

Format for

Succinct summary of representative risk management measures (RMMs) and operational conditions (OCs)

Legal name of Applicant: ENTEK International Limited

Submitted by: ENTEK International Limited

Substance: Trichloroethylene

CAS: 79-01-6

EC Number: 201-167-4

Use title: Trichloroethylene as an extraction solvent for removal of process oil and formation of the porous structure in polyethylene based separators used in lead-acid batteries.

Use number: 1

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Trichloroethylene as an extraction solvent for removal of process oil and formation of the porous structure in polyethylene based separators used in lead-acid batteries – ENTEK International

ECS and WCS	Task (ERC/spERC or PROC)	Annual amount per site (tonnes/year)	Technical RMMs, including: Containment, Ventilation (general, LEV...) Customized technical installation, etc	Organisational RMMs, including: Duration and Frequency of exposure OSH management system Supervision Monitoring arrangements Training, etc	PPE (characteristics)	Other conditions	Effectiveness of waste water and waste air treatment (for ERC)	Release factors: water, air and soil (for ERC)	Detailed info. in CSR (section)
ECS 1	ERC 4 Use as process solvent in semi-closed systems	Annual use rate at a site assessed: <90,000 tonnes/year (total amount (re)processed) – see footnote 1.	Exhaust air treatment: Use of four carbon beds for solvent capture, three for adsorption and one for desorption (99.7% efficiency). Municipal STP: Effectiveness Water: 89.6%. See footnote 4.	Uncaptured trichloroethylene is released to the atmosphere via a stack with a permit set limit at 100 mg/m ³ (17 ppm). There is an internal site operating limit for the stack set at 70 mg/m ³ (12 ppm).	N/A	See footnote 7.	Particular considerations on the waste treatment operations: No (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient).	Water release factor: (based on measured data): 1.11E-06% Local release rate: 2.8E-3 kg/day. See footnote 2. Air release factor: 0.051% Local release rate: 130 kg/day. See footnote 3. Soil release factor: 0 % There is no direct release of the substance to	9.1.1

								soil at the site.	
WCS 1	PROC 13 Solvent extraction in an enclosed bath and maintenance activities in an enclosure		<p>The following safety measures to minimise worker exposure to trichloroethylene during use of the substance are implemented:</p> <p>Entry to the enclosures is restricted.</p> <p>Respirators or air fed hoods are mandatory when entering the enclosures.</p> <p>Worker time in the enclosure is also restricted.</p> <p>Use of local exhaust ventilation (LEV).</p> <p>Enhanced general ventilation: 5-10 air exchanges per hour.</p> <p>For further detail see footnote 7.</p>	<p>ENTEK carries out quarterly badge monitoring studies to assess exposure of workers to trichloroethylene at the Newcastle site.</p> <p>Local exhaust ventilation (LEV): Mechanical seals associated with the drive shafts and fixed and free running rollers are sealed and the air is locally extracted to remove and capture the trichloroethylene.</p> <p>Occupational Health and Safety Management System: Advanced</p> <p>For further detail see footnote 6.</p>	<p>Respiratory protective equipment (RPE) with APF of 10</p> <p>Dermal protection – Use of chemically resistant gloves conforming to EN374 with basic employee training.</p>	<p>Operating temperature: <= 25 °C</p> <p>Place of use: Indoor.</p>	N/A	N/A	9.1.13
WCS 2	PROC 2 Drying operations in enclosed systems	As above	<p>The trichloroethylene concentration level within the enclosure is continuously monitored.</p>	<p>The extracted air from the oven and mechanical seal covers are all sent to the carbon beds for solvent capture /</p>	<p>Respiratory protective equipment (RPE) with APF of 10.</p>	<p>Operating temperature: <= 100 °C.</p> <p>Place of use: Indoor.</p>	N/A	N/A	9.1.11

			<p>Outside of the enclosure trichloroethylene concentrations are monitored continuously at relevant line positions.</p> <p>Two Tiger hand held monitoring devices which are specifically set up for measuring trichloroethylene concentration. For further detail see footnote 6.</p> <p>Use of local exhaust ventilation (LEV)</p> <p>Enhanced general ventilation: 5-10 air exchanges per hour.</p>	<p>recovery of solvent.</p> <p>Local exhaust ventilation (LEV): Mechanical seals associated with the drive shafts and fixed and free running rollers are sealed and the air is locally extracted to remove and capture the trichloroethylene.</p> <p>Occupational Health and Safety Management System: Advanced.</p>	<p>Dermal protection – Use of chemically resistant gloves conforming to EN374 with basic employee training.</p>				
WCS 3	PROC 8b Transfer operations, palletising and winder operations	As above and see footnote 5.	<p>Use of local exhaust ventilation (LEV)</p> <p>Basic general ventilation: 1-3 air exchanges per hour.</p>	<p>Local exhaust ventilation (LEV): Mechanical seals associated with the drive shafts and fixed and free running rollers are sealed and the air is locally extracted to remove and capture the trichloroethylene. The extracted air from the oven and mechanical seal covers are all sent to the</p>	<p>Dermal protection – Use of chemically resistant gloves conforming to EN374 with basic employee training</p>	<p>Operating temperature: <= 25 °C</p> <p>Place of use: Indoor and outdoor</p>	N/A	N/A	9.1.12

				carbon beds for solvent capture / recovery of solvent					
				Occupational Health and Safety Management System: Advanced					

Abbreviations: WCS=Worker contributing scenario, ECS=Environmental Contributing Scenario, ERC=Environmental Release Category (or spERC if available) , PROC= Process category, LEV=Local Exhaust Ventilation, PPE=Personal Protective Equipment, RPE= respiratory protection equipment, APF = Applied protection factor, STP = Sewage treatment plant, OSH = Occupational Safety and Health

Footnotes:

- 1) <90,000 tonnes/year - is the average (2017-2019) annual turnover of trichloroethylene 'processed' (i.e., circulating recovered and recycled within the plant's trichloroethylene system). The estimate based on the 2019 data alone is similar to, but slightly lower than this figure at <90,000 tonnes/year. The higher estimate has been used as the basis of the assessment. The volume of trichloroethylene in the system at any one time is <55 tonnes (allocated as follows: Lines 1 and 2 have 7.5 t in each; Lines 7 and 8 have 15 t each and there is 5 t in storage). <50,000 tonnes/year - is actual annual amount of trichloroethylene lost from the system during processing through point source and fugitive emissions - described in Section 9.0 of the CSR. The <50,000 tonnes per year lost comprise of <30 tonnes lost as controlled emissions (via the stack), <30 tonnes of fugitive emissions and the remaining <1 tonnes assumed to be residual in the product (equivalent to <0.005% by weight in UHMWPE).
- 2) Explanation / Justification: The daily release rate is based on measured monthly discharges in 2019 and operating days of 355 days/year.
- 3) Explanation / Justification: The daily release rate to air has been estimated from the annual amount of <50 tonnes purchased to replace 'lost' trichloroethylene within the system and operating days of 348 days/year. The release factor has been estimated from the daily use rate assessed and the estimated daily release rate. The final release factor to air is a combination of release to air after treatment of waste gas containing trichloroethylene in carbon beds and fugitive losses/releases. The estimated annual contribution to release to air from the stack (after cleaning of waste gas) is <26 tonnes and from fugitive releases is <23 tonnes (based on site data for 2019).
- 4) Discharge rate of STP: $\geq 3.89E+05 \text{ m}^3/\text{d}$. The discharge rate is obtained from Northumbria Water, UK. The sewage is treated at Howden treatment works which is operated by Northumbria Water.
- 5) Trichloroethylene is delivered to the Newcastle site via road tanker. At the current usage rate three tanker deliveries per year are required (maximum delivery accepted 18 tonnes). Offloading from road tanker is controlled via a standard operating procedure. All venting which is undertaken during tanker delivery is routed to the carbon beds. This is through fixed lines direct to the carbon beds for solvent capture / recovery. Minor fugitive releases may be encountered upon disconnecting the transfer hose from the tanker to the offloading point and during sampling for quality control purposes. The double skinned bulk storage tanks containing trichloroethylene, which are sited within a sealed bund, are all vented to the carbon beds for solvent capture / recovery. The main equipment containing trichloroethylene is within a sealed system. The air from the oven is extracted to carbon beds for capture and recovery. Fugitive emissions from the processing equipment are either captured through local exhaust ventilation (LEV) or from the air extracted from within the enclosure.
- 6) These monitoring studies are set up and carried out according to EN 482:2012 standard (Workplace exposure. General requirements for the performance of procedures for the measurement of chemical agents). In each campaign specific workers in different working positions wear two badge monitors and one sampling

pump in the breathing zone of the worker at the same time, during day and night shifts. The monitoring measurements include exposures to workers during various activities outside the enclosed area (where they spend almost all their working shift) and inside the enclosure where workers typically spend less than 10 minutes during a shift. In each campaign specific workers in different working positions wear two badge monitors and one sampling pump in the breathing zone of the worker at the same time, during day and night shifts. The monitoring measurements include exposures to workers during various activities outside the enclosed area (where they spend almost all their working shift) and inside the enclosure where workers typically spend less than 10 minutes during a shift. Trichloroethylene concentrations within the plant are continuously monitored using static monitors located in different areas within the plant. Specific sampling points around the factory take samples every 15 minutes, 24 hours a day and 365 days a year. The samples are analysed in the Smart Extruder monitoring system utilising 7 analysers, most being equipped to sample 8 locations and a number of sample points are indicative of worker locations (see Annex 5 of CSR ES1). There is therefore a comprehensive dataset of concentration of trichloroethylene at these specific locations on the factory floor.

- 7) The following safety measures to minimise worker exposure to trichloroethylene during use of the substance are implemented at the site and considered for the exposure assessment: Entry to the enclosures in which the bulk of the trichloroethylene is handled is restricted to essential process checks and essential maintenance. As part of the Safe Working Procedure (SWP), respirators (Sundstrom SR 100 Half Mask Respirator with A2 organic respirators) or air fed hoods are mandatory when entering the enclosures and the trichloroethylene concentration is < 30 ppm to 500 ppm. An air fed hood (3M Juniper model) must be used if the trichloroethylene concentration within the enclosure is > 500 ppm (see Annex 6 of CSR ES1 for details).
The length of time a worker can remain in the enclosure is also restricted. This is in line with current guidelines for maximum working time. The maximum allowed time a worker can spend in the enclosure is 90 minutes with a half mask & A2 vapour filters respirator, or 180 minutes with a powered air respirator with a minimum break time (i.e., leaving the enclosure) of 15 minutes before another entry or work within the enclosure. At high trichloroethylene concentration within the enclosure (>1000 ppm) access is prohibited, workers should leave immediately & notify engineering / management. (see Annex 6 of CSR ES1 for details of standard operating procedures and further details of repeat entry/work within the enclosure).
The trichloroethylene concentration level within the enclosure is continuously monitored and data recorded at 15 minute intervals. The trichloroethylene level measured is used to determine the length of time a person can work in the enclosure even with respiratory protection.
Internal limits / alarms are set for the solvent level within the enclosure. The air extraction system flow rate is monitored and if the flow drops below a set level this activates a two-stage alarm system.