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Checklists for surveying and assessing industrial plant handling materials and substances, which are hazardous to water

№ 1

Substances

For our Environment

Umwelt Bundesamt

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Advisory Assistance Programme (AAP) of the
Federal Ministry for the
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Substances

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Definition of water-polluting substances according the recommendations of the International River Basin commission for preventing accidents and improvement of plant safety

By definition, water-polluting substances according to the recommendations of the International River basin commission for preventing accidents and plant safety are substances that have at least one of the following characteristics in accordance with the EC Directive 67/548/EEC:

(T^+) Very toxic

(T) Toxic

(C) Corrosive

(Xn) Harmful to health

(N) Endangering the environment

Or **(R 52)** Harmful to water organisms

Or **(R 53)** Can have harmful effects in aquatic environments in the long term

The international river basin commission suggests that the contracting parties should preferentially apply the recommendations for plant safety and precaution against accident for these substances.
As a supplement to this, the catalogue of water-polluting substances (Federal Environmental Agency Berlin, UBA) can be consulted.

WRC 1: Water risk Class 1 – low hazard to waters

WRC 2: Water risk Class 2 – hazard to waters

WRC 3: Water risk Class 3 – severe hazard to waters

This catalogue can be accessed on the Internet at the following address: http://webrigoletto.uba.de/rigoletto/public/welcome.do,

This following table for recording substances hazardous to water being handled in a plant is only a suggestion for application.

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Checklist for monitoring the implementation of the recommendations

Table for recording substances hazardous to water

Ser.-No.:	Name of substance	Properties of substance according to EC Directive 67/548/EEC							UBA Catalogue [1)]			Amount of substances kg	WRC 3-equivalent
		T^+	T	C	Xn	N	R52	R53	WRC1	WRC2	WRC3		
Sum:													
Water Risk Index (WRI)													

1)UBA-Katalog: Siehe http:// http://webrigoletto.uba.de/rigoletto/public/welcome.do

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Notes:

The **water risk class** (WRC) describes the ability of different substances in polluting water. Substances possessing a water risk class between 1 to 3 can thus be present in a plant. The WRC of a substance can either be obtained from the manufacturer or can be taken from the catalogue of substances hazardous to water issued by the federal environmental agency Berlin, UBA. The catalogue can be downloaded from the following link on the internet: http:// www. www.umweltbundesamt.de/wgs/wgs-index.htm, list: Appendix 2. If no details about a substance is given in the textbooks , then the WRC can be determine using a point system method on the basis of the available R-Phrases. (see „Alert thresholds for extraordinary water pollution in the framework of the International Danube Accident Emergency Warning System“)

Examples: WRC „0“ - no hazard to water (rapeseed oil)
WRC 1 - low hazard to water (HCl)
WRC 2 - hazard to water (diesel)
WRC 3 - severe hazard to water (benzol)

Characterising the risk potential of a plant with the aid of the WRC is complicated and difficult and this does not give any clear picture.
It is far more easier to describe the potential risk of a unit, plant or company in regard to waters pollution with the **Water Risk Index** *(WRI)*.

WRI 1 - 3 low potential risk
WRI 3 - 5 middle potential risk
WRI 5 - 10 high potential risk

To calculate the water risk index one needs their equivalent of water risk class 3.
The equivalent of water risk class 3 (WRC 3-equivalent) is the sum of the volume of substances hazardous to water in a unit of area based on the water hazard class 3.

Amount of substances in kg	WRC	WRC 3-equivalent
M	“0”	M x 10^{-3}
M	1	M x 10^{-2}
M	2	M x 10^{-1}
M	3	M

Example:

Amount of substances in kg	WRC	WRC 3-equivalent
1000	1	10
700	2	70
50	3	50
Sum		130 kg

The water risk index (WRI) corresponds to the exponent of base 10 of the WRC 3 equivalent. That means for example that a substance of 1000 tons weight (**10** ^{6} Kg) belonging to substances of Water risk class 3 corresponds to WRI 6 (log **10** ^{6}), WRC 2 substances to WRI 5 and WRC 1 substances to WRI 4.
Example: log 130 = 2,11 (means a WRI = 2).

Thus, a water risk index equal to 2 can be calculated for our model plant. That results in a low potential risk of the examined plant on waters.

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Classification of substances hazardous to waters, on the basis of R-phrases

1. R-phrase classifications and evaluation criteria

Following classification, the R-phrases are assigned evaluation points as follows:

R-Satz	Points	Remarks
R 21	1	Is not additively assigned to R 22, R 20/22, R 25, R 23/25, R 28 or R 26/28
R 22	1	Is not additively assigned to R 24, R 23/24, R 27 or R 26/27
R 24	3	Is not additively assigned to R 25, R 23/25, R 28 or R 26/28
R 25	3	Is not additively assigned to R 27 or R 26/27
R 27	5	Is not additively assigned to R 28 or R 26/28
R 28	5	
R 29	2	
R 33	2	
R 40	2	
R 45	9	
R 46	9	Is not additively assigned to R 45
R 50	6	
R 52	3	
R 53	3	
R 60	4	
R 61	4	Is not additively assigned to R 60
R 62	2	is not additively assigned to R 61
R 63	2	is not additively assigned to R 60 and R 62
R 65	1	is not additively assigned to R 21 and R 22
R 15/29	2	
R 20/21	1	is not additively assigned to R 22, R 25 or R 28
R 20/21	1	is not additively assigned to R 22, R 25 or R 28
R 20/22	1	is not additively assigned to R 24 or R 27
R 20/21/22	1	
R 21/22	1	
R 23/24	3	is not additively assigned to R 25 or R 28
R 23/25	3	is not additively assigned to R 27
R 23/24/25	3	
R 24/25	3	
R 26/27	5	is not additively assigned to R 28
R 26/28	5	
R 26/27/28	5	
R 27/28	5	
R 39/24	4	
R 39/25	4	
R 39/23/24	4	
R 39/23/25	4	
R 39/24/25	4	
R 39/23/24/25	4	
R 39/27	6	
R 39/28	6	
R 39/26/27	6	

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R 39/26/28	6	
R 39/27/28	6	
R 39/26/27/28	6	
R 40/21	2	
R 40/22	2	
R 40/20/21	2	
R 40/20/22	2	
R 40/21/22	2	
R 40/20/21/22	2	
R 48/21	2	
R 48/22	2	
R 48/20/21	2	
R 48/20/22	2	
R 48/21/22	2	
R 48/20/21/22	2	
R 48/24	4	
R 48/25	4	
R 48/23/24	4	
R 48/23/25	4	
R 48/24/25	4	
R 48/23/24/25	4	
R 50/53	8	
R 51/53	6	
R 52/53	4	

2. Default values

If, for a given substance, no proof of testing for certain toxic characteristics and for certain environmental impacts is available, and if the substance has not been classified into one of the R-phrases listed below, in Annex 1 of Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances, in its applicable version, the substance shall be assigned the following point values as default values:

a) The default value shall be 5 points, if a substance, in Annex 1 of Directive 67/548/EEC, has not been classified into the R-phrases 21, 22, 24, 25, 27 or 28, either alone or in combination, and if no proof is available of testing for acute toxicity for a rodent species upon swallowing and in contact with skin.

b) The default value shall be 6 points, if a substance, in Annex 1 of Directive 67/548/EEC, has not been classified into the R-phrases 50, 50/53, 51/53 or 52/53, and if no proof is available of testing for acute toxicity for a fish species and a water-flea species, and for inhibition of algae growth. Notwithstanding the first sentence of this paragraph, the default value shall be 8 points, if also
   - testing for ready biodegradability has shown that the substance is not readily biodegradable or
   - the substance is potentially bio-accumulative or
   - no proof of testing for biodegradability is available or
   - no proof of testing for potential bioaccumulation is available.

c) The default value shall be 3 points, if a substance in Annex 1 of Directive 67/548/EEC has not been classified into the R-phrases 50/53, 51/53, 52/53 or 53 and
   - no proof of testing for biodegradability or for potential bioaccumulation is available or
   - no proof of testing for biodegradability is available and the sub-stance is potentially bio-accumulative or

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- no proof of testing for potential bioaccumulation is available and the substance is not readily or inherently biodegradable.

Notwithstanding the first sentence, the default value shall be 4 points, if no proof of testing for biodegradability is available and a test is known whereby the acute toxicity for a fish species (96 h LC50) or a water-flea species (48 h EC50) or for inhibition of algae growth (72 h IC50) is more than 10 mg/l and not more than 100 mg/l.

Notwithstanding the first sentence, the default value shall be 6 points, if no proof of testing for ready biodegradability or for potential bioaccumulation is available and a test is known whereby the acute toxicity for a fish species (96 h LC50) or a water-flea species (48 h EC50) or for inhibition of algae growth (72 h IC50) is more than 1 mg/l and not more than 10 mg/l.

Notwithstanding the first sentence, the default value shall be 2 points, if the substance is classified, pursuant to Number 1, in R 50 and if no proof of testing for ready biodegradability or for potential bioaccumulation is available.

3. Evaluation basis

The basis for classification of substances hazardous to waters shall be scientific testing of the relevant substance in accordance with the specifications of Annex V in conjunction with Annexes VII (A) through (D) and VIII of Directive 67/548/EEC.
Substances in which the log octanol/water-distribution coefficient (log Pow) is not less than 3.0 shall be considered potentially bioaccumulative if the experimentally determined bioconcentration factor (BCF) is not less than 100. A calculated log Pow may thus be used as a basis for evaluating the bioaccumulation behavior (in keeping with Chapter 4 of the Technical Documents in Support of the Commission Directive 93/67/EEC on Risk Assessment of New Notified Substances and the Commission Regulation 1488/94 on Risk Assessment of Existing Substances, Ispra 1996).
Ready biodegradability shall be determined using a procedure, defined in Directive OECD 301 or another equivalent, generally accepted procedure.
Inherent biodegradability shall be determined in accordance with a procedure, determined in a Directive OECD 302, Part B or C, or another equivalent, generally accepted procedure.

4. Classification into water hazard classes

4.1 Each substance is assigned a total number of evaluation points, formed as the sum of points determined pursuant to Numbers 1 and 2.

4.2 The point total determined in accordance with Number 4.1 shall be assigned to water hazard classes in accordance with the following scheme:

In general Foods and Consumer Goods: WRC "0"

0 through 4 points: WRC 1,

5 through 8 points: WRC 2,

9 and more points: WRC 3

<u>Example</u>: Benzol

R45	**9**	
R46	**9 (is not additively assigned to R 45)**	
R11	**0**	
R36/38	**0**	
R48/23/24/25	**0**	
R65	**1**	
Total	***10 →***	***WRC 3***

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