

gemäß Verordnung (EG) Nr.1907/2006

Produktbezeichnung: erstellt am: 01.04.1994 Eisen-II-chlorid-Lösung überarbeitet am: 09.09.2016

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ABSCHNITT 1: Bezeichnung des Stoffes / der Mischung und Firmenbezeichnung

1.1 1.1.1 1.1.2 1.1.3	Produktidentifikator Bezeichnung auf dem Kennzeichnungs- schild/ Handelsname: Zusätzliche Bezeichnungen: REACH Registrierungsnummer:	Eisen-II-chlorid-Lösung Eisen-II-chlorid-Lösung, technisch, enthält Salzsäure n.a. für Mischungen
1.2 1.2.1	Relevante identifizierte Verwendungen d Relevante identifizierte Verwendungen:	er Mischung und Verwendungen, von denen abgeraten wird Eine komplette Liste der identifizierten Verwendungen, für die ein Expositionsszenarium im Anhang des Sicherheitsdatenblattes angefügt ist, finden Sie im ABSCHNITT 16.
1.2.2	Verwendungen, von denen abgeraten wird:	Keine bekannt
1.3	Einzelheiten zum Lieferanten, der das Si	cherheitsdatenblatt bereitstellt
1.3.1	EG-Inverkehrbringer (Hersteller):	Salzgitter Flachstahl GmbH
1.3.2	Hausadresse:	Eisenhüttenstraße 99, 38239 Salzgitter
1.3.3	Postadresse:	38223 Salzgitter
1.3.4	Land	Deutschland
1.3.5	Telefon:	05341 / 21-01
1.3.6	Telefax:	05341 / 21-39 21
1.3.7	Auskunft gebender Bereich:	Hauptabteilung Arbeitssicherheit Tel. 05341 / 21-22 01 Fax. 05341 / 21-39 21
1.3.8	E-Mail (sachkundige Person):	szfg.reach@salzgitter-ag.de
1.4	Notrufnummer: (24 h/d besetzt)	05341 / 21-112 (Werkfeuerwehr)

ABSCHNITT 2: Mögliche Gefahren

2.1 Einstufung des Stoffes oder Gemisches

2.1.1 Gemäß Verordnung (EG) Nr. 1272/2008:

Korrosiv gegenüber Metallen, Kategorie 1 Akute Toxizität, Kategorie 4 Hautreizungen, Kategorie 2 Sensibilisierung der Haut, Kategorie 1 Augenschädigung, Kategorie 1

- H290 Kann gegenüber Metallen korrosiv sein.
- H302 Gesundheitsschädlich beim Verschlucken.
- H315 Verursacht Hautreizungen.

GHS05: Ätzend

Gefahr

H317 Kann allergische Hautreaktionen hervorrufen.

GHS07: Achtung

H318 Verursacht schwere Augenschäden.

2.2 Kennzeichnungselemente VO (EG) Nr.1272/2008:

- 2.2.1 Gefahrenpiktogramme:
- 2.2.2 Signalwort:
- 2.2.3 Gefahrenhinweise:

- **H290** Kann gegenüber Metallen korrosiv sein.
- H302 Gesundheitsschädlich beim Verschlucken.
- H315 Verursacht Hautreizungen.
- H317 Kann allergische Hautreaktionen hervorrufen.
- H318 Verursacht schwere Augenschäden.

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2.2.4	Sic	cherheitshinwei	se:		P301+ P302+ P305+ P333+	Gesichtschutz trage P312 Bei Verschluck oder Arzt anrufen. P352 Bei Berührung waschen. P351+P338+P310 E lang behutsam mit Kontaktlinsen nach Sofort Giftinformatio P313 Bei Hautreizur ärztliche Hilfe hinzu	ken: Bei Unwohlsein Giftinformationszentrum g mit der Haut: Mit viel Wasser und Seife Bei Kontakt mit den Augen: Einige Minuten Wasser ausspülen evt. vorhandene Möglichkeit entfernen. Weiter ausspülen. onszentrum oder Arzt anrufen. ng oder –ausschlag: Ärztlichen Rat einholen /
2.3		sätzliche Gefa ensch und Um	ahrenhinweise welt:	für	Keine		
ABSC	HN	ITT 3: Zusa	<u>mmensetzung</u>	/ Angaber	n zu B	<u>estandteilen</u>	
3.1	Ch	emische Cha	rakterisierung (Mischung):	Lös	sung von Eisen-II-chl	orid und Salzsäure in Wasser
3.2	Ge	efährliche Inha	altsstoffe:				
REACH EG-Nr.		gistriernummer CAS-Nr.	: 01-2119498060 Anteil [%])-41-0003 E Einstufung VO (EG) Nr.		nung: Eisen-II-chlor	id
231-843	3-4	7758-94-3	20 -25%	Akute Toxizi Hautreizung	ität, Kat jen, Kat rung der	egorie 4; egorie 2; [.] Haut, Kategorie 1;	H302 H315 H317 H318
REACH	l Reg	gistriernummer	: 01-2119484862	-27 E	Bezeich	nung: Hydrogenchlo	prid
EG-Nr. 231-59		CAS-Nr. 7647-01-0	Anteil [%] <10 %	Einstufung nach Verord		EG) Nr. 1272/2008, Ir	ndex-Nr.: 017-002-01-X (Salzsäure …%)
Spezifis Hautätz Hautrei Augenr	sche zung, zung eizur		yrenzen (VO (EG) ≥25% 10 – 25% 10 – 25% 3 ≥10%				
3.3	Zu	satzinformatio	onen:		(EINE		ann bis zu 0,1% Nickel-II-chlorid 7718-54-9) enthalten. Dies führt zu g H317.
ABSC	HN	ITT 4: Erste I	Hilfe Maßnahr	nen			
4.1	Be	eschreibung d	er Erste-Hilfe N	laßnahmen			
4.1.1		gemeine Hinwe					Erste-Hilfe-Maßnahmen sofort Arzt getränkte Kleidung sofort ausziehen.

4.1.2 Nach Einatmen:

Die betroffene Person an die frische Luft bringen. Gesicht abwaschen, Mund und Nase mit Wasser spülen.

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4.1.3	Nach Hautkontakt:	Betroffene Hautpartie mit viel Wasser spülen.
4.1.4	Nach Augenkontakt:	Auge unter Schutz des unverletzten Auges mindestens 10 Minuten unter fließendem Wasser bei weitgespreizten Lidern spülen. Augenarzt hinzuziehen.
4.1.5	Nach Verschlucken:	Mund sofort mit Wasser ausspülen und reichlich Wasser trinken lassen. Kein Erbrechen herbeiführen. Sofort Arzt hinzuziehen.
4.2	Wichtigste akute und verzögert aut tretende Symptome und Wirkunger	
4.3	Hinweise für den Arzt:	Hinweise zur Toxikologie siehe ABSCHNITT 11.
<u>ABSC</u> 5.1	CHNITT 5: Maßnahmen zur Brandl Geeignete Löschmittel:	bekämpfung Löschmaßnahmen auf die Umgebung abstimmen. Stoff selbst brennt nicht.
5.2	Aus Sicherheitsgründen ungeeigne Löschmittel:	ete Keine.
5.3	Besondere vom Stoff ausgehende Gefahren:	Entstehung giftiger, ätzender Gase (Hydrogenchlorid).
5.4	Besondere Schutzausrüstung bei o Brandbekämpfung:	der Umgebungsluftunabhängiges Atemschutzgerät und Chemikalienschutzanzug tragen.
5.5	Zusätzliche Hinweise:	Kontaminiertes Löschwasser getrennt sammeln. Nicht in die Kanalisation, Oberflächenwasser oder Grundwasser gelangen lassen. Bei Kontakt mit Metallen Wasserstoffbildung möglich.

ABSCHNITT 6: Maßnahmen bei unbeabsichtigter Freisetzung

6.1	Personenbezogene Vorsichtsmaßnahmen	: Schutzausrüstung ggf. umluftunabhängiges Atemschutzgerät tragen. Ungeschützte Personen fernhalten. Für ausreichende Lüftung sorgen.
6.2	Umweltschutzmaßnahmen:	Nicht in den Boden, die Kanalisation oder in Gewässer gelangen lassen.
6.3	Methoden und Material für Rückhaltung und Reinigung:	Mit geeignetem flüssigkeitsbindenden Material (Sand, Kieselgur, Säurebinder, Universalbinder) aufnehmen, um Materialschäden zu vermeiden. In geeigneten, geschlossenen Behältern sammeln und zur Entsorgung bringen. Den betroffenen Bereich belüften.

ABSCHNITT 7: Handhabung und Lagerung

7.1	Schutzmaßnahmen zur sicheren Handhabung:		
7.1.1	Hinweise zum sicheren Umgang:	Aerosolbildung vermeiden. Beim Ab- und Umfüllen Verspritzen vermeiden. Bei Verwendung dieses Produktes nicht essen, trinken oder rauchen.	
7.1.2	Technische Maßnahmen:	Für ausreichende Belüftung sorgen und ggf. lokale Absaugung verwenden. Notdusche und Augenspülvorrichtung / Spülflasche in Arbeitsplatznähe bereit halten.	

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7.1.3	Hinweise zum Brand- und Explosions	sschutz: Wasserstoffbildung als nicht (vgl. Pkt.5)	Reaktionsprodukt möglich. Sto	ff selbst brennt
7.1.4	Allgemeine Hygienemaßnahmen:		t Essen, Trinken oder Rauchen. sbereich aufbewahren. Nach Ar aschen.	
7.2	Bedingungen zur sicheren Lageru	Metallen aufbewahren In korrosionsbeständig Materialien: Kunststoff	Ikalien (Laugen) lagern. Getrenn gen Behältern aufbewahren. Kon e (PE, PP, PVC), Glasfaser vers rz-beschichteter Beton.	npatible
7.3	Spezifische Endanwendungen:	Abwasserbehandlung Expositionsszenarien	und Biogasbehandlung: Siehe im Anhang.	

ABSCHNITT 8: Begrenzung und Überwachung der Exposition/Persönliche Schutzausrüstung

8.1 Expositionsgrenzwerte

8.1.1 Arbeitsplatzgrenzwerte (TRGS 900):

CAS-Nr.	Bezeichnung	ml/m³	mg/m³	Spitzenbegrenzung
7647-01-0	Hydrogenchlorid	2	3	2 (I)

8.1.2 Arbeitsplatz-Richtgrenzwert (RL 2000/39/EG)

CAS-Nr. Bezeichnung		8 Stund	8 Stunden		Kurzzeit (15 min)	
		ml/m³ (ppm)	mg/m³	ml/m³ (ppm)	mg/m ³	
7647-01-0	Hydrogenchlorid	5	8	10	15	

8.1.3 DNEL- und PNEC-Werte:

Eisenchlorid: PNEC Sediment aquatisch: PNEC terrestisch:	49,5 g/kg dwt 55 g/kg dwt
DNEL (Arbeiter) dermal (Langzeit)	0,57 mg/kg bw/day
DNEL (Verbraucher) dermal (Langzeit)	0,29 mg/kg bw/day
Hydrogenchlorid: PNEC Frischwasser: PNEC Meerwasser: PNEC Kläranlage:	0,036 mg/l 0,036 mg/l 0,036 mg/l
DNEL (Arbeiter) Inhalativ (akut/ Kurzzeit):	15 mg/m ³
DNEL (Arbeiter) Inhalativ (Langzeit):	8 mg/m ³

8.2 Begrenzung und Überwachung der Exposition

8.2.1	Begrenzung und Überwachung der Exposition am Arbeitsplatz:	vgl. ABSCHNITT 7
8.2.2	Atemschutz:	Bei Auftreten von Dämpfen /Aerosolen Atemschutzgerät mit Filtertyp E und Partikelschutz P2 tragen.
8.2.3	Handschutz:	Hautschutzplan erstellen und beachten! Die Chemikalienbeständigkeit der Schutzhandschuhe ist mit dem Lieferanten abzuklären und muss den Spezifikationen der EG-Richtlinie 89/686/EWG und der daraus ergebenden Norm EN374 genügen. Geeignet sind Handschuhe aus folgenden Materialien

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Bei Vollkontakt: Handschuhmaterial: Nitrilkautschuk, NBR Schichtstärke: 0,35 mm Durchbruchszeit: > 480 Min.

Bei Kurzzeitkontakt / Spritzkontakt: Handschuhmaterial: Nitrilkautschuk Schichtstärke: 0,11 mm Durchbruchszeit: > 480 Min.

8.2.4 Augenschutz:

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- 8.2.5 Körperschutz:
- 8.3 Begrenzung und Überwachung der Umweltexposition:

Dichtsitzende Schutzbrille bzw. Vollvisier-Gesichtsschutz tragen.

Säurebeständige Schutzkleidung (ggf. mit Kopf und Nackenschutz)

Siehe ABSCHNITT 7. Es sind keine darüber hinausgehenden Maßnahmen erforderlich.

ABSCHNITT 9: Physikalische und chemische Eigenschaften

9.1 9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7 9.1.8 9.1.9 9.1.10 9.1.11 9.1.11	Allgemeine Angaben Aggregatzustand: Farbe: Geruch: pH-Wert: Schmelzpunkt/-bereich: Siedepunkt/-bereich: Dichte: Wasserlöslichkeit: Flammpunkt: Zündtemperatur: Untere Explosionsgrenze:	flüssig dunkelgrün leicht stechend < 1 n.z. n.z. ca. 1,35 g/ml mischbar n.z. n.z. n.z. n.z.	(1013 hPa) (20°C) (20°C) (1013 hPa) (1013 hPa)
9.1.12 9.1.13	Obere Explosionsgrenze: Dampfdruck:	n.z. k.D.v.	(20°C)
9.2	Sonstige Angaben:	Keine	

ABSCHNITT 10: Stabilität und Reaktivität

10.1	Reaktivität:	Wirkt korrodierend.
10.2	Chemische Stabilität:	Stabil unter normalen Bedingungen.
10.3	Möglichkeit gefährlicher Reaktionen:	Bildung von Wasserstoff bei Kontakt mit Metallen. Beim Erhitzen Freisetzung von Hydrogenchlorid.
10.4	Zu vermeidende Bedingungen:	Erhitzen und Kontakt mit unedlen Metallen.
10.5	Unverträgliche Materialien:	Unedle Metalle.
10.6	Gefährliche Zersetzungsprodukte:	k.D.v.

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ABSCHNITT 11: Toxikologische Angaben

11.1	Akute Wirkungen	
11.1.1	Akute Toxizität:	Für die Mischung sind keine Daten verfügbar.
		oral: Ratte LD 50: 132 - 881 mg/kg (Fe, metallisch) (CSR) LD 50: 300 - 2000 mg/kg (FeCl ₂) (CSR) LD 50: ca. 237 mg/kg (HCl) (CSR) inhalativ: Ratte, Prüfatmosphäre: Staub/Nebel LC 50: 45,6 mg/l (HCL) 5 Minuten LC 50: 8,3 mg/l (HCL) 30 Minuten dermal: Ratte Ratte Ratte
		LD 50: $> 2000 \text{ mg/kg}$ (FeCL ₂) (CSR)
		Kaninchen LD 50: > 5010 mg/kg (HCL)
11.1.2	Reiz- / Ätzwirkung auf die Haut:	Kaninchen Für FeCl ₂ : 500 mg (OECD TG 405 und GLP) Ergebnis: Leicht reizend (CSR) Für HCI: Ergebnis: ätzend
11.1.3	Reiz- / Ätzwirkung auf die Augen:	Kaninchen Für FeCl ₂ : 100 mg (OECD TG 405 und GLP) Ergebnis: ätzend (CSR) Für HCl: Ergebnis: ätzend
11.2	Sensibilisierung:	Es gibt keinen Hinweis darauf, dass Eisensalze sensibilisierend auf die Haut sind, jedoch führt die geringe Menge an Nickelchlorid zu der Einstufung.
11.3	Toxizität bei wiederholter Aufnahme:	FeCl ₂ , Ratte NOAEL:125 mg/kg/d bis zu 54 Tagen
		HCl, Ratte LOAEL: 10 ppm inhalativ Dosierungen: 0-10-20-50 ppm bis zu 90 Tagen Hinweise auf andere Organschäden außer an den Atmungsorganen ergaben sich nicht.
11.4	CMR-Wirkungen (krebserzeugende, erbgu	itverändernde und fortpflanzungsgef. Wirkung)
11.4.1	Mutagen:	Keine Hinweise auf mutagene Wirkung.
11.4.2	Karzinogen:	Keine Hinweise auf Karzinogenität.
11.4.3	Reproduktionstoxisch:	Keine Hinweise auf Reproduktionstoxizität.
11.5	Zielorgantoxisch (STOT):	
11.5.1	Einmalige Exposition:	Für HCI: Kann die Atemwege reizen. Für FeCl ₂ : Keine Daten verfügbar.
11.5.1	Wiederholte Exposition:	Keine Daten verfügbar.
11.6	Aspirationstoxisch:	Keine Daten verfügbar.

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ABSCHNITT 12: Umweltbezogene Angaben

12.1 Ökotoxizität:	Für die Mischung sind keine Daten verfügbar.
12.1.1 Aquatisch:	
12.1.1.1 Fischtoxizität:	Kurzzeit:
	Für FeCl ₂ (Fisch: Oryzias latipes) (CSR) LC50 (96 h): 47 mg/l Fe _(gesamt) (CSR) LC50 (96 h): 6,9 mg/l Fe _(gelöst) (CSR) Für HCl (Fisch: Leopomis macrochirus) (CSR) LC50 (96 h): 20,5 mg/l HCl (pH 3,25-3,5)
	Langzeit: Für FeCl ₂ <i>(Fisch: Salmo gairdneri)</i> In vitro LOEC: 0,0005 mg/l (CSR)
12.1.1.2 Daphnientoxizität:	Kurzzeit: Für FeCl ₂ (<i>Wirbellose: Daphnia magna</i>) EC50 (48h) 19 mg/l Fe _(gesamt) EC50 (48h) 1,6 mg/l Fe _(gelöst) Für HCl (<i>Wirbellose: Daphnia magna</i>) (CSR) EC50 (48 h) 0,45 mg/l HCl (pH 4,92) (OECD 202)
12.1.1.3 Algentoxizität:	Kurzzeit: Für FeCl ₂ (<i>Alge: pseudokirchneriella subcapiata)</i> EC50 (72h): 6,9 mg/l Fe _(gesamt) (CSR) Für HCl (<i>Alge:Chlorella vulgaris</i>) EC50 (72 h) 0,73 mg/l HCl (pH 4,7) (OECD 201)
12.1.1.4 Bakterientoxizität:	Für HCI <i>(Belebtschlamm)</i> EC50: 0,23 mg/l HCI (pH 5,2) (OECD 209)
12.2 Persistenz und Abbaubarkeit:	Die Methoden zur Bestimmung der biologischen Abbaubarkeit sind bei anorganischen Stoffen nicht anwendbar.
12.3 Bioakkumulationspotenzial:	Keine Daten verfügbar.
12.4 Mobilität im Boden:	Keine Daten verfügbar.
12.5 Ergebnis der Ermittlung der PBT-Eigenschaften:	Diese Mischung erfüllt nicht die Kriterien für eine Einstufung als PBT oder als vPvB.
12.6 Weitere ökologische Hinweise:	Für HCI: Schadwirkung auf Fische, Plankton und auf festsitzende Organismen durch pH-Verschiebung.
ABSCHNITT 13: Hinweise zur Entsorgung	

- 13.1 Verfahren zur Abfallbehandlung:
- 13.2 Vorschlagsliste für Abfallschlüssel/ Abfallbezeichnungen gemäß EAKV:
- Produktreste sind unter der Beachtung der Abfallrichtlinie 2008/98/EG zu entsorgen.
- 11 01 05 (saure Beizlösungen)
- keine Daten vorhanden

13.3 Verpackung:

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ABSCHNITT 14: Angaben zum Transport

14.1	Landtransport ADR/RID und GGVS/GGVE (gren	nzüberschreitend/Inland):
14.1.1	ADR/RID-GGVS/E Klasse:	8
14.1.2	Verpackungsgruppe:	III
14.1.3	Klassifizierungscode:	-
14.1.4	Kemmlerzahl:	80
14.1.5	UN-Nummer:	3264
14.1.6	Gefahrzettel:	8
14.1.7	Bezeichnung des Gutes:	ätzender saurer anorganischer flüssiger Stoff, n.a.g.
14.1.8	Tunnelbeschränkungscode:	-
14.1.9	Begrenzte Mengen:	-
14.2	Binnenschiffstransport (ADNR):	-
14.2.1	ADR/RID-GGVS/E Klasse:	-
14.2.2	Verpackungsgruppe:	-
14.2.3	Klassifizierungscode:	-
14.2.4	Kemmlerzahl:	-
14.2.5	UN-Nummer:	-
14.2.6	Gefahrzettel:	-
14.2.7	Bezeichnung des Gutes:	-
14.3	Seeschifftransport (GGVSee):	kein Seeschifftransport
14.4	Lufttransport (ICAO-IATA):	kein Lufttransport

ABSCHNITT 15: Rechtsvorschriften

15.1	Vorschriften zu Sicherheit, Gesundheits- und Umweltschutz/spezifische Rechtsvorschriften für den Stoff oder das Gemisch					
15.1.1	Beschäftigungsbeschränkung:	Beschäftigungsbeschränkungen für Jugendliche nach § 22 JArbSch.				
15.1.2	Wassergefährdungsklasse:	Einstufung gemäß (VwVwS, Anhang 2): WGK 1 (schwach wassergefährdend)				
15.1.3	Störfallverordnung:	n.z.				
15.1.4	Zusätzliche Hinweise zu nationalen Vorschriften:	Die nationalen Vorschriften sind zu beachten.				
15.2	Stoffsicherheitsbeurteilung:	Im Rahmen der REACH-Verordnung (EG) Nr.1907/2006 wurde eine Stoffsicherheitsbeurteilung für Eisen-II-chlorid durchgeführt, welche im Stoffsicherheitsbericht (CSR) dokumentiert ist.				

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ABSCHNITT 16: Sonstige Angaben

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16.1	Änderungen:	keine				
16.2	Liste der relevanten identifizierten Verwendungen der Mischung:	 ES I: Manufacturing of Iron Chlorides ES II: Generic Formulation ES III: Water Treatment: Treatment of raw and potable wate ES IV: Water Treatment: Treatment of waste water and WV sludge ES V: Use as a reactive product precursor ES VI: Industrial and Consumer Use as a metal etchant and surface treatment agent 				
16.3	Wortlaut der H- und EUH-Sätze gemäß CLP Verordnung (EG 1272/2008) unter den Abschnitten 2 und 3:	 H290 Kann gegenüber Metallen korrosiv sein. H302 Gesundheitsschädlich beim Verschlucken. H314 Verursacht schwere Verätzung der Haut und schwere Augenschäden H315 Verursacht Hautreizungen. H317 Kann allergische Hautreaktionen hervorrufen. H318 Verursacht schwere Augenschäden. H319 Verursacht schwere Augenreizung. H335 Kann die Atemwege reizen. 				
16.4	Literatur, Quellen:	Stoffsicherheitsbericht (CSR Chemical Safety Report) "Eisenchlori erstellt gemäß Verordnung (EG) Nr.1907/2006. Institut für Arbeitschutz der gesetzlichen Unfallversicherungen: GESTIS Stoffdatenbank http://www.dguv.de/ifa/de/gestis/stoffdb/index.jsp				
16.5	Weitere Informationen:	Abkürzungen: k.D.v. = keine Daten vorhanden n.z. = nicht zutreffend n.d. = nicht durchführbar u.a. = unter anderem n.a. = nicht anwendbar				

Erklärung:

Dieses Sicherheitsdatenblatt ist überarbeitet worden gemäß Anhang II der REACH Verordnung (2010). Die in diesem Sicherheitsdatenblatt verwendeten Daten beruhen auf dem Registrierungsdossier und dem Chemischen Sicherheitsbericht für Eisen-II-chlorid. Die Angaben in diesem Sicherheitsdatenblatt stützen sich auf den heutigen Stand unserer Kenntnisse und Erfahrungen. Das Sicherheitsdatenblatt beschreibt die Produkte im Hinblick auf Sicherheitserfordernisse. Die Angaben haben nicht die Bedeutung von Eigenschaftszusicherungen

ANHANG

Exposure Scenario I: Manufacturing of Iron Chlorides

This exposure scenario describes the common manufacturing processes used within the EEA to manufacture iron (II) chloride (FeCl₂, ferrous chloride) and iron (III) chloride (FeCl₃, ferric chloride) which may be supplied as solids in various hydration states or in aqueous solution.

Description of the process

The pickling process in steel plants is a surface treatment process of belts/strips prior to the coating, rolling (hot or cold) or finishing of these articles. In order to generate a suitable surface on the belts/strips remaining iron oxides (and some other minor impurities) and the first surface layer of iron are removed in continuous pickling lines by treating the belt/strip with hydrochloric acid.

 $\begin{array}{l} \mbox{Fe} + 2 \ \mbox{HCl} \rightarrow \mbox{Fe} \mbox{Cl}_2 + \mbox{H}_2 \mbox{\begin{picture}l} \\ \mbox{Fe} \mbox{O} + 2 \ \mbox{HCl} \rightarrow \mbox{Fe} \mbox{Cl}_2 + \mbox{H}_2 \mbox{O} \end{array}$

The resulting liquid is often filtered to remove percipitates and is stored in tanks. On a regular basis the iron chloride solution is filled in tank vehicles, transported and sold to the costumers or send to the neutralization bath existing in the company as part of a fabrication flow.

The resulting liquid contains mainly water with iron dichloride (up to 30 %) and remaining hydrochloric acid (up to 15 %)

Contributing Exposure Scenarios:

Iron Chlorides: Manufacturing of Iron Chlorides (Exposure Scenario 1 from the Iron Salts Dossier) Hydrochloric Acid: Industrial End Use of Hydrochloric Acid (Exposure Scenario 4 from the Hydrogen Chloride Dossier)

Both exposure scenarios are attached as such.

Exposure Scenario 1: Manufacturing of Iron Chlorides

Short Title of the Exposure Scenario					
Sector of Use	SU 3				
Product Category	Not applicable				
Process Category	PROC 1, PROC 2, PROC 3, PROC 8b				
Article Category	Not applicable				
Environmental Release Category	ERC 1				
Operational conditions related to frequency, duration	on and amount of use				
Duration, frequency and amount					
Information type Duration of exposure per day at workplace [for one	Data field Up to 8 hours	Explanation			
worker]	Op to 8 hours	Worst case assumption			
Frequency of exposure at workplace [for one worker]	Daily				
Annual amount used per site	>10000 T/yr manufactured	Manufactured on site not used			
Emission days per site	Up to 365				
Operational conditions and risk management meas	ures related to product characterist	ics			
Characteristics of the substance or preparation					
Information type	Data field	Explanation			
Physical state Risk management measures related to the design of	Liquid (aqueous solution) Precautions against irritation	Physical state at STP. See below RMM for exposure			
product	Frecautions against initiation	See below Rivin for exposure			
Operational conditions related to available dilution	capacity and characteristics of exp	osed human			
Operational conditions related to respiration and sk	kin contact				
Information type	Data field	Explanation			
Respiration volume under conditions of use	10 m ³ /d	Default respiration volume for light work.			
Area of skin contact with the substance under	240 (PROC3)	ECETOC assumptions for exposed skin surface			
conditions of use	480 (PROC2, PROC8b)	area.			
Body weight Other operational conditions of use	70 kg	Default bodyweight for workers.			
For simplicity a manufacturing site producing 5,000	tonnes in total of Fe salts per year	is envisaged as a standard for the ES			
Releases to air	tonnes in total of re suits per year	is christiged us a standard for the Eo			
Given the highly controlled conditions used in the manu	facture of ferrous chloride and ferric c	hloride to prevent the release of gases such as			
chlorine or HCl, it can be assumed that the release of ir	on chloride in any form to air is effection	vely zero.			
Releases to water					
Wastewater containing ferrous chloride is usually recyc					
exposed to the air oxidise to ferric oxides and hydroxide		ecipitating. Ferric chionde is a little less soluble			
I and is hydrolysed directly to Ee(OH). Thus, any release	a to water will be converted to an inco	uble precipitate at a rate dependent on factors			
and is hydrolysed directly to Fe(OH) ₃ . Thus, any release such as the ferrous versus ferric content, pH, concentra					
such as the ferrous versus ferric content, pH, concentra	tion, and extent of exposure to air, the	e "parent salt" being no longer present.			
such as the ferrous versus ferric content, pH, concentra Technical fate of substance and losses from process	ation, and extent of exposure to air, the ss/use to waste, waste water and air	e "parent salt" being no longer present.			
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Municipal or other type of external waste treatment	water	Yes				
Effluent (of the waste water treatment pla	ant) discharge	10000 m ³ /d				
rate Recovery of sludge for agriculture or hor	ticulture	Yes				
Waste related measures						
Details of the treatment of aqueous wast			s but as a minimu	m the effluent tr	eated in either in on-site or municipal	
secondary biological treatment plants pr	or to discharge.				-	
Exposure estimation						
Workers exposure Acute/Short-term exposure						
Short-term exposure is not relevant.						
Long-term exposure						
	are only assum	ned where ne	cessary to manag	e possible risks	. Modifications are predominantly for use	
of personal protective equipment (PPE).						
exposure.						
Dermal exposure				lilealesta anassa		
As processes are enclosed, occupationa maintenance and clean-out. Given the n						
prevent contact with the substance.		ustry, it may t	e assumed mar a	uequate fisk fild	anagement systems are in place to	
Inhalation exposures						
Again, accidental exposure during transf	er or transport,	or maintenan	ce and clean-out i	s the most likel	y source of inhalation exposure. This is	
most likely to be to dust in the preparation	n of solid produ	icts. Again, gi	ven the nature of			
management systems are in place to pre-	vent contact wi	th the substa	nce.			
The dermal and inhalation exposure esti				ure levels are gi	ven below.	
Summary of highest long-term exposed Highest value for relevant tasks.	ire concentrat	ion to worke	rs			
Routes of exposure	Concentration	าร		Justification		
Dermal local exposure	200 (PROC8b		of LEV)		of gloves is accounted for in this value	
(in µg/cm ²)					_	
Dermal systemic exposure via contact	0.14 (PROC8b)			of 10% dermal uptake is assumed in	
with substance as such				deriving this v	value.	
(in mg/kg bw/d)	0.014 (PROC8	2h)		The limitation of <1% dermal uptake is assumed in		
Dermal systemic exposure via aqueous solution	0.014 (FROCo	(uu		deriving this value.		
(in mg/kg bw/d)						
Inhalation exposure	Negligible for c	contributing ta	sks that do not	The product is	s a wet solid salt which will not give rise	
·	involve handlin	ng of solid pro	ducts leading to	to airborne du	ist and therefore no risk of inhalation	
	evolution of du	ists, or sprayi	ng of liquid			
	product. See also below	N				
Inhalation exposure	i) Negligible, a		solids are			
(in mg/m ³)/8h workday	processed only					
(refers only to any contributing tasks	ii) 1.8 (PROC 8			ii) Derived usi	ng Stoffenmanager scenario assuming	
involving handling of solid products				handling of product with low speed or with little force in		
leading to evolution of dusts)	N		· · · · · · · · · · · · · · · · · · ·	medium quan	tities	
Inhalation exposure (in mg/m ³)/8h workday	Negligible, ass only in a close		braying occurs			
(in fight) of workday		u system.				
(refers only to any contributing tasks						
involving spraying of liquid product)						
Risk characterisation						
The DNEL values and therefore the risk	characterisatior	n are in the m	oment under revis	ion by the Iron	Salts Consortium.	
Consumer exposure						
Consumer exposure is not relevant for the	e production of	iron chloride	S			
Environmental exposure Environmental releases						
As a worst-case scenario, it is assumed	that the product	tion of iron ch	laridas sulphatas	and chlorido su	uphatos takos placo at the same site	
The total production level of iron for cons						
production of iron chlorides and iron sulp						
The BREF for large volume inorganic chemicals (and the additional material relating to ferric chloride specifically) contains useful information						
about releases to the environment assoc						
The Steel industry scenario is thought to					e amounts and systems used and	
therefore will produce lower release leve Environmental releases from product		below should	d be used as a wo	rst case.		
Environmental releases from product	Ferric chlo	oride ¹	Ferric sulphate		Ferrous sulphate	
Compartments	(all emissi		(all emissions i		(all emissions in kg/tonne of	
	kg/tonne o		of product)		product)	
Emissions to air						
Dust			0.03-0.5 (35 mg		0.08 (monohydrate)	
			solution to solid	product)	0.004-0.08 (monohydrate and dried copperas) – bag filters ³ .	
					0.4 (monohydrate) – wet scrubbing	
					$<30-<50 \text{ mg/m}^3$	

Emissions to water						
Iron	0.05-5		.8 (0.32 kg/m ³) ² (using sure oxidation)	0.75 (with wet scrubbing)		
Sulfate			.0 (0.8 kg/m ³) ² (using sure oxidation)			
Zinc	0.005-1.5					
Heavy metals	<5E-04-0.	6				
Waste to land						
Solid waste	5-35	asso conta	(insoluble residue ciated with removal of amination)	8-25 (monohydrate) a section discussing production of ferric		
product (0.001 kg/m ³); Sulfa ³ Bag filters may not always I EC 2005 (ferric chloride). This scenario uses 0.15% to water. In reality these are ur smaller fraction. Such a site would commonly 2003) indicates that a treatm industrial locations. The environmental releases Fraction in formulation – 0.5 kg/day to water – 725 kg Fe	he water stream that drains tes: 0.35 kg/t product (2.3 be applicable because of the owaste water, equivalent to derstood to be figures price y be served by a larger that hent plant with a throughput based on 145,000 tpa iron , Number of days – 300, A (day prior to WWTP, WWT	s into the gypsum plan kg/m ³). The physical nature of to 725 kg Fe/d. This is or to neutralisation/set n normal WWTP. The t of 10,000 m ³ /d with the salts are as follows: mount per day – 485	nt. The actual emissions t this dust. Data taken from consistent with a release tling and amounts passin ESD for synthetic interm dilution of x40 into receiv tonnes Fe/day, kg/day to	to surface water are: Fe: 1E-04 kg/t n EC 2006 (ferrous and ferric sulfates) and e of approx. 0.05-5 kg iron/tonne to waste g to waste water may in fact be a far nediates (from part IV of the TGD: EC ing water is not unusual for larger air – 0, Fraction to waste water – 0.0015,		
Releases to the environme						
Compartments	Predicted releases (kg/d)	•	lanation / source of measured data			
			ond to release to sewage			
Air (direct + STP)	0					
Soil (direct only)	0					
determine Predicted Enviror and continental background	mental Concentrations (Pl concentrations are also ta	ĔCs) of iron salts in s ken into account.		2.1 software, have been used to ediment and agricultural soil. Regional		
Predicted Exposure Conce	entrations (PEC) for the p		1			
Justification		Local PEC	Justific			
Surface water (in mg/l)		6.0E-07	the expo	ed using EUSES 2.1.1 in accordance with osure scenario.		
Freshwater sediment (in g/kg dwt)		45.0	the expo	ted using EUSES 2.1.1 in accordance with osure scenario.		
Agricultural soil (in g/kg dwt)		53.0	0 Calculated using EUSES 2.1.1 in accordance with the exposure scenario.			
Risk Characterisation						
	WTP: According to experie	nce, under normal co		es cause no disturbance in the normal		
operation of the biological de Compartments	PEC	PNEC	RCR			
	6.0E-07	PNEC				
Surface water (in mg/l) Freshwater sediment (in	45.0	49.5	0.909			
g/kg dwt) Agricultural soil (in g/kg	53.0	55	0.965			
dwt)						

Exposure Scenario 4: Industrial End Use of Hydrogen Chloride

Sector of Use SU 3 Product Gatagory Not applicable Process Catagory PROC 1, PROC 2, PROC 3, PROC 4, PROC 9, PROC 10, PROC 15, PROC 19 Antida Catagory Not applicable Environmental Release Catagory EVA (SC 4, PROC 3, PROC 10, PROC 10, PROC 15, PROC 19 Duration of exposure oper day at workplace [for one worked] Up to 8 hours Work case assumption Environmental Release Control operational Concessors Data (SC 4, PROC 15, PROC 15, PROC 15, PROC 19 Operational Conditions related to frequency, duration and amount of use Work case assumption Information type Data (Figure 10, Figure 10, Fig	Short Title of the Exposure Scenario							
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neglected. The dermal exposure was not assessed quantitatively. Inhalation exposure								
Inhalation exposure			s accidently. Therefore it is assumed that the daily exposition can be					
PROC Derived Effect Level (DEL)	Inhalation exposure							
1 0.02 mg/m ³								
2 1.50 mg/m ³	2		1.50 mg/m³					

3			3.75 m	na/m ³		
4				ig/m³		
9			7.50 m			
10			7.50 m			
13			7.50 m			
15				ıg/m³ (15 min – 1	b)	
15				ig/m³ (1 h – 4 h)	"')	
19					protection apparatus with half mask)	
19				g/m^3 (< 15 min)		
	orioption		7.00 m			
Risk charact				00	Dementer	
PROC	DEL (mg/m ³)	DNEL (mg/m ³)		CR	Remarks	
1	0.02	8	0.	.0025		
2	1.50	8	0.	.19		
3	3.75	8	0.	.47		
4	3.00	8	0.	.375		
9	7.50	8	0.	.94		
10 7.50 8			0.	0.94		
13	7.50	8	0.	.94		
15	3.00	8	0.	.375	15 min – 1 h	
15	1.80	8	0.	.225	1 h – 4 h	
19	7.50	8	0.	.94	respiratory protection apparatus with half mask	
19	7.50	8	0.	.94	< 15 min	
Long-term ex	xposure		•			
		use the substance has onl	ly local derm	nal and/or inhalat	ion effects and no systemic effects.	
			*		*	

Environmental exposition was not derived because the substance has only local derival and/or inhalation enects and no systemic enects. Environmental exposure The substance dissociates in contact with water. The only effect is the very low pH value. Therefore any exposition after the WWTP treatment can be assumed as insignificant and without any risk.

Exposure Scenario II: Generic Formulation

This exposure scenario describes the common processes in which iron salts (ferrous Chloride and Ferrous Sulphate) are used within generic formulation of other products that are produced within the EU.

Description of the process

The iron salts are most frequently manufactured and used in the form of aqueous formulations. Some formulation is understood to be necessary in connection with some of the end uses.

Formulation associated with use in water treatment (raw/potable waters):

Formulation is carried out by specialist formulators at the point of use. Manufacturers' datasheets for relevant iron salts mention the need to dissolve or dilute the as-supplied products prior to use for treatment of raw water. For example, FeCISO_{4(aq)} supplied at a concentration of 41% should be used "undiluted as delivered or diluted with water to a ratio of 1:30 at most" and ferrous sulphate heptahydrate supplied as a solid "should be diluted to give a saturated or concentrated solution containing at least 25% actives" (Kronos 2009). It is, therefore, presumed that this formulation step (dilution) takes place at the point of use. In the case of raw water intended for public supply this would be at a facility dedicated to water treatment; in the case of industry this would be at the industrial site where the water will be used, hence there is no need to account this as a separate step for the environmental assessment.

Formulation associated with use in water treatment (waste waters/ WWTP sludges):

Formulation is carried out by specialist formulators at the point of use. Formulation for this application is essentially a dilution step to produce the required concentration, where supplied as solid or concentrate. Other chemicals such as alkali may be added. Since it is presumed to occur at the point of use there is no need to account this as a separate step for the environmental assessment.

Formulation associated with use in biogas treatment at WWTP:

Formulation for this application is essentially a dilution step to produce the required concentration, where supplied as solid or concentrate. Other chemicals such as alkali may be added. Since it is presumed to occur at the point of use there is no need to account this as a separate step for the environmental assessment.

Formulation associated with use as an etchant:

The ESD for the electronics industry (Environment Agency 2009) estimates releases to waste water of 0.3-2.0% depending on the size of the site. The consumption at a typical site is unknown but the ESD indicates that consumption of more than 1 tonne per year of any etchant chemical constitutes 'large scale' use as these are relatively small operations. To be conservative, consumption of 50 tonnes per year is assumed.

Contributing Exposure Scenarios:

Iron Chlorides: Generic Formulation and Pelletisation of Iron Chlorides (Exposure Scenario 3 from the Iron Salts Dossier) Hydrochloric Acid: Formulation and Packaging of Hydrochloric Acid (Exposure Scenario 3 from the Hydrogen Chloride Dossier)

Both exposure scenarios are attached as such.

ES 3: Generic formulation including pelletisation of Iron Chlorides

Short title of the exposure scenario					
Sector of Use		SU 3, SU 8			
Product Category		PC 14, PC 15, PC 20, PC			
Process Category		PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 8b, PROC 9, PROC 14, PROC 15			
Article Category		Not applicable			
Environmental Release Category		ERC 2, ERC 5			
Operational conditions related to frequency, duration and	amount of	of use			
Information type	Data field		Explanation		
Used amount of substance per day	170 kg	salt; 420 kg solution			
Duration of exposure per day at workplace [for one worker]	<8 h da	ау			
Frequency of exposure at workplace [for one worker]	daily				
Annual amount used per site kg/y	50 t/y				
Emission days per site	300				
Operational conditions and risk management measures re	elated to p	product ¹ characteristics			
Information type	Data fi		Explanation		
Physical state	Liquid	(aqueous solution) or	Physical state at STP.		
		alts (assumed to be in			
	granula	ar/flake form rather than			
	powde				
Risk management measures related to the design of product		tions against irritation	As necessary		
Operational conditions related to available dilution capacity					
Information type	Data fi		Explanation		
Respiration volume under conditions of use	10 m ³ /	-	Default respiration volume for light work.		
Area of skin contact with the substance under conditions of		ROC1, PROC3, PROC15)	ECETOC assumptions for exposed skin		
use	PROC	ROC2, PROC4, PROC5, 8b, PROC9, PROC14)	surface area.		
Body weight	70 kg		Default bodyweight for workers		
Other operational conditions of use					
Information type	Data fi	eld	Explanation		
Fraction of applied amount lost from process/use to waste gas	0				
Fraction of applied amount lost from process/use to waste	Variabl	e depending on industry;			
water		t levels of control are			
		Worst case approx. 2%			
	(e.g. Fo	ormulation of etchants)			
Risk management measures		••			
Information type	Data fie		Explanation		
Containment and local exhaust ventilation					
Container and also an advisal, an advisal	Vee				
Containment plus good work practice required	Yes				
Local exhaust ventilation required plus good work practise	Yes No				
Local exhaust ventilation required plus good work practise Personal protective equipment (PPE)	No				
Local exhaust ventilation required plus good work practise Personal protective equipment (PPE) Skin protection	No Protecti	ve gloves			
Local exhaust ventilation required plus good work practise Personal protective equipment (PPE) Skin protection Eye protection	No Protecti Safety g	glasses			
Local exhaust ventilation required plus good work practise Personal protective equipment (PPE) Skin protection Eye protection Clothing	No Protecti Safety of Working	glasses g clothing worn.			
Local exhaust ventilation required plus good work practise Personal protective equipment (PPE) Skin protection Eye protection Clothing Respiratory protection	No Protecti Safety Working Refer to	glasses g clothing worn. o control technologies below			
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 $^{1\ \}mbox{``Product"}$ includes substances, preparations and articles

Waste related measures							
Any solid wastes are ultimately assur	ned to be	e disposed of via lan	dfill or incineration.				
Details of the treatment of aqueous v	vaste wo	uld vary at different s		m the efflu	uent treate	d in either in on-site or municipal	
secondary biological treatment plants	s prior to	discharge.					
Exposure estimation							
Workers exposure Acute/Short-term exposure							
•							
Short-term exposure is not relevant.							
Long-term exposure Modifications to the predicted exposu	ires are d	only assumed where	necessary to manag	<u>a nossible</u>	a risks Mo	difications are predominantly for use	
of personal protective equipment (PF considered likely. The exposure leve	E). The	presence of local ex	haust ventilation (LEV	/) is taken	into acco	unt in scenarios where this is	
Dermal exposure is most likely to occ							
vessels), where mechanical handling	is not in	place.	-				
The dermal and inhalation exposure	estimates	s derived using the E	ECETOC TRA exposu	ure levels			
Summary of highest long-term exp Highest value for relevant tasks	osure c	oncentration to wo	orkers				
Routes of exposure		Concentrations				Justification	
Dermal local exposure		400 (PROC5, in a	absence of LEV)			The wearing of gloves is accounted	
(in µg/cm ²)						for in this value	
Dermal systemic exposure via contac	ct with	0.7 (PROC4)				The limitation of 10% dermal uptake	
substance as such						is assumed in deriving this value.	
(in mg/kg bw/d)						The limitation of 404 down also the	
Dermal systemic exposure via aquec solution	us	0.07 (PROC4)				The limitation of <1% dermal uptake is assumed in deriving this value.	
(in mg/kg bw/d)						is assumed in deriving this value.	
Inhalation exposure		Negligible for con	tributing tasks that do	o not invol	ve		
			products leading to ev				
		or spraying of liqu	uid product				
		See also below					
Inhalation exposure (in mg/m ³)/8h workday ²		 Negligible, assu a closed system. 	uming any solids are p	processed	l only in		
(refers only to any contributing tasks			.(LEV but no PPE)			ii) Derived using Stoffenmanager	
involving handling of solid products le	eading	1) 1.0 (1100000)				scenario assuming handling of	
to evolution of dusts)	Ũ					product with low speed or with little	
						force in medium quantities	
Inhalation exposure		n/a				n/a	
(in mg/m ³)/8h workday ³ (refers only to any contributing tasks							
involving spraying of liquid product)							
Risk Characterisation							
The DNEL values and therefore the r	isk chara	cterisation are in the	e moment under revis	ion by the	e Iron Salts	s Consortium.	
Consumer exposure							
Consumer exposure is not relevant for	or this sc	enario					
Environmental exposure							
Summary of the releases to the en			ourco (ka/d) (local	luctific	ation		
Compartments	ex	lease from point source (kg/d) (local Justification			allon		
Aquatic (before WWTP)	3.3	,					
Air (direct + STP) Soil (direct releases only)	0						
		REACH quidance a	nd implemented within	n the FUS	SES 2.1 er	oftware, have been used to determine	
Predicted Environmental Concentrati							
Regional and continental background	d concent						
Predicted Exposure Concentration	is (PEC)						
Compartments			Local PEC		Justific		
Surface water (in mg/l)			2.4E-06			ted using EUSES 2.1.1 in accordance exposure scenario.	
Freshwater sediment (in g/kg dwt)			45.0			ted using EUSES 2.1.1 in accordance exposure scenario.	
			50.1		Calculat	ted using EUSES 2.1.1 in accordance exposure scenario.	
Industrial soil (in g/kg dwt)							
Risk Characterisation	PEC		PNEC		RCR		
Industrial soil (in g/kg dwt) Risk Characterisation Compartments Surface water (in mg/l)	PEC 2.4E-0	6	PNEC				
Risk Characterisation Compartments	-	6	PNEC 49.5				

 $[\]frac{2}{3}$ air concentration at the workplace $\frac{3}{3}$ air concentration at the workplace

Exposure Scenario 3: Formulation of Hydrochloric Acid

Short Title of the Exposu	re Scenario			
Sector of Use		SU 10		
Product Category		Not applic	cable	
Article Category		Not applic		
Process Category				4, PROC 5; PROC 8b, PROC 9
Environmental Release Ca		ERC 2		
Operational conditions re Duration, frequency and a	elated to frequency, duratio amount	n and amo	unt of use	
Information type		Data field		Explanation
Duration of exposure per da	ay at workplace [for one	Up to 8 ho	ours	Worst case assumption
worker]				
Frequency of exposure at v	vorkplace [for one worker]	Daily	0	
Emission days per site	nd risk management measu	Up to 360		
Characteristics of the sub		ires related	to product characteristi	ics
Information type		Data field	d	
Physical state			queous solution)	
Concentration Range			% in the product	
Amount per use and perio	od	1 - 1		
	sampling) and cubic metres (material trar	nsfer)	
Other operational condition				
	above 20°C over the room te	mperature.		
A good industrial hygiene h				
	keep the exposures as low a	s possible.		
Risk management measu				
Personal protection meas			and the first state of the	te he commente ll Ca
	rties of the substance suitable			to be worn at all times.
Organizational protection	n addition suitable gloves ac	Cording EN	ST4 have to be worn.	
•	of spillage have to be cleare	d immediate	oly	
Technical protection mea			ciy.	
	as to be handled in a closed	system, Tra	nsfer systems have to be e	emptied before decoupling.
				one under LEV or be embanked. Transfer
systems have to be emptie		-,		
		system. Sys	stem has to be emptied and	d flushed before the equipment is opened or
				have to be emptied before decoupling.
				e to be used where applicable. System has to be
emptied and flushed before	the equipment is opened or	maintained	. LEVs have to be used wh	nere emission can occur.
				have to be used. If pouring is used additional
				for skin and eyes and breathing equipment
		system has	to be emptied and flushed	
			hava ta ha waad whara am	before the equipment is opened or maintained.
	to be handled in a closed sys		have to be used where em	ission can occur. System has to be emptied and
flushed before the equipme	to be handled in a closed sys ent is opened or maintained.	stem. LEVs I		ission can occur. System has to be emptied and
flushed before the equipme PROC 9: The substance ha	to be handled in a closed sys ant is opened or maintained. as to be handled in a closed s	stem. LEVs I	stem has to be emptied bef	hission can occur. System has to be emptied and fore the equipment is opened or maintained.
flushed before the equipme PROC 9: The substance ha	to be handled in a closed sys ent is opened or maintained.	stem. LEVs I	stem has to be emptied bef	hission can occur. System has to be emptied and fore the equipment is opened or maintained.
flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure	to be handled in a closed sys ent is opened or maintained. as to be handled in a closed a done under LEV or be emb	stem. LEVs I system. Sys anked. Tran	stem has to be emptied bef sfer systems have to be en	hission can occur. System has to be emptied and fore the equipment is opened or maintained.
flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure	to be handled in a closed sys ent is opened or maintained. as to be handled in a closed a done under LEV or be embe- relevant for the end use of h	stem. LEVs I system. Sys anked. Tran	stem has to be emptied bef sfer systems have to be en	hission can occur. System has to be emptied and fore the equipment is opened or maintained.
flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure Consumer exposure is not Environmental release mo Water: The whole contamin	to be handled in a closed sys ent is opened or maintained. as to be handled in a closed e done under LEV or be ember relevant for the end use of hy easures nated waste water has to be	system. LEVs I system. Sys anked. Tran ydrochloric a treated in ar	stem has to be emptied bei sfer systems have to be en acid. n industrial or public WWT	hission can occur. System has to be emptied and fore the equipment is opened or maintained. mptied before decoupling. P with a primary and secondary treatment step.
flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure Consumer exposure is not Environmental release mo Water: The whole contamin Leakage has to be prevented	to be handled in a closed sys ent is opened or maintained. as to be handled in a closed e done under LEV or be ember relevant for the end use of hy easures nated waste water has to be	system. LEVs I system. Sys anked. Tran ydrochloric a treated in ar	stem has to be emptied bei sfer systems have to be en acid. n industrial or public WWT	ission can occur. System has to be emptied and fore the equipment is opened or maintained. mptied before decoupling.
flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure Consumer exposure is not Environmental release mo Water: The whole contamin Leakage has to be prevented episodic release.	to be handled in a closed sys ent is opened or maintained. as to be handled in a closed e done under LEV or be ember relevant for the end use of hy easures nated waste water has to be	system. LEVs I system. Sys anked. Tran ydrochloric a treated in ar	stem has to be emptied bei sfer systems have to be en acid. n industrial or public WWT	hission can occur. System has to be emptied and fore the equipment is opened or maintained. mptied before decoupling. P with a primary and secondary treatment step.
flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure Consumer exposure is not Environmental release mo Water: The whole contamin Leakage has to be prevent episodic release. Exposure estimation	to be handled in a closed sys ent is opened or maintained. as to be handled in a closed e done under LEV or be ember relevant for the end use of hy easures nated waste water has to be	system. LEVs I system. Sys anked. Tran ydrochloric a treated in ar	stem has to be emptied bei sfer systems have to be en acid. n industrial or public WWT	hission can occur. System has to be emptied and fore the equipment is opened or maintained. mptied before decoupling. P with a primary and secondary treatment step.
flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure Consumer exposure is not Environmental release me Water: The whole contamin Leakage has to be prevente episodic release. Exposure estimation Workers exposure	to be handled in a closed system is opened or maintained. as to be handled in a closed set of the embed of th	system. LEVs I system. Sys anked. Tran ydrochloric a treated in ar sures accor	stem has to be emptied bef isfer systems have to be en acid. n industrial or public WWT ding to a "spillage plan" ha	A primary and secondary treatment step. ave to be in place to minimise the impact of
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flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure Consumer exposure is not Environmental release me Water: The whole contamin Leakage has to be prevente episodic release. Exposure estimation Workers exposure The method used for expos Dermal exposure During the use of acidic sub	to be handled in a closed system is opened or maintained. as to be handled in a closed set of the embed of th	system. LEVs I system. Sys anked. Tran ydrochloric a treated in ar sures accor TRA. The LE rect contact	tem has to be emptied before sfer systems have to be en acid. In industrial or public WWT ding to a "spillage plan" ha	A primary and secondary treatment step. ave to be in place to minimise the impact of
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flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure Consumer exposure Consumer exposure is not Environmental release me Water: The whole contamin Leakage has to be prevente episodic release. Exposure estimation Workers exposure The method used for expos Dermal exposure During the use of acidic sub neglected. The dermal expo Inhalation exposure PROC 1 2 3 4 5 8b 9 Risk characterisation PROC 1 2	to be handled in a closed system is opened or maintained. as to be handled in a closed is a done under LEV or be embined of the end use of hyself waste water has to be easures and waste water has to be ed. Adequate protective means are estimation is ECETOC 1 bostances and formulations di osure was not assessed quate and the system of th	tem. LEVs I system. Sys anked. Tran ydrochloric a treated in ar sures accor 'RA. The LE rect contact ntitatively.	etem has to be emptied before stem has to be emptied before acid. In industrial or public WWT roling to a "spillage plan" has to set to 90 % efficiency is accidently. Therefore it Derived Effect Level (DE 0.02 mg/m ³ 1.50 mg/m ³ 3.00 mg/m ³ 7.50 mg/m ³ 7.50 mg/m ³	ission can occur. System has to be emptied and fore the equipment is opened or maintained. mptied before decoupling. P with a primary and secondary treatment step. ave to be in place to minimise the impact of is assumed that the daily exposition can be EL) EL RCR 0.0025 0.19
flushed before the equipme PROC 9: The substance ha Material transport has to be Consumer exposure Consumer exposure Consumer exposure Consumer exposure Environmental release m Water: The whole contamin Leakage has to be prevente episodic release. Exposure estimation Workers exposure The method used for expose Dermal exposure During the use of acidic sult neglected. The dermal expo Inhalation exposure PROC 1 2 3 4 5 8b 9 Risk characterisation PROC 1	to be handled in a closed sys ent is opened or maintained. as to be handled in a closed is a done under LEV or be embi- relevant for the end use of hy easures nated waste water has to be ed. Adequate protective mean sure estimation is ECETOC 1 bostances and formulations di osure was not assessed qua	treated in ar system. Sys anked. Tran ydrochloric a treated in ar sures accor RA. The LE rect contact ntitatively.	etem has to be emptied before stem has to be emptied before acid. In industrial or public WWT roling to a "spillage plan" has to set to 90 % efficiency is accidently. Therefore it Derived Effect Level (DE 0.02 mg/m ³ 1.50 mg/m ³ 3.00 mg/m ³ 7.50 mg/m ³ 7.50 mg/m ³	ission can occur. System has to be emptied and fore the equipment is opened or maintained. mptied before decoupling. P with a primary and secondary treatment step. ave to be in place to minimise the impact of is assumed that the daily exposition can be EL) EL RCR 0.0025

4	3.00	8	0.375		
5	7.50	8	0.94		
8b	7.50	8	0.94		
9	7.50	8	0.94		
Long-term expo	osure				
The exposition w	The exposition was not derived because the substances has only local dermal and/or inhalation effects and no systemic effects.				
Environmental	exposure				

The substance dissociates in contact with water. The only effect is the very low pH value. Therefore any exposition after the WWTP treatment can be assumed as insignificant and without any risk.

Exposure Scenario III: Water Treatment: Treatment of raw and potable waters

This generic exposure scenario describes the use of selected iron salts in the treatment of raw water in the supply of either potable water or industrial process water. Disposal is relevant only in that the treatment process produces a sludge which contains the residue of the iron salt treating agent. This has been considered as "losses in use".

Description of the process

When added to water, iron salts act as both excellent coagulants and flocculants. The chemical processes involved are complex but ultimately an insoluble gelatinous precipitate of ferric hydroxide is formed which bridges and traps all the particles (Kemmer 1988, Letterman, 1999).

Potable water: Typical doses for treatment of drinking water are given as 4-10 mg/litre as iron (WHO 2006). Another source indicates approx. 15-25 g Iron salt flocculant added per m3 raw water (Kronos 1997). The exact nature of typical salts is not defined in the WHO report but there is ample indication elsewhere that all combinations of ferrous or ferric and chloride or sulfate salts plus ferric chlorosulfate are used (for example, Cheremisinoff 2002). Pulp and paper production: Typical dosage rates are in the range 5-100 mg/litre.

Contributing Exposure Scenarios:

Iron Chlorides: Iron Salts water treatment (Exposure Scenario 4 from the Iron Salts Dossier) Hydrochloric Acid: Industrial End Use of Hydrochloric Acid (Exposure Scenario 4 from the Hydrogen Chloride Dossier)

Both exposure scenarios are attached as such.

Exposure Scenario 4: Water treatment: treatment of raw and potable waters by Iron Chlorides

Short title of the exposure scenario			
Sector of Use		SU 3	
Product Category		PC 20, PC 37	
Process Category		PROC 2, PROC 5, PROC 8b	
Article Category		Not applicable	
Environmental Release Category		ERC 4	
Operational conditions related to frequency, duration	on and amount		
Duration, frequency and amount			
Information type	Data field		Explanation
Duration of exposure per day at workplace [for one worker]	Up to 8 hours		Default value.
Frequency of exposure at workplace [for one worker]	Daily		
Annual amount used per site	210 T Fe/y		
Emission days per site	300		
Operational conditions and risk management meas	ures related to	product characterist	ICS
Characteristics of the substance or preparation Information type	Data field		Exploration
mormation type		ous solution) or Solid	Explanation
Physical state	salts (assume	ed to be in granular / her than powdered)	Physical state at STP.
Risk management measures related to the design of product	Precautions a	against irritation	As necessary
Operational conditions related to available dilution Operational conditions related to respiration and sk	capacity and ch	naracteristics of expo	osed human
Information type	Data field		Explanation
Respiration volume under conditions of use	10 m ³ /d		Default respiration volume for light work.
Area of skin contact with the substance under conditions of use	480 (PROC2,	PROC5, PROC8b)	ECETOC assumptions for exposed skin surface area.
Body weight	70 kg		Default bodyweight for workers.
Releases in use Given the low volatility and the high water solubility of the be assumed that the entire release is via water and not the as-supplied iron salts to insoluble ferric hydroxide. I land treatment may lead to releases to soil. In waterway releases to soil.	volatilised. The lowever, as som ys, partitioning to	coagulation and floccu ne iron salts may rema o sediment is possible.	ulation processes result in near total conversion of ain in settled sludge, the use of sewage sludge for . Hence, dredging of sediments may also lead to
Technical fate of substance and losses from proces		, waste water and air	
Information type	Data field		Explanation
Fraction of applied amount lost from process/use to waste gas	0		
Fraction of applied amount lost from process/use to waste water	1		
Risk management measures Risk management measures for industrial site	-		
Information type	Data field		Explanation
Containment and local exhaust ventilation			
Containment plus good work practice required	Yes		
Local exhaust ventilation required plus good work practise	No		
Personal protective equipment (PPE)	1 -		
Skin protection	Protective glo		
Eye protection	Safety glasses		
Clothing	Working cloth		0
Respiratory protection		id salts, Filter mask P2 be used, in the absenc	
Breathing apparatus	None		

Exposure Scenario 4: Industrial End Use of Hydrogen Chloride

Sector of Use SU 3 Product Garagory Not applicable Process Catagory PROC 1, PROC 2, PROC 3, PROC 4, PROC 9, PROC 10, PROC 15, PROC 15, PROC 19 Anticle Category Environmental Release Category Environmental Release Category Environmental Release Category Data field Explorational Conditions related to frequency, duration and amount of use Information type Data field Explorational Explorational Duration of exposure at workplace Data field Explorational Explorational Operational Conditions related to frequency, duration and amount of use Work case assumption Work case assumption Operational Conditions and risk management measures related to product characteristics Characteristics Characteristics Characteristics of the substance or preparation Data field Explorational Conditions of use Product Case Case Case Case Case Case Case Case	Short Title of the Exposure Scenario	0				
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neglected. The dermal exposure was not assessed quantitatively. Inhalation exposure						
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PROC Derived Effect Level (DEL)	Inhalation exposure					
	PROC		Derived Effect Level (DEL)			
1 0.02 mg/m ³			·			
2 1.50 mg/m ³	2		1.50 mg/m³			

3			3.75	mg/m ³	
4				mg/m ³	
				mg/m ³	
10				mg/m ³	
13				mg/m ³	
15				mg/m ³ (15 min – 1	h)
15				mg/m ³ (1 h – 4 h)	
19					protection apparatus with half mask)
19				mg/m ³ (< 15 min)	
Risk charact	erisation			<u> </u>	
PROC	DEL (mg/m ³)	DNEL (mg/m ³)		RCR	Remarks
1	0.02	8		0.0025	
2	1.50	8		0.19	
3	3.75	8		0.47	
4	3.00	8		0.375	
9	7.50	8		0.94	
10	7.50	8		0.94	
13	7.50	8		0.94	
15	3.00	8		0.375	15 min – 1 h
15	1.80	8		0.225	1 h – 4 h
19	7.50	8		0.94	respiratory protection apparatus with half mask
19	7.50	8		0.94	< 15 min
Long-term e					
		use the substance has only	local de	rmal and/or inhalat	ion effects and no systemic effects.

Environmental exposure

The substance dissociates in contact with water. The only effect is the very low pH value. Therefore any exposition after the WWTP treatment can be assumed as insignificant and without any risk.

Exposure Scenario IV: Water Treatment: Treatment of Waste water and WWTP sludge

This generic exposure scenario describes the use of selected iron salts in the treatment of raw water in the supply of either potable water or industrial process water. Disposal is relevant only in that the treatment process produces a sludge which contains the residue of the iron salt treating agent. This has been considered as "losses in use".

Description of the process

When added to water, iron salts act as both excellent coagulants and flocculants. The chemical processes involved are complex but ultimately an insoluble gelatinous precipitate of ferric hydroxide is formed which bridges and traps all the particles (Kemmer 1988, Letterman, 1999).

The EU BREF (2006) for waste treatment indicates that coagulation/Flocculation agents are typically used at a level of 1-7 kg/m³ waste water. A concentration of 3 kg of 40 % iron salt solution/tonne effluent is reported as auxiliary in treatment by anaerobic digestion in the BREF.

Contributing Exposure Scenarios:

Iron Chlorides: Water Treatment: Treatment of Waste Waters and WWTP sludge by Iron Chlorides (Exposure Scenario 5 from the Iron Salts Dossier)

Hydrochloric Acid: Industrial End Use of Hydrochloric Acid (Exposure Scenario 4 from the Hydrogen Chloride Dossier)

Both exposure scenarios are attached as such.

Exposure Scenario 5: Water treatment: treatment of Waste Waters and WWTP sludge by Iron Chloride

Sector of Use SU3 Product Category PRC 20, PRC 5, PRC 5, PRC 6 Process Category Not applicable Environmental Release Category Data field Explanation Unroth of Equancy and allow the frequency, duration and amount of use Default value. Process Category Data field Explanation Process Category Data field Explanation Process Category Bat field Explanation Process Category Data field Explanation Deration of Applicable Bats field Explanation Prospical State Bats field Explanation Propriation Applicable Data field Explanation Prospical State of the substance or preparation Prospical State of the substance or preparation Physical state State field Explanation Prospical State of the substance or preparation Prospical State of the substance or preparation and aprepriston applicable	Short title of the exposure scenario				
Process Category PROC 3, PROC 8, PROC					
Article Category Not applicable Environmental Release Category ER C 4, ER C 5 Operational conditions related to frequency, duration and amount of use Data field Explanation Duration regression per day at workplace [for one worker] Up to 8 hours Default value. Frequency of exposure per day at workplace [for one worker] Daily Default value. Annual amount used per site 85 T Fe/y Emission days per site 365 Operational conditions and risk management measures related to product characteristics Emission days per site Asta field Explanation Physical state Bats field Explanation Physical state at STP. Emission days per site As a coessary Physical state Data field Explanation Physical state at STP. Explanation Risk management measures related to the design of product Precautions against inntation As a necessary Operational conditions related to respiration and skin contact Explanation Information type Data field Explanation Explanation Operational conditions of use 10 m ² /d Default bodyweight for worke. Operational conditions of use					
Environmental Release Category ERC 5 Duration, frequency and amount Field Explanation Information type Data field Explanation Duration of exposure per day at workplace [for one worker] Up to 8 hours Default value. Frequency of exposure at workplace [for one worker] Daily Image: Comparison of Compa				PROC 8b	
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Interview of the substances, direct releases to air and soil can be considered negligible; thus it can be assumed that the entire release is via water and not volatilised. The coagulation and floculation processes result in near total conversion of the as-supplied iron salts to insoluble ferric hydroxide. However, as some iron salts may remain in settled sludge, the use of sewage sludge for land treatment may lead to releases to soil. In waterways, partitioning to sediment is possible. Hence, dredging of sediments may also lead to releases to soil. The typical final concentration of 50 g Fe/kg dry sludge solids is used in EUSES as the basis of the soil exposure scenario from coagulant use. As an overall worst case: a loading of 100 g/m ³ for the total flow of a typical municipal WWTP would be equivalent to approx. 200 kg Fe/d and this is assumed in the model for the coagulant use. Information type Data field Explanation Fraction of applied amount lost from process/use to waste, waste water and air 0 Information type Release water 0 1 Information type Containment plus good work practice required Yes Information type Information type Containment plus good work practice required plus good work gractice required plus good work practice required plus good wore. Safety glasses	Body weight	70 kg		Default	t bodyweight for workers.
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Exposure Scenario 4: Industrial End Use of Hydrogen Chloride

Sector of Use SU 3 Product Garagory Not applicable Process Catagory PROC 1, PROC 2, PROC 3, PROC 4, PROC 9, PROC 10, PROC 15, PROC 15, PROC 19 Anticle Category Environmental Release Category Environmental Release Category Environmental Release Category Data field Explorational Conditions related to frequency, duration and amount of use Information type Data field Explorational Explorational Duration of exposure at workplace Data field Explorational Explorational Operational Conditions related to frequency, duration and amount of use Work case assumption Work case assumption Operational Conditions and risk management measures related to product characteristics Characteristics Characteristics Characteristics of the substance or preparation Data field Explorational Conditions of use Product Case Case Case Case Case Case Case Case	Short Title of the Exposure Scenario	0				
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PROC Derived Effect Level (DEL)	Inhalation exposure					
	PROC		Derived Effect Level (DEL)			
1 0.02 mg/m ³			·			
2 1.50 mg/m ³	2		1.50 mg/m³			

3			3.75	mg/m ³	
4				mg/m ³	
				mg/m ³	
10				mg/m ³	
13				mg/m ³	
15				mg/m ³ (15 min – 1	h)
15				mg/m ³ (1 h – 4 h)	
19					protection apparatus with half mask)
19				mg/m ³ (< 15 min)	
Risk charact	erisation			<u> </u>	
PROC	DEL (mg/m ³)	DNEL (mg/m ³)		RCR	Remarks
1	0.02	8		0.0025	
2	1.50	8		0.19	
3	3.75	8		0.47	
4	3.00	8		0.375	
9	7.50	8		0.94	
10	7.50	8		0.94	
13	7.50	8		0.94	
15	3.00	8		0.375	15 min – 1 h
15	1.80	8		0.225	1 h – 4 h
19	7.50	8		0.94	respiratory protection apparatus with half mask
19	7.50	8		0.94	< 15 min
Long-term e					
		use the substance has only	local de	rmal and/or inhalat	ion effects and no systemic effects.

Environmental exposure

The substance dissociates in contact with water. The only effect is the very low pH value. Therefore any exposition after the WWTP treatment can be assumed as insignificant and without any risk.

Exposure Scenario V: Use as a reactive product precursor

This generic exposure scenario describes the use of selected iron salts as precursors in the preparation of iron oxide pigments and other iron compounds. The salts are used in the process "as supplied" without formulating. Three industrial processes will be considered which are representative of the overall category: one high temperature, solid-phase conversion and two solution/precipitation reactions. No consumer (or professional) use of this type is expected; this will not be considered further at this time. By definition these are conversion processes so the iron chloride or sulphate is not expected to be present at the end but there are potential losses or potential for exposure in-process. Some consideration will be made of the waste re-processing, recycling, and disposal as appropriate.

Description of the process

Roasting of copperas (ferrous sulphate heptahydrate) to give ferric oxide

Ferrous sulphate heptahydrate (copperas) may be converted to ferrous sulphate monohydrate by heating in a kiln. This process is covered elsewhere. The monohydrate is further heated to complete dehydration and then calcined (with loss of SO₃, which is captured and converted to sulphuric acid) to form impure ferric oxide. This is washed to remove any soluble salts, mainly ferrous and ferric sulphates. This wash liquor is treated for disposal. It is not clear whether the dissolved salts are returned to the process or are precipitated as oxides which are land filled (EC 2007a).

The roasting and calcination process is continuous and enclosed. Only likely source of exposure or release would be to dust during charging. The fate of the wash liquor is a potential source of exposure dependent on how it is handled in a particular process.

Precipitation process

This is a reaction between aqueous ferrous sulphate and alkali (NaOH, Ca(OH)₂, ammonia) with oxidation by air (EC 2007b). It is carried out in a batch process, in large tanks open to the atmosphere, at moderately high temperatures (65°C-100°C). Reaction conditions determine the exact product, which may be black, red, yellow, or orange, which is produced as a precipitate. This process can take a few hours or can take many days. The precipitate is collected by filtration and washed. The wash liquor primarily contains soluble non-Fe salts such as sodium sulphate (Schwertmann and Cornell 2003). Opportunities for losses to air are nil. There is the possibility for spillage and loss to water in charging or through accident (industrial accidents are outside the scope of REACH. Only routine non-intentional releases associated with handling are considered here). Preparation of iron blue (Prussian Blue)

Insoluble blue pigments based on Fe(II)/Fe(III)/cyano complexes have been known for more than 300 years with names such as Prussian Blue or Turnbull's Blue. Although commonly referred to as ferric ferrocyanide, as recently as 1980 the structure was still a matter of some debate (Cotton and Wilkinson 1980). More recent analyses show that as well as ferrous and ferric ions, they also contain another cation (Na⁺, K⁺, NH₄⁺). Industrially the pigment, generically called Iron Blue, is prepared by, firstly, precipitation in large stirred batch reactors by simultaneous or sequential addition of alkali hexacyanoferrate(II) [alkali ferrocyanide] and either solid ferrous sulphate or ferrous chloride solution to dilute acid. This gives a white suspension which is aged by heating. This suspension is oxidised to give the characteristic blue colour by the addition of chlorate. The, now intensely blue, suspended precipitate is isolated by filtration and washed free of all soluble salts, then dried (spray drying is used), ground, and bagged (Buxbaum and Pfaff 2005). Opportunities for losses of the initial iron salt to air are nil. There is the possibility for spillage and loss to water in charging or through accident (industrial accidents are outside the scope of REACH. Only routine non-intentional releases associated with handling are considered here).

Description of the process

Ferrous sulphate and chloride are freely soluble in water but aqueous solutions exposed to the air oxidise to ferric oxides and hydroxides, with the highly insoluble Fe(OH)₃ precipitating. Thus, any release to wastewater will be converted to an insoluble precipitate at a rate dependent on factors such as the pH, concentration, and extent of exposure to air, the "parent salt" being no longer present

Contributing Exposure Scenarios:

<u>Iron Chlorides:</u> Use as a reactive product precursor (Iron Chloride) (Exposure Scenario 7 from the Iron Salts Dossier) <u>Hydrochloric Acid:</u> Industrial End Use of Hydrochloric Acid (Exposure Scenario 4 from the Hydrogen Chloride Dossier) <u>Hydrochloric Acid:</u> Use as an Intermediate (Hydrogen Chloride) (Exposure Scenario 2 from the Hydrogen Chloride Dossier)

All three exposure scenarios are attached as such.

ES 7: Use as reactive product precursor (Iron Chloride)

Short title of the exposure scenario Sector of Use Product Category Process Category					
Product Category			SU 3, SU 8, SU 9	SU 10 SU 14	
			PC 9, PC 18, PC		
· · · · · · · · · · · · · · · · · · ·					, PROC 9, PROC 15,
			PROC 22, PROC 26		
Article Category			Not applicable		
Environmental Release Category				RC 5, ERC 6a, ERC	6b
Operational conditions related to frequency,	duratio	on and ar	nount of use		
Duration, frequency and amount					
Information type			Data field		Explanation
Used amount of substance at site per day			Approx. 20 tonnes in	on salt per day	
Duration of exposure per day at workplace [for o		rker]	8 h/day		Default value.
Frequency of exposure at workplace [for one wo	orkerj		daily		
Used amount of substance at site per year			6000 tonnes/year 300 d/v		Defeutionalise
Emission days per site Operational conditions and risk management	+ maaa	uroc rolo		otoriotion	Default value.
Characteristics of the substance or preparati		ures reid	ted to product chara	ICLEHSLICS	
Information type		a field			Explanation
Physical state			us solution) or		Physical state at STP.
		Liquid (aqueous solution) or Solid salts (assumed to be in grar		lar/flake form rather	
		n powdere			
Risk management measures related to the			gainst irritation		As necessary
design of product			-		, ,
Operational conditions related to available di				of exposed humans	
Operational conditions related to respiration			ct		
Information type		a field		Explanation	
Respiration volume under conditions of use		n3/d			volume for light work.
Area of skin contact with the substance under			PROC15)		ons for exposed skin
conditions of use			PROC4, PROC8b,	surface area.	
		DC9) 0 (PROC2	201		
			ot specified by		
			assumed to be		
		rox. 1980			
Body weight	70 k			Default bodyweight	for workers.
Other operational conditions of use		Ŭ			
Releases to air					
The only likely source of release to air would be				nost especially coppe	eras. However, in view of
the low volatility of iron salts it is not envisaged t	hat rele	eases to a	ir are realistic.		
Releases to water There is the possibility for spillage and loss to wa	otorin	oboraina	or through appidant wh		a colta or processing
waste liquor.		charging	or through accident wi	ien using aqueous in	on saits of processing
It is, however, necessary to consider the potentia	al relea	ases of iro	n in anv form.		
The ERC default is 5% released to water with pr				days/year. These de	efaults are not realistic for
the industry. It is far more realistic to consider a	scenar	io in whic	h the production proce	ess takes place on sa	y 300 days per year and
with the known extent of reprocessing of process	s water	r and rinse	e water, a far lower per	rcentage waste is an	ticipated.
This scenario uses:					
0.5% to waste water, equivalent to 100 kg salt/d					
Equivalent to approx. 40 kg Fe/d					
Technical fate of substance and losses from	proces			and air	Explanation
Information type Fraction of applied amount lost from process/use	o to	Data fiel	u		Explanation
waste gas		0			
Fraction of applied amount lost from process/use	e to	0.005			
waste water		0.000			
Risk management measures					
	te				
		Data field			Explanation
Risk management measures for industrial sit Information type					
Risk management measures for industrial sit		Yes			
Risk management measures for industrial sit Information type		163			
Risk management measures for industrial sit Information type Containment and local exhaust ventilation Containment plus good work practice required Local exhaust ventilation required plus good work		No			
Risk management measures for industrial sit Information type Containment and local exhaust ventilation Containment plus good work practice required Local exhaust ventilation required plus good wor practise					
Risk management measures for industrial sit Information type Containment and local exhaust ventilation Containment plus good work practice required Local exhaust ventilation required plus good wor practise Personal protective equipment (PPE)	rk I	No			
Risk management measures for industrial sit Information type Containment and local exhaust ventilation Containment plus good work practice required Local exhaust ventilation required plus good wor practise Personal protective equipment (PPE) Skin protection	rk 1 F	No Protective			
Risk management measures for industrial site Information type Containment and local exhaust ventilation Containment plus good work practice required Local exhaust ventilation required plus good work practise Personal protective equipment (PPE) Skin protection Eye protection	rk 1 F	No Protective Safety gla	sses		
Risk management measures for industrial site Information type Containment and local exhaust ventilation Containment plus good work practice required Local exhaust ventilation required plus good work practise Personal protective equipment (PPE) Skin protection Eye protection Clothing	rk f F	No Protective Safety gla Working c	sses lothing worn.		
Risk management measures for industrial sit Information type Containment and local exhaust ventilation Containment plus good work practice required Local exhaust ventilation required plus good work practise Personal protective equipment (PPE) Skin protection Eye protection Clothing Respiratory protection	rk f F S	No Protective Safety gla Working c Refer to co	sses lothing worn. ontrol technologies bel		
Risk management measures for industrial site Information type Containment and local exhaust ventilation Containment plus good work practice required Local exhaust ventilation required plus good work practise Personal protective equipment (PPE) Skin protection Eye protection Clothing	rk r F S V F	Protective Safety gla Working c Refer to co Refer to co	sses lothing worn.		

¹ "Product" includes substances, preparations and articles

Descendental and a sector best for the sector		المحاجب الألاجي لمطلا المعصي معاللا	يتامره امقاله	
Procedural and control technologies	i	It is assumed that solid salts are han closed systems or with LEV	idled only in	
Training. Monitoring/reporting and a	uditing	Equipment must be well maintained	and cleaned	
systems	-	daily.		
		ental emissions from industrial site	S	
Onsite pre-treatment of waste water				
Resulting fraction of initially applied waste water released from site to the				
sewage system	e external			
Air emission abatement				
Resulting fraction of applied amount	in waste das			
released to environment	J			
Onsite waste treatment				
Fraction of initially applied amount s				
waste treatment. This is the sum of				
from processes to waste, and the re				
onsite waste water and waste gas tr Municipal or other type of external w		Yes		
treatment	asle waler	Tes		
Effluent (of the waste water treatment	nt plant)	2000 m3/d		
discharge rate	in planty	2000 110/0		
Recovery of sludge for agriculture of	r horticulture	Yes		
Waste related measures		· · · · · · · · · · · · · · · · · · ·		·
Any solid wastes are ultimately assu				
Details of the treatment of aqueous	waste would vary	y at different sites but as a minimum th	ne effluent treate	d in either in on-site or
municipal secondary biological treat	ment plants prior	to discharge.		
Exposure estimation				
Workers exposure				
Acute/Short-term exposure				
Short-term exposure is not relevant				
Long-term exposure	ures are only as	sumed where necessary to manage po	ossible risks. Mo	difications are
		ent (PPE). The presence of local exha		
		ure levels from the ECETOC TRA mod		
exposure.	.,		(,	
Dermal exposure				
		dental spillage or during transfer and c	charging of stora	ge and feed vessels where
mechanical handling is not in place.		dental spillage or during transfer and c	charging of stora	ge and feed vessels where
mechanical handling is not in place.	-			-
mechanical handling is not in place. Inhalation exposures Transfer and charging of solid iron s	alts in powder or	granular form could give the potential	for inhalation.	Use of iron salts in solution
mechanical handling is not in place. Inhalation exposures Transfer and charging of solid iron s is unlikely to give any opportunity for	alts in powder or r inhalation; char	granular form could give the potential	for inhalation. I	Use of iron salts in solution drying of the isolated
mechanical handling is not in place. Inhalation exposures Transfer and charging of solid iron s is unlikely to give any opportunity for product, e.g. Iron Blue pigment, this	alts in powder or r inhalation; char is done after a w	granular form could give the potential	for inhalation. I e. Where spray s, there is little lik	Use of iron salts in solution drying of the isolated
mechanical handling is not in place. Inhalation exposures Transfer and charging of solid iron s is unlikely to give any opportunity for product, e.g. Iron Blue pigment, this	alts in powder or r inhalation; char is done after a w chloride, which is	granular form could give the potential nces of aerosol formation are negligible vash step to remove soluble salts; thus soluble, being released during spray of	for inhalation. I e. Where spray s, there is little lik	Use of iron salts in solution drying of the isolated
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 $^{^2}$ air concentration at the workplace

³ air concentration at the workplace

Risk characterisation				
The DNEL values and therefore the	risk characte	risation are in the moment u	under revision by the Iron Salts Consortium.	
Consumer exposure				
Exposure to consumers is not relevant to this exposure scenario.				
Environmental exposure				
	Concentratio	ns (PECs) in surface water,	ented within the EUSES 2.1 software, are then used to seawater, sediment and agricultural soil. bunt	
Predicted Exposure Concentratio	ns (PEC)			
Compartments		Local PEC	Justification	
Surface water (in mg/l)		2.4E-06	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.	
Freshwater sediment (in g/kg dwt)		45.0	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.	
Agricultural soil (in g/kg dwt)		50.8	Calculated using EUSES 2.1.1 in accordance with the exposure scenario.	
Risk characterisation				
Compartments	PEC	PNEC	RCR	
Surface water (in mg/l)	2.4E-06			
Freshwater sediment (in g/kg dwt)	45.0	49.5	0.909	
Agricultural soil (in g/kg dwt)	50.8	55	0.924	

Exposure Scenario 4: Industrial End Use of Hydrogen Chloride

Short Title of the Exposure Scenario		
Sector of Use	SU 3	
Product Category	Not applicable	
Process Category		PROC 4, PROC 9, PROC 10, PROC 13, PROC 15, PROC 19
Article Category	Not applicable	
Environmental Release Category	ERC 4, ERC 6b	
Operational conditions related to fre	quency, duration and amour	it of use
Duration, frequency and amount Information type	Data field	Explanation
Duration of exposure per day at	Up to 8 hours	Worst case assumption
workplace [for one worker]		
Frequency of exposure at workplace	Daily	
[for one worker]		
Emission days per site	Up to 360	
Operational conditions and risk man		o product characteristics
Characteristics of the substance or Information type	Data field	
Physical state	Liquid (aqueous solution)	
Concentration Range	Up to 40 % in the product	
Amount per use and period		
Differs between millilitres (sampling) ar	nd cubic metres (material trans	fer)
Other operational conditions of use		
The temperature of use is not above 20		
A good industrial hygiene has to be imp		
The workers are trained to keep the ex	posures as low as possible.	
Risk management measures Personnel protection measures		
	ubstance suitable personnel p	otective equipment has to be worn at all times.
For PROC 2 and 3: In addition suitable		
PROC 2: In addition suitable gloves ac		
PROC 3: In addition suitable gloves ac		
PROC 10: In addition suitable gloves a		
PROC 13: In addition suitable gloves a		
PROC 15: In addition suitable gloves a		
		orn. Perform the activity only up to15 minutes or wear a respiratory
protection apparatus according to EN 1		
Organizational protection measures		
PROC 9: Areas of spillage have to be of	cleared immediately.	
PROC 9: Areas of spillage have to be of PROC 10: Areas of spillage have to be	cleared immediately.	ible automatisation.
PROC 9: Areas of spillage have to be of	cleared immediately.	ible automatisation.
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3 7.50 mg/m³ 5 3.00 mg/m³ (15 min - 1 h) 5 1.80 mg/m³ (1 h - 4 h) 7 7.50 mg/m³ (respiratory protection apparatus with half mask) 7 7.50 mg/m³ (sepiratory protection apparatus with half mask) 7 7.50 mg/m³ (sepiratory protection apparatus with half mask) 7 7.50 mg/m³ (sepiratory protection apparatus with half mask) 7 7.50 mg/m³ (< 15 min) isk characterisation ROC 0.02 8 0.02 8 0.02 8 0.02 8 0.19 1.50 3.75 8 0.47 3.00 3.00 8 0.750 8 0.750 8 0.94 1.50 3.00 8 0.94 3.00 8 0.94 5 3.00 8 0.225 1.80 8 0.225 1 h - 4 h 9 7.50 8 0.94	4			3.00 mg/m ³				
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5 3.00 8 0.375 15 min - 1 h 5 1.80 8 0.225 1 h - 4 h 6 7.50 8 0.94 respiratory protection apparatus with half mask 6 7.50 8 0.94 < 15 min	10	7.50	8	0.94				
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9 7.50 8 0.94 respiratory protection apparatus with half mask 9 7.50 8 0.94 < 15 min	15	3.00	8	0.375	15 min – 1 h			
9 7.50 8 0.94 < 15 min ong-term exposure	15	1.80	8	0.225	1 h – 4 h			
ong-term exposure	19	7.50	8	0.94	respiratory protection apparatus with half mask			
	19	7.50	8	0.94	< 15 min			
ne exposition was not derived because the substance has only local dermal and/or inhalation effects and no systemic effects.								
	The exposition	on was not derived beca	use the substance has o	nly local dermal and/or ir	nhalation effects and no systemic effects.			

Environmental exposure

The substance dissociates in contact with water. The only effect is the very low pH value. Therefore any exposition after the WWTP treatment can be assumed as insignificant and without any risk.

Exposure Scenario 2: Use as an intermediate (Hydrogen Chloride)

Short Title of the Exposure Scenario										
Sector of Use										
Product Category	Not applicable									
Process Category		PROC 1, PROC 2, PROC 3, PROC 4, PROC 9								
Article Category	Not app	icable								
Environmental Release Category										
	Operational conditions related to frequency, duration and amount of use Duration, frequency and amount									
Information type	Data fie	Id	Explanation							
Duration of exposure per day at workplace [for			Worst case assumption							
worker]		louio								
Frequency of exposure at workplace [for one v	vorker] Daily									
Emission days per site	Up to 3									
Operational conditions and risk manageme		d to product ch	aracteristics							
Characteristics of the substance or prepara										
Information type Physical state	Data fie	aqueous solution)							
Concentration Range		% in the produc								
Amount per use and period		,	-							
Differs between millilitres (sampling) and cubic	metres (material tra	ansfer)								
Other operational conditions of use										
The temperature of use is not above 20°C over										
	ance temperature in	the areas where	the workers can come into contact has to be room							
temperature. A good industrial hygiene has to be implement	ed									
The workers are trained to keep the exposures										
Risk management measures										
Personnel protection measures										
Due to the corrosive properties of the substant			pment has to be worn at all times.							
For PROC 2 and 3: In addition suitable gloves	according EN 374 h	ave to be worn.								
Organizational protection measures										
For PROC 9: Areas of spillage have to be clea	red immediately.									
Technical protection measures										
PROC 1: The substance has to be handled in	a closed system. Tra	ansfer systems h	have to be emptied before decoupling.							
		aterial transport h	has to be done under LEV or be embanked. Transfer							
systems have to be emptied before decoupling	j. a closed system Sy	stem has to he e	emptied before the equipment is opened or maintained.							
PROC 4: The substance has to be handled in	bulk and semi-bulk	systems. Drum p	umps have to be used where applicable. System has to	Material transport has to be done under LEV or be embanked. Transfer systems have to be emptied before decoupling. PROC 4: The substance has to be handled in bulk and semi-bulk systems. Drum pumps have to be used where applicable. System has to be						
emptied and flushed before the equipment is c				be						
) be						
Material transport has to be done under LEV of	PROC 9: The substance has to be handled in a closed system. System has to be emptied before the equipment is opened or maintained. Material transport has to be done under LEV or be embanked. Transfer systems have to be emptied before decoupling.									
	or be embanked. Tra	nsfer systems ha	ave to be emptied before decoupling.	be						
Consumer exposure			ave to be emptied before decoupling.	be						
Consumer exposure Consumer exposure is not relevant for the form			ave to be emptied before decoupling.	be						
Consumer exposure Consumer exposure is not relevant for the form Environmental release measures	nulation of hydrochlo	pric acid.	· · · · ·							
Consumer exposure Consumer exposure is not relevant for the form Environmental release measures Water: The whole contaminated waste water h	nulation of hydrochle	pric acid. In industrial or pu	ublic WWTP with a primary and secondary treatment st							
Consumer exposure Consumer exposure is not relevant for the form Environmental release measures Water: The whole contaminated waste water h	nulation of hydrochle	pric acid. In industrial or pu	· · · · ·							
Consumer exposure Consumer exposure is not relevant for the form Environmental release measures Water: The whole contaminated waste water h Leakage has to be prevented. Adequate prote episodic release. Exposure estimation	nulation of hydrochle	pric acid. In industrial or pu	ublic WWTP with a primary and secondary treatment st							
Consumer exposure Consumer exposure is not relevant for the form Environmental release measures Water: The whole contaminated waste water h Leakage has to be prevented. Adequate prote episodic release. Exposure estimation Workers exposure	nulation of hydrochlo las to be treated in a ctive measures acco	pric acid. In industrial or pu ording to a "spilla	ublic WWTP with a primary and secondary treatment st ge plan" have to be in place to minimise the impact of							
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The substance dissociates in contact with water. The only effect is the very low pH value. Therefore any exposition after the WWTP treatment can be assumed as insignificant and without any risk.

Exposure Scenario VI: Industrial and Consumer Use as a metal etchant and a surface treatment agent

This generic exposure scenario describes the use of aqueous ferric chloride as a metal etchant in the process commonly called photochemical machining or milling. Industrial users tend to be SMEs. Disposal is an important consideration as used etchant solution still contains substantial levels of ferric chloride. Many users regenerate the used solution themselves and/or send it to third parties for further processing, a practice ultimately with economic as well as environmental benefits but with potential for releases in process.

Description of the process

Photochemical machining is described as being "almost universally" done in a spray etching machine. The article to be treated is carried on a conveyor into a chamber where it is "vigorously sprayed with hot etchant from batteries of nozzles above and below" (Qualitech 2009). One may presume that the excess etchant and run-off is captured within the machine and stored for re-use, recycle, or disposal.

An alternative process is dipping of the article to be treated batchwise in a bath of ferric chloride; it is not clear whether this process is much practised. The ESD for the electronics industry (Environment Agency 2009) refers to the high level of wastage in dipping tank etching, noting that "There is a high level of carry-over of solution into rinsing and cleaning tanks and although initial rinse solutions may be recycled back into the plating tank, there is the potential for a high level of waste. Large volumes of water are involved and it is assumed that a high proportion will be discharged as waste water." This model assumes that the inorganic salt etchant substances are freely soluble in water.

An estimated 50% release to waste water is possible, though the waste water may be collected for treatment or regeneration rather than passing to WWTP, depending on various other factors. Even if it is assumed that the release is to WWTP, this will be subject to local discharge monitoring and pH controls, and dilution and pH adjustment would be expected to lead to the precipitation of almost all iron as solid waste prior to release of the waste stream to WWTP. Therefore the emission scenario is controlled so that iron levels in influent are limited by the water solubility.

Contributing Exposure Scenarios:

Iron Chlorides: Industrial and Consumer Use as a metal etchant and surface treatment agent (Iron Chlorides) (Exposure Scenario 10 from the Iron Salts Dossier)

<u>Hydrochloric Acid:</u> Industrial End Use of Hydrochloric Acid (Exposure Scenario 4 from the Hydrogen Chloride Dossier) <u>Hydrochloric Acid:</u> Consumer End Use of Hydrochloric Acid (Exposure Scenario 6 from the Hydrogen Chloride Dossier)

All three exposure scenarios are attached as such.

ES 10a and c: Industrial and consumer use as a metal etchant and surface treatment agent (Iron Chlorides)

Short title of the exposure scenario worker	,						
Sector of use	SU 3, SU 10, SU 15, SU 16						
Product Category	PC 14, PC 15						
Process Category		PROC 5, PROC 7, PROC 8b, PROC13					
Article Category		Not applicable					
Environmental Release Category			ERC 2, ERC 6b				
Short title of the exposure scenario consur	ner		•				
Sector of use			SU 21				
Product Category			PC 14				
Process Category			Not applicable				
Article Category			Not applicable				
Environmental Release Category			ERC 2 ERC 6	b			
Operational conditions related to frequency	y, duration	and amo	unt of use				
Duration, frequency and amount					_ .		
Information type		Data fiel			Explana	tion	
Used amount of substance per day		167 kg s	alt; 420 kg soluti	on			
Duration of exposure per day at workplace [fo	r 000	Up to 8 h	67 kg Fe)		Default v		
worker]	rone	Up 10 8 f	louis		Delault	alue.	
Frequency of exposure at workplace [for one w	worker]	Daily					
Annual amount used per site		20 T Fe/	у				
Emission days per site		300					
Operational conditions and risk manageme		es related	l to product ¹ ch	aracteristi	ics		
Characteristics of the substance or prepara			•				
Information type	Data fiel				Explana		
Physical state		queous so			Physical	state at STP.	
			ed to be in granul	lar/flake			
Risk management measures related to the		er than po			As neces	seon/	
design of product	Flecauli	Jiis ayailis			AS HELE	ssary	
Operational conditions related to available			d characteristic	s of expos	sed humai	IS	
Operational conditions related to respiration	on and skir	n contact					
Information type	Data fiel	d		Explanat	tion		
Respiration volume under conditions of use	10 m³/d				Default respiration volume for light work.		
Area of skin contact with the substance		DC5, PRO	C8b,	ECETOC assumptions for exposed skin surface		ons for exposed skin surface	
under conditions of use	PROC13			rea.			
	1500 (PF	ROC7)		Default bodyweight for workers.			
Body weight	70 kg			Default b	odyweight	for workers.	
Please note that the respiration volume is acc Other operational conditions of use	ounted for V	when deriv	ING THE DNEL				
Technical fate of substance and losses from	mprocoso	luse to wa	ste waste wete	r and air			
Information type	Data fie		isie, waste wate		tion		
Fraction of applied amount lost from		iu –	Explanation				
process/use to waste gas	Ŭ						
Fraction of applied amount lost from	0.02 (ha	ndlina) + 0	ng) + 0.5 (use)				
process/use to waste water	0.02 (10		()				
Risk management measures				·			
Risk management measures for industrial	site						
Information type		Data	a field			Explanation	
Containment and local exhaust ventilation							
Containment plus good work practice required			Yes				
Local exhaust ventilation required plus good w	ork practis	e No					
Personal protective equipment (PPE)							
Skin protection			Protective gloves				
Eye protection			Safety glasses				
Clothing			Working clothing worn.				
Respiratory protection			Refer to control technologies below Refer to control technologies below				
Breathing apparatus		Refe	er to control tech	nologies be	NOIE		
Other risk management measures related t	o workers			P.J P	_		
Procedural and control technologies It is assumed that solid salts are							
r rooddurar and control technologies		nan	handled only in closed systems or with				
Troodadial and control technologies				LEV. If performing spraying, it is assumed that closed systems apply			
			 If performing sports 				
	stems	ass	 If performing sp umed that closed 	systems a	apply		
Training. Monitoring/reporting and auditing sys		assi Equ clea	 If performing sp umed that closed ipment must be uned daily. 	systems a well mainta	apply		

 $^{^{1}\,}$ "Product" includes substances, preparations and articles

Onsite pre-treatment of waste water				
Resulting fraction of initially applied amount in w				
released from site to the external sewage system	n			
Air emission abatement Resulting fraction of applied amount in waste ga	e rologgad			
to environment	10100300			
Onsite waste treatment				
Fraction of initially applied amount sent to extern	nal waste			
treatment. This is the sum of direct losses from				
waste, and the residues from onsite waste wate				
gas treatment.				
Municipal or other type of external waste water t	reatment	Yes		
Effluent (of the waste water treatment plant) disc	charge rate	2000 m ³ /d		
Recovery of sludge for agriculture or horticulture	<u>}</u>	Yes		
Waste related measures				
A study was carried out in 1999 into the regener				
(Allen and Ler 1999). At that time, many using c				
be noted that even a single regeneration step ca				
by more than 50% <i>versus</i> using fresh ferric chlo using fresh solution. This regeneration converts				
concentration of other dissolved metal ions and				
this stage most companies sent the liquid waste				
chloride; reclamation of dissolved metals such a				
the waste, which is likely to involve hydrolysis to				
Exposure estimation	• 			
Workers exposure				
Acute/Short-term exposure				
Short-term exposure is not relevant				
Long-term exposure				
Modifications to the predicted exposures are only				
for use of personal protective equipment (PPE).				
this is considered likely. The exposure levels fro	m the ECETO	IRA model (2010) are used to es	stimate occupational exposure).
Dermal exposure is most likely to occur through	accidental ani	illage or during transfer and chargin	a of storage and food vocable	whore
Dermal exposure is most likely to occur through				
Dermal exposure is most likely to occur through closed liquid handling (pumps etc.) is not in place	e. If dipping in	baths is a standard process, then	his brings additional hazards	where
Dermal exposure is most likely to occur through closed liquid handling (pumps etc.) is not in plac articles to be etched are manipulated by hand. L	e. If dipping in EV is assume	h baths is a standard process, then ad to be present for each life-cycle s	his brings additional hazards tage (PROC 5, 7, 8 and 13). T	where The
Dermal exposure is most likely to occur through closed liquid handling (pumps etc.) is not in place	e. If dipping in EV is assume	h baths is a standard process, then ad to be present for each life-cycle s	his brings additional hazards tage (PROC 5, 7, 8 and 13). T	where The
Dermal exposure is most likely to occur through closed liquid handling (pumps etc.) is not in plac articles to be etched are manipulated by hand. L exposed skin surface area for PROC 5 and 13 is Inhalation exposures Use of iron salts in solution is unlikely to give an	e. If dipping in EV is assume s 480 cm ² , for y opportunity f	h baths is a standard process, then ad to be present for each life-cycle s PROC 7 it is 1,500 cm ² and for PR for inhalation; chances of aerosol for	his brings additional hazards tage (PROC 5, 7, 8 and 13). T DC 8 960 cm ² skin is exposed.	where [[] he
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Dermal exposure is most likely to occur through closed liquid handling (pumps etc.) is not in place articles to be etched are manipulated by hand. L exposed skin surface area for PROC 5 and 13 is <u>Inhalation exposures</u> Use of iron salts in solution is unlikely to give an are small. For inhalation exposure estimates, LE Summary of highest long-term exposure con Highest value for relevant tasks.	e. If dipping in EV is assume s 480 cm ² , for y opportunity f EV efficiency o centration to	h baths is a standard process, then be to be present for each life-cycle s PROC 7 it is 1,500 cm ² and for PR for inhalation; chances of aerosol fo of 90% is assumed.	his brings additional hazards to tage (PROC 5, 7, 8 and 13). T DC 8 960 cm ² skin is exposed. rmation outside dedicated equ	where [[] he
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Dermal exposure is most likely to occur through closed liquid handling (pumps etc.) is not in place articles to be etched are manipulated by hand. L exposed skin surface area for PROC 5 and 13 is <u>Inhalation exposures</u> Use of iron salts in solution is unlikely to give an are small. For inhalation exposure estimates, LE Summary of highest long-term exposure con Highest value for relevant tasks. Routes of exposure Dermal local exposure (in µg/cm ²) Dermal systemic exposure via contact with substance as such	e. If dipping in EV is assume s 480 cm ² , for y opportunity f V efficiency o iccentration to Concentra 400 (PROC	a baths is a standard process, then be to be present for each life-cycle s PROC 7 it is 1,500 cm ² and for PRO for inhalation; chances of aerosol for of 90% is assumed. workers tions C5, 7, in absence of LEV) C8b)	his brings additional hazards v tage (PROC 5, 7, 8 and 13). T DC 8 960 cm ² skin is exposed. rmation outside dedicated equ Justification The wearing of gloves is a for in this value The limitation of 10% derm is assumed in deriving this Note that while PROC7 is to this scenario it is assum spraying would only apply	where The Lipment ccounted ccounted hal uptake s value. relevant led that to pw)
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Dermal exposure is most likely to occur through closed liquid handling (pumps etc.) is not in plac articles to be etched are manipulated by hand. L exposed skin surface area for PROC 5 and 13 is <u>Inhalation exposures</u> Use of iron salts in solution is unlikely to give an are small. For inhalation exposure estimates, LE Summary of highest long-term exposure con Highest value for relevant tasks. Routes of exposure (in µg/cm ²) Dermal systemic exposure via contact with substance as such (in mg/kg bw/d)	e. If dipping in EV is assume s 480 cm ² , for y opportunity is V efficiency o iccentration to Concentra 400 (PROC 0.14 (PRO 0.09 (PRO	a baths is a standard process, then be to be present for each life-cycle s PROC 7 it is 1,500 cm ² and for PRO for inhalation; chances of aerosol for 90% is assumed. • workers ations C5, 7, in absence of LEV) C8b)	his brings additional hazards v tage (PROC 5, 7, 8 and 13). T DC 8 960 cm ² skin is exposed. rmation outside dedicated equ Justification The wearing of gloves is a for in this value The limitation of 10% derm is assumed in deriving this Note that while PROC7 is to this scenario it is assum spraying would only apply aqueous salt (see row below The limitation of <1% derm	where The
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 $^{^2}$ air concentration at the workplace

³ air concentration at the workplace

The DNEL values and therefore the risk characterisation are at the moment under revision by the Iron Salts Consortium. Consumer exposure							
Consumers may purchase ferric chloride solution for art work. This is the subject of this part of the scenario. Etching solution is likely to be strongly acidic and hazardous and this has a number of implications, particularly that the systemic effects of the iron salt present in the formulation is likely to be significantly dominated by other hazardous substances, probably corrosive. Consumers' use of such products is likely to be carefully controlled and it is certainly not anticipated to include any spraying scenarios. Risk management measures related to consumers' use							
Risk management measures related to consul Information type		a field	Evo	anation			
				anation			
Personal protective equipment (PPE) required under regular conditions of consumer use Type of PPE (gloves, etc) Protective gloves and safety glasses Reasonable expectation, given the corrosive properties of the solution and the specialist applications.							
Instructions addressed to consumers							
	advi and/	necessary, consumers should be vised to avoid contact with skin/eyes d/or to Use suitable protection d/or to Use suitable protection		y ≥10% iron salt what other t) would require			
Risk management measures related to emissi		e environment					
Municipal or other type of waste water treatment	Yes		with	ime standard muni disposal of sludge ading.			
Effluent (of the waste water treatment plant) discharge rate		0 m ³ /d	Defa	ult			
Summary of highest long-term exposure conc							
Routes of exposure		trations		Justification			
Dermal local exposure (in µg/cm ²)	5000			ECETOC TRA (estimate, assum are not worn, a improbable scen	ning that gloves highly nario.		
Dermal systemic exposure (in mg/kg bw/d)	0.36 The limitation of ≤1% der uptake from aqueous sol assumed in deriving this This value assuming that gloves are not worn, a hi improbable scenario.			ieous solution is ving this value. ming that vorn, a highly			
Inhalation exposure	handling	le for contributing tasks that do g of solid products leading to ev r spraying of liquid product o below					
Inhalation exposure (in mg/m ³)/day ⁴ (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)	n/a			n/a			
Inhalation exposure (in mg/m ³)/day ⁵ (refers only to any contributing tasks involving spraying of liquid product) Risk characterisation	n/a			n/a			
The DNEL values and therefore the risk characte	risation a	e at the moment under revision	by the Iron	Salts Consortium.			
Environmental exposure							
Environmental releases Although ferric chloride solution is sprayed, this is done inside a dedicated chamber so losses to air are assumed to be negligible. However, the entire PCM process involves transfer of the solution from container to container or to equipment, followed by capture, transfer, regeneration and/or disposal of the spent solution. Each step has potential for accidental release to groundwater or wastewater. The potential for approx 2% loss is estimated in The ESD for the electronics industry (Environment Agency 2009) to cover such handling losses. A summary of the local releases to air, waste water and industrial soil is given in the table below.							
Summary of environmental releases							
Life cycle stage		Formulation	Handling I	osses	Industrial use – etching		
Annual consumption at main site		50 t/y 50 t/y			50 t/y		
Fraction in formulation		0.4			0.4		
Number of days Amount per day		300 170 kg salt; 420 kg solution	300 167 kg salt	; 420 kg solution	300 164 kg salt; 420 kg solution		
Fraction to air		-	-		-		
Amount to air	0 kg/day	0 kg/day		0 kg/day			

⁴ air concentration at the location of consumer use

 5 air concentration at the location of consumer use

Fraction to waste water		0.02	0.02	0.5
Amount to waste water		3.3 kg salt/day	3.3 kg salt/day	85 kg salt/day
WWTP flow (default)	/WTP flow (default) 2E+06 L		2E+06 L/day	2E+06 L/day
Dilution in surface water (default)	10	10	10	
For full exposure assessment and ris considered as a worst case scenario of product would be using profession pass to drain. Standard equations, described in det determine Predicted Environmental C Regional and continental background Predicted Exposure Concentration Compartments	for the use stage. In r al chemical collection ail in the REACH guid concentrations (PECs) concentrations are a	eality it is far more realisti and disposal contractors ance and implemented wi) in surface water, seawate lso taken into account.	c to consider that a site consum and these quantities of product ithin the EUSES 2.1 software, a	ing such quantities would not therefore re then used to
				EU050 0 4 4 1
Surface water (in mg/l)	2.5E-06		ng EUSES 2.1.1 in the exposure	
Freshwater sediment (in g/kg dwt)	45.0		Calculated using EUSES 2.1.1 in accordance with the exposure scenario.	
Agricultural soil (in g/kg dwt)	51.8		Calculated using EUSES 2.1.1 in accordance with the exposure scenario.	
Risk characterisation for handling	+ etching			
Compartments	PEC		RCR	
Surface water (in mg/l)	2.4E-06			
Freshwater sediment (in g/kg dwt)	45.0	49.5	0.909	
Agricultural soil (in g/kg dwt)	55	0.91		

Exposure Scenario 4: Industrial End Use of Hydrogen Chloride

Short Title of the Exposure Scenario	Short Title of the Exposure Scenario						
Sector of Use	SU 3						
Product Category	Not applicable						
Process Category	PROC 1, PROC 2, PROC 3, PROC 4, PROC 9, PROC 10, PROC 13, PROC 15, PROC 19						
Article Category	Not applicable						
Environmental Release Category ERC 4, ERC 6b							
Operational conditions related to frequency, duration and amount of use Duration, frequency and amount							
Information type	Data field Explanation						
Duration of exposure per day at	Up to 8 hours	Worst case assumption					
workplace [for one worker]		·					
Frequency of exposure at workplace	Daily						
[for one worker]							
Emission days per site	Up to 360						
Operational conditions and risk man		o product characteristics					
Characteristics of the substance or Information type	Data field						
Physical state	Liquid (aqueous solution)						
Concentration Range	Up to 40 % in the product						
Amount per use and period							
Differs between millilitres (sampling) a		fer)					
Other operational conditions of use							
The temperature of use is not above 2							
A good industrial hygiene has to be im							
The workers are trained to keep the ex	posures as low as possible.						
Risk management measures Personnel protection measures							
	substance suitable personnel p	rotective equipment has to be worn at all times.					
For PROC 2 and 3: In addition suitable							
PROC 2: In addition suitable gloves ad							
PROC 3: In addition suitable gloves ad							
PROC 10: In addition suitable gloves a	according EN 374 have to be w	orn.					
PROC 13: In addition suitable gloves a							
PROC 15: In addition suitable gloves a							
		orn. Perform the activity only up to15 minutes or wear a respiratory					
protection apparatus according to EN Organizational protection measures							
PROC 9: Areas of spillage have to be							
PROC 10: Areas of spillage have to be							
PROC 13: Let the product flow off the		ible automatisation.					
Technical protection measures							
		fer systems have to be emptied before decoupling.					
		ial transport has to be done under LEV or be embanked. Transfer					
systems have to be emptied before de							
		m has to be emptied before the equipment is opened or maintained. er systems have to be emptied before decoupling.					
PROC 4: The substance has to be har	ndled in bulk and semi-bulk sys	tems. Drum pumps have to be used where applicable. System has to be					
		EVs have to be used where emission can occur.					
		m has to be emptied and flushed before the equipment is opened or					
		nked. Transfer systems have to be emptied before decoupling. air changes an hour) has to be guaranteed. System has to be emptied					
and flushed before the equipment is o		an changes an nour) has to be guaranteed. System has to be emptied					
		ust devices. In deaerated cabin use laminar air current.					
	PROC 13: At material transfer locations and other openings use exhaust devices. In deaerated cabin use laminar air current. PROC 15: Use in fume cupboard or with exhaust device. Perform the activities only up to 4 hours.						
Consumer exposure							
Consumer exposure is not relevant for the end use of hydrochloric acid.							
Environmental release measures							
Water: The whole contaminated waste water has to be treated in an industrial or public WWTP with a primary and secondary treatment step.							
Leakage has to be prevented. Adequate protective measures according to a "spillage plan" have to be in place to minimise the impact of							
episodic release. Exposure estimation							
Workers exposure							
	tion is ECETOC TRA. The LEV	is set to 90 % (PROC 15: 80 %) efficiency.					
Dermal exposure	ad formulations direct content is	people and the second short the delivery section and the					
neglected. The dermal exposure was r		accidently. Therefore it is assumed that the daily exposition can be					
Inhalation exposure							
PROC		Perived Effect Level (DEL)					
1		.02 mg/m ³					
2	1	.50 mg/m ³					

3			3.74	5 mg/m ³	
4) mg/m³	
) mg/m ³	
10) mg/m ³	
13) mg/m ³	
15) mg/m ³ (15 min	– 1 b)
15				0 mg/m (10 mm)	
19					ory protection apparatus with half mask)
19				0 mg/m^3 (< 15 mi	
	• .•		7.50		11)
Risk charact					
PROC	DEL (mg/m ³)	DNEL (mg/m ³)		RCR	Remarks
1	0.02	8		0.0025	
2	1.50	8		0.19	
3	3.75	8		0.47	
4	3.00	8		0.375	
9	7.50	8		0.94	
10	7.50	8		0.94	
13	7.50	8		0.94	
15	3.00	8		0.375	15 min – 1 h
15	1.80	8		0.225	1 h – 4 h
19	7.50	8		0.94	respiratory protection apparatus with half mask
19	7.50	8		0.94	< 15 min
Long-term ex	xposure				
		use the substance has on	lv local de	ermal and/or inha	alation effects and no systemic effects.
			,		

Environmental exposition was not derived because the substance has only local derival and/or inhalation enects and no systemic enects. Environmental exposure The substance dissociates in contact with water. The only effect is the very low pH value. Therefore any exposition after the WWTP treatment can be assumed as insignificant and without any risk.

Exposure Scenario 6: Consumer End Use of Hydrogen Chloride

Short Title of the Exposure Scenario					
Sector of Use					
Product Category	PC 20, PC 21, PC 35, PC 37, PC 38				
Process Category	Not applicable				
Article Category	Not applicable				
Environmental Release Category	ERC 8b, ERC 8e				
Operational conditions related to frequency, duration	on and amount of use				
Duration, frequency and amount					
Information type	Data field	Explanation			
Duration of exposure per day at workplace [for one worker]	Up to 4 hours	To 5 times a year			
Frequency of exposure at workplace [for one worker]	Daily				
Emission days per site	Up to 360				
Operational conditions and risk management measure	ures related to product c	haracteristics			
Characteristics of the substance or preparation					
Information type	Data field				
Physical state	Liquid (aqueous solutio	n)			
Concentration Range	Up to 20 % in the produ	ict			
Amount per use and period	· · ·				
500 ml per use					
Other operational conditions of use					
The temperature of use is not above 20°C over the roor	n temperature.				
Risk management measures					
Personnel protection measures					
The substance causes only local irritating effects. There	efore suitable gloves and s	afety glasses have to be worn during the use and handling.			
Consumer exposure					
Consumer exposure is not relevant for the end use of h	ydrochloric acid.				
Environmental release measures					
Leakage has to be prevented. Adequate protective mea episodic release.		public WWTP with a primary and secondary treatment step. age plan" have to be in place to minimise the impact of			
Exposure estimation					
Consumer					
Dermal exposure					
During the use of acidic substances and formulations di neglected. The dermal exposure was not assessed qua		Therefore it is assumed that the daily exposition can be			
Inhalation exposure					
Worst-case calculation with ConsExpo showed that the	re is no unacceptable risk.				
Long-term exposure					
The exposition was not derived because the substance	has only local dermal and	/or inhalation effects and no systemic effects.			
Environmental exposure					
	nly effect is the very low pl	I value. Therefore any exposition after the WWTP treatment			
can be assumed as insignificant and without any risk.					