85 is spilled on the skin, wash at once with plenty of water repetitively. Case should be referred to a competent physician.



If the material is splashed into the eyes, wash with plenty of water for at least fifteen minutes. Call an eye specialist immediately, informing him of the exact nature of the case and where the patient may be found when he arrives.

5. **FIRE FIGHTING MEASURES**

The fire and explosion hazards are quite small, but cars and tanks containing UF-85 should be electrically grounded. If the material should become involved in a fire, pungent formaldehyde fumes will contaminate the area affected. A fire hose with a spray or fog nozzle will aid in controlling such fumes.

6. **ACCIDENTAL RELEASE MEASURES**

Spilled material should be collected by raking, sweeping or vacuuming and be placed in a container. Do not wash into any public water system.

7. **HANDLING and STORAGE**

CORROSION - Among the common materials of construction suitable for handling and storing UF-85 at temperature up to 60 °C (140 °F) are aluminium 2S, brass, copper, Monel, nickel, tin, zinc, stainless steels (304, 316, 405), Everdur, and Inconel. Since some contamination results when aluminium is used, stainless steel or stainless clad steel is generally preferred for tanks.

Phenolic-coated (such as Lithcote and Heresite) mild steel, as well as polyethylene-coated mild steel have shown no attack by UF-85 after 102 days' exposure at temperature of 30 to 35 °C (86 - 95 °F). However, lined tanks are often expensive to maintain. In general, UF-85 Concentrate has been found to be somewhat less corrosive than ordinary formaldehyde solutions or liquid resins.

STORAGE - UF-85 should be stored in well-ventilated areas away from strong acids and oxidizing and alkaline materials. UF-85 is stable for at least six months under recommended storage conditions. At 55 °C (131 °F) viscosity will increase rapidly upon storage (Refer Annexure-I). For this reason, storage tanks should not be exposed to direct summer sunlight & should be shielded from the direct rays of sun. Extended storage at temperatures as low as -20 °C (-4 °F) has no permanent detrimental effect on UF-85, but to maintain the proper viscosity it is recommended that the Concentrate be stored below 35 °C (68 - 86 °F). For this reason, the minimum requirement for storage tank would be provision of mineral wool insulation of 30-40 mm thickness. As an additional precaution, it is recommended to provide circulation cooler. If low ambient



temperatures are anticipated, indoor or insulated storage tanks should be used, with provisions for heating and recirculation or agitation. Agitation inside the tank is also recommended to avoid hot spots and maintain uniform viscosity. Due to normal drift in UF-85 pH on storage over a period of time, process adjustments may be necessary. A heating coil is sometimes needed only near the outlet of small tanks, this can be used to avoid having to heat the entire contents of the tank. Water heated to about 50 °C (122 °F) should be used instead of steam for heating stored concentrate, since localized overheating could deteriorate the material. This can be done by making a water line connection to the coil inlet by using a tee at the existing steam connection, if necessary. The water is then heated by the steam to a temperature which is controlled by the rate of water flow. A check valve should be used in either the water or the steam line, depending on which utility has the lower pressure.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONNEL PROTECTION INFORMATION

Use of approved respiratory, goggles, suitable protective clothing and gloves is recommended. Use safety shoes when handling drums. UF-85 Concentrate should be handled with all the safety precautions normally taken with formaldehyde solutions. Gloves and aprons made of resistant materials should be worn by personnel handling UF-85, and adequate ventilation should be provided. Reasonable care in handling this formaldehyde containing material is more effective in preventing dermatitis than protective creams, which cannot be solely depended upon. Skin exposed to concentrate should be washed as soon as possible.

Tanks should be cleaned from the outside whenever possible. Complete protective suits and safety goggles, face shields, airline respirators or gas masks should be worn when needed. Only experienced, reliable personnel should be given the responsibility of handling UF-85.



9. PHYSICAL and CHEMICAL PROPERTIES

Appearance	Clear liquid
Odor	Pungent
Specific Gravity	1.32 at 25/ °C (77 °F)
Weight per Gallon	11.0 pounds
Viscosity at 25 °C	(300-500) C.P.S.
Surface Tension	64 dynes/cm. at 25 °C (77 °F)
Boiling Point	About 100 °C (212 °F)
Freezing Point	-20 to - 30 °C (- 4 to -22 °F)
Vapor Pressure, 25 °C (77 °F)	10 mm. Hg.
39 °C (102 °F)	31 mm. Hg.
49 °C (120 °F)	50 mm. Hg.
62 °C (144 °F)	100 mm. Hg.
Flash Point, Cleveland Open Cup	None up to 100 °C (212 °F)
Flash Point, Closed Cup	About 79 °C (175 °F)
Auto Ignition Temp.	430 °C
Flammable limits	LEL:7%; UEL: 73% for gas
TLV	10 ppm
Solubility in 100 grams of UF-85 at 25 °C (77 °F)	
Water	Miscible
Methanol	Miscible
Ethanol	Miscible

10. STABILITY and REACTIVITY

UF-85 is a clear, colorless, viscous solution of HCHO and urea reacted in a small amount of water. It is relatively non-volatile, having a vapor pressure lower than that of normally-used formaldehyde solutions at corresponding temperatures, and no permanent adverse effects are produced by storing the concentrate at low temperatures. High temperature storage above 45° C may deteriorate the material quality rapidly. The material contains approximately 85% solids combined in a formaldehyde to urea mole ratio of about 4.6 to 1. A typical sample contains (60%) formaldehyde and (25%) urea.



UF-85 does not have a definite boiling point or freezing point. It begins to boil at about 100° C (212 °F). It becomes extremely viscous and glass like between - 20 and - 30 °C (-4° F to -22 °F). ANNEXURE-1 shows the change of viscosity with temperature. UF-85 Concentrate behaves like a mixture of methylolureas and formaldehyde and contains no resinified material.

STRUCTURE

Because of the difficulty involved in distinguishing between different polymethylolureas in solution, the composition of UF-85 is best reported in terms of weight percent Urea and HCHO. The following equilibria are thought to exist in the Concentrate:

$\text{NH}_2\text{CONH}_2 + \text{HCHO} =$	$\text{NH}_2\text{CONHCH}_2\text{OH}$
$\text{NH}_2\text{CONHCH}_2\text{OH} + \text{HCHO} =$	$\text{HOCH}_2\text{NHCONHCH}_2\text{OH}$
$\text{HOCH}_2\text{NHCONHCH}_2\text{OH} + \text{HCHO} =$	$\text{HOCH}_2\text{NHCON}(\text{CH}_2\text{OH})_2$
$\text{HOCH}_2\text{NHCON}(\text{CH}_2\text{OH})_2 + \text{HCHO} =$	$(\text{HOCH}_2)_2\text{NCON}(\text{CH}_2\text{OH})_2$

Experimental results indicate that the Concentrate is a low molecular weight non-polymeric product whose behavior is best explained by one or a combination of the above structures. Dialysis through cellophane of UF-85 showed that large quantities of both urea and formaldehyde passed through the membrane, indicating that the bulk of the material in the Concentrate is not colloidal in nature, and therefore, non-polymeric. Other results show that all of the formaldehyde in UF-85 is available for resin forming reactions and can actually be separated from the urea present under proper conditions of temperature and pressure.

Infrared absorption studies showed that the uron ring is not present in UF-85. In this respect, it is different from some other types of urea-formaldehyde concentrates investigated. The infrared studies in general favored the polymethylolurea structure and the weight of experimental evidence makes this structure the one most generally acceptable.

11. TOXICOLOGICAL INFORMATION

TOXICOLOGY AND OCCUPATION HEALTH

Formaldehyde is an essential intermediate in cell metabolism in mammals and humans. All tissues contain measurable amounts of formaldehyde e.g. human blood 2-3 ppm.



Formaldehyde does not accumulate in the environment or in the human body because it is rapidly oxidized or biodegraded. In the body, exogenous formaldehyde is metabolized with a half-life of 1.5 min. into formic acid and carbon dioxide.

EFFECTS OF FORMALDEHYDE EXPOSURE IN HUMANS

Formaldehyde has been used on a large scale for more than 90 years in medicine and industry. Millions of people have been occupationally exposed to it. However, apart from acute irritation and allergic contact dermatitis in a limited number of cases, no adverse effects on human health have been observed. Gaseous formaldehyde does not cause allergies. Formaldehyde exposure has not been demonstrated to restrict or obstruct pulmonary function at concentrations tolerated by humans. Irritation thresholds in humans vary; data are shown in **TABLE - 1**.

It is rapidly metabolized in the upper respiratory tract. Formaldehyde blood levels did not increase after inhalation of 1.9 ppm for 40 min. by human volunteers.

SPECIAL REMARKS ON OTHER TOXIC EFFECTS ON HUMANS:

Acute Potential Health Effects:

Skin: Corrosive. Causes skin irritation which may range from mild to severe with possible burns depending on the extent of exposure and concentration of solution. Other symptoms may include brownish discoloration of the skin, urticaria, and pustulovesicffular eruptions. May be absorbed through skin with symptoms paralleling those of ingestion.

Eyes: Corrosive. Contact with liquid causes severe eye irritation and burns. It may cause irreversible eye damage (severe corneal Solutions containing low formaldehyde concentrations may produce transient discomfort and irritation.

Inhalation: Causes irritation of the respiratory tract (nose, throat, airways). Symptoms may include dry and sore mouth and throat, thirst, and sleep disturbances, difficulty breathing, shortness of breath, coughing, sneezing, wheezing rhinitis, chest tightness, pulmonary edema, bronchitis, tracheitis, laryngospasm, pneumonia, palpitations. It may also affect metabolism weight loss, metabolic acidosis), behavior/central nervous system (excitement, central nervous system depression, somnolence, convulsions, stupor, aggression, headache, weakness, dizziness, drowsiness, coma), peripheral nervous system, and blood.



Ingestion: Harmful if swallowed. May be fatal. Causes gastrointestinal irritation with nausea, vomiting (possibly with blood), diarrhea, severe pain in mouth, throat and stomach, and possible corrosive injury to the gastrointestinal mucosa/ulceration or bleeding from stomach. May also affect the liver(jaundice), urinary system/kidneys (difficulty urinating, albuminuria, hematuria, anuria), blood, endocrine system, respiration (respiratory obstruction, pulmonary edema, bronchiolar obstruction), cardiovascular system (hypotension), metabolism (metabolic acidosis), eyes (retinal changes, visual field changes), and behavior/central nervous system (symptoms similar to those for inhalation). Contains Methanol which may cause blindness if swallowed. Chronic Potential Health Effects: Skin: Prolonged or repeated exposure may cause contact dermatitis both irritant and allergic. It may also cause skin discoloration. Inhalation: Although there is no clear evidence, prolonged or repeated exposure may induce allergic asthma. Other effects are similar to that of acute exposure. Ingestion: Prolonged or repeated ingestion may cause gastrointestinal tract irritation and ulceration or bleeding from the stomach. Other effects may be similar to that of acute ingestion.

TABLE -2 lists maximum allowable workplace concentrations permitted in various countries.

TABLE - 1 DOSE - RESPONSE RELATIONSHIP FOLLOWING HUMAN EXPOSURE TO GASEOUS FORMALDEHYDE	
EFFECT	EXPOSURE LEVEL, PPM
Irritation threshold in eyes, nose or throat	0.2 - 1.6
Stronger irritation of upper respiratory tract, coughing, lacrimation, extreme discomfort	3 - 6
Immediate dyspnea, burning in nose and throat, heavy coughing and lacrimation	10 - 20
Necrosis of mucous membranes, laryngospasm, pulmonary edema	> 50

NOTE: This table represents data for gaseous formaldehyde. Limits for Urea Formaldehyde because of high vapor pressure and low Formaldehyde Content are much higher.



TABLE - 2 MAXIMUM ALLOWABLE WORKPLACE CONCENTRATIONS FOR FORMALDEHYDE IN VARIOUS COUNTRIES		
COUNTRY	MAXIMUM ALLOWABLE WORK PLACE CONCENTRATION PPM	TYPE OF LIMIT
Australia	2	Ceiling
Belgium	2	Ceiling
Brazil	1.6	TLV
Canada	No official standard USA/ACGIH used as a basis, i.e. 2 1	Ceiling Ontario recommended
Denmark	1 0.3	Ceiling For new plants from 1980
Federal Republic of Germany	0.05	TWA ceiling for a max. of 8 x 5 min. per shift
Germany	1 2	STEL (15 min.) TWA
France	2	STEL (15 min.)
Great Britain	2 2	TWA STEL (10 min.)
Italy	1	TWA
Japan	2 2	TWA Ceiling
The Netherlands	1 2	TWA Ceiling
Norway	1	Ceiling
Sweden	0.8 1 0.5	TWA UEL (15 min.) For new and converted installations.
Switzerland	1	TWA
United States	1 2	TWA STEL (15 min.)

NOTE: This table represents data for gaseous formaldehyde. Limits for Urea Formaldehyde because of high vapor pressure & low formaldehyde content are much higher

Reference: ULLMANN - October 1988 - Vol. A11



12. ECOLOGICAL INFORMATION

Product should be used only for its designated purposes.

13. DISPOSAL CONSIDERATIONS

Local authority guidelines should be followed.

14. TRANSPORT INFORMATION

Shipping Name	:	Urea Formaldehyde (UF-85)
Hazard class	:	8- Corrosive
U N No.	:	2209
IMDG Code (Page no.)	:	8176-1
Packing Group	:	III

15. REGULATOR INFORMATION

OSHA:

CAS# 50-00-0 is considered hazardous by OSHA.

16. OTHER INFORMATION

NA

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event OFCC shall be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if OFCC has been advised of the possibility of such damages.



Annexure - 1

