

ETRMA

SpERC Fact Sheet

ERC 3 and ERC 6d

[Includes Summary Tables from ETRMA Emission
Factor Guidance]

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Version 1.0

REACH SpERC (Specific Emission Release Category)

Formulation and Industrial Use of Materials Resulting in Inclusion on a Matrix (ERC 3) in the General Rubber Good and Tyre Industries

Characteristics of specific ERC		Type of Input Information	Processing of Input Information																						
Title of specific ERC	Formulation and industrial use of materials resulting in inclusion on a matrix	None	None																						
Applicable ERC	3 – Formulation in materials	ERC	None																						
Responsible	ETRMA	None	None																						
Version	Version 1 [4 August 2010]	None	None																						
SpERC Code	ETRMA SPERC 3/6d.1 v.1 Small or moderate scale use (≤ 100 t/y) with no-pretreatment ETRMA SPERC 3/6d.2 v.1 Small or moderate scale use (≤ 100 t/y) with pretreatment ETRMA SPERC 3/6d.3 v.1 Large scale use (> 100 t/y)	Tonnage	None																						
	Covers the whole process of formulation (e.g. filling and weighing) and processing (e.g. extrusion) that occurs in the manufacture of tyres and general rubber goods. The specific processes covered include storage, weighing, mixing, cement preparation, shaping, curing and final treatment. The domain of substances covered is listed below.	None	None																						
	<table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>Mastication agents/peptiser</td> </tr> <tr> <td>02</td> <td>Vulcanization agents</td> </tr> <tr> <td>03</td> <td>Anti-ageing agents / antidegradants</td> </tr> <tr> <td>04</td> <td>Fillers and pigments</td> </tr> <tr> <td>06-1</td> <td>Lubricants</td> </tr> <tr> <td>06-2</td> <td>Tackifiers</td> </tr> <tr> <td>06-4</td> <td>Filler activators</td> </tr> <tr> <td>06-6</td> <td>Bonding agents</td> </tr> <tr> <td>07-12</td> <td>Reinforcing agents</td> </tr> <tr> <td>07-7</td> <td>Hardeners</td> </tr> </tbody> </table>	Code	Description	01	Mastication agents/peptiser	02	Vulcanization agents	03	Anti-ageing agents / antidegradants	04	Fillers and pigments	06-1	Lubricants	06-2	Tackifiers	06-4	Filler activators	06-6	Bonding agents	07-12	Reinforcing agents	07-7	Hardeners	TGD Use Classification	None
Code	Description																								
01	Mastication agents/peptiser																								
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06-4	Filler activators																								
06-6	Bonding agents																								
07-12	Reinforcing agents																								
07-7	Hardeners																								
Coverage	Process Categories: 5, 7, 8b, 9, 10, 13, 14, 21	None	None																						

Characteristics of specific ERC			Type of Input Information	Processing of Input Information
Operational Conditions	ETRMA SPERC 3/6d.1 v.1	Process with efficient raw material use ($M_{SPERC} \leq 100$ ton/year substance use)	Classification of formulation and processing facilities.	<p><u>Default</u></p> $M_{SPERC} = M_{SITE} \times R \times (W \div 100 \text{ phr}) \div F$ <p>where:</p> $M_{SITE, TYRE} = 52400 \text{ ton/year tyre (see ETRMA Production Rate Guidance)}$ $M_{SITE, GRG} = 5000 \text{ ton/year rubber (OECD, 2004)}$ $R_{TYRE} = \text{rubber compound fraction in tyre} = 0.85$ $R_{GRG} = \text{rubber compound fraction in GRG} = 1$ $W = \text{weight content of additive in phr or wt\%}$ $F_{phr} = \text{recipe factor} = 2 \text{ when } W \text{ in phr}$ $F_{\%} = \text{recipe factor} = 1 \text{ when } W \text{ in wt\%}$ <p><u>Example</u></p> $W=2 \text{ phr} = 1\% \text{ (for example, vulcanization accelerator)}$ $M_{SPERC, TYRE} = 52400 \times 0.85 \times (2 \div 100) \div 2 = 450 \text{ ton/year} = 1500 \text{ kg/day for 300 day/year} \rightarrow \text{Use ETRMA SPERC 3/6d.3 v.1}$ $M_{SPERC, GRG} = 5000 \times 1 \times (2 \div 100) \div 2 = 50 \text{ ton/year} = 227 \text{ kg/day for 220 day/year} \rightarrow \text{Use ETRMA SPERC 3/6d.2 v.1 (with pretreatment) or ETRMA SPERC 3/6d.3 v.1 (with or without pretreatment)}$
	ETRMA SPERC 3/6d.2 v.1	Process with efficient raw material use and mechanical pre-treatment ($M_{SPERC} \leq 100$ ton/year substance use)		
	ETRMA SPERC 3/6d.3 v.1	<p>Process with optimization* for efficient raw materials use ($M_{SPERC} > 100$ ton/year substance use)</p> <p>* Processes with optimization for efficient raw material use (ETRMA SPERC 3/6d.3) include state of art, optimized and/or automated systems for the transport and handling of raw materials, that minimize overall exposure levels and incidental spills.</p>		
Days Emitting	ETRMA SPERC 3/6d.1 v.1	220 days/year	Classification of formulation and processing facilities.	<p>Conservative default values assigned based on survey of facilities used to derive emission factor. The average days of release for ≤ 100 ton/year substances in the ETRMA survey was 232 days per year. The average days of release for > 100 tons/year of use was 318 days per year.</p>
	ETRMA SPERC 3/6d.2 v.1	220 days/year		
	ETRMA SPERC 3/6d.3 v.1	300 days/year		

Date: 04 August 2010

Ref: ETRMA 3/6d.x v.1

Characteristics of specific ERC				Type of Input Information	Processing of Input Information
Environmental Parameters for Fate Calculation	Dilution factor of 10 for freshwater and 100 for marine water.			REACH TGD Default.	None, but can be scaled with site specific data,
Emission fraction to air (f_{AIR})	Process classification	BP (C)	VP (Pa)	F_{AIR}^*	Substance physical properties including vapor pressure (VP in Pa) and boiling point (BP in °C)
	ETRMA SPERC 3/6d.x v.1 where x =1, 2 or 3	>300 <300 >300 <300 >300 <300	<1 <1 1-100 1-100 >100 >100		
Emission fraction to water (F_{WATER})	Process classification	F_{WATER}		Classification of formulation and processing facilities.	Default values from EU TGD A-Tables for the polymer industry (IC-11; Table A3.11). *Note: Air (F_{AIR} emission factors for processing aids (IV) are a factor 10 times higher. This includes lubricants and release agents.
	ETRMA SPERC 3/6d.1 v.1	0.0002			
	ETRMA SPERC 3/6d.2 v.1	0.00008			
	ETRMA SPERC 3/6d.3 v.1	0.00001			
Type of RMM	Typical environmental risk management measures by production phase are described in detail in the GRG and Tyre Generic Exposure Scenario available from the ETRMA website.			None	None

Characteristics of specific ERC		Type of Input Information	Processing of Input Information
Narrative description of / justification for specific ERC	<p>Formulation and processing activities in the GRG and tyre industries are designed to minimize the loss of raw materials for economic efficiency. Processes for substances with large scale local use (>100 tons/year) are highly optimized for raw material use and recovery. The formulation and processing lifecycle stages in the rubber industry are dry processes. However, incidental emissions to water can occur as a result of floor scrubbing, equipment washing/blowdown or collection of curing press steam condensate. The specific processes covered include storage, weighing, mixing, cement preparation, shaping, curing and final treatment. The emission factors to air are based on the conservative A-Table emission values, as recommended in the Emission Scenario Document for the Rubber Industry. The emission factors for water are based on a large data collection effort in April and May 2010 of 13 tyre facilities and 6 GRG facilities. The emission factor estimates were based on measured concentrations of 6-PPD, CBS and DPG in water, annual wastewater flow rate, annual chemical usage and the source contribution of hydrolysis products. The study is documented in the ETRMA Emission Factor Guidance for Formulation and Industrial Use Version 2.0 dated 4 August 2010.</p>	None	None

Attachment

Summary Tables from ETRMA Emission Factor Guidance

[See Guidance for More Details]

Table S1: Description of available emission factor estimates.

Emission Factor Estimate	Source	Summary Table in this Guidance	Air	Water
Tier 0 (Screening)	ECHA REACH TGD Chapters D and 16 ERC	Table S2	ERC 3, ERC 4 and ERC 6d	ERC 3, ERC 4 and ERC 6d
Tier 1 (Refined Screening)	EU TGD A-Tables	Table S3	Replaces Tier 0 ERC 3 / 4 / 6d Emission Factors	Replaces Tier 0 ERC 3 / 4 / 6d Emission Factors
Tier 2 (Refined Data-Based Emission Factor for Wastewater)	Industry-wide GRG and Tyre Facility Data Collection	Table S4	Not Applicable	Replaces Tier 1 ERC 3 and ERC 6d Emission Factors ^a
SpERC 3/6d (Tier 1 air and Tier 2 wastewater for ERC 3 and ERC 6d) ^a	Tier 1 for Air and Tier 2 for Water	[This Document]	Tier 1 Air	Tier 2 Water

^aSee ETRMA SpERC for substance domain.

Table S2: Recommended ERC by TGD Use Category (Tier 0 Emission Factor).

TGD Classification	Proc. Cat.	Valid ERC ^a	Process Category Used to Assign ERC	Selected ERC ^b	Default Release to air (Tier 0)	Default release to water (Tier 0)
01 - MASTICATION AGENTS / PEPTISER	(4), 5, 9	2, 3, 6d	(4-batch processes where opportunity for exposure exists) 5-Mixing or blending in batch processes for formulation of articles	6d-Industrial use of process regulators for polymerization processes in production of resins, rubbers, polymers (e.g. vulcanization agents)	35%	0.005%
02 - VULCANISATION AGENTS	(4), 5, 9, 10, 14, 21	1,2,3, 4,5, 6d, 8a, 8c, 8d, 8f	(4-batch processes where opportunity for exposure exists) 5-Mixing or blending in batch processes for formulation of articles 14-Production of articles by tableting, etc	6d-Industrial use of process regulators for polymerization processes in production of resins, rubbers, polymers (e.g. vulcanization agents)	35%	0.005%
03 - ANTI AGEING AND ANTIFLEX-CRACKING AGENTS / ANTIDEGRADANTS	5, 8b, 9, 10, 14, 21	1,2,3, 4,5, 8a, 8c, 8d, 8f	5-Mixing or blending in batch processes for formulation of articles 14-Production of articles by tableting, etc.	3- Formulation in materials - resulting in inclusion on a matrix (e.g. additives, fillers, pigments, plasticizers)	30%	0.20%
04 - FILLERS AND PIGMENTS	5, 8b, 9, 10, 14, 21	1,2,3, 4,5, 8a, 8c, 8d, 8f	5-Mixing or blending in batch processes for formulation of articles 14-Production of articles by tableting, etc.	3- Formulation in materials - resulting in inclusion on a matrix (e.g. additives, fillers, pigments, plasticizers)	30%	0.20%
05 - PLASTICISER	5, 8b, 9, 10, 14, 21	1,2,3, 4,5, 8a, 8c, 8d, 8f	5-Mixing or blending in batch processes for formulation of articles 14-Production of articles by tableting, etc.	3- Formulation in materials - resulting in inclusion on a matrix (e.g. additives, fillers, pigments, plasticizers)	30%	0.20%
06 - PROCESSING AIDS	5, 9, 14, 21	1,2,3	5-Mixing or blending in batch processes for formulation of articles 14-Production of articles by tableting, etc.	3- Formulation in materials - resulting in inclusion on a matrix (e.g. additives, fillers, pigments, plasticizers)	30%	0.20%
07 - OTHER AGENTS						
07-5 - Solvents	7, 8b,9, 10	4,5, 8a, 8c, 8d, 8f	7-Spraying in industrial settings 10-Roller or brush application	4-Industrial use of processing aids (e.g. solvents, anti-set agents)	95%	100%
07-6 - Emulsifier	7, 9, 10	4,5, 8a, 8c, 8d, 8f	7-Spraying in industrial settings 10-Roller or brush application	4-Industrial use of processing aids (e.g. solvents, anti-set agents)	95%	100%
07-7; 07-12 - Hardeners, reinforcing agents	5, 8b, 9, 14	1,2,3	5-Mixing or blending in batch processes for formulation of articles 14-Production of articles by tableting, etc.	3- Formulation in materials - resulting in inclusion on a matrix (e.g. additives, fillers, pigments, plasticizers)	30%	0.20%
09 - RELEASE AGENTS	7, 8b, 9, 14	1,2,3,4, 5, 8a, 8c, 8d, 8f	7-Spraying in industrial settings	4-Industrial use of processing aids (e.g. solvents, anti-set agents)	95%	100%

^aREACH CSA TGD Appendix D-4.

^bREACH CSA TGD Table R.16-23.

Table S3: Tier 1 air and water emissions factors for tyre and GRG production.

TGD Classification	Use Category	Selected A-Table Category/ Type	Air Emission Factors				Water Emission Factors, F_{water}^a		
			ERC	TGD A-Table			ERC	OECD ESD for Rubber Industry	TGD A-Table (Tier 1)
				BP (C)	VP (Pa)	F_{air}			
01 - MASTICATION AGENTS / PEPTISER^b	43 (mastication agent)	Additive (I)	0.35	>300	<1	0.0005	5×10^{-5}	0.005	0.0005 ^c
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			
02 - VULCANISATION AGENTS^b	43, 53 (vulcanizing agent)	Additive (I)	0.35	>300	<1	0.0005	5×10^{-5}	0	0.0005 ^c
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			
03 - ANTI AGEING AND ANTIFLEX-CRACKING AGENTS / ANTIDEGRADANTS	49 (stabilizers)	Additive (I)	0.30	>300	<1	0.0005	0.002	0.01	0.0005
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			
04 - FILLERS AND PIGMENTS	20 (filler) 10 (pigment)	Fillers/ Pigments (I)	0.30	>300	<1	0.0005	0.002	0.01	0.0005
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			
05 - PLASTICISER	47 (softener)	Plasticizers (II)	0.30	<400	All	0.01	0.002	0.05	0.001 ^d
				>400	All	0.005			
06-1- LUBRICANTS	35 (lubricants)	(IV) Processing aids	0.30	>300	<1	0.005	0.002	0.005	0.0005
				<300	<1	0.01			
				>300	1-100	0.01			
				<300	1-100	0.025			
				>300	>100	0.05			
				<300	>100	0.1			
06-2- TACKIFIER	2 (adhesive and binding agents)	Additive (I)	0.30	>300	<1	0.0005	0.002	0.005	0.0005
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			
06-4- FILLER ACTIVATOR	43 (process regulator)	Additive (I)	0.30	>300	<1	0.0005	0.002	0.005	0.0005
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			
06-6- BONDING AGENTS	2 (adhesive and binding agents)	Additive (I)	0.30	>300	<1	0.0005	0.002	0.001	0.0005
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			

TGD Classification	Use Category	Selected A-Table Category/ Type	Air Emission Factors				Water Emission Factors, F _{water} ^a		
			ERC	TGD A-Table			ERC	OECD ESD for Rubber Industry	TGD A-Table (Tier 1)
				BP (C)	VP (Pa)	F _{air}			
07-03 – EMULSIFIERS	49 (stabilizers)	Additive (I)	0.95	>300	<1	0.0005	1	0.05	0.0005
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			
07-12- RE-INFORCING AGENTS	0 (other)	Additive (I)	0.30	>300	<1	0.0005	0.002	0.05	0.0005
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			
07-7- HARDENERS	0 (other)	Additive (I)	0.30	>300	<1	0.0005	0.002	0.05	0.0005
				<300	<1	0.001			
				>300	1-100	0.001			
				<300	1-100	0.0025			
				>300	>100	0.005			
				<300	>100	0.01			
07 - SOLVENTS	48 (solvents)	Solvent (III)	0.95	All	<100	0.1	1	0.05	0
				All	100-1000	0.25			
				All	1000-10000	0.5			
				All	>10000	0.75			
09 - RELEASE AGENTS	0 (release agents)	(IV) Processing aids	0.95	>300	<1	0.005	1	0.05	0.0005
				<300	<1	0.01			
				>300	1-100	0.01			
				<300	1-100	0.025			
				>300	>100	0.05			
				<300	>100	0.1			

^aTGD emission factors recommended as alternative to ERC emission factors. A survey of ETRMA European facilities in 2009 found that the overall average emission factor to water based on total zinc and total hydrocarbon (after oil/water separation) was 5×10^{-5} and 1×10^{-5} , respectively. Upper bound emission factors were 8×10^{-5} and 3×10^{-5} for total zinc and total hydrocarbon (after RMM), respectively.

^bA-Table entry for UC 43 does not apply to rubber industry. UC 53 is not covered in A-table. Additive category selected as surrogate.

^cA-Table emission factor for additives exceeds the ERC emission factor. This occurred because ERC 6d relies on an A-Table emission factor not directly applicable to rubber manufacture. TGD A-Table Category V cited by the ERC represents 'cross-linking agent' monomers such as styrene or formaldehyde and 'curing agents' such as peroxides used in the plastics industry. Accordingly, the emission factor to air is quite high, ranging from 0.075 to 0.35 and these classes of compounds are not the same as the vulcanization agents used in the rubber industry. Vulcanising agents chemicals assigned to use category 43 (process regulators).used in the rubber and tyre industry are not explicitly covered in the TGD A-Table and were assigned to Category I in this table.

^dTotal hydrocarbon data indicates an oil/water separator efficiency of approximately 95%.

Table S4: Tier 2 Water Emissions Factors for Tyre and GRG Production.

TGD Classification	ERC	SPERC ^a	Water Emission Factors, F _{water} ^a				
			Tier 1	Tier 2			Regional Emission Factor (all use scales) ^c
			TGD A-Table	Local Emission Factor ^b			
			ETRMA 3/6d.1 Process with efficient raw material use (local use ≤100 ton/year/substance)	ETRMA 3/6d.2 Process with efficient raw material use and mechanical pre-treatment (local use ≤100 ton/year/substance)	ETRMA 3/6d.3 Process with optimization for efficient raw materials use (local use >100 ton/year)		
01 - MASTICATION AGENTS / PEPTISER	6d	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
02 - VULCANISATION AGENTS	6d	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
03 - ANTI AGEING AND ANTIFLEX-CRACKING AGENTS / ANTI DEGRADANTS	3	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
04 - FILLERS AND PIGMENTS	3	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
05 - PLASTICISER	3	N/A	0.001 ^c	N/A	N/A	N/A	N/A
06-1- LUBRICANTS	3	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
06-2- TACKIFIER	3	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
06-4- FILLER ACTIVATOR	3	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
06-6- BONDING AGENTS	3	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
07-03 – EMULSIFIERS	4	N/A	0.0005	N/A	N/A	N/A	N/A
07-12- RE-INFORCING AGENTS	3	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
07-7- HARDENERS	3	ETRMA 3/6d.x v.1	0.0005	0.0002	0.00008	0.00001	0.00002
07 - SOLVENTS	4	N/A	0	N/A	N/A	N/A	N/A
09 - RELEASE AGENTS	4	N/A	0.0005	N/A	N/A	N/A	N/A

Note: N/A indicates not applicable.

^aETRMA 3/6d.x v.1 where 3/6d indicates ERC 3 or ERC 6d, x = 1 (≤100 t/y use), 2 (≤100 t/y use with pretreatment) or 3 (>100 t/y) and v.1 indicates Version 1.

^bSmall/moderate scale uses are defined as annual uses ≤100 t/y. Large scale uses are defined as annual uses > 100 t/y.

^cSubstance-specific emissions should be calculated based on the typical scale of the use (small/moderate versus large scale uses). A regional emission factor is presented here to provide a bounding estimate for substance with both small/moderate scale and large scale uses.