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July 20, 1988

Dr. Robert H. Brink
Executive Secretary
ISCA ITC (TS-792)
Room 535, East Tower
401 Mst., SW
Washington, DC 20460

Dear Dr. Brink:

Reference: n-Butyraldehyde (CAS NO. 123-72-8)

84940000239

The Chemical Division of Eastman Kodak Company is responding to a written request by the Dynamac Corporation for information on n-butyraldehyde as requested by the InterAgency Testing Committee.

This letter contains confidential information, enclosed in brackets, which is exempt from public disclosure pursuant to Section 552(b)(4) of Title 5 of the United States Code. A nonconfidential copy of this letter is enclosed and is also being provided to Dynamac Corporation.

1. Production Volume and Process Data

Annual current and projected nonconfidential production range: 300 to 600 million pounds.

n-Butyraldehyde is produced using continuous, enclosed reactor system via the aldol condensation route. The product is purified by continuous, enclosed distillation. Processing equipment is typically located outdoors, further minimizing potential exposure.

2. Use Information

n-Butyraldehyde is used internally at Texas Eastman Company and Tennessee Eastman Company to produce other chemicals. In 1987 the internal usage accounted for 94.6% of total production. The sales for the last 12 months were less than 20 million pounds. Ninety-eight percent of all material sold was purchased by two of the top ten largest domestic chemicals companies. These two chemical companies chemically convert n-butyraldehyde at their plant sites to other chemicals and polymers.

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3. Unpublished Toxicity Data

See the enclosed material safety data sheet.

4. Occupational Exposure Data

The major points of worker exposure are sampling, loading and unloading shipping containers, and maintaining the equipment. Workers wear gloves, safety glasses, and hats. Other safety equipment, such as respirators, aprons, and emergency showers are readily available and are used if conditions are such that workers could be exposed.

During the production of n-butyraldehyde, from 4 to 8 workers are potentially exposed for 4 to 30 minutes daily. Typically 4 workers per 12 hour shift, will sample the process and 1 to 2 workers will analyze the sample under prudent laboratory conditions. Maintenance operations typically involve 1 or sometimes 2 workers and potential exposure times range up to one hour per day for approximately 120 days per year. Potential exposure to workers during maintenance is minimized by cleaning and flushing the equipment with water before disassembly or repair.

During the use of n-butyraldehyde to manufacture other chemicals. 12 to 18 workers are potentially exposed from 4 minutes to 1 hour per day. These processes run from 180-360 days per year. Actual exposure to the aldehyde is minimal during the sampling, analyzing and equipment maintenance because the aldehyde is essentially converted to other chemicals at this point. Potential worker exposure during maintenance is further minimized by flushing and cleaning the equipment with water before disassembly.

Personal monitoring of production workers (42 samples) indicates air concentrations averaging less than 1.0 ppm (8 hr TWA) with no sample above 1.25 ppm. Personal industrial hygiene monitoring of materials handling workers (7 samples) for n-butyraldehyde indicate a geometric mean (8 hr. TWA) of 3.7 ppm, with high values of 21.3 and 4.57 ppm and remaining samples under 1.0 ppm. Ninety-nine percent of shipments of n-butyraldehyde are made by railcar.

5. Environmental Data

Eastman's equipment for the manufacture and use of n-butyraldehyde is designed to minimize releases. Waste streams from the processes are either incinerated or sent to industrial waste water treatment systems that are on site. Air emission controls include scrubbers, vent condensers, and conservation vents.

In the atmosphere, n-butyraldehyde is expected to undergo photochemical decomposition with a half-life in the range of 4 to 9 hours. n-Butyraldehyde is biodegradable and will not persist in the aquatic environment either, (Formaldehyde and Other Aldehydes, National Academy Press 1981).

Using methods developed by McCall and others ("Estimation of Environmental partitioning of organic chemicals in model ecosystems," Residue Review, Spring-Verlag, Vol. 85, 1983), we have calculated the distribution of n-butyraldehyde releases in the environment. As much as 97 percent of a release to any medium is predicted to partition to the atmosphere.

For the 1987 SARA Section 313 report the Texas Eastman Company plant site of Eastman Chemical Division reported total emission of 831,000 pounds with ninety percent for the emission listed as fugitive. The Tennessee Eastman site reported total emission of 60,000 pounds. Ninety-six percent of the emission at the Tennessee site came from storage tanks and the remaining four percent from process vents. Fugitive emissions were only 160 pounds.

Yours very truly,

R D Gerwe by SMB

R. D. Gerwe, Ph.D.
Technical Associate
Material Safety Program
P. O. Box 511

baTX/2501I

Enclosures

cc: Ms. Roberta Wedge
Staff Scientist
Dynamac Corporation
The Dynamac Building
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Rockville, Maryland 20852

MATERIAL SAFETY DATA SHEET

EASTMAN CHEMICAL PRODUCTS, INC.
EASTMAN KODAK COMPANY
Kingsport, Tennessee 37662

For Health Hazard Information, Call: (615) 229-6094

For Other Information, Call Your Eastman Representative

Eastman Operator: (615) 229-2000

Date of Preparation 12-10-87

SECTION I. IDENTIFICATION

-- Name:

Butyraldehyde

-- Synonyms: PM 3986; Butanal
-- Formula: C_4H_8O
-- Molecular Weight: 72.11

SECTION II. COMPONENT AND PRECAUTIONARY DATA

A. COMPONENTS:

	Approx Weight %	CAS Reg No	Eastman Kodak No
Butyraldehyde*	100	123-72-8	900440

See Section VI-A for information on exposure limits.
*Hazardous material as defined by OSHA, 29 CFR 1910.1200.

B. PRECAUTIONARY LABEL STATEMENTS:

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR
CAUSES EYE BURNS AND SKIN IRRITATION
MAY FORM EXPLOSIVE PEROXIDES
MAY POLYMERIZE

Keep away from heat, light, sparks, and flame.
Do not get in eyes, on skin, on clothing.
Avoid breathing vapor.
Do not allow to evaporate to near dryness.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.

FIRST AID: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician. Flush skin with water. Wash clothing before reuse. In case of vapor irritation of eyes, nose, and throat, remove from exposure, treat symptomatically, and get medical attention if symptoms persist.

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IN CASE OF FIRE: Use "alcohol" foam, dry chemical, CO_2, or water spray. Water may be ineffective in fighting the fire. Use water spray to keep fire-exposed containers cool.

IN CASE OF SPILL: Eliminate all ignition sources. Emergency personnel should wear self-contained breathing apparatus (or air-supplied NIOSH-approved respirator). Use water spray to disperse vapors and to protect personnel attempting to stop the leak. Flush spill area with water spray. Prevent runoff from entering drains, sewers, and streams.

Since emptied containers retain product residue, follow label warnings even after container is emptied. Do not cut, drill, grind, or weld on or near this container.

FOR MANUFACTURING USE ONLY

SECTION III. PHYSICAL DATA (1)

— Appearance and Odor: Clear, colorless liquid; very strong pungent, penetrating odor.
— Boiling Point: 76°C (169°F)
— Specific Gravity (H_2O = 1): 0.805 at 20°/20°C
— Vapor Pressure: 90 mm Hg at 20°C
— Volatile Fraction by Weight: 1.0.
— Vapor Density (Air = 1): 2.5
— Solubility in Water: 6%

SECTION IV. FIRE AND EXPLOSION HAZARD DATA (1)

— Flash Point: -13°C (9°F); Method Used: Setaflash Closed Cup.
— Autoignition Temperature: 199°C (390°F); Method Used: ASTM E 659
— Cool Flame: 168°C (335°F), Method Used: ASTM E 659-78.
— Flammable Limits: LEL 2.0% at 27°C
UEL 11.8% at 36°C
— Extinguishing Agent: Water Spray, "Alcohol" Foam, Dry Chemical, or CO_2.
— Special Fire-Fighting Procedures: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Foam is the preferred method of fire fighting. Water may be ineffective for fire fighting, but it should be used to keep fire-exposed containers cool or to disperse vapors. Water dilutions may be flammable.
— Unusual Fire and Explosion Hazard: EXTREMELY FLAMMABLE LIQUID, VAPORS MAY CAUSE FLASH FIRE. Materials used to absorb spills should be immersed in water or placed in a closed metal container without delay or spontaneous combustion may occur.

SECTION V. REACTIVITY DATA

— Stability: Unstable at elevated temperatures. May form explosive peroxides.
— Incompatibility: Oxidizing materials can cause a vigorous reaction. Reacts vigorously with strong base or mineral acids.
— Hazardous Decomposition Products: As with any other organic material, combustion will produce carbon dioxide and probably carbon monoxide.
— Hazardous Polymerization: May occur. Conditions to Avoid: Contact with strong bases or mineral acids.

SECTION VI. TOXICITY AND HEALTH

A. EXPOSURE LIMITS

-- OSHA Permissible Exposure Limit (PEL): Not established.
-- Threshold Limit Value (TLV): Not established.
-- An industrial hygiene analytical method is available to health and safety professionals upon request.

B. EXPOSURE EFFECTS

Inhalation: High vapor concentrations may cause upper respiratory tract irritation and narcosis (sleepiness, dizziness, etc.).

Eyes: Causes burns.

Skin: Causes irritation.

C. FIRST AID

Inhalation: Remove from exposure, treat symptomatically, and get medical attention if symptoms persist.

Eyes: Immediately flush with plenty of water for at least 15 min and call a physician.

Skin: Immediately flush with plenty of water for at least 15 min. Get medical attention if symptoms persist. Wash contaminated clothing before reuse.

D. TOXICITY DATA

In IR already

Test	Species	Result	Acute Toxicity Classification (2)
Acute oral LD_{50}	Rat	5900 mg/kg (3)	Practically nontoxic
Dermal LD_{50}	Guinea pig	>20 mL/kg (3)	
Inhalation LC_{50}	Rat	~~60,000 ppm/0.5 h (3)~~	
Skin irritation	Guinea pig	Moderate (3)	
Eye irritation	Rabbit	Severe (3)	
Eye irritation	Rabbit	Strong (4)	

Butyraldehyde at 1000 ppm, 6 h/day for 20 days, produced no observable toxic effects in rats. (3)

SECTION VII. VENTILATION AND PERSONAL PROTECTION

A. VENTILATION

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. Local exhaust ventilation or an enclosed handling system may be needed to control airborne levels.

B. RESPIRATORY PROTECTION

An appropriate full-face NIOSH-approved respirator for organic vapor must be worn if needed. If respirators are used, a program should be established to assure compliance with OSHA Standard 29 CFR 1910.134.

C. SKIN AND EYE PROTECTION

Wear safety glasses with side shields (or goggles) and a face shield. Impermeable gloves should be worn. An impermeable apron or smock and boots should be worn to minimize skin contact. A safety shower, an eye bath, and washing facilities should be available. Wash thoroughly after handling.

SECTION VIII. SPECIAL STORAGE AND HANDLING PRECAUTIONS

Material is extremely flammable. Vapors may ignite explosively. Prevent buildup of vapors to explosive concentrations -- use only with cross-ventilation. Keep away from heat, sparks, and flame. Do not smoke; extinguish all flames and pilot lights; and turn off stoves, heaters, electric motors, and other sources of ignition when explosive concentrations of vapor are present or likely. Keep container closed. Peroxide former. Do not allow to evaporate to near dryness. Store away from heat and light. After opening, purge container with nitrogen before reclosing. Periodically test for peroxide formation on long-term storage. Addition of water or appropriate reducing materials will lessen peroxide formation. Comply with all federal, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids. Since emptied containers retain product residue, follow label warnings even after container is emptied. Do not cut, drill, grind, or weld on or near this container.

SECTION IX. SPILL, LEAK, AND DISPOSAL PRACTICES

Steps to be Taken in Case Material is Released or Spilled: Eliminate all ignition sources. Small spills may be collected with absorbent materials. Use water spray to disperse vapors and to protect workers attempting to stop leak. Prevent runoff from entering drains, sewers, or streams. Wear self-contained breathing apparatus and protective clothing.

Waste Disposal Method: Mix with compatible chemical which is less flammable and incinerate. Observe all federal, state, and local laws concerning health and environment.

SECTION X. ENVIRONMENTAL EFFECTS DATA

A. SUMMARY: Some laboratory test data and published data are available for this product, and these data (5-10) have been used to provide the following estimate of environmental impact:

This product has a high biological oxygen demand, and may cause oxygen depletion in aquatic systems. It has a moderate potential to affect aquatic organisms, and secondary waste treatment microorganisms and the germination and growth of some plants. This product is readily biodegradable and is not expected to persist in the environment. It is not likely to bioconcentrate. The direct, instantaneous discharge to a receiving body of water of an amount of this product which will rapidly produce by dilution a final concentration of 5.0 mg/L or less is not expected to have any adverse environmental impact. After dilution with a large amount of water, followed by secondary waste treatment, this product is not expected to have any adverse environmental impact.

B. OXYGEN DEMAND DATA

-- ThOD: 2.44 g/g (5)
-- COD: 99% of ThOD (5)
-- BOD_5: 1.06 g/g (5); 1.07 g/g (6); 1.6 g/g (5)
-- BOD_{20}: 66.4% ThOD (5)

C. ACUTE AQUATIC EFFECTS

-- 48-h LC_{50}: Golden orfe (minnow): 114 mg/L; 57 mg/L (7)*
-- 24-h LC_{50}: Water flea: 340 mg/L (8)
-- 24 h EC_{50} (immobilization); Water flea: 195 mg/L (9)

*Results of the same test carried out at two different laboratories.

D. BIOCONCENTRATION POTENTIAL

-- Octanol/water partition coefficient: Log P = 0.88; P = 7.6 (10)

SECTION XI. TRANSPORTATION

DOT Hazard Classification: Flammable liquid.
Flash Point: See Section IV.
Proper DOT Shipping Name: Butyraldehyde.
UN Number: 1129.

SECTION XII. REFERENCES

1. File data, Material Safety Program, Eastman Chemicals Division, Eastman Kodak Company, Kingsport, Tennessee.

2. AM IND HYG ASSOC Q 10, 93-96 (1949).

3. G. D. Clayton and F. E. Clayton, Editors. PATTY'S INDUSTRIAL HYGIENE AND TOXICOLOGY, 3rd Revised Edition, Volume 2A. Wiley-Interscience, New York, 1981, pp. 2642, 2647.

4. AMA ARCH IND HYG OCCUP MED 4, 119-122 (1951).

5. K. Verschueren. HANDBOOK OF ENVIRONMENTAL DATA ON ORGANIC CHEMICALS, 2nd Edition. Van Nostrand Reinhold Company, New York, 1983, pp. 323-324.

6. Unpublished data, Health and Environment Laboratories, Eastman Kodak Company, Rochester, New York.

7. Z WASSER ABWASSER FORSCH 11, 161-164 (1978).

8. Z WASSER ABWASSER FORSCH 10, 161-166 (1977).

9. Z WASSER ABWASSER FORSCH 15, 1-4 (1982).

10. A. J. Leo and C. Hansch, Editors. CHEMICAL PARAMETER DATA BASE. Medicinal Chemistry Project, Pomona College, Seaver Chemistry Laboratory, Claremont, California, June 21, 1985.

SECTION XIII. HAZARD RATINGS

	Health	Flammability	Reactivity
HMIS* Rating:	3	3	1
NFPA** Rating:	3	3	1

NOTICE: These ratings involve data and interpretations that may vary from company to company and are intended only for rapid, general identification of the magnitude of the specific hazard. TO DEAL ADEQUATELY WITH THE SAFE HANDLING OF THIS MATERIAL, ALL THE INFORMATION CONTAINED IN THIS MSDS MUST BE CONSIDERED. The customer is responsible for determining the proper perronal protective equipment needed for its particular use of this material.

*Hazardous Materials Identification System's [HMIS] Revised RAW MATERIALS RATING MANUAL, National Paint & Coatings Association, Fall 1984.

**NFPA 704 Standard System for the Identification of the Fire Hazards of Materials, National Fire Protection Association, 1985.

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.

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