FURFURAL

SECTION 1: Identification of the substance / mixture and of the company / undertaking

1.1 Product identifier

Chemical name	2-Furaldehyde		
Synonyms	Furan-2-carbaldehyde, 2-Furfuraldehyde, Furan-2-carboxaldehyde, 2-Furylmethanal, Fural, 2-Formyl furan, Furanaldehyde, Pyromucis aldehyde, Ant Oil.		
Formula	$C_5H_4O_2$		
Molecular mass	96,09	**FL-No.**	13.018
CAS-No.	98-01-1	**FEMA-No.**	2489
EC-No.	202-627-7	**Annex VI-No.**	605-010-00-4
Registration number	01-2119486861-27-0002		

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses of the substance or mixture	**Exposure scenario**	
Intermediate for manufacturing furan derivatives	ES3	(IS) *
Use of Furfural as intermediate in pesticide production	ES4	(IS)
Manufacturing of blends/formulations	ES5	(F) **
Manufacturing of polymers	ES6	(IS)
Industrial end-use: use of furfural in the manufacturing of abrasive wheels, brake linings and refractories - by using formulations	ES7	(IS)
Use of Furfural in the petroleum refining industry as extraction agent	ES8	(IS)
Professional end use of acid resistant coatings - by using formulations	ES9	(PW) ***
Spray Turf Indoor Uses	ES10	(PW)
Spray Turf Outdoor Uses	ES11	(PW)
Dripper Indoor Uses	ES12	(PW)
Dripper Outdoor Uses	ES13	(PW)
Spray Indoor Uses	ES14	(PW)
Spray Outdoor Uses	ES15	(PW)

*IS ** *Use at industrial sites*
*F *** *Formulation or re-packing*
*PW **** *Widespread use by professional workers*

Uses advised against None

1.3 Details of the supplier of the safety data sheet

Importer	International Furan Chemicals B.V.
Address	Rotterdam Airportplein 33 3045 AP ROTTERDAM The Netherlands
Telephone number	+31 10 238 05 55
E-mail address	sales@furan.com

1.4 Emergency telephone numbers

Emergency	+32 14 58 45 45 (24 h /24 h)	Information centre of dangerous goods (BIG)
Medical information		
United Kingdom	844 892 0111	National Poisons Information Service

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

According to Regulation (EC) No. 1272/2008 (EU-GHS / CLP)

Hazard Classes / Hazard Class-, Category- and -Statement Codes

Flammable liquid	Flam. Liq. 3, H226
Acute toxicity	Acute Tox. 2, H330
Acute toxicity	Acute Tox. 3, H301
Acute toxicity	Acute Tox. 4, H312
Eye irritation	Eye Irrit. 2, H319
Skin irritation	Skin Irrit. 2, H315
Specific target organ toxicity – single exposure	STOT SE 3, H335
Carcinogenicity	Carc. 2, H351
Hazardous to the aquatic environment	Aquatic Chronic 3, H412

For full text of Hazard statements: see subsection 2.2.

2.2 Label elements

Hazard pictograms

Signal word	Danger
Hazard statements	
H226	Flammable liquids and vapour.
H330	Fatal if inhaled.
H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H319	Causes serious eye irritation.
H315	Causes skin irritation.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
H412	Harmful to aquatic life with long lasting effects.
Precautionary statements	
P201	Obtain special instructions before use.
P210 *	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P271	Use only outdoors or in a well-ventilated area.
P280 *	Wear protective gloves / protective clothing / eye protection.
P403 + P233 *	Store in a well-ventilated place. Keep container tightly closed.
P304 + P340 *	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P301 + P310 *	IF SWALLOWED: Immediately call a POISON CENTER / doctor / physician.
P302 + P352	IF ON SKIN: Wash with plenty of water / soap.
P305 + P351 + P338 *	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 *	IF exposed or concerned: Get medical advice / attention.
P501	Dispose of contents / container to a specialised processing facility for disposal in accordance with local / regional regulations.

* on label

2.3 Other hazards

Furfural does not meet the criteria for PBT or vPvB according to Regulation 1907/2006.

SECTION 3: Composition / information on ingredients

3.1 Substances

Main constituent	**Identity**		**Percentage**
2-Furaldehyde	CAS-No.	98-01-1	> 98 %
	EC-No.	202-627-7	

Classified impurities or stabilizers

None

SECTION 4: First aid measures

4.1 Description of first aid measures

Inhalation	Fresh air, rest, half upright position. Get medical advice / attention if you feel unwell.
Skin contact	Remove contaminated clothes, rinse skin with water or shower. If skin irritation occurs: get medical advice / attention.
Eye contact	First rinse with plenty of water (remove lenses if possible). If eye irritation persists: get medical advice / attention.
Ingestion	Rinse mouth. Immediately call a doctor / physician if you feel unwell.

4.2 Most important symptoms and effects, both acute and delayed

Respiratory irritation (nose and upper respiratory tract). Eye and skin irritation.

4.3 Indication of any immediate medical attention and special treatment needed

Information on medical attendance

Not necessary.

Special means to provide treatment at the workplace

Not necessary.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Powder, water spray, alcohol-resistant foam, carbon dioxide.

Unsuitable extinguishing media

Water jet, alcohol unstable foam.

5.2 Special hazards arising from the substance or mixture

Hazardous combustion products

May produce toxic fumes of carbon monoxide if burning.

Additional hazards

Extreme generation of heat in the case of larger fires.

5.3 Advice for fire-fighters

Protective actions

In case of fire: keep containers cool by spraying with water.
Retain contaminated extinguishing water; do not allow entering into the sewage system.
In the case of larger fires: Cordon affected area.

Special protective equipment

Self-contained respiratory protective device.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Information for non-emergency personnel

In the case of large quantities: Use filter respirator with filter type A for organic vapours.
Use personal protective equipment to avoid any contamination of skin, eyes and personal clothes. Remove potential sources of ignition. Do not smoke.
Assure sufficient ventilation.

Information for emergency responders

If available, observe corporate hazard-control and emergency plans.

6.2 Environmental precautions

In the case of spills: Avoid penetration into the sewage canal, surface water and ground water.
In the case of accidental release: Do not discharge in surface water, sewers or soil.

6.3 Methods and material for containment and cleaning up

Advice on spillage containment

Take up small amounts spilled product with an inert absorbent. Dispose of as hazardous waste.
Dam spilled large amounts in and suck carefully; recycle if possible.

Appropriate clean-up procedures

Collect remainder in inert absorbent and dispose of as hazardous waste. Wash away remainder with water.

Inappropriate containment or clean-up techniques

None known.

6.4 Reference to other sections

See also the sections 8 and 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Recommendations for safe handling

Use only in well ventilated areas.
Only transfer into suited and resistant containers. Containers have to be properly labelled.
Keep away from heat / sparks / open flames / hot surfaces and do not smoke.

Above 60 ˚C: use in a closed system.

Advice on general occupational hygiene

The usual precautionary measures when handling chemicals have to be observed. Do not eat, drink and smoke in work areas. Wash hands thoroughly with water and soap.

7.2 Conditions for safe storage, including any incompatibilities

Protection against incompatible substances

Keep away from oxidants, strong acids and strong bases. The substance affects many synthetic materials; store only in original packing.
Keep container tightly closed.

Protection against ambient influences

Protect against heat and solar radiation. Recommended storage temperature: 20 ºC.
Store in a dark area.

Maintenance of the integrity of the substance

Not required.

7.3 Specific end use(s)

Consult the supplier when used as food-additive.

SECTION 8: Exposure controls / personal protection

8.1 Control parameters

	Limit values				
Country	**TWA-8 hours**		**TWA-15 min.**		**Notation**
	mg/m³	**ppm**	**mg/m³**	**ppm**	
Austria	20	5			skin
Belgium	8	2			skin
Czech Republic	10		20 (C)		skin
Denmark	7.9	2	15.8	4	
Finland	8	2	20	5	
France			8	2	
Poland	10		25		
Spain	8	2			skin
Sweden	8	2	20	5	
Switzerland	8	2			
United Kingdom	8	2	20	5	skin

The exposure limits may be exceeded before the odour is perceived.

DNEL / DMEL

Workers short term exposition

DNEL worker (acute, inhalation - systemic)	36.48 mg/m³
DNEL worker (acute, inhalation - local)	24 mg/m³
DNEL worker (acute, dermal - systemic)	no hazard identified

Workers long term exposition

DNEL worker (long-term, inhalation - systemic)	4.26 mg/m³
DNEL worker (long-term, inhalation - local)	8 mg/m³
DNEL worker (long-term, dermal - systemic)	1.66 mg/kg bw/day

Consumers short term exposition

DNEL general population (acute, inhalation - systemic)	27.22 mg/m³
DNEL general population (acute, inhalation - local)	24 mg/m³
DNEL general population (acute, oral - systemic)	0.47 mg/kg bw/day
DNEL general population (acute, dermal - systemic)	no hazard identified

Consumers long term exposition

DNEL general population (long-term, inhalation - systemic)	1.067 mg/m³
DNEL general population (long-term, inhalation - local)	8 mg/m³
DNEL general population (long-term, oral - systemic)	0.47 mg/kg bw/day
DNEL general population (long-term, dermal - systemic)	0.83 mg/kg bw/day

PNEC		
Aquatic		
– **fresh water**	PNEC aquatic (freshwater)	0.033 mg/L
– **marine water**	PNEC aquatic (marine water)	0.0033 mg/L
– **intermittent release**	PNEC aquatic (intermittent release)	0.027 mg/L
Sedimentary		
– ***fresh water sediment***		
	PNEC sediment	0.175 mg/kg sediment dw
– ***marine water sediment***		
	PNEC marine-sediment	0.018 mg/kg sediment dw
Air		no hazard identified
Terrestrial		
– **soil**	PNEC soil	2.6 mg/kg dw
Sewage treatment		
– **sewage treatment plants**		
	PNEC STP	7.6 mg/L
Secondary poisoning		
– **food chain**	PNEC oral	not required

8.2 Exposure controls

8.2.1 Appropriate engineering controls

Ventilation and local exhaust.

8.2.2 Individual protection measures, such as personal protective

a) Eye/face protection

Safety goggles (EN 166).

b) Skin protection

Hand protection	Gloves butyl rubber 0.7 mm	Breakthrough time > 8 hours (EN 374)
	Gloves neoprene 0.75 mm	Breakthrough time 2 hours (EN 374)
Other	Protective clothing (EN 304/EN 14605).	

c) Respiratory protection

In case of insufficient local exhaust: filter respirator with filter type A for organic vapours (EN 14387).

d) Thermal hazards

Not applicable.

8.2.3 Environmental exposure controls

Direct polluted air of the local exhaust ventilation out of the plant in a manner in accordance with environmental regulations.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	Colourless to yellow oily liquid.
Odour	Characteristic: pungent, almond.
Odour threshold (mg/m3)	0.25 - 1.0
pH	3.5 - 4.5
Melting point / freezing point (˚C)	– 37
Boiling point (˚C) at 1013 hPa	162
Flash point (˚C)	60 (closed cup)
Evaporation rate (ether=1)	75
Lower/upper explosive limits (vol%)	2.1 - 19.3
Vapour pressure at 25 ˚C (hPa)	3.33
Vapour density (air=1)	3.3
Relative density (water=1)	1.16
Solubility(ies)	
Solubility in water at 20 ˚C (g/l)	83
Solubility in fat	Good
Partition coefficient (log K octanol/water)	0.41
Auto-ignition temperature (˚C)	392
Decomposition temperature	Not applicable

Viscosity at 25 ˚C (mPa.s)	1.49
Explosive properties	Non explosive
Oxidizing properties	No oxidizing properties

9.2 Other information

Miscibility with	Solvents (acetone, ethanol, ether, xylene, chloroform, petroleum ether, ethyl acetate)
Conductivity (pS/m)	$1.5 * 10^8$
Heat of combustion (kJ/kg)	24 410
Surface tension at 20 ˚C (mN/m)	43.5

SECTION 10: Stability and reactivity

10.1 Reactivity

The substance may polymerize violently (resinification) under the influence of strong acids or strong bases. Reacts violently with oxidants.

10.2 Chemical stability

Turns yellow to brown on exposure to air and light and resinifies.

10.3 Possibility of hazardous reactions

Reacts violently with strong acids and strong bases with the possibility of fire and explosion (resinification).
At elevated temperatures, a risk for fire or explosion exists.

10.4 Conditions to avoid

Temperatures in storage > 40 °C should be avoided. Also contact with direct sunlight, heat sources and air. Avoid static discharge and sources of ignition (open flames, warm surfaces, sparks).
Avoid contact with combustible materials and plastics.

10.5 Incompatible materials

Strong acids or alkaline substances and oxidants. Many plastics.

10.6 Hazardous decomposition products

Upon decomposition emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.

SECTION 11 Toxicological information

11.1 Information on toxicological effects

a) Acute toxicity

– **Oral**	LD50 (rat)	100 mg/kg
– **Dermal**	LD50 (rat)	>2000 mg/kg
– **Inhalation**	LC50 (rat, 4 hours)	1 mg/L
	NOAEC	0.16 mg/L

b) Skin corrosion/irritation

The substance is irritating to skin.

c) Serious eye damage/irritation

The substance is irritating to eyes.

d) Respiratory or skin sensitisation

Concluded not to be sensitising.

e) Germ cell mutagenicity

Concluded not to be genotoxic in vivo.

f) Carcinogenicity

Target organ(s): digestive: liver.
Suspected of causing cancer. Liver tumors induced via mechanism involving liver toxicity. Concluded that at levels at which no liver toxicity is induced (in rats 53 mg/kg bw/d), tumors will not arise.

NOAEL (oral)	53 mg/kg bw/day

g) Reproductive toxicity

– **Fertility/developmental**

Concluded not to be reprotoxic.

	NOAEL (oral)	60 mg/kg bw/day

h) Specific target organ toxicity – single exposure

– **Respiratory tract** From acute toxicity studies, evident that the substance may cause respiratory irritation, particularly to the upper respiratory tract and the nose.

i) Specific target organ toxicity – repeated exposure

– **Respiratory tract** From repeated dose toxicity studies, evident that the substance may cause respiratory irritation particularly to the upper respiratory tract and the nose. No classification warranted.

NOAEL	100 mg/kg bw/day

j) Aspiration hazard

Based on available data, the classification criteria for this hazard class are not met.

11.2 Likely routes of exposure

Furfural can be easily absorbed in the lungs and from the skin, with dermal absorption of liquid furfural being approx. 3 µg/cm² per minute. Following absorption, the biological half life is 2-2.5 h.

SECTION 12: Ecological information

12.1 Toxicity

Aquatic compartment and sediment

– **Fish**		
	LC50 (freshwater, 14 d)	10.5 mg/L
	NOEC (freshwater, 12 d)	0.33 mg/L
– **Aquatic invertebrates**		
	EC50 (Daphnia, freshwater, 72 h)	13 mg/L
	NOEC (Daphnia, freshwater, 21 d)	1.9 mg/L
– **Algae and aquatic plants**		
	EC50 (algae, freshwater, 96 h)	11.1 mg/L
	NOEC (algae, freshwater, 8 d)	2.7 mg/L
– **Aquatic micro-organisms**		
	EC50	760 mg/L
– **Sediment organisms**		
	Not a relevant compartment.	

Terrestrial compartment

– **Soil macro-organisms**		
	LC50 (earthworm, 14 d)	406.18 mg/kg soil dw
	NOEC (earthworm, 14 d)	225 mg/kg soil dw
– **Anthropods**		
	NOEC (collembola, 28 d)	37.5 mg/kg soil dw
– **Terrestrial plants**		
	NOEC (sugarbeet)	26 mg/kg soil dw
– **Soil micro-organisms**		
	NOEC (soil micro-organisms)	597 mg/kg soil dw

12.2 Persistence and degradability

Abiotic degradability

– **Photolysis**	Half-life (DT50 in air)	0.44 d

Biodegradability

– **Biodegradability in water**		
	O2 consumption (5 days)	96.3 % degradation
	Readily biodegradable.	
– **Biochemical oxygen demand**		
	BOD (14 days)	93.5% degradation

12.3 Bioaccumulative potential

Aquatic bioaccumulation

BCF (estimation based on a calculation method).	1.41 L/kg
No remarkable bioaccumulation potential (log K_{ow} 0.41).	

12.4 Mobility in soil

Adsorption/desorption	K_{oc} at 20 °C (calculated)	17.1 L/kg
Volatilisation	Henry's Law constant at 20 °C (in Pa m^3/mol)	0.2

12.5 Results of PBT and vPvB assessment

The substance does not meet the PBT and vPvB criteria according to annex XIII of Regulation (EC) No 1907/2006.

12.6 Other adverse effects

Hazardous to water (Water hazard class 2, WGK Germany)

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product disposal Recycling by distillation.
Removal to an authorized waste incinerator for solvents or as chemical waste in accordance with local regulations. Do not discharge wastewater into sewer.

Packaging disposal Uncleaned empty package have to be treated like the content. The labelling of uncleaned containers must not be removed.

Waste treatment-relevant information

European waste list (EURAL) 07 01 04

SECTION 14: Transport information

14.1 UN number	1199
14.2 UN proper shipping name	FURALDEHYDES
14.3 Transport hazard class(es)	6.1
14.4 Packing group	II

14.5 Environmental hazards

Marine pollutant (IMO/IMDG)	No
Hazards for tank vessels (ADN)	6.1+3

14.6 Specials precautions for user

Classification code (ADR/RID/ADN)	TF1
Label(s) (ADR/RID/ADN/IMDG/IATA)	6.1 + 3
Tunnel restriction code (ADR/RID)	(D/E)
Hazard Identification No. (ADR/RID)	63
Limited quantity (ADR/RID/ADN/IMDG/IATA)	100 ml
Excepted quantity (ADR/RID/ADN/IMDG/IATA)	E4
ERICard (ADR)	6-54
Emergency Schedules (IMDG)	
– **Fire schedule**	Echo (F - E)
– **Spillage schedule**	Delta (S - D)

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

Ship type required (IMDG)	3
Pollution category (IMDG)	Y

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations / legislation specific for the substance or mixture

Authorisations (REACH)

Not subject to Title VII of Regulation (EC) No 1907/2006

Restrictions (REACH), SVHC

Annex XVII of Regulation (EC) No 1907/2006 is not applicable.
SVHC (Substance of Very High Concern) status: negative.

Control of major-accident hazards (Seveso III)

Subject to Directive 2012/18/EU.

Hazard category:	H2 ACUTE TOXIC
Qualifying quantity column 2:	50 000 kg
Qualifying quantity column 3:	200 000 kg

List of flavouring substances

Approved as a flavouring agent (Regulation (EC) No 872/2012).

Classification, labelling and packaging
Regulation (EC) No 1272/2008 (CLP-Regulation)

Other EU-/national regulations
Other applicable EU-/national regulations have to be observed.

15.2 Chemical safety assessment
A Chemical Safety Assessment has been carried out for furfural.

SECTION 16: Other information

16.1 Changes to the previous version

Previous version	12.0
Changes	Adaptations to the Chemical Safety Report 30-11-2020.

16.2 Abbreviations and acronyms

ADN	Transport of dangerous goods by inland waterways
ADR	Transport of dangerous goods by road
DNEL	Derived No Effect Level
EC50	Effect Concentration, 50 percent
ERICard	Emergency Response Intervention Card
GHS / CLP	Globally Harmonised System / Classification, Labelling and Packaging
IC50	Inhibitory Concentration, 50 percent
IATA	Transport of dangerous goods by air
IMDG	Transport of dangerous goods by sea
LC50	Lethal Concentration, 50 percent
LD50	Lethal Dose, 50 percent
LOAEC	Lowest observed adverse effect concentration
NOAEC	No observed adverse effect concentration
NOAEL	No observed adverse effect level
NOEC	No observed effect concentration
NOEL	No observed effect level
PBT	Persistent, Bioaccumulative and Toxic
PNEC	Predicted No Effect Concentration
RID	Transport of dangerous goods by rail
TWA	Time Weighted Average
vPvB	very Persistent and very Bioaccumulative

16.3 Literature references and sources for data
REACH dossier.

16.4 Full text of hazard statements which are not written out in full under Sections 2 to 15
None

This data sheet has been compiled by KWA. Despite the careful attention paid to the setting up of the text, KWA cannot be held responsible for any error appearing in the text and resulting in whatever damage it may cause.
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