Hygiene-Institut des Ruhrgebiets
Institut für Umwelthygiene und Toxikologie
Director: Prof. Dr.rer.nat. Lothar Dunemann
Legal Entity: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V.

Hygiene-Institut · PO Box 10 12 55 · DE 45812 Gelsenkirchen · Germany

CW FIRE – SUPPORT GmbH
Sprudelallee 14
D-63628 Bad Soden - Salmünster

Address:
Rotthauser Str. 21, 45879 Gelsenkirchen

Switchboard +49 (0)209 9242-0
Direct +49 (0)209 9242-350
Telefax +49 (0)209 9242-333
E-Mail s.bien@hyg.de
Internet www.hyg.de

Our reference: A-324878-20-Bi_en
Contact person: Mr Bien

Gelsenkirchen, 25.02.2020

Foam fire extinguishing agents "TRIDENT"

here: Ecotoxicological assessment with regard to use in forest fires

Your letters dated 06.02.2020 and 24.02.2020; Mr Clemens Widmayr

Dear Mr Widmayer,

as you state in the above-mentioned letters, the extinguishing agent **"TRIDENT"** is also used to fight forest fires. As a rule, an admixing rate of 0.2 % is selected as the application concentration of the extinguishing agent concentrate in these cases.

The foam fire extinguishing agent with the name **"TRIDENT"** was examined relating to biodegradability, for the content of fluoro-organic compounds, with regard to the behaviour towards higher and lower water organisms (aquatic toxicity), towards seed emergence and growth of higher plants as well as the behaviour of earthworms (terrestrial toxicity), with respect to irritation effect on skin and eyes as well as regarding oral toxicity to mammals.

The analytical work was carried out in accordance with the OECD Test Guidelines as well as the regulations laid down in the German standard methods for the examination of water, waste water and sludge (Deutsches Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung).

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As part of these examinations carried out on the extinguishing agent concentrate **"TRIDENT"** dated 15.09.2017 (Test reports A-292355-17-Bi dated 26.01.2018, A-294153-18-Bi dated 29.01.2018 and A-294188-18-Bi dated 29.01.2018), the subsequent summarised test data can be calculated:

Method	Unit	**Toxicity value / test data concentrate**
Bacterial toxicity (TTC / DIN 38412 - L3)	NOEC	**3.0 ml/l**
Toxicity to fish (OECD 203)	LC_{50}	**1 600 mg/l**
Daphnia toxicity (OECD 202)	EC_{50}	**1 400 mg/l**
Algal toxicity (OECD 201)	IC_{50}	**800 mg/l**
Biodegradability (OECD 301f)	Degradation after 28 days	**95.6 %**
Light bacterial toxicity (DIN ISO 11348-2)	EC_{50}	**580 mg/l**
Fluoro-organic compounds content (DIN 38407 - F42)	µg/l	**bld.**
Toxicity to mammals (OECD 420)	LD_{50} rat	**> 2 000 mg/kg** body weight
Corrosivity and irritation to skin (OECD 404)	-	**not skin irritating / corrosive**
Eye Irritation / Corrosion (OECD 405)	-	**not harmful to eyes / irritating**
Earthworm toxicity (DIN ISO 11268-1)	LOEC	**10 000 mg/kg**
Plant growth test (DIN ISO 11269-2)	LOEC	**100 mg/kg**

bld. = below limit of detection
LOEC = Lowest Observed Effect Concentration

With reference to the application concentration of 0.2 % mentioned at the beginning, the test data determined on the concentrate can be converted or transferred so that, in our opinion, the following data can be used to characterise a **0.2 % solution**:

Method	Unit	**Toxicity value / test data 0.2 % solution**
Bacterial toxicity (TTC / DIN 38412 - L3)	NOEC	**1 500 ml/l**
Toxicity to fish (OECD 203)	LC_{50}	**800 000 mg/l**
Daphnia toxicity (OECD 202)	EC_{50}	**700 000 mg/l**
Algal toxicity (OECD 201)	IC_{50}	**400 000 mg/l**
Biodegradability (OECD 301f)	Degradation after 28 days	**95.6 %**
Light bacterial toxicity (DIN ISO 11348-2)	EC_{50}	**290 000 mg/l**
Fluoro-organic compounds content (DIN 38407 - F42)	µg/l	**bld.**
Toxicity to mammals (OECD 420)	LD_{50} rat	**> 2 000 mg/kg** body weight
Corrosivity and irritation to skin (OECD 404)	-	**not skin irritating / corrosive**
Eye Irritation / Corrosion (OECD 405)	-	**not harmful to eyes / irritating**
Earthworm toxicity (DIN ISO 11268-1)	LOEC	**5 000 000 mg/kg**
Plant growth test (DIN ISO 11269-2)	LOEC	**50 000 mg/kg**

bld. = below limit of detection
LOEC = Lowest Observed Effect Concentration

With regard to the use of the product **"TRIDENT"** in a 0.2 % application solution as an extinguishing agent for fighting forest fires, it should be noted that due to the above mentioned test results on terrestrial organisms (acute earthworm toxicity and plant growth test), there are no objections to the use of the product if the application quantity of the 0.2 % extinguishing solution is selected in such a way that the input into the soil is below the mass concentration of 50 000 mg / kg soil and it can then be assumed that the growth of plants and the life cycle of soil organisms in the regeneration phase of the affected areas is not significantly disturbed.

Under the conservative assumption of a soil thickness of only 1 metre and a very low bulk density of the existing soil of only 1 000 kg/m³, the input of approx. 50 litres of extinguishing agent solution per m² of forest area would thus correspond to the above-mentioned harmless dosage.

Best regards
The Director of the Institute
p.p.

Dipl.-Umweltwiss. Sebastian Bien
Deputy Head of Department
Wastewater-, Soil- and Air-Hygiene