

# eteam project: Characterisation of dataset

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# Overview

- ❖ Data sources
- ❖ Data collection and consolidation
- ❖ Summary of final external validation dataset
  - Individual measurements
  - Aggregated datasets
- ❖ Database structure
- ❖ Generation of tool estimates
  - Coding of situations into tools
- ❖ Conclusions

# Data sources



- ❖ Exposure measurement data and descriptive contextual information were collected from a wide variety of data providers
  - Advisory Board members (BAuA, EBRC, HSE, IFA, NIOSH, SECO)
  - Lund University, BEAT dermal database
  - Project team: ITEM and IOM
  
- ❖ Personal samples
  - Powders/ liquids/ metal processing fumes/ metal abrasion
  - Mix of task-based and time weighted average representative samples
  - REACh-relevant where possible
  
- ❖ Inhalation and dermal data sought, however dermal data limited in scope and quality

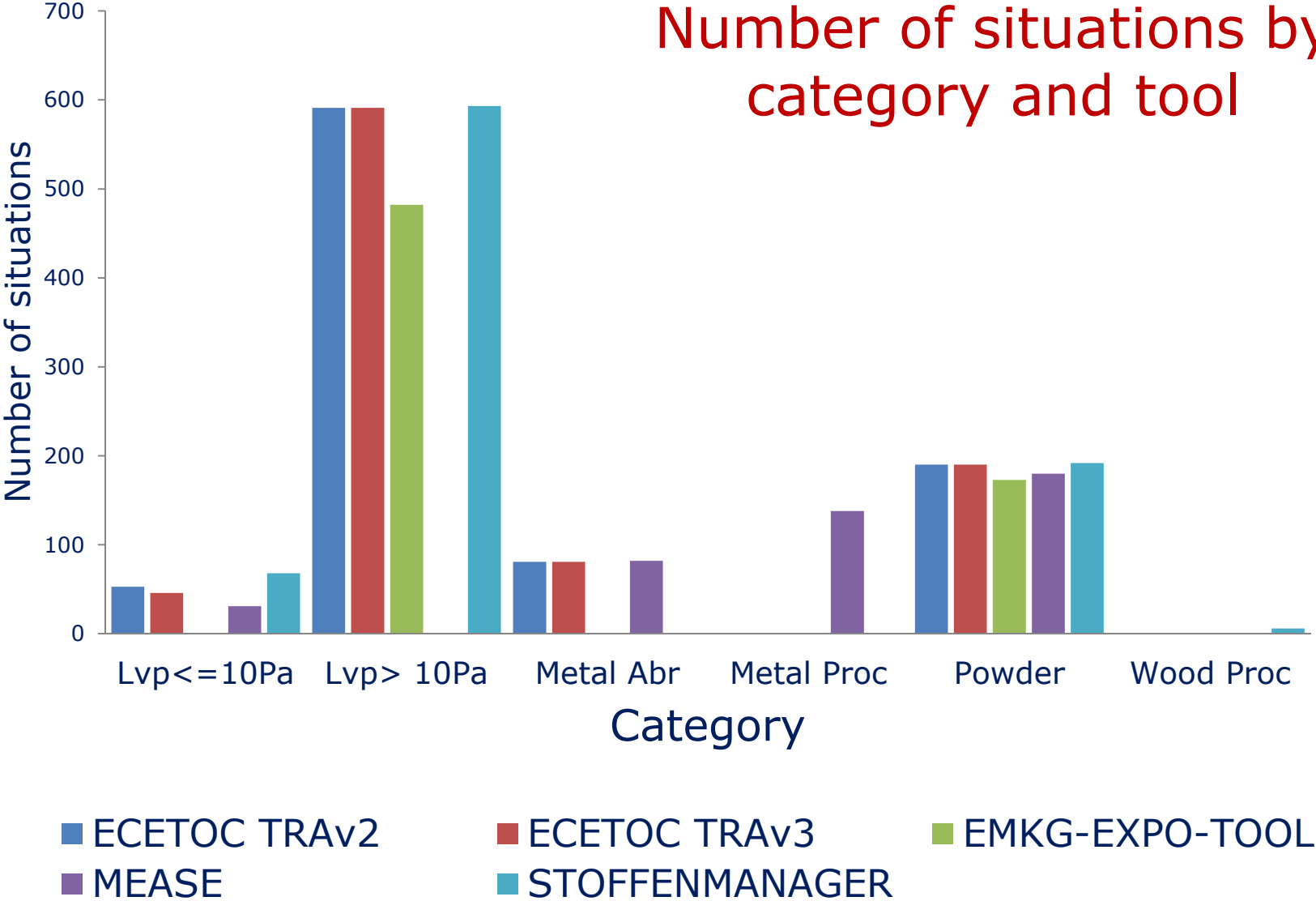
# Tasks common to majority of tools



- ❖ **PROC3**: Use in closed batch process (synthesis or formulation)
- ❖ **PROC4**: Use in batch and other process (synthesis) where opportunity for exposure arises
- ❖ **PROC5**: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
- ❖ **PROC7/11**: Industrial and non-industrial spraying
- ❖ **PROC8a/8b**: Transfer of substance or preparation from/to vessels/large containers
- ❖ **PROC9**: Transfer of substance or preparation into small containers
- ❖ **PROC10**: Roller application or brushing (liquids)
- ❖ **PROC13**: Treatment of articles by dipping and pouring (liquids)
- ❖ **PROC14**: Production of preparations or articles by tableting, compression (solids)
- ❖ **PROC15**: Use as laboratory reagent
- ❖ **Plus metals data**: hot and abrasive processes

Physical form/ emission generating process	Number of situations by Data Provider											
	A	B	C	D	E	F	G	H	J	K	M	Total
Liquid with vapour pressure ≤10Pa	3	5	31	0	14	10	19	2	18	0	14	116
Liquid with vapour pressure > 10Pa	95	86	270	7	0	0	7	0	0	109	20	594
Metal abrasion	17	6	54	1	0	0	2	3	0	0	0	83
Metal Processing	24	9	98	0	0	0	0	7	0	0	0	138
Powder	16	7	130	0	0	0	2	23	2	0	14	194
Wood processing	3	0	0	3	0	0	0	0	0	0	0	6
Total	158	113	583	11	14	10	30	35	20	109	48	1131

# Number of situations by category and tool



## Number of situations by PROC code (all providers)

PROC	No. of situations	PROC	No. of situations
1 - Use in closed process, no likelihood of exposure	1	13 -Treatment of articles by dipping and pouring	185
2 - Use in closed, continuous process with occasional controlled exposure	2	14 - Production of preparations or articles by tableting, compression, extrusion, pelletisation	17
3 - Use in closed batch process (synthesis or formulation)	5	15 - Use of laboratory reagents in small scale laboratories	5
4 - Use in batch and other process (synthesis) where opportunity for exposure arises	34	19 - Hand-mixing with intimate contact (only PPE available)	51
5 -Mixing or blending in batch processes (multistage and/or significant contact)	82	21 - Low energy manipulation of substances bound in materials and/or articles	14
7 -Industrial spraying	108	22 - Potentially closed processing operations with minerals/metals at elevated temperatures	20
8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	37	23 - Open processing and transfer operations with minerals/metals at elevated temperatures	41
8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	139	24- High (mechanical) energy work-up of substances bound in materials or articles	80
9 -Transfer of chemicals into small containers (dedicated filling line)	44	25 - Other hot work operations with metals	76
10 - Roller application or brushing	135	27a - Production of metal powders (hot processes)	1
11 - Non industrial spraying	54	Total number of situations	1131

# Number of individual inhalation measurements by category

Category	Number of measurements
Lvp $\leq$ 10Pa	316
Lvp > 10Pa	1356
Metal Abrasion	84
Metal Processing	71
Powder	257
Wood processing	14
Total	2098



# Aggregated inhalation data



## Type 1- aggregated for a single situation

### ❖ Provider H

- 35 situations
- 1056 measurements
- Mixture of hot metal processes, metal abrasion and powder handling

### ❖ Provider B

- 46 situations
- 301 measurements
- Volatile liquids and powders
- Food processing and battery manufacture

## Type 2- aggregated across a range of situations

### ❖ Provider C

- Data grouped by PROC code, physical form, presence of LEV
- Grouped by single substance where possible, otherwise mixed chemical group used
- Summary statistics provided for groups by provider
- Range of activities: powders, volatile liquids, metal and abrasive processes
- 266 measurements for liquids and 220 for solids

# Number of situations by tool (Type 1 aggregated data)



Category	Tool/ Number of situations				
	ECETOC TRAv2	ECETOC TRAv3	MEASE	EMKG-EXPO-Tool	STOFFEN-MANAGER
Lvp $\leq$ 10Pa	0	0	2	0	1
Lvp > 10Pa	38	38	0	37	38
Metal Abrasion	3	3	3	0	0
Metal Processing	0	0	7	0	0
Powder	29	29	29	28	29

# Number of groups by tool (Type 2 aggregated data)

Category	Tool/ Number of groups				
	ECETOC TRAv2	ECETOC TRAv3	MEASE	EMKG-EXPO-Tool	STOFFEN-MANAGER
Lvp $\leq$ 10Pa	0	0	0	0	4
Lvp > 10Pa	30	30	0	24	30
Metal Abrasion	7	7	7	0	0
Metal Processing	0	0	18	0	0
Powder	16	16	16	14	16

# eteam database

- ❖ Microsoft Access: based on ART exposure database
  
- ❖ Multifunctional
  - contextual information on exposure situations
  - results from related exposure measurements
  - coded parameters for all the tools and
  - procedures for applying the tools and storing the resultant exposure estimates

# Exposure Situation Description



## Exposure Situation Details

ES System ID: 6197

Date Added: 21/11/2012

ES ID	HSE1	Entered By	JL
PROC	PROC 10 Roller application or brushing of adhesive and other coating	Owner	HSEHSL
Chemical Name	Styrene	CAS No	100-42-5
		% Chem In Prod	35
Inhalation	<input checked="" type="checkbox"/>	Dermal Actual	<input type="checkbox"/>
		Dermal Potential	<input type="checkbox"/>
		8 Hour	<input type="checkbox"/>
		Task Based Meas	<input checked="" type="checkbox"/>
Owner			

### Exposure Situation Name

exposure to styrene during manual laminating of GRP during manufacture of water tanks - long term sampling- task based sampling

### General Description of the situation (e.g. industry, activities, type of product)

The situation covers the manufacture Glass Reinforced Plastic (GRP) water storage tanks using manual lamination processes.

### Activity determinants (techniques, use-rate)

Tanks of various sizes are constructed from a series of GRP panels which are bolted together. The GRP panels are produced in the laminating area at the rear half of the unit then passed through to be finished in the front half of the unit. The two halves of the unit are separated to prevent dust spread from the finishing area into the laminating area.

Four male employees were operating in the laminating area. Three of these were laminators (2 full time and 1 part time), there was also a labourer.

### RMM (Local exhaust ventilation, enclosure, segregation, type of RPE, type of PPE )

Operators wore nitrile gloves and polythene aprons over work wear that they provided. No Respiratory Protective Equipment was worn for routine production tasks:

A push pull system of venting the laminating work area was available. This consisted of floor standing fans situated at the end of the unit adjacent the finishing area and two axial fans mounted at low level in the exterior wall at the end of the unit. The system was not in use during the survey, as the laminators wanted the temperature in the unit to increase and thereby shorten the setting time for the resin.

### Product information (analyte concentration, dustiness, volatility)

no information on concentration of styrene in resin was available. Assumption made that the percentage composition is 35% styrene.

### Environment (location, room volume, general ventilation)

unit was formally an aircraft hanger used by the Royal Navy and measured approximately 50 meters long by 18 metres wide and 12 meters in height to the apex of the roof.

### Exposure pattern (duration, frequency per shift/day/week/year)

there was no information available on the duration or frequency of exposure.

# e.g. ECETOC TRAv2 input parameters



<b>ES ID</b>	HSE1	<b>ES Title</b>	exposure to styrene during manual laminating of GRP during man		<b>Quality of assessment</b>	<input type="text"/>
<b>Date Coded</b>	<input type="text"/>	<b>Coder</b>	<input type="text"/>			
		<b>Entered Value</b>	<b>Rating</b>	<b>Alternative used</b>		
<b>Molecular Weight</b>	<input type="text"/>					
<b>Indicative Reference Value (Inhalation) mg/m3</b>	<input type="text"/>					
<b>Basis of the Inhalation Indicative Reference Value</b>	<input type="text"/>					
<b>Indicative Reference Value (Dermal) mg/kg bw/day</b>	<input type="text"/>					
<b>Basis of the Demal Indicative Reference Value</b>	<input type="text"/>					
<b>Is this Substance Solid?</b>	<input type="text"/>					
<b>Dustiness</b>	<input type="text"/>		<input type="text"/>	<input type="text"/>		
<b>Volatility (Pa)</b>	<input type="text"/>					
<b>Select a Process Category (PROC)</b>	<input type="text"/>		<input type="text"/>	<input type="text"/>		
<b>Industrial or Public Domain (Professional) Activity?</b>	<input type="text"/>		<input type="text"/>	<input type="text"/>		
<b>Does this activity take place indoors or outdoors?</b>	<input type="text"/>		<input type="text"/>	<input type="text"/>		
<b>Is Local Exhaust Ventilation present ?</b>	<input type="text"/>		<input type="text"/>	<input type="text"/>		
<b>What is the Duration of the Activity?</b>	<input type="text"/>		<input type="text"/>	<input type="text"/>		
<b>What type of respiratory protection is used?</b>	None		<input type="text"/>	<input type="text"/>		
<b>Is the substance used in a Preparation?</b>	<input type="text"/>		<input type="text"/>	<input type="text"/>		
<b>Select the concentration range (w/w)</b>	<input type="text"/>		<input type="text"/>	<input type="text"/>		
<b>Inhalative Exposure Estimate (ppm)</b>	0					
<b>Inhalative Exposure Estimate (mg/m3)</b>	0					
<b>Dermal Exposure Estimate (mg/kg bw/day)</b>	0					
<b>Total Exposure=Dermal+Inhalative(mg/kg bw/day)</b>	0					
<b>All required fields have been entered?</b> <input type="checkbox"/>						





Data  
collection

Team  
coding  
approach

Generation  
of exposure  
estimates  
from tools

# Coding of situations into the tools



❖ BURE had identified a number of issues where between user variation was common:

- Allocation of task/handling activity
- Allocation of setting (professional v industrial)
- Dustiness
- Duration of exposure

❖ Quality control manual

- “Best” option chosen in first instance
- Agreed defaults where the description was unclear - “middle” option chosen
- Recorded level of uncertainty in choice

❖ Coding meetings

❖ Blind recoding of 10% of situations

- Anomalies investigated and corrected
- Additional check by provider C during grouping process



# Generating tool estimates

<b>Tool</b>	<b>Estimate generation method</b>
<b>ECETOC TRAv2</b>	Routine developed to run tool in batch mode
<b>ECETOC TRAv3</b>	Tool inputs extracted and entered into normal tool batch mode
<b>EMKG-EXPO-Tool</b>	Decision tree replicated in database
<b>MEASE</b>	Routine developed to run tool in batch mode
<b>Stoffenmanager</b>	Tool algorithms programmed in database then scores converted using equations from Marquart et al (2008)

- ❖ Proportion of input choices from situations run through real tools to verify functionality/ estimates
- ❖ Tool exposure estimates linked back to the situation in database

# Conclusions



- ❖ Final inhalation data set is representative of REACh-relevant activities, physical forms and substances, but some gaps
- ❖ Dermal data were not considered sufficient to carry out an effective validation
- ❖ Main inhalation process types are well covered-transfers, mixing, spraying and fume generation
  - situations reflect normal occ. hygiene risk concerns rather than being REACh-specific, i.e. majority relate to volatile organics
  - high, medium and low exposures included
- ❖ Adequate coverage of applicability range of tools to proceed with external validation exercise

# Acknowledgements



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