

MDI: Final Exposure Scenarios in the e-SDS format

As of 30 April 2012

On the next pages the MDI Exposure Scenarios (ES) in the e-SDS format are presented.

At the request of the consortia TNO clustered the eleven ES in the MDI CSR into eight broad clusters following the life cycle tree of MDI.

ES cluster	Life cycle stage	MDI
1	Manufacturing	- Manufacturing of MDI
2	Manufacturing of other substances and formulation	- Manufacturing of other Substances - Formulating, Repackaging and Distribution
3	End uses – industrial	- Flexible Foam - Elastomers, TPU, Polyamide, Polyimide and Synthetic Fibres and Manufacturing of other Polymers
4		- Rigid foam - Coatings - Adhesives and sealants
5		- Composite Material Based on Wood/Man-made/Mineral/Natural Fibres
6		- Foundry - Other Composite Material
7	End uses – professional	- Rigid foam - Coatings - Composite Material Based on Wood/Man-Made/Mineral/Natural Fibres - Adhesives and sealants - Other Composite Material
8	End uses - consumer	- Rigid Foam - Coatings - Adhesives and sealants

Exposure scenario cluster 1: Manufacturing of MDI

ES Annex to the e-SDS	
Section 1	Exposure Scenario Title
Title	Manufacturing of MDI
Use Descriptor	<p>Sector of Use: SU 3, SU 8, SU 9</p> <p>Process Categories and Environmental Release Categories: PROC 0a, PROC 1, PROC 2, PROC 3, PROC 4, PROC 8a, PROC 8b, PROC 15 ERC 1, ERC 2, ERC 6c</p>
Processes, tasks, activities covered	<p>Covers:</p> <p>Industrial:</p> <ul style="list-style-type: none"> – PROC 0a: Removal of solidified materials by mechanical means in containers, vessels, blenders – PROC 1: Use in closed process, no likelihood of exposure. (e.g. including enclosed sampling, waste collection & transfer, charging, discharging) – PROC 2: Use in closed continuous processes with occasional exposure (e.g. during sampling, maintenance, equipment cleaning, occasional interventions). – PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. during sampling, maintenance, equipment breaks). – PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. during use, sampling, maintenance, equipment breaks). – PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/ large containers at non-dedicated facilities (e.g. drum filling, sampling, waste collection & transfer, charging, discharging). – PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. drum filling, sampling, waste collection

	& transfer, charging, discharging) – PROC 15: Use as a laboratory reagent
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
Product characteristics	
Physical form of product	Physical state: liquid (only solid when specifically mentioned)
Concentration of substance in product	G13: Covers percentage substance in the product up to 100 % (unless stated differently).
Amounts used	Not applicable.
Frequency and duration of use	G2: Covers daily exposures up to 8 hours (unless stated differently).
Human factors not influenced by risk management	None identified.
Contributing Scenarios	Risk Management Measures <i>Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organisational measures , 4. Personal protection</i>
All contributing scenarios at product temperatures <u>below</u> 40 °C for pure MDI or <u>below</u> 45 °C for other MDI based substances	<ul style="list-style-type: none"> - E11: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). - E3: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimize exposures and to report any skin problems that may develop. - PPE14: Use suitable eye protection and gloves. - PPE27: Wear suitable coveralls to prevent exposure to the skin.
All contributing scenarios at product temperatures <u>above</u> 40 °C for pure MDI or <u>above</u> 45 °C for other MDI based substances	Same as above, and: - E54: Provide extract ventilation to points where emissions occur. <u>Or</u> - E82: Provide extract ventilation to material transfer points and other openings.

	<p><u>Or</u></p> <ul style="list-style-type: none"> - E83: Handle in a fume cupboard or under extract ventilation. - PPE30: If above technical/organisational control measures are not feasible, then adopt following PPE: - PPE22: Wear a respirator conforming to EN140 with Type A filter or better. <p>Or</p> <ul style="list-style-type: none"> - demonstrate, e.g. by workplace monitoring, that exposures are below the relevant worker DNEL values for acute and long-term.
PROC 0a: Removal of solidified materials by mechanical means in containers, vessels, blenders	<ul style="list-style-type: none"> - G4: Covers frequency up to: monthly use - PPE14: Use suitable eye protection and gloves.² - PPE27: Wear suitable coveralls to prevent exposure to the skin. - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better
PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging)	- EI18: No specific measures identified.
PROC 2. Use in closed, continuous process with occasional controlled exposure (e.g. during sampling, maintenance, equipment cleaning, occasional interventions)	- EI18: No specific measures identified.
PROC 3. Use in closed batch processes (synthesis or formulation) (e.g. during sampling, maintenance, equipment breaks)	- EI18: No specific measures identified.
PROC 4. Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. during use, sampling, maintenance, equipment breaks)	- EI18: No specific measures identified
PROC 8a. Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. drum filling, sampling, waste collection & transfer, charging, discharging)	<ul style="list-style-type: none"> - EI18: No specific measures identified <p>If solid MDI:</p> <ul style="list-style-type: none"> - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.

PROC 8b. Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. drum filling, sampling, waste collection & transfer, charging, discharging)	- EI18: No specific measures identified.
PROC 15. Use as a laboratory reagent	- EI18: No specific measures identified
Section 2.2	Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1]. OR: Substance is complex UVCB [PrC3].
	Predominantly hydrophobic [PrC4a].
	Not biodegradable [PrC5f].
Operational conditions	Indoor/Outdoor use [OOC3].
Amounts used	
Fraction of EU tonnage used in region [A1]:	1
Regional use tonnage (tonnes/year) [A2]:	2,000,000
Fraction of regional tonnage used locally [A3]:	0.281
Maximum daily site tonnage (kg/day) [A4].	1,873,333
Frequency and duration of use	
Type of release	Continuous release [FD2].
Emission days (days/year) [FD4]	≥ 300
Environmental factors not influenced by risk management	
Local freshwater dilution factor [EF1].	10
Local marine water dilution factor [EF2].	100
Other given operational conditions affecting environmental exposure	Used in closed systems.
	Dry processes.
Release fraction to air from process [OOC4].	$3.2 \cdot 10^{-8}$
Release fraction to wastewater from process [OOC5].	0

Release fraction to soil from process (regional only) [OOC6].	0			
Risk Management Measures				
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites thus conservative process release estimates used [TCS 1].			
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Off-gases are treated by: Incineration, and/or Carbon absorption, and/or Caustic scrubbing.			
Air:	Treat air emissions to provide a typical removal efficiency of >99% [TCR7].			
Soil:	Soil emission controls are not applicable as there is no direct release to soil [TCR4].			
Organizational measures to prevent/limit release from site	Prevent discharge of un-dissolved substance to or recover from wastewater [OMS1].			
Conditions and measures related to municipal sewage treatment plant	Domestic sewage treatment is not assumed [STP2].			
Conditions and measures related to external treatment of waste for disposal	Not applicable.			
Conditions and measures related to external recovery of waste	Not applicable.			
Other environmental control measures additional to above	None.			
Section 3	Exposure Estimation			
3.1. Health				
Measured data has been used to estimate worker exposure.				
PROC #	Inhalation exposure – long term (mg/m ³)	RCR inhalation – long term	Inhalation exposure –short term (mg/m ³)	RCR inhalation - short term
PROC 0a	0.0056	0.112	0.011	0.112
PROC 1	0.013	0.260	0.026	0.260
PROC 2	0.013	0.260	0.026	0.260
PROC 3	0.009	0.184	0.018	0.184
PROC 4	0.008	0.164	0.016	0.164
PROC 8a	0.029	0.582	0.058	0.582

PROC 8b	0.029	0.582	0.058	0.582
PROC 15	0.006	0.112	0.011	0.112
3.2. Environment				
Used EUSES model [EE4].				
Compartment	Predicted Environmental Concentration		Risk Characterisation Ratio	
Freshwater (mg/l)	6.87·10 ⁻³		< 6.87·10 ⁻³	
Marine water (mg/l)	5.43·10 ⁻⁴		< 5.43·10 ⁻³	
Agricultural soil (mg/kg)	0.239		< 0.239	
Grassland (mg/kg)	0.239		< 0.239	
Section 4	Guidance to check compliance with the Exposure Scenario			
4.1. Health				
Guidance to DU	Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented [GC 22]			
	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. [GC 23]			
	Further information on the assumptions contained in this Exposure Scenario can be found at: [GC 24] ISOPA interpretation on selection of Use Descriptors			
4.2. Environment				
Not applicable				
Section 5				
Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.				
Control of Worker Exposure				
Not applicable				
Control of environmental exposure				
Not applicable				

Exposure scenario cluster 2: Use of MDI for Manufacturing of other Substances and Formulation (including Resin Manufacture), Repackaging and Distribution

ES Annex to the e-SDS	
Section 1	Exposure Scenario Title
Title	Use of MDI for Manufacturing other Substances and Formulation (including Resin Manufacture), Repackaging and Distribution
Use Descriptor	<p>Sector of Use for Manufacturing of other Substances: SU 3, SU 8, SU 9</p> <p>Sector of use Formulation (including Resin Manufacture), Repackaging and Distribution: SU 3, SU 10</p> <p>Process Categories and Environmental Release Categories:</p> <p><u>A) Use for Manufacturing of other substances</u> PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 8a, PROC 8b, PROC 9, PROC 15 ERC2, ERC3, ERC6a</p> <p><u>B) Formulation (including Resin Manufacture), Repackaging and Distribution</u> PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 8a, PROC 8b, PROC 9, PROC 15 ERC2, ERC3, ERC6c</p>
Processes, tasks, activities covered	<p>Covers:</p> <p>Industrial:</p> <ul style="list-style-type: none"> – PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging) – PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. during sampling, maintenance, equipment cleaning, occasional interventions) – PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. during sampling, maintenance, equipment breaks) – PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises

	<p>(e.g. during use, sampling, maintenance, equipment breaks)</p> <ul style="list-style-type: none"> – PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact) (e.g. mixing) – PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. drum filling, sampling, waste collection & transfer, charging, discharging) – PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. drum filling, sampling, waste collection & transfer, charging, discharging) – PROC 9: Transfer of substance or preparation into small containers (e.g. dedicated filling line, including weighing) – PROC 15: Use as a laboratory reagent
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
Product characteristics	
Physical form of product	Physical state: liquid (only solid when specifically mentioned)
Concentration of substance in product	G13: Covers percentage substance in the product up to 100 % (unless stated differently).
Amounts used	Not applicable.
Frequency and duration of use	G2: Covers daily exposures up to 8 hours (unless stated differently).
Human factors not influenced by risk management	None identified.
Contributing Scenarios	Risk Management Measures <i>Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical</i>

	<i>measures to prevent dispersion, 3. Organisational measures, 4. Personal protection</i>
All contributing scenarios at product temperatures <u>below</u> 40 °C for pure MDI or <u>below</u> 45 °C for other MDI based substances	<ul style="list-style-type: none"> - E11: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). - E3: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimize exposures and to report any skin problems that may develop. - PPE14: Use suitable eye protection and gloves - PPE27: Wear suitable coveralls to prevent exposure to the skin.
All contributing scenarios at product temperatures <u>above</u> 40 °C for pure MDI or <u>above</u> 45 °C for other MDI based substances	<p>Same as above, and:</p> <ul style="list-style-type: none"> - E54: Provide extract ventilation to points where emissions occur. <p><u>Or</u></p> <ul style="list-style-type: none"> - E82: Provide extract ventilation to material transfer points and other openings. <p><u>Or</u></p> <ul style="list-style-type: none"> - E83: Handle in a fume cupboard or under extract ventilation. <ul style="list-style-type: none"> - PPE30: If above technical/organizational control measures are not feasible, then adopt following PPE: - PPE22: Wear a respirator conforming to EN140 with Type A filter or better. <p><u>Or</u></p> <ul style="list-style-type: none"> - demonstrate, e.g. by workplace monitoring, that exposures are below the relevant worker DNEL values for acute and long-term.
PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging)	- EI18: No specific measures identified.
PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. during sampling, maintenance, equipment cleaning, occasional interventions)	- EI18: No specific measures identified.
PROC 3: Use in closed batch processes (synthesis or	- EI18: No specific measures identified.

formulation) (e.g. during sampling, maintenance, equipment breaks)	
PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. during use, sampling, maintenance, equipment breaks)	- EI18: No specific measures identified
PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact) (e.g. mixing)	- E54: Provide extract ventilation to points where emissions occur.
PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. drum filling, sampling, waste collection & transfer, charging, discharging)	- EI18: No specific measures identified If solid MDI: - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. drum filling, sampling, waste collection & transfer, charging, discharging)	- EI18: No specific measures identified.
PROC 9: Transfer of substance or preparation into small containers (e.g. dedicated filling line, including weighing)	- EI18: No specific measures identified
PROC 15: Use as a laboratory reagent	- EI18: No specific measures identified
Section 2.2	Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1]. OR: Substance is complex UVCB [PrC3].
	Predominantly hydrophobic [PrC4a].
	Not biodegradable [PrC5f].
Operational conditions	Indoor/Outdoor use [OOC3].

Amounts used	
Fraction of EU tonnage used in region [A1]:	1
Regional use tonnage (tonnes/year) [A2]:	520,000
Fraction of regional tonnage used locally [A3]:	0.019
Average local daily tonnage (kg/d) [A5]:	33,333
Frequency and duration of use	
Type of release	Continuous release [FD2].
Emission days (days/year) [FD4]	≥ 300
Environmental factors not influenced by risk management	
Local freshwater dilution factor [EF1].	10
Local marine water dilution factor [EF2].	100
Other given operational conditions affecting environmental exposure	Used in open systems.
	Dry processes.
Release fraction to air from process [OOC4].	$1.2 \cdot 10^{-5}$
Release fraction to wastewater from process [OOC5].	0
Release fraction to soil from process (regional only) [OOC6].	0
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites thus conservative process release estimates used [TCS 1].
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Air:	No air emission controls required; required removal efficiency is 0% [TCR5].
Soil:	Soil emission controls are not applicable as there is no direct release to soil [TCR4].
Organizational measures to prevent/limit release from site	Prevent discharge of un-dissolved substance to or recover from wastewater [OMS1].

Conditions and measures related to municipal sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater [TCR3].			
Conditions and measures related to external treatment of waste for disposal	Not applicable.			
Conditions and measures related to external recovery of waste	Not applicable.			
Other environmental control measures additional to above	None.			
Section 3	Exposure Estimation			
3.1. Health				
Measured data has been used to estimate worker exposure.				
PROC #	Inhalation exposure – long term (mg/m ³)	RCR inhalation – long term	Inhalation exposure – short term (mg/m ³)	RCR inhalation – Short term
PROC 1	0.013	0.260	0.026	0.260
PROC 2	0.013	0.260	0.026	0.260
PROC 3	0.009	0.184	0.018	0.184
PROC 4	0.008	0.164	0.016	0.164
PROC 5	0.029	0.582	0.058	0.582
PROC 8a	0.029	0.582	0.058	0.582
PROC 8b	0.029	0.582	0.058	0.582
PROC 9	0.005	0.094	0.009	0.094
PROC 15	0.006	0.112	0.011	0.112
3.2. Environment				
Used EUSES model [EE4].				
Compartment	Predicted Environmental Concentration		Risk Characterisation Ratio	
Freshwater (mg/l)	6.85·10 ⁻³		< 6.85·10 ⁻³	
Marine water (mg/l)	5.43·10 ⁻⁴		< 5.43·10 ⁻³	
Agricultural soil (mg/kg)	0.239		< 0.239	
Grassland (mg/kg)	0.239		< 0.239	
Section 4	Guidance to check compliance with the Exposure Scenario			

4.1. Health	
Guidance to DU	Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented [GC 22]
	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. [GC 23]
	Further information on the assumptions contained in this Exposure Scenario can be found at: [GC 24] ISOPA interpretation on selection of Use Descriptors
4.2. Environment	
Not applicable	
Section 5	
Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)	
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
Not applicable	
Control of environmental exposure	
Not applicable	

Exposure scenario cluster 3: Industrial use of MDI for Flexible Foam and Elastomers, TPU, Polyamide, Polyimide and Synthetic Fibres and Manufacturing of other Polymers

ES Annex to the e-SDS	
Section 1	Exposure Scenario Title
Title	Industrial use of MDI for Flexible Foam and Elastomers, TPU, Polyamide, Polyimide and Synthetic Fibres and Manufacturing of other Polymers
Use Descriptor	Sector of Use: SU 3
	<p>Process Categories and Environmental Release Categories:</p> <p><u>A) Use in Flexible Foam</u> PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 7, PROC 8a, PROC 8b, PROC 14, PROC 15, PROC 21 ERC 2, ERC 3, ERC 6c</p> <p><u>B) Use in Elastomers TPU, Polyamide, Polyimide and Synthetic Fibres and Manufacturing of other Polymers</u> PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 7, PROC 8a, PROC 8b, PROC 9, PROC 14, PROC 15 ERC 2, ERC 3, ERC 6c</p>
Processes, tasks, activities covered	<p>Covers:</p> <p>Industrial:</p> <ul style="list-style-type: none"> – PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging) – PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. automatic or manual closed moulding, sawing in cabinet, during sampling, charging, discharging, maintenance, equipment cleaning, occasional interventions) – PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. closed moulding, sawing in cabinet, blending, sampling, maintenance, equipment cleaning, occasional interventions) – PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. open moulding, pouring on conveyor or in box, open sawing, during casting, other open uses, maintenance,

	<p>equipment cleaning, occasional interventions)</p> <ul style="list-style-type: none"> – PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact) – PROC 7: Industrial spraying. – PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging) – PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging) – PROC 9: Transfer of substance or preparation into small containers (e.g. dedicated filling line, including weighing) – PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation – PROC 15: Use as laboratory reagent – PROC 21: Low energy manipulation of substances bound in materials and/or articles (e.g. demoulding, trimming, repairing, cutting)
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
Product characteristics	
Physical form of product	Physical state: liquid (only solid when specifically mentioned)
Concentration of substance in product	G13: Covers percentage substance in the product up to 100 % (unless stated differently).
Amounts used	Not applicable.
Frequency and duration of use	G2: Covers daily exposures up to 8 hours (unless stated differently).
Human factors not influenced by	None identified.

risk management	
Contributing Scenarios	Risk Management Measures <i>Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organisational measures, 4. Personal protection</i>
All contributing scenarios at product temperatures <u>below</u> 40 °C for pure MDI or <u>below</u> 45 °C for other MDI based substances	<ul style="list-style-type: none"> - E11: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). - E3: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimize exposures and to report any skin problems that may develop. - PPE14: Use suitable eye protection and gloves.¹ - PPE27: Wear suitable coveralls to prevent exposure to the skin.
All contributing scenarios at product temperatures <u>above</u> 40 °C for pure MDI or <u>above</u> 45 °C for other MDI based substances	<p>Same as above, and:</p> <ul style="list-style-type: none"> - E54: Provide extract ventilation to points where emissions occur. <p><u>Or</u></p> <ul style="list-style-type: none"> - E82: Provide extract ventilation to material transfer points and other openings. <p><u>Or</u></p> <ul style="list-style-type: none"> - E83: Handle in a fume cupboard or under extract ventilation. <ul style="list-style-type: none"> - PPE30: If above technical/organizational control measures are not feasible, then adopt following PPE: - PPE22: Wear a respirator conforming to EN140 with Type A filter or better. <p><u>Or</u></p> <ul style="list-style-type: none"> - demonstrate, e.g. by workplace monitoring, that exposures are below the relevant worker DNEL values for acute and long-term.
PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging)	- EI18: No specific measures identified.
PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. automatic or manual closed)	- EI18: No specific measures identified.

moulding, sawing in cabinet, during sampling, charging, discharging, maintenance, equipment cleaning, occasional interventions)	
PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. closed moulding, sawing in cabinet, blending, sampling, maintenance, equipment cleaning, occasional interventions)	- EI18: No specific measures identified.
PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. open moulding, pouring on conveyor or in box, open sawing, during casting, other open uses, maintenance, equipment cleaning, occasional interventions)	- EI18: No specific measures identified
PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact)	- E54: Provide extract ventilation to points where emissions occur.
PROC 7: Industrial spraying.	<p>- E59: Carry out in a vented booth provided with laminar airflow</p> <p><u>Or</u></p> <p>- E57: Carry out in a vented booth or extracted enclosure</p> <p><u>Or</u></p> <p>- E61: Minimize exposure by-extracted full enclosure for the operation or equipment</p> <p><u>Or</u></p> <p>- E60: Minimize exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings</p> <p>- PPE30: If above technical/organizational control measures are not feasible, then adopt following PPE:</p> <p>- PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.</p>

PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging)		- EI18: No specific measures identified If solid MDI: - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter
PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging)		- EI18: No specific measures identified -
PROC 9: Transfer of substance or preparation into small containers (e.g. dedicated filling line, including weighing)		- EI18: No specific measures identified
PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation		- EI18: No specific measures identified
PROC 15: Use as laboratory reagent		- EI18: No specific measures identified
PROC 21: Low energy manipulation of substances bound in materials and/or articles (e.g. demoulding, trimming, repairing, cutting)		- EI18: No specific measures identified
Section 2.2		Control of environmental exposure
Product characteristics		Substance is a unique structure [PrC1]. OR: Substance is complex UVCB [PrC3].
		Predominantly hydrophobic [PrC4a].
		Not biodegradable [PrC5f].
Operational conditions		Indoor/Outdoor use [OOC3].
Amounts used		
Fraction of EU tonnage used in region [A1]:		1
Regional use tonnage	<u>Use in Flexible Foams</u>	260,000

(tonnes/year) [A2]:	Use in Elastomers etc.	160,000
Fraction of regional tonnage used locally [A3]:	Use in Flexible Foams	0.038
	Use in Elastomers etc.	0.063
Maximum daily site tonnage (kg/day) [A4].		33,333
Frequency and duration of use		
Type of release		Continuous release [FD2].
Emission days (days/year) [FD4]		≥ 300
Environmental factors not influenced by risk management		
Local freshwater dilution factor [EF1].		10
Local marine water dilution factor [EF2].		100
Other given operational conditions affecting environmental exposure		Used in open systems.
		Dry processes.
Release fraction to air from process [OOC4].		$1.2 \cdot 10^{-5}$
Release fraction to wastewater from process [OOC5].		0
Release fraction to soil from process (regional only) [OOC6].		0
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release		Common practices vary across sites thus conservative process release estimates used [TCS 1].
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil		
Air:		No air emission controls required; required removal efficiency is 0% [TCR5].
Soil:		Soil emission controls are not applicable as there is no direct release to soil [TCR4].
Organizational measures to prevent/limit release from site		Prevent discharge of un-dissolved substance to or recover from wastewater [OMS1].].
Conditions and measures related		Wastewater emission controls are not applicable as there is

to municipal sewage treatment plant	no direct release to wastewater [TCR3].			
Conditions and measures related to external treatment of waste for disposal	Not applicable.			
Conditions and measures related to external recovery of waste	Not applicable.			
Other environmental control measures additional to above	None.			
Section 3	Exposure Estimation			
3.1. Health				
Measured data has been used to estimate worker exposure.				
PROC #	Inhalation exposure – long term (mg/m ³)	RCR inhalation – long term	Inhalation exposure – short term (mg/m ³)	RCR inhalation – short term
PROC 1	0.013	0.260	0.026	0.260
PROC 2	0.013	0.260	0.026	0.260
PROC 3	0.009	0.184	0.018	0.184
PROC 4	0.008	0.116	0.016	0.116
PROC 5 Flexible Foam	0.029	0.582	0.058	0.582
PROC 5 Elastomers	0.012	0.246	0.025	0.246
PROC 7	0.011	0.224	0.022	0.224
PROC 8a	0.029	0.582	0.058	0.582
PROC 8b	0.029	0.582	0.058	0.582
PROC 9	0.005	0.094	0.010	0.094
PROC 14	0.006	0.116	0.012	0.116
PROC 15	0.006	0.112	0.011	0.112
PROC 21	0.006	0.128	0.013	0.128
3.2. Environment				
Used EUSES model [EE4].				
Compartment		Predicted Environmental Concentration	Risk Characterisation Ratio	

Freshwater (mg/l)	$6.87 \cdot 10^{-3}$	$< 6.87 \cdot 10^{-3}$
Marine water (mg/l)	$5.43 \cdot 10^{-4}$	$< 5.43 \cdot 10^{-3}$
Agricultural soil (mg/kg)	0.239	< 0.239
Grassland (mg/kg)	0.239	< 0.239
Section 4	Guidance to check compliance with the Exposure Scenario	
4.1. Health		
Guidance to DU	Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented [GC 22]	
	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. [GC 23]	
	Further information on the assumptions contained in this Exposure Scenario can be found at: [GC 24] ISOPA interpretation on selection of Use Descriptors	
4.2. Environment		
Not applicable		
Section 5		
Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)		
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.		
Control of Worker Exposure		
Not applicable		
Control of environmental exposure		
Not applicable		

Exposure Scenario cluster 4: Industrial use of MDI for Rigid Foam, Coatings, and Adhesives and Sealants

ES Annex to the e-SDS	
Section 1	Exposure Scenario Title
Title	Industrial use of MDI for Rigid Foam, Coatings and Adhesives and Sealants
Use Descriptor	<p>Sector of Use: SU 3</p> <p>Process Categories and Environmental Release Categories:</p> <p><u>A) Use for Rigid Foam</u> PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 7, PROC 8a, PROC 8b, PROC10, PROC 15, PROC 21 ERC 2, ERC 3, ERC 6c</p> <p><u>B) Use for Coatings</u> PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 7, PROC 8a, PROC 8b, PROC 9, PROC 10, PROC 13, PROC 15 ERC 2, ERC 3, ERC 5, ERC 6c</p> <p><u>C) Use for Adhesives and Sealants</u> PROC 1, PROC 2, PROC 3, PROC 4, PROC 5, PROC 7, PROC 8a, PROC 8b, PROC 9, PROC 10, PROC 13, PROC 14, PROC 15 ERC 2, ERC 3, ERC 5, ERC 6c</p>
Processes, tasks, activities covered	<ul style="list-style-type: none"> – PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging) – PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. automatic or manual closed moulding, sawing, during sampling, maintenance, equipment cleaning, occasional interventions) – PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. closed moulding, sawing in cabinet, blending, during sampling, maintenance, equipment cleaning, occasional interventions) – PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. open

	<p>moulding, pouring on conveyor or in box, open sawing, during sampling, maintenance, equipment cleaning, occasional interventions)</p> <ul style="list-style-type: none"> – PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact) – PROC 7: Industrial spraying – PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging) – PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging) – PROC 9: Transfer of substance or preparation into small containers (e.g. dedicated filling line, including weighing) – PROC 10: Roller application or brushing – PROC 13: Treatment of articles by dipping and pouring – PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation – PROC 15: Use as laboratory reagent – PROC 21: Low energy manipulation of substances bound in materials and/or articles (e.g. demoulding, trimming, repairing, cutting)
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
Product characteristics	
Physical form of product	Physical state: liquid (only solid when specifically mentioned)

Concentration of substance in product	G13: Covers percentage substance in the product up to 100 % (unless stated differently).
Amounts used	Not applicable.
Frequency and duration of use	G2: Covers daily exposures up to 8 hours (unless stated differently).
Human factors not influenced by risk management	None identified.
Contributing Scenarios	Risk Management Measures <i>Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organisational measures, 4. Personal protection</i>
All contributing scenarios at product temperatures <u>below</u> 40 °C for pure MDI or <u>below</u> 45 °C for other MDI based substances	<ul style="list-style-type: none"> - E11: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). - E3: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. - PPE14: Use suitable eye protection and gloves. - PPE27: Wear suitable coveralls to prevent exposure to the skin.
All contributing scenarios at product temperatures <u>above</u> 40 °C for pure MDI or <u>above</u> 45 °C for other MDI based substances	<p>Same as above, and:</p> <ul style="list-style-type: none"> - E54: Provide extract ventilation to points where emissions occur. <p>Or</p> <ul style="list-style-type: none"> - E82: Provide extract ventilation to material transfer points and other openings. <p>Or</p> <ul style="list-style-type: none"> - E83: Handle in a fume cupboard or under extract ventilation. <ul style="list-style-type: none"> - PPE30: If above technical/organizational control measures are not feasible, then adopt following PPE: - PPE22: Wear a respirator conforming to EN140 with Type A filter or better. <p>Or</p> <ul style="list-style-type: none"> - demonstrate, e.g. by workplace monitoring, that exposures are below the relevant worker DNEL values for acute and long-term.
PROC 1: Use in closed process, no likelihood of	- EI18: No specific measures identified.

exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging)	
PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. automatic or manual closed moulding, sawing, during sampling, maintenance, equipment cleaning, occasional interventions)	- EI18: No specific measures identified.
PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. closed moulding, sawing in cabinet, blending, during sampling, maintenance, equipment cleaning, occasional interventions)	- EI18: No specific measures identified.
PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. open moulding, pouring on conveyer or in box, open sawing, during sampling, maintenance, equipment cleaning, occasional interventions)	- EI18: No specific measures identified
PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact)	- E54: Provide extract ventilation to points where emissions occur.
PROC 7. Industrial spraying	<p>Same as mentioned above for all PROCs, and:</p> <p>- E59: Carry out in a vented booth provided with laminar airflow</p> <p><u>Or</u></p> <p>- E57: Carry out in a vented booth or extracted enclosure</p> <p><u>Or</u></p> <p>- E61 Minimize exposure by-extracted full enclosure for the</p>

	<p>operation or equipment</p> <p>Or</p> <ul style="list-style-type: none"> - E60: Minimize exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings - PPE30: If above technical/organizational control measures are not feasible, then adopt following PPE: - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging)	<ul style="list-style-type: none"> - EI18: No specific measures identified <p>If solid MDI:</p> <ul style="list-style-type: none"> - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging)	<ul style="list-style-type: none"> - EI18: No specific measures identified -
PROC 9: Transfer of substance or preparation into small containers (e.g. dedicated filling line, including weighing)	<ul style="list-style-type: none"> - EI18: No specific measures identified
PROC 10: Roller application or brushing	<ul style="list-style-type: none"> - EI18: No specific measures identified
PROC 13: Treatment of articles by dipping and pouring	<ul style="list-style-type: none"> - EI18: No specific measures identified
PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation	<ul style="list-style-type: none"> - EI18: No specific measures identified
PROC 15: Use as laboratory reagent	<ul style="list-style-type: none"> - EI18: No specific measures identified

PROC 21: Low energy manipulation of substances bound in materials and/or articles (e.g. demoulding, trimming, repairing, cutting)		- EI18: No specific measures identified
Section 2.2		Control of environmental exposure
Product characteristics		Substance is a unique structure [PrC1]. OR: Substance is complex UVCB [PrC3].
		Predominantly hydrophobic [PrC4a].
		Not biodegradable [PrC5f].
Operational conditions		Indoor/Outdoor use [OOC3].
Amounts used		
Fraction of EU tonnage used in region [A1]:		1
Regional use tonnage (tonnes/year) [A2]:	Rigid Foam	1,120,000
	Coating	60,000
	Adhesives and sealants	300,000
Fraction of regional tonnage used locally [A3]:	Rigid foam	$8.9 \cdot 10^{-3}$
	Coating	0.167
	Adhesives and sealants	0.033
Maximum daily site tonnage (kg/day) [A4].		33,333
Frequency and duration of use		
Type of release		Continuous release [FD2].
Emission days (days/year) [FD4]		≥ 300
Environmental factors not influenced by risk management		
Local freshwater dilution factor [EF1].		10
Local marine water dilution factor [EF2].		100
Other given operational		Used in open systems.

conditions affecting environmental exposure	Dry processes.			
Release fraction to air from process [OOC4].	1.2·10 ⁻⁵			
Release fraction to wastewater from process [OOC5].	0			
Release fraction to soil from process (regional only) [OOC6].	0			
Risk Management Measures				
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites thus conservative process release estimates used [TCS 1].			
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil				
Air:	No air emission controls required; required removal efficiency is 0% [TCR5].			
Soil:	Soil emission controls are not applicable as there is no direct release to soil [TCR4].			
Organizational measures to prevent/limit release from site	Prevent discharge of un-dissolved substance to or recover from wastewater [OMS1].].			
Conditions and measures related to municipal sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater [TCR3].			
Conditions and measures related to external treatment of waste for disposal	Not applicable.			
Conditions and measures related to external recovery of waste	Not applicable.			
Other environmental control measures additional to above	None.			
Section 3	Exposure Estimation			
3.1. Health				
Measured data has been used to estimate worker exposure.				
PROC #	Inhalation	RCR	Inhalation	RCR inhalation

	exposure – long term (mg/m³)	inhalation – long term	exposure – short term (mg/m³)	– short term
PROC 1	0.013	0.260	0.026	0.260
PROC 2	0.013	0.260	0.026	0.260
PROC 3	0.009	0.184	0.018	0.184
PROC 4	0.008	0.164	0.016	0.164
PROC 5	0.029	0.582	0.058	0.582
PROC 7 (Hotmelt)	0.011	0.224	0.022	0.224
PROC 7 (other than hotmelt)	0.010	0.204	0.020	0.204
PROC 8a	0.029	0.582	0.058	0.582
PROC 8b	0.029	0.582	0.058	0.582
PROC 9	0.005	0.094	0.009	0.094
PROC 10	0.017	0.344	0.034	0.344
PROC 13	0.017	0.344	0.034	0.344
PROC 14	0.006	0.116	0.012	0.116
PROC 15	0.006	0.112	0.011	0.112
PROC 21	0.006	0.260	0.013	0.128
3.2. Environment				
Used EUSES model [EE4].				
Compartment		Predicted Environmental Concentration	Risk Characterisation Ratio	
Freshwater (mg/l)		6.87·10 ⁻³	< 6.87·10 ⁻³	
Marine water (mg/l)		5.43·10 ⁻⁴	< 5.43·10 ⁻³	
Agricultural soil (mg/kg)		0.239	< 0.239	
Grassland (mg/kg)		0.239	< 0.239	
Section 4		Guidance to check compliance with the Exposure Scenario		
4.1. Health				
Guidance to DU		Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are		

	implemented [GC 22]
	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. [GC 23]
	Further information on the assumptions contained in this Exposure Scenario can be found at: [GC 24] ISOPA interpretation on selection of Use Descriptors
4.2. Environment	
Not applicable	
Section 5	
Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)	
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
Not applicable	
Control of environmental exposure	
Not applicable	

Exposure Scenario cluster 5: Industrial use of MDI for Composite Material Based on Wood/Man-made/Mineral/Natural Fibres

ES Annex to the e-SDS	
Section 1	Exposure Scenario Title
Title	Industrial use of MDI for Composite Material Based on Wood/Man-Made/Mineral/Natural Fibres
Use Descriptor	<p>Sector of Use: SU 3</p> <p>Process Categories and Environmental Release Categories:</p> <p>PROC 0a, PROC 0b, PROC 0c, PROC 1, PROC 2, PROC 3, PROC 4, PROC7, PROC 8a, PROC 8b, PROC 10, PROC 14, PROC 15, PROC 21</p> <p>ERC 2, ERC 3, ERC 5</p>
Processes, tasks, activities covered	<ul style="list-style-type: none"> – PROC 0a: Removal of solidified materials by mechanical means in containers, vessels, blenders – PROC 0b: Cleaning production line area with high pressurized air – PROC 0c: Cleaning production line area with brush – PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging, blowline injections, blender operations) – PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. during sawing, sampling, maintenance, equipment cleaning, occasional interventions/inspections at enclosed areas) – PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. during sampling, maintenance, equipment cleaning, occasional interventions) – PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. during mat dumping, sampling, maintenance, equipment cleaning, occasional intervention at open areas) – PROC7: Industrial Spraying – PROC 8a: Transfer of substance or preparation

	<p>(charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging)</p> <ul style="list-style-type: none"> – PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging) – PROC 10: Roller application or brushing (low energy spreading) – PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation – PROC 15: Use as laboratory reagent – PROC 21: Low energy manipulation of substances bound in materials and/or articles
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
Product characteristics	
Physical form of product	Physical state: liquid (only solid when specifically mentioned)
Concentration of substance in product	G13: Covers percentage substance in the product up to 100 % (unless stated differently).
Amounts used	Not applicable.
Frequency and duration of use	G2: Covers daily exposures up to 8 hours (unless stated differently).
Human factors not influenced by risk management	None identified.
Contributing Scenarios	Risk Management Measures <i>Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organisational measures, 4. Personal protection</i>
All contributing scenarios at product temperatures <u>below</u> 40 °C for pure MDI or <u>below</u> 45 °C for other MDI based substances	<ul style="list-style-type: none"> - E11: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). - E3: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off

	<p>any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.</p> <ul style="list-style-type: none"> - PPE14: Use suitable eye protection and gloves. - PPE27: Wear suitable coveralls to prevent exposure to the skin.
All contributing scenarios at product temperatures <u>above</u> 40 °C for pure MDI or <u>above</u> 45 °C for other MDI based substances	<p>Same as above, and:</p> <ul style="list-style-type: none"> - E54: Provide extract ventilation to points where emissions occur. <p><u>Or</u></p> <ul style="list-style-type: none"> - E82: Provide extract ventilation to material transfer points and other openings. <p><u>Or</u></p> <ul style="list-style-type: none"> - E83: Handle in a fume cupboard or under extract ventilation. <ul style="list-style-type: none"> - PPE30: If above technical/organizational control measures are not feasible, then adopt following PPE: - PPE22: Wear a respirator conforming to EN140 with Type A filter or better. <p><u>Or</u></p> <ul style="list-style-type: none"> - demonstrate, e.g. by workplace monitoring, that exposures are below the relevant worker DNEL values for acute and long-term.
PROC 0a: Removal of solidified materials by mechanical means in containers, vessels, blenders	<ul style="list-style-type: none"> - G4: Covers frequency up to: monthly use - PPE14: Use suitable eye protection and gloves. - PPE27: Wear suitable coveralls to prevent exposure to the skin. - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
PROC 0b: Cleaning production line area with high pressurized air	<ul style="list-style-type: none"> - PPE14: Use suitable eye protection and gloves. - PPE27: Wear suitable coveralls to prevent exposure to the skin. - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
PROC 0c: Cleaning production line area with brush	<ul style="list-style-type: none"> - PPE14: Use suitable eye protection and gloves. - PPE27: Wear suitable coveralls to prevent exposure to the skin.
PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste	<ul style="list-style-type: none"> - EI18: No specific measures identified.

collection & transfer, charging, discharging, blowline injections, blender operations)	
PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. during sawing, sampling, maintenance, equipment cleaning, occasional interventions/inspections at enclosed areas)	- EI18: No specific measures identified.
PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. during sampling, maintenance, equipment cleaning, occasional interventions)	- EI18: No specific measures identified.
<u>Activities close to the former line</u> PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. during mat dumping, sampling, maintenance, equipment cleaning, occasional intervention at open areas)	- E82: Provide extract ventilation to material transfer points and other openings. - Minimal efficiency exhaust ventilation: $\geq 25\%$ - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
<u>Activities close to the mat line</u> PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. during mat dumping, sampling, maintenance, equipment cleaning, occasional intervention at open areas)	- EI18: No specific measures identified.
PROC 7: Industrial spraying	- E59: Carry out in a vented booth provided with laminar airflow <u>Or</u> - E57: Carry out in a vented booth or extracted enclosure <u>Or</u> - E61: Minimise exposure by-extracted full enclosure for the operation or equipment

	<p>Or</p> <ul style="list-style-type: none"> - E60: Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings - PPE30: If above technical/organisational control measures are not feasible, then adopt following PPE: - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging)	<ul style="list-style-type: none"> - EI18: No specific measures identified. <p>If solid MDI:</p> <ul style="list-style-type: none"> - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging)	<ul style="list-style-type: none"> - EI18: No specific measures identified.
PROC 10: Roller application or brushing (low energy spreading)	<ul style="list-style-type: none"> - EI18: No specific measures identified.
PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation	<ul style="list-style-type: none"> - E54: Provide extract ventilation to points where emissions occur.
PROC 15: Use as laboratory reagent	<ul style="list-style-type: none"> - EI18: No specific measures identified.
PROC 21: Low energy manipulation of substances bound in materials and/or articles	<ul style="list-style-type: none"> - E54: Provide extract ventilation to points where emissions occur.
Section 2.2	Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1]. OR: Substance is complex UVCB [PrC3].
	Predominantly hydrophobic [PrC4a].

	Not biodegradable [PrC5f].
Operational conditions	Indoor/Outdoor use [OOC3].
Amounts used	
Fraction of EU tonnage used in region [A1]:	1
Regional use tonnage (tonnes/year) [A2]:	43,600
Fraction of regional tonnage used locally [A3]:	0.229
Maximum daily site tonnage (kg/day) [A4].	33,333
Frequency and duration of use	
Type of release	Continuous release [FD2].
Emission days (days/year) [FD4]	≥ 300
Environmental factors not influenced by risk management	
Local freshwater dilution factor [EF1].	10
Local marine water dilution factor [EF2].	100
Other given operational conditions affecting environmental exposure	Used in open systems.
	Dry processes.
Release fraction to air from process [OOC4].	$1.2 \cdot 10^{-5}$
Release fraction to wastewater from process [OOC5].	0
Release fraction to soil from process (regional only) [OOC6].	0
Risk Management Measures	
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites thus conservative process release estimates used [TCS 1].
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Air:	No air emission controls required; required removal efficiency is 0% [TCR5].

Soil:	Soil emission controls are not applicable as there is no direct release to soil [TCR4].			
Organizational measures to prevent/limit release from site	Prevent discharge of un-dissolved substance to or recover from wastewater [OMS1].			
Conditions and measures related to municipal sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater [TCR3].			
Conditions and measures related to external treatment of waste for disposal	Not applicable.			
Conditions and measures related to external recovery of waste	Not applicable.			
Other environmental control measures additional to above	None.			
Section 3	Exposure Estimation			
3.1. Health				
Measured data has been used to estimate worker exposure.				
PROC #	Inhalation exposure – long term (mg/m ³)	RCR inhalation – long term	Inhalation exposure – short term (mg/m ³)	RCR inhalation – short term
PROC 0a	0.0056	0.112	0.0112	0.112
PROC 0b	0.002	0.042	0.004	0.042
PROC 0c	0.014	0.28	0.028	0.28
PROC 1	0.002	0.038	0.004	0.038
PROC 2	0.038	0.76	0.076	0.76
PROC 3	0.002	0.038	0.004	0.038
PROC 4 <u>Activities close to the former line</u>	0.011	0.227	0.023	0.227
PROC 4 <u>Activities close to the mat line</u>	0.007	0.136	0.014	0.136

PROC 7	0.010	0.204	0.020	0.204
PROC 8a	0.029	0.582	0.058	0.582
PROC 8b	0.002	0.034	0.003	0.034
PROC 10	0.017	0.328	0.034	0.328
PROC 14	0.006	0.078	0.012	0.078
PROC 15	0.006	0.112	0.011	0.112
PROC 21	0.0004	0.008	0.001	0.008
3.2. Environment				
Used EUSES model [EE4].				
Compartment	Predicted Environmental Concentration		Risk Characterisation Ratio	
Freshwater (mg/l)	6.87·10 ⁻³		< 6.87·10 ⁻³	
Marine water (mg/l)	5.43·10 ⁻⁴		< 5.43·10 ⁻³	
Agricultural soil (mg/kg)	0.239		< 0.239	
Grassland (mg/kg)	0.239		< 0.239	
Section 4	Guidance to check compliance with the Exposure Scenario			
4.1. Health				
Guidance to DU	Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented [GC 22]			
	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. [GC 23]			
	Further information on the assumptions contained in this Exposure Scenario can be found at: [GC 24] ISOPA interpretation on selection of Use Descriptors			
4.2. Environment				
Not applicable				
Section 5				
Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.				
Control of Worker Exposure				

Not applicable
Control of environmental exposure
Not applicable

Exposure Scenario cluster 6: Industrial use of MDI in Foundry and Other Composite Material

ES Annex to the e-SDS	
Section 1	Exposure Scenario Title
Title	Industrial use of MDI in Foundry and Other Composite Material
Use Descriptor	Sector of Use: SU 3
	<p>Process Categories and Environmental Release Categories:</p> <p><u>A) Industrial use in Foundry</u> PROC 1, PROC 2, PROC 3, PROC4, PROC 5, PROC 8a, PROC 8b, PROC 14, PROC 15 ERC2, ERC3, ERC5</p> <p><u>B) Industrial use in Other Composite Material</u> PROC 1, PROC 2, PROC 3, PROC 5, PROC 8a, PROC 8b, PROC 13, PROC 14, PROC 15 ERC 2, ERC 3, ERC 5, ERC 6c</p>
Processes, tasks, activities covered	<ul style="list-style-type: none"> – PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging) – PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. during sampling, sawing, maintenance, equipment cleaning, occasional interventions, checking quality of sand mix) – PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. during sampling, maintenance, equipment cleaning, occasional interventions, checking quality of sand mix) - PROC 4: Open batch/continuous processes with opportunity for exposure (e.g., during mat dumping, sampling, maintenance, equipment cleaning, occasional

	<p>interventions at open areas)</p> <ul style="list-style-type: none"> - PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact) - PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging) - PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging) - PROC 13: Treatment of articles by dipping and pouring - PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation - PROC 15: Use as laboratory reagent
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
Product characteristics	
Physical form of product	Physical state: liquid (only solid when specifically mentioned)
Concentration of substance in product	G13: Covers percentage substance in the product up to 100 % (unless stated differently).
Amounts used	Not applicable.
Frequency and duration of use	G2: Covers daily exposures up to 8 hours (unless stated differently).
Human factors not influenced by risk management	None identified.
Contributing Scenarios	Risk Management Measures <i>Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organisational measures , 4. Personal protection</i>
All contributing scenarios at	- E11: Provide a good standard of general ventilation (not less

product temperatures <u>below</u> 40 °C for pure MDI or <u>below</u> 45 °C for other MDI based substances	<p>than 3 to 5 air changes per hour).</p> <ul style="list-style-type: none"> - E3: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. - PPE14: Use suitable eye protection and gloves. - PPE27: Wear suitable coveralls to prevent exposure to the skin.
All contributing scenarios at product temperatures <u>above</u> 40 °C for pure MDI or <u>above</u> 45 °C for other MDI based substances	<p>Same as above, and:</p> <ul style="list-style-type: none"> - E54: Provide extract ventilation to points where emissions occur. <p><u>Or</u></p> <ul style="list-style-type: none"> - E82: Provide extract ventilation to material transfer points and other openings. <p><u>Or</u></p> <ul style="list-style-type: none"> - E83: Handle in a fume cupboard or under extract ventilation. <ul style="list-style-type: none"> - PPE30: If above technical/organizational control measures are not feasible, then adopt following PPE: - PPE22: Wear a respirator conforming to EN140 with Type A filter or better. <p><u>Or</u></p> <ul style="list-style-type: none"> - demonstrate, e.g. by workplace monitoring, that exposures are below the relevant worker DNEL values for acute and long-term.
PROC 1: Use in closed process, no likelihood of exposure (e.g. including enclosed sampling, waste collection & transfer, charging, discharging)	<ul style="list-style-type: none"> - EI18: No specific measures identified.
PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. during sampling, sawing, maintenance, equipment cleaning, occasional interventions, checking quality of sand mix)	<p><u>For use of MDI in Foundry</u></p> <ul style="list-style-type: none"> - E82: Provide extract ventilation to material transfer points and other openings. <p><u>For use of MDI in Other Composite Material</u></p> <ul style="list-style-type: none"> - EI18: No specific measures identified.
PROC 3: Use in closed batch processes (synthesis or	<p><u>For use of MDI in Foundry</u></p> <ul style="list-style-type: none"> E82: Provide extract ventilation to material transfer points and

formulation) (e.g. during sampling, maintenance, equipment cleaning, occasional interventions, checking quality of sand mix)	other openings. <u>For use of MDI in Other Composite Material</u> - EI18: No specific measures identified.
PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises	- E54: Provide extract ventilation to points where emissions occur.
<u>Foundry</u> PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact)	- E82: Provide extract ventilation to material transfer points and other openings. - E54: Provide extract ventilation to points where emissions occur.
<u>Other composite materials</u> PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact)	- E54: Provide extract ventilation to points where emissions occur.
PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging)	- EI18: No specific measures identified If solid MDI: - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging)	- EI18: No specific measures identified
PROC 13: Treatment of articles by dipping and pouring	- EI18: No specific measures identified

PROC 14. Production of preparations or articles by tableting, compression, extrusion, pelletisation		- E54: Provide extract ventilation to points where emissions occur.
PROC 15. Use as laboratory reagent		- EI18: No specific measures identified
Section 2.2		Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1]. OR: Substance is complex UVCB [PrC3].	
	Predominantly hydrophobic [PrC4a].	
	Not biodegradable [PrC5f].	
Operational conditions		Indoor/Outdoor use [OOC3].
Amounts used		
Fraction of EU tonnage used in region [A1]:		1
Regional use tonnage (tonnes/year) [A2]:	Foundry	56,400
	Other Composite Material	1,120,000
Fraction of regional tonnage used locally [A3]:	Foundry	0.177
	Other Composite Material	$8.9 \cdot 10^{-3}$
Maximum daily site tonnage (kg/day) [A4].		33,333
Frequency and duration of use		
Type of release		Continuous release [FD2].
Emission days (days/year) [FD4]		≥ 300
Environmental factors not influenced by risk management		
Local freshwater dilution factor [EF1].		10
Local marine water dilution factor [EF2].		100
Other given operational conditions affecting environmental exposure	Used in open systems.	
	Dry processes.	

Release fraction to air from process [OOC4].	1.2·10 ⁻⁵			
Release fraction to wastewater from process [OOC5].	0			
Release fraction to soil from process (regional only) [OOC6].	0			
Risk Management Measures				
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites thus conservative process release estimates used [TCS 1].			
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil				
Air:	No air emission controls required; required removal efficiency is 0% [TCR5].			
Soil:	Soil emission controls are not applicable as there is no direct release to soil [TCR4].			
Organizational measures to prevent/limit release from site	Prevent discharge of un-dissolved substance to or recover from wastewater [OMS1].			
Conditions and measures related to municipal sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater [TCR3].			
Conditions and measures related to external treatment of waste for disposal	Not applicable.			
Conditions and measures related to external recovery of waste	Not applicable.			
Other environmental control measures additional to above	None.			
Section 3	Exposure Estimation			
3.1. Health				
Measured data has been used to estimate worker exposure.				
PROC #	Inhalation exposure – long term (mg/m³)	RCR inhalation – long term	Inhalation exposure – short term (mg/m³)	RCR inhalation – short term
PROC 1 Foundry	0.002	0.036	0.004	0.036

PROC 1 Other Composite	0.013	0.260	0.026	0.260
PROC 2 – Foundry	0.002	0.036	0.004	0.036
PROC 2 – Other Composite	0.013	0.260	0.026	0.260
PROC 3 – Foundry	0.002	0.036	0.004	0.036
PROC 3 – Other Composite	0.009	0.184	0.018	0.184
PROC 4 – Foundry	0.004	0.078	0.008	0.078
PROC 5 - Foundry	0.002	0.036	0.004	0.036
PROC 5 – Other Composite	0.029	0.582	0.058	0.582
PROC 8a	0.029	0.582	0.058	0.582
PROC 8b	0.029	0.582	0.058	0.582
PROC 13	0.017	0.344	0.034	0.344
PROC 14 Foundry	0.004	0.078	0.008	0.078
PROC 14 Other Composite	0.006	0.116	0.012	0.116
PROC 15	0.006	0.112	0.011	0.112

3.2. Environment

Used EUSES model [EE4].

Compartment	Predicted Environmental Concentration	Risk Characterisation Ratio
Freshwater (mg/l)	$6.87 \cdot 10^{-3}$	$< 6.87 \cdot 10^{-3}$
Marine water (mg/l)	$5.43 \cdot 10^{-4}$	$< 5.43 \cdot 10^{-3}$
Agricultural soil (mg/kg)	0.239	< 0.239
Grassland (mg/kg)	0.239	< 0.239
Section 4	Guidance to check compliance with the Exposure Scenario	

4.1. Health	
Guidance to DU	Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented [GC 22]
	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. [GC 23]
	Further information on the assumptions contained in this Exposure Scenario can be found at: [GC 24] ISOPA interpretation on selection of Use Descriptors
4.2. Environment	
Not applicable	
Section 5	
Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)	
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.	
Control of Worker Exposure	
Not applicable	
Control of environmental exposure	
Not applicable	

Exposure Scenario cluster 7: Professional end uses of MDI

ES Annex to the e-SDS	
Section 1	Exposure Scenario Title
Title	Professional end uses of MDI
Use Descriptor	<p>Sector of Use: SU 22</p> <p>Process Categories and Environmental Release Categories:</p> <p><u>A) Rigid Foam, professional use</u> PROC 3, PROC 4, PROC 5, PROC 8a, PROC 8b, PROC 10, PROC 11 ERC 8c, ERC 8f</p> <p><u>B) Coatings professional use</u> PROC 5, PROC 8a, PROC 10, PROC 11, PROC 13 ERC 8c, ERC 8f</p> <p><u>C) Adhesives and sealants professional use</u> PROC 4, PROC 5, PROC 8a, PROC 8b, PROC 10, PROC 11, PROC 13 ERC 8c, ERC 8f</p> <p><u>D) Composite material based on wood/man-made/mineral/natural fibres, professional use</u> PROC 3, PROC 4, PROC 5, PROC 8a, PROC 8b, PROC 10, PROC 11, PROC 15, PROC 21 ERC 8c, ERC 8f</p> <p><u>E) Other composite material, professional use</u> PROC 2, PROC 3, PROC 5, PROC 8a, PROC 14 ERC 8c, ERC 8f</p>
Processes, tasks, activities covered	<ul style="list-style-type: none"> – PROC 2: Use in closed, continuous process with occasional controlled exposure (e.g. during sampling, sawing, maintenance, equipment cleaning, occasional interventions) – PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. cavity filling, during sampling, maintenance, equipment cleaning, occasional interventions) – PROC 4: Use in batch and other process (synthesis)

	<p>where opportunity for exposure arises (e.g. cavity filling, during use, maintenance/cleaning/incidental interventions)</p> <ul style="list-style-type: none"> – PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact) – PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging) – PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities (e.g. sampling, waste collection & transfer, charging, discharging) – PROC 10: Roller application or brushing (e.g. one component foam use, low energy spreading) – PROC 11: Non industrial spraying – PROC 13: Treatment of articles by dipping and pouring – PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation – PROC 15: Use as laboratory reagent – PROC 21: Low energy manipulation of substances bound in materials and/or articles
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.1	Control of worker exposure
Product characteristics	
Physical form of product	Physical state: liquid (only solid when specifically mentioned)
Concentration of substance in product	G13: Covers percentage substance in the product up to 100 % (unless stated differently).

	Exception: PROC 11 < 60%
Amounts used	Not applicable.
Frequency and duration of use	G2: Covers daily exposures up to 8 hours (unless stated differently).
Human factors not influenced by risk management	None identified.
Contributing Scenarios	Risk Management Measures <i>Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organisational measures, 4. Personal protection</i>
All contributing scenarios at product temperatures <u>below</u> 40 °C for pure MDI or <u>below</u> 45 °C for other MDI based substances	<ul style="list-style-type: none"> - E11: Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). - E3: Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. - PPE14: Use suitable eye protection and gloves. - PPE27: Wear suitable coveralls to prevent exposure to the skin.
All contributing scenarios at product temperatures <u>above</u> 40 °C for pure MDI or <u>above</u> 45 °C for other MDI based substances	<p>Same as above, and:</p> <ul style="list-style-type: none"> - E54: Provide extract ventilation to points where emissions occur. <p>Or</p> <ul style="list-style-type: none"> - E82: Provide extract ventilation to material transfer points and other openings. <p>Or</p> <ul style="list-style-type: none"> - E83: Handle in a fume cupboard or under extract ventilation. <ul style="list-style-type: none"> - PPE30: If above technical/organizational control measures are not feasible, then adopt following PPE: - PPE22: Wear a respirator conforming to EN140 with Type A filter or better. <p>Or</p> <ul style="list-style-type: none"> - demonstrate, e.g. by workplace monitoring, that exposures are below the relevant worker DNEL values for acute and long-term.
PROC 2: Use in closed, continuous process with	- EI18: No specific measures identified.

occasional controlled exposure (e.g. during sampling, sawing, maintenance, equipment cleaning, occasional interventions)	
PROC 3: Use in closed batch processes (synthesis or formulation) (e.g. cavity filling, during sampling, maintenance, equipment cleaning, occasional interventions)	- EI18: No specific measures identified.
PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. cavity filling, during use, maintenance/cleaning/incidental interventions)	- EI18: No specific measures identified.
<u>Activities close to the former line</u> PROC 4: Use in batch and other process (synthesis) where opportunity for exposure arises (e.g. during mat dumping, sampling, maintenance, equipment cleaning, occasional intervention at open areas)	<u>Professional use of MDI for Composite Material Based on Wood/Man-made/Mineral/Natural Fibres</u> - E82: Provide extract ventilation to material transfer points and other openings. - Minimal efficiency exhaust ventilation: $\geq 25\%$ - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.
PROC 5: Mixing or blending in batch processes for formulations or preparations and articles (multistage and/or significant contact)	<u>Rigid foams and Coatings</u> <u>Professional use of MDI for Composite Material Based on Wood/Man-made/Mineral/Natural Fibres</u> - EI18: No specific measures identified. <u>Adhesives and sealants and Other Composite Material</u> - E54: Provide extract ventilation to points where emissions occur.
PROC 8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities (e.g. sampling, waste collection &	- EI18: No specific measures identified. If solid MDI: - PPE29: Wear a respirator conforming to EN140 with Type A/P2 filter or better.

transfer, charging, discharging)	
PROC8b: Transfer of substance or preparation (charging/ discharging) from/to vessels/ large containers at dedicated facilities(e.g. sampling, waste collection & transfer, charging, discharging).	- EI18: No specific measures identified.
PROC 10: Roller application or brushing (e.g. one component foam use, low energy spreading)	- EI18: No specific measures identified.
PROC 11: Non industrial spraying (indoor and outdoor)	<ul style="list-style-type: none"> - OC28: Avoid carrying out activities involving exposure for more than 4 hours - PPE32: Wear a full face respirator conforming to EN140 with Type A/P2 filter or better. - E4: Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying
PROC 13: Treatment of articles by dipping and pouring	- EI18: No specific measures identified
PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation	- E54: Provide extract ventilation to points where emissions occur.
PROC 15: Use as laboratory reagent	- EI18: No specific measures identified.
PROC 21: Low energy manipulation of substances bound in materials and/or articles	- E54: Provide extract ventilation to points where emissions occur.
Section 2.2	Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1].
	OR: Substance is complex UVCB [PrC3].
	Predominantly hydrophobic [PrC4a].
	Not biodegradable [PrC5f].
Operational conditions	Indoor/Outdoor use [OOC3].
Amounts used	
Fraction of EU tonnage used in	1

region [A1]:		
Regional use tonnage (tonnes/year) [A2]:	Rigid foam, Composite Material based on Wood/Man-made/Mineral/ Natural Fibres and Other Composite Material	Up to 1,120,000
	Coatings and Adhesives and sealants	60,000
Fraction of regional tonnage used locally [A3]:		$2.0 \cdot 10^{-3}$
Maximum daily site tonnage (kg/day) [A4].	Rigid foam , Composite Material based on Wood/Man-made/Mineral/ Natural Fibres and Other Composite Material	6,137
	Coatings and Adhesives and sealants	329
Frequency and duration of use		
Type of release		Dispersive use [FD3].
Emission days (days/year) [FD4]		365
Environmental factors not influenced by risk management		
Local freshwater dilution factor [EF1].		10
Local marine water dilution factor [EF2].		100
Other given operational conditions affecting environmental exposure		Used in open systems.
		Dry processes.

Release fraction to air from process [OOC4].	0.15			
Release fraction to wastewater from process [OOC5].	0			
Release fraction to soil from process (regional only) [OOC6].	5.0·10 ⁻³			
Risk Management Measures				
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites thus conservative process release estimates used [TCS 1].			
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil				
Air:	No air emission controls required; required removal efficiency is 0% [TCR5].			
Soil:	Soil emission controls are not applicable as there is no direct release to soil [TCR4].			
Organizational measures to prevent/limit release from site	Prevent discharge of un-dissolved substance to or recover from wastewater [OMS1].			
Conditions and measures related to municipal sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater [TCR3].			
Conditions and measures related to external treatment of waste for disposal	Not applicable.			
Conditions and measures related to external recovery of waste	Not applicable.			
Other environmental control measures additional to above	None.			
Section 3	Exposure Estimation			
3.1. Health				
Measured data has been used to estimate worker exposure.				
PROC #	Inhalation exposure – long term (mg/m ³)	RCR inhalation – long term	Inhalation exposure – short term (mg/m ³)	RCR inhalation – short term
PROC 2	0.013	0.260	0.026	0.260

PROC 3	0.009	0.184	0.018	0.184
PROC 3 (<u>Composite material based on wood/man-made/ mineral/ natural fibers. professional use</u>)	0.002	0.038	0.004	0.038
PROC 4	0.006	0.116	0.012	0.116
PROC 4 (<u>Composite material based on wood/man-made/ mineral/ natural fibers. professional use</u>)	0.011	0.227	0.023	0.227
PROC 5	0.029	0.582	0.058	0.582
PROC 5 (enclosed)	0.012	0.246	0.025	0.246
PROC 8a	0.029	0.582	0.058	0.582
PROC 8b	0.029	0.582	0.058	0.582
PROC 8b (<u>Composite material based on wood/man-made/ mineral/ natural fibers. professional use</u>)	0.002	0.034	0.003	0.034
PROC 10	0.017	0.328	0.034	0.328
PROC 11- Indoor	0.04	0.80	0.08	0.80
PROC 11- Outdoor	0.043	0.87	0.087	0.87
PROC 13	0.017	0.344	0.034	0.344
PROC 14	0.006	0.116	0.012	0.116
PROC 15	0.006	0.112	0.011	0.112
PROC 21	0.0004	0.008	0.001	0.008

3.2. Environment		
Used EUSES model [EE4].		
Compartment	Predicted Environmental Concentration	Risk Characterisation Ratio
Freshwater (mg/l)	$6.94 \cdot 10^{-3}$	$< 6.94 \cdot 10^{-3}$
Marine water (mg/l)	$5.45 \cdot 10^{-4}$	$< 5.45 \cdot 10^{-3}$
Agricultural soil (mg/kg)	0.240	< 0.240
Grassland (mg/kg)	0.240	< 0.240
Section 4	Guidance to check compliance with the Exposure Scenario	
4.1. Health		
Guidance to DU	Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented [GC 22]	
	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. [GC 23]	
	Further information on the assumptions contained in this Exposure Scenario can be found at: [GC 24] ISOPA interpretation on selection of Use Descriptors	
4.2. Environment		
Not applicable		
Section 5		
Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)		
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.		
Control of Worker Exposure		
Not applicable		
Control of environmental exposure		
Not applicable		

Exposure Scenario cluster 8: Consumer end uses of MDI

ES Annex to the e-SDS	
Section 1	Exposure Scenario Title
Title	Consumer uses of MDI
Use Descriptor	Sector of Use: SU 21
	Product category: PC 1, PC 9a, PC 32
	Environmental Release Categories: ERC 8c, ERC 8f
Processes, tasks, activities covered	<ul style="list-style-type: none"> • Rigid foam • Coatings • Adhesives and sealants
Section 2	Operational conditions and risk management measures
<i>Field for additional statements to explain scenario if required.</i>	
Section 2.2	Control of consumer exposure
Physical form of product	Physical state: liquid (only solid when specifically mentioned)
Contributing Scenarios	Operations conditions
PC 32: Rigid, insulation foams	<ul style="list-style-type: none"> – For each use event, covers use amounts up to 825 g [ConsOC2]; – Covers use in room size of 57.5 m³ [ConsOC11]; – For each use event, covers exposure up to 0.5 hr/event [ConsOC14];
PC 9a: Coatings, paints Use of 2-component paint, solvent rich	<ul style="list-style-type: none"> – Covers concentrations up to 30% [ConsOC1]; – For each use event, covers use amounts up to 150g [ConsOC2]; – Covers use in room size of 20m³ [ConsOC11]; – For each use event, covers exposure up to 2.00 hr/event [ConsOC14];
PC 9a: Coatings, paints Use of 2-component paint, high solid	<ul style="list-style-type: none"> – Covers concentrations up to 30% [ConsOC1]; – For each use event, covers use amounts up to 195g [ConsOC2]; – Covers use in room size of 20m³ [ConsOC11]; – For each use event, covers exposure up to 0.5 hr/event [ConsOC14];
PC 9a: Coatings, paints Mixing and loading of 2-component solvent rich paint	<ul style="list-style-type: none"> – Covers concentrations up to 100% [ConsOC1]; – For each use event, covers use amounts up to 150g [ConsOC2];

	<ul style="list-style-type: none"> For each use event, covers exposure up to 5 minutes/event [ConsOC14];
PC9a: Coatings, paints Mixing and loading of 2-component high solid paint	<ul style="list-style-type: none"> Covers concentrations up to 100% [ConsOC1]; For each use event, covers use amounts up to 195g [ConsOC2]; For each use event, covers exposure up to 5 minutes/event [ConsOC14];
PC 9a: Coatings, paints Floor coating high solid	<ul style="list-style-type: none"> Covers concentrations up to 10% [ConsOC1]; For each use event, covers use amounts up to 3000g [ConsOC2]; Covers use in room size of 34m³ [ConsOC11]; For each use event, covers exposure up to 1.00 hr/event [ConsOC14];
PC 1 Adhesives and sealants, sealant joint	<ul style="list-style-type: none"> Covers concentrations up to 2% [ConsOC1]; Covers skin contact area up to 2cm² [ConsOC5]; For each use event, covers use amounts up to 75g [ConsOC2]; Covers use in room size of 10m³ [ConsOC11]; For each use event, covers exposure up to 45 min./event [ConsOC14];
PC 1 Adhesives and sealants, sealant assembly	<ul style="list-style-type: none"> Covers concentrations up to 2% [ConsOC1]; Covers skin contact area up to 43cm² [ConsOC5]; For each use event, covers use amounts up to 390g [ConsOC2]; Covers use in room size of 20m³ [ConsOC11]; For each use event, covers exposure up to 4.00 hr/event [ConsOC14];
PC 1 Adhesives and sealants, adhesive hotmelt	<ul style="list-style-type: none"> Covers skin contact area up to 43cm² [ConsOC5]; For each use event, covers use amounts up to 65g [ConsOC2]; Covers use in room size of 20m³ [ConsOC11]; For each use event, covers exposure up to 25 min./event [ConsOC14];
Contributing Scenarios	Risk Management Measures
PC 32: Rigids, insulation foams	ConsRMM06: Avoid using without gloves.
PC 9a: Coatings, paints Use of 2-component paint,	ConsRMM06: Avoid using without gloves. ConsRMM08: Avoid using when windows closed.

solvent rich		
PC 9a: Coatings, paints Use of 2-component paint, high solvent		ConsRMM06: Avoid using without gloves. ConsRMM08: Avoid using when windows closed.
PC 9a: Coatings, paints Mixing and loading of 2- component solvent rich paint		ConsRMM06: Avoid using without gloves.
PC 9a: Coatings, paints Mixing and loading of 2- component high solid paint		ConsRMM06: Avoid using without gloves.
PC 9a: Coatings, paints Floor coating high solid		ConsRMM06: Avoid using without gloves. ConsRMM08: Avoid using when windows closed.
PC 1 Adhesives and sealants, sealant joint		ConsRMM06: Avoid using without gloves.
PC 1 Adhesives and sealants, sealant assembly		ConsRMM06: Avoid using without gloves. ConsRMM08: Avoid using when windows closed.
PC 1 Adhesives and sealants, adhesive hotmelt		ConsRMM06: Avoid using without gloves.
Section 2.2		Control of environmental exposure
Product characteristics		Substance is a unique structure [PrC1]. OR: Substance is complex UVCB [PrC3].
		Predominantly hydrophobic [PrC4a].
		Not biodegradable [PrC5f].
Operational conditions		Indoor/Outdoor use [OOC3].
Amounts used		
Fraction of EU tonnage used in region [A1]:		1
Regional use tonnage (tonnes /year) [A2]:	Rigid foam	Up to 1,120,000
	Coatings and Adhesives and sealants	60,000
Fraction of regional tonnage used locally [A3]:		$2.0 \cdot 10^{-3}$
Maximum daily site tonnage (kg/day) [A4].	Rigid foam	6,137
	Coatings	329

	and Adhesives and sealants	
Frequency and duration of use		
Type of release	Dispersive use [FD3].	
Emission days (days/year) [FD4]	365	
Environmental factors not influenced by risk management		
Local freshwater dilution factor [EF1].	10	
Local marine water dilution factor [EF2].	100	
Other given operational conditions affecting environmental exposure	Used in open and closed systems	
	Dry processes.	
Release fraction to air from process [OOC4].	0.15	
Release fraction to wastewater from process [OOC5].	0	
Release fraction to soil from process (regional only) [OOC6].	5.0·10 ⁻³	
Risk Management Measures		
Technical conditions and measures at process level (source) to prevent release	Common practices vary across sites thus conservative process release estimates used [TCS 1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil		
Air:	No air emission controls required; required removal efficiency is 0% [TCR5].	
Soil:	Soil emission controls are not applicable as there is no direct release to soil [TCR4].	
Organizational measures to prevent/limit release from site	Prevent discharge of undissolved substance to or recover from wastewater [OMS1].	
Conditions and measures related to municipal sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater [TCR3].	

Conditions and measures related to external treatment of waste for disposal	Not applicable.			
Conditions and measures related to external recovery of waste	Not applicable.			
Other environmental control measures additional to above	None.			
Section 3	Exposure Estimation			
G31: The Consexpo model has been used to estimate consumer exposures unless otherwise indicated.				
Relevant Use	Inhalation exposure (mg/m ³ /day)	RCR chronic	Inhalation exposure (event) (mg/m ³ /day)	RCR acute
PC 32: Rigid, insulation foams	2,54E-05	<0.01	1.22E-03	0.02
PC 9a: Coatings, paints Use of 2-component paint, solvent rich	3.72E-03	0.15	4.06E-02	0.81
PC 9a: Coatings, paints Use of 2-component paint, high solid	8.22E-04	0.03	3.7E-02	0.74
PC 9a: Coatings, paints Mixing and loading of 2-component solvent rich paint	1.92E-07	<0.01	5.52E-05	<0.01
PC 9a: Coatings, paints Mixing and loading of 2-component high solid paint	1.92E-07	<0.01	5.52E-05	<0.01
PC 9a: Coatings, paints Floor coating high solid	1.39E-03	0.06	3.0E-02	0.67
PC 1 Adhesives and sealants, sealant joint	2.31E-05	<0.01	7.39E-04	0.01
PC 1 Adhesives and sealants, sealant assembly	0.01	0.30	4.0E-02	0.90
PC 1 Adhesives and	6.94E-07	<0.01	4.00E-05	<0.01

sealants, adhesive hotmelt				
3.2. Environment				
Used EUSES model [EE4].				
Compartment	Predicted Environmental Concentration		RCR	
Freshwater (mg/l)	6.94·10 ⁻³		< 6.94·10 ⁻³	
Marine water (mg/l)	5.45·10 ⁻⁴		< 5.45·10 ⁻³	
Agricultural soil (mg/kg)	0.240		< 0.240	
Grassland (mg/kg)	0.240		< 0.240	
Section 4	Guidance to check compliance with the Exposure Scenario			
4.1. Health				
Guidance to DU	Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented [GC 22]			
	Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. [GC 23]			
	Further information on the assumptions contained in this Exposure Scenario can be found at: [GC 24] ISOPA interpretation on selection of Use Descriptors			
4.2. Environment				
Not applicable				
Section 5				
Additional good practice advice beyond the REACH Chemical Safety Assessment - (Section Optional)				
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37 (4) of REACH.				
Control of Consumer Exposure				
Not applicable				
Control of environmental exposure				
Not applicable				