

Application of ProScale™ – a life cycle oriented method to assess human toxicity potentials of product systems

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ProScale™ calculation scheme

$$\text{ProScale} = \sum_{\text{substances unit processes}} \text{HF} \times \text{ECF} \times \text{PHF} \times \text{MF}$$

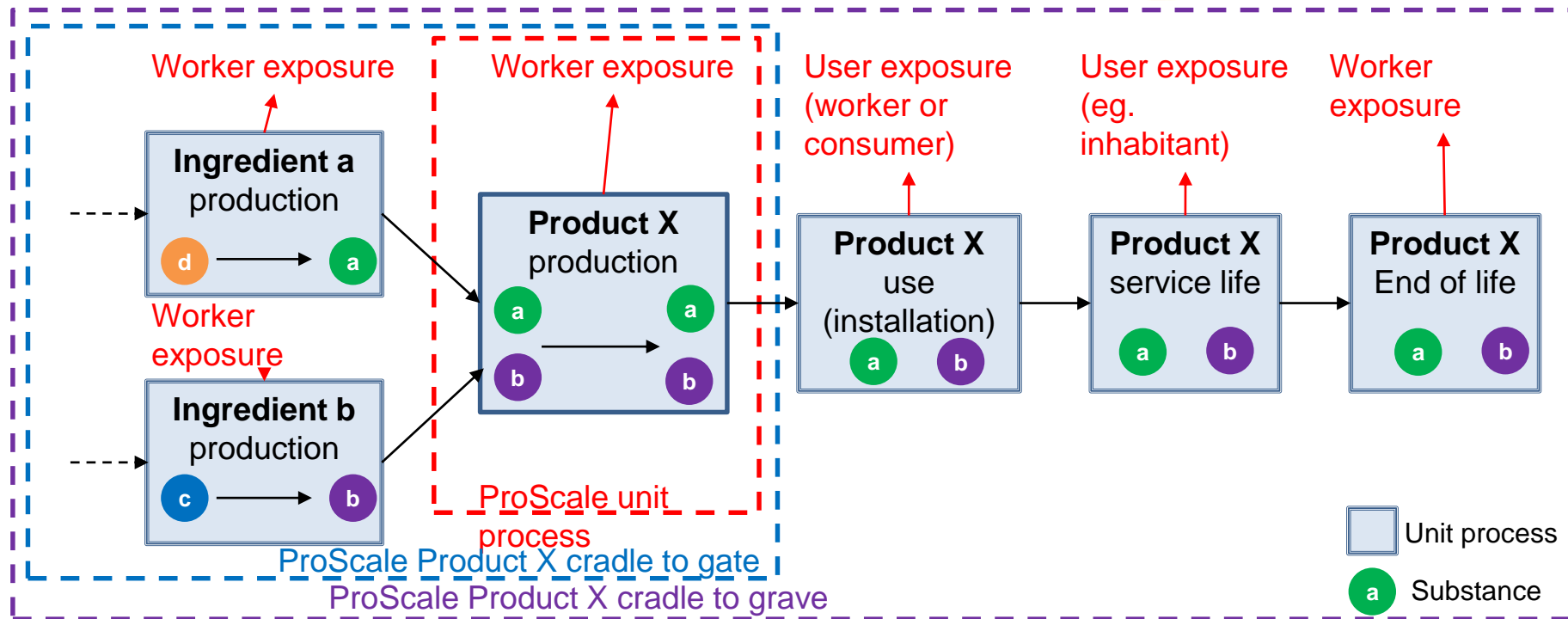
HF
Hazard Factor
Substance hazard, based on H-phrase and OEL

ECF
Exposure Concentration Factor
Modelled exposure, based on standard process conditions

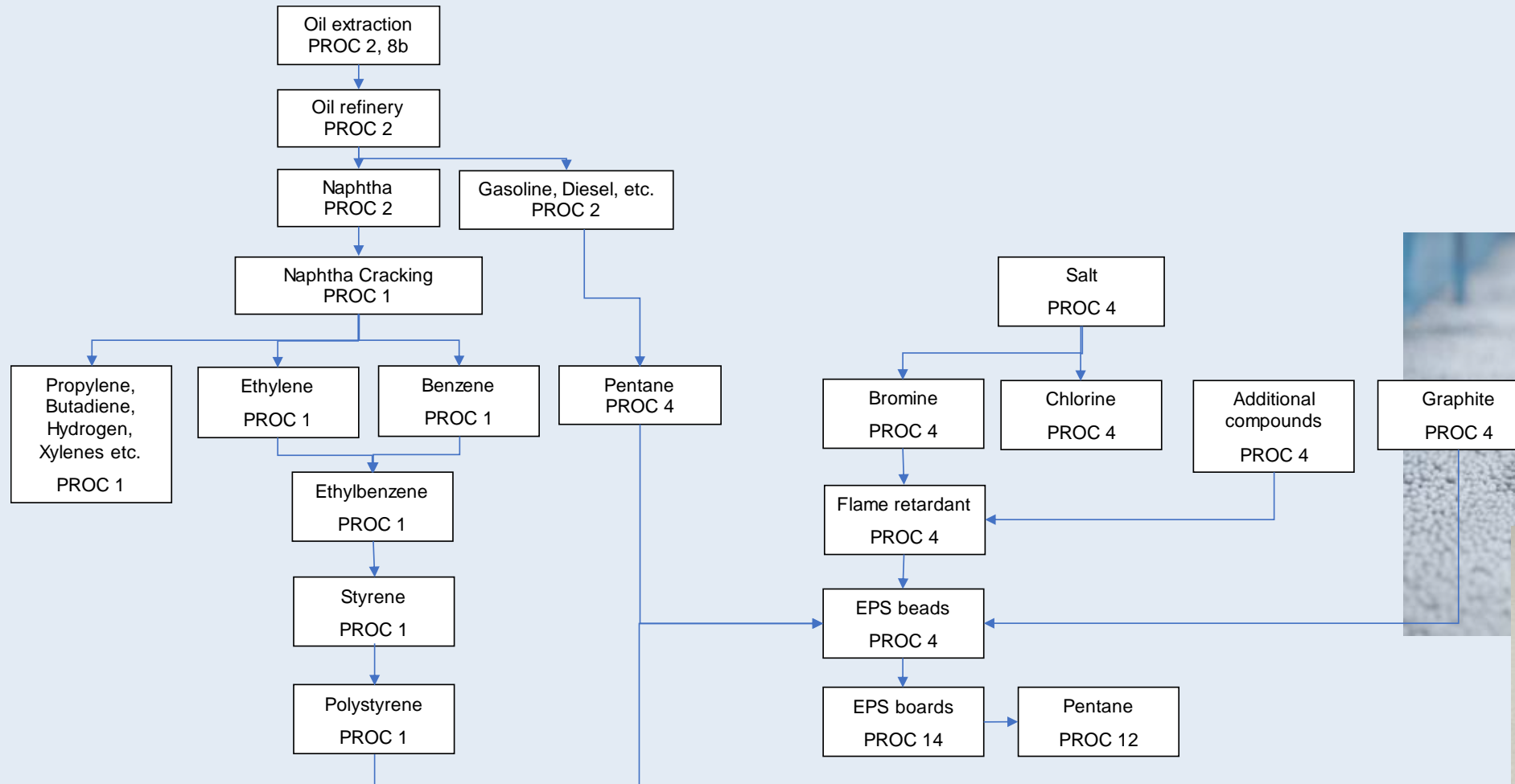
PHF
Person-Hours Factor
Number of person-hours of exposure per mass unit of produced product

MF
Mass Flow
The amount of substance used per functional unit

■ Substance specific
■ Process specific
■ Product system dependent

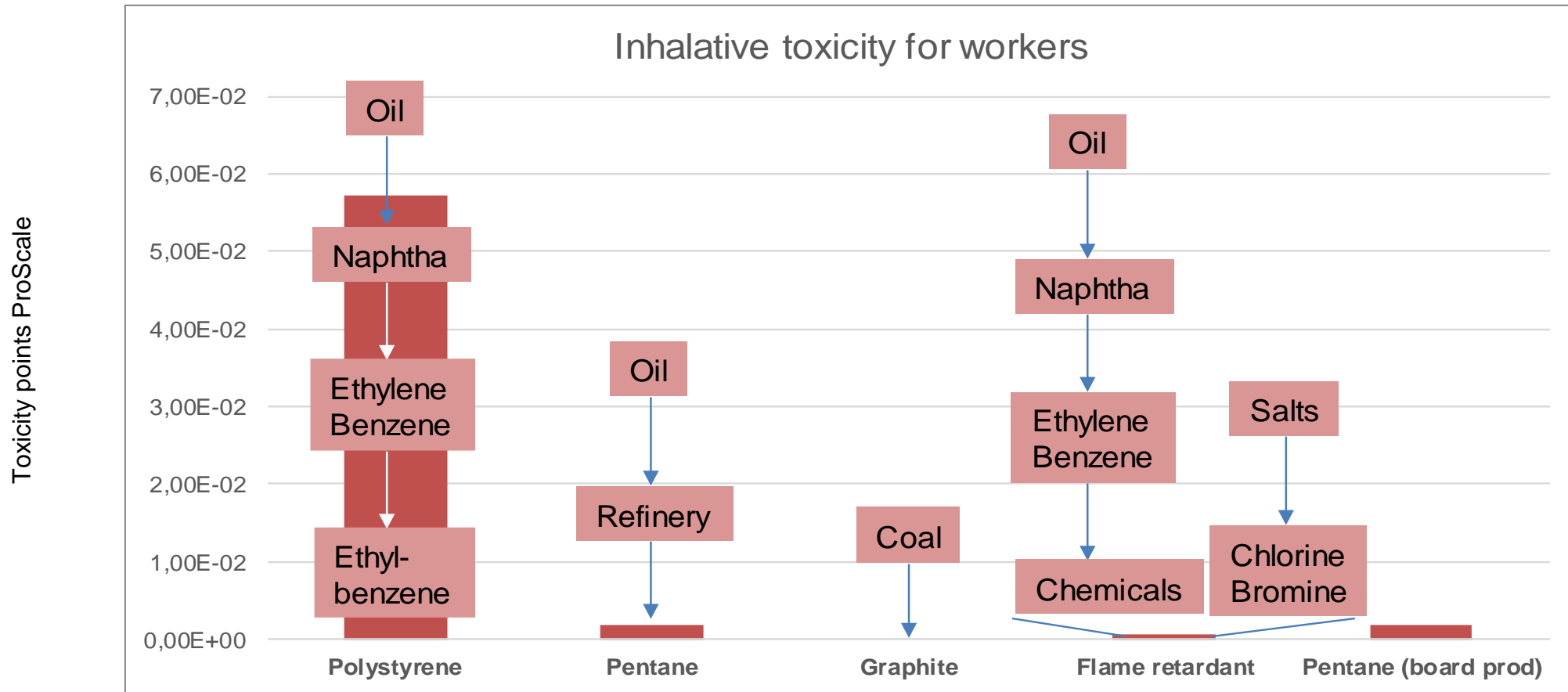


ProScale™ example EPS insulation board – system boundaries from cradle-to-gate



Scope of the ProScale™ test case

Results EPS boards for different compounds



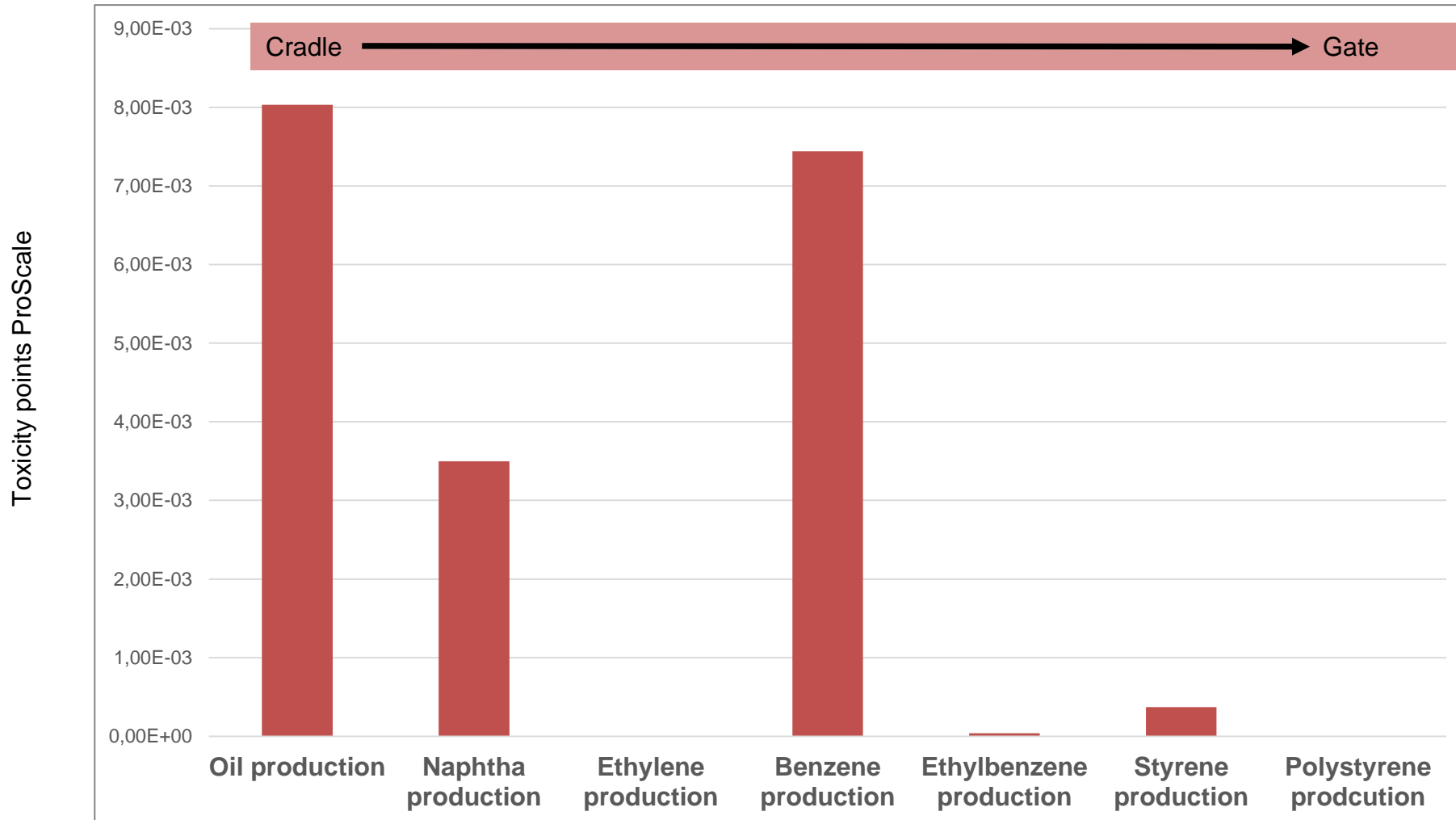
Highest contribution

- Polystyrene via naphtha upstream calculation
- Flame retardant bromine production
- Pentane exposure in the blowing process

All products assessed as cradle to gate with mass flows, the total is the EPS board system

Scope of the ProScale™ test case

Contribution of the substances to the process (EPS board production) + the upstream part; Inhalative toxicity for workers



Highest contribution

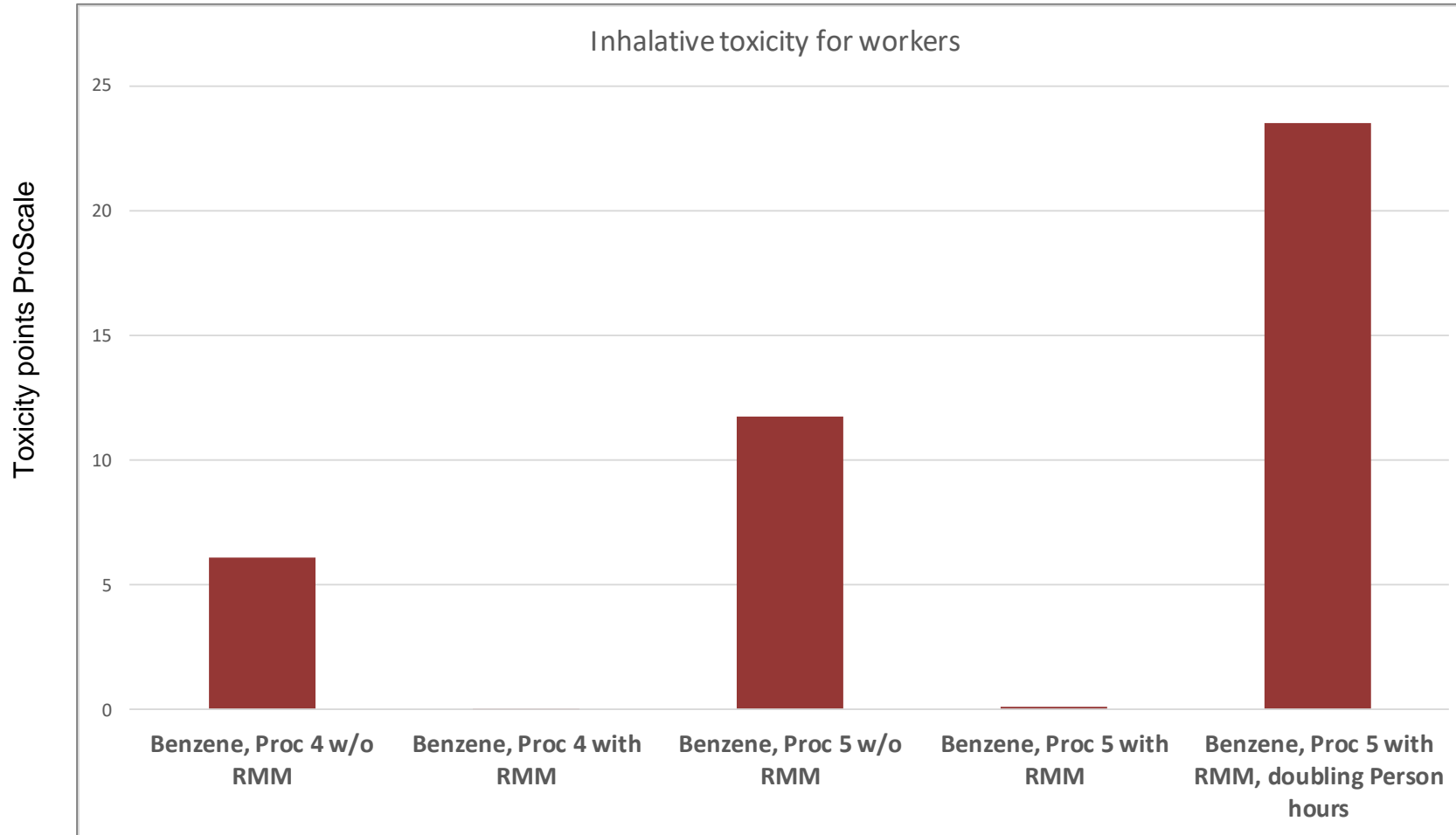
- Oil production as basis for all petrochemical products
- Benzene with H350, H340 classification
- Naphtha production with H350, H340 classification

Low contribution

- Ethylene with H220, H336
- ...
- Styrene with H226, H332, H 315 ...

Scope of the ProScale™ test case

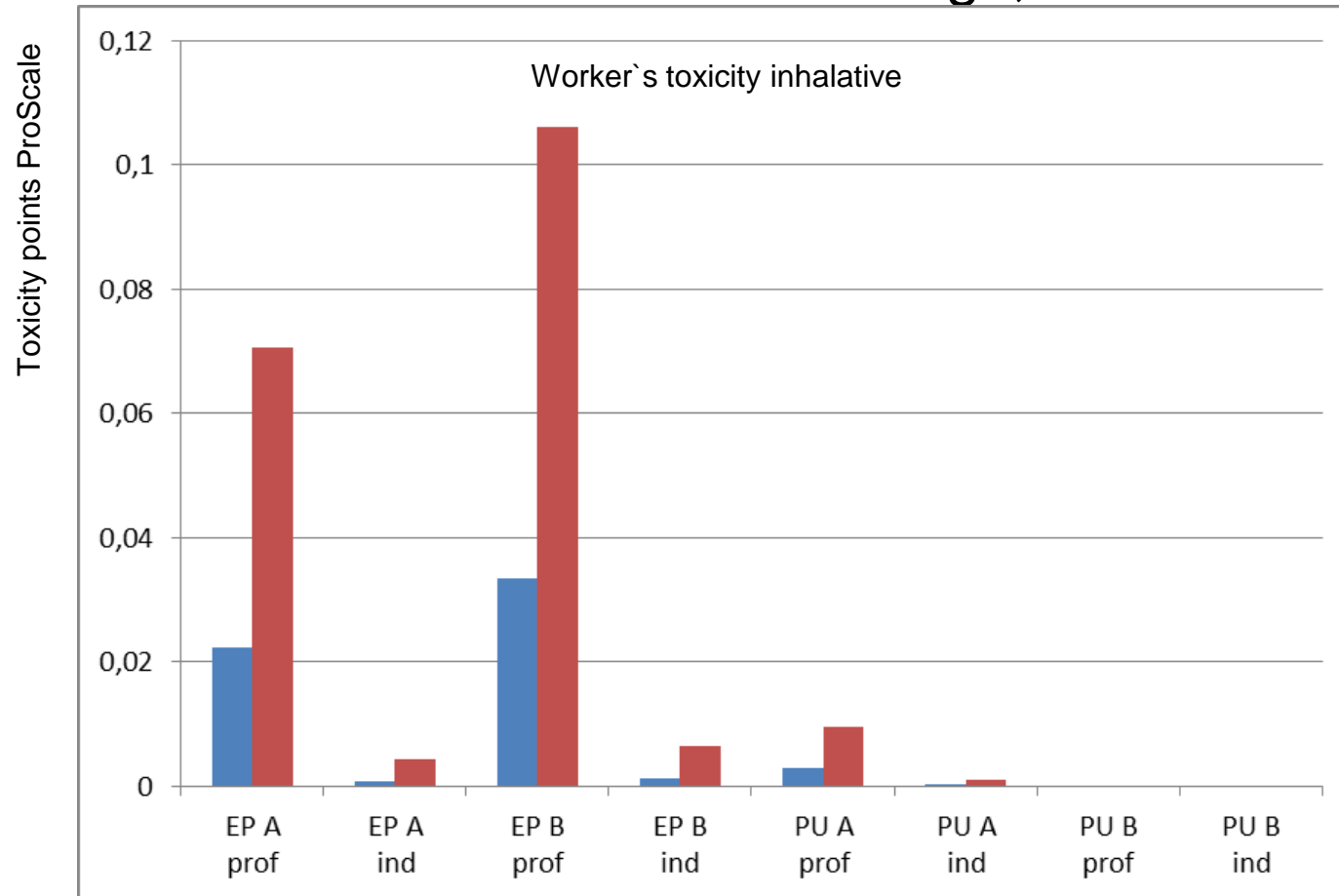
Scenarios and variations of ProScale results of benzene



- Person hours can influence the result significantly
- The selection of the PROC is important
- RMM needs to be selected carefully
- ProScale distinguishes between different reaction conditions

Test case „*Construction Chemicals*“

Comparison of professional (time factor 0,2) and industrial (time factor 0,02) settings, PROC 5



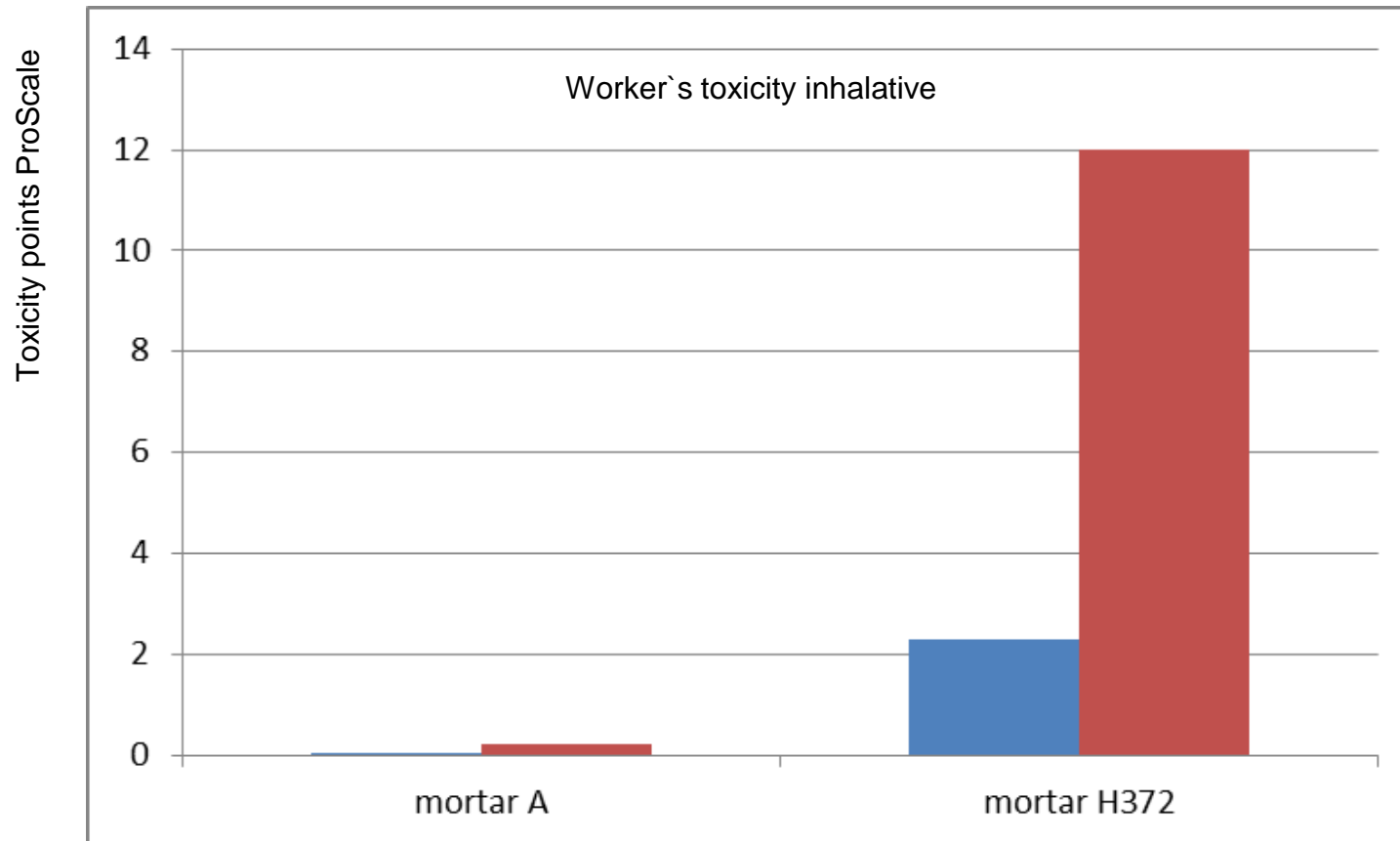
- Significant differences between “Industrial” and “Professional” via time factor and RMM
- Important impacts by materials in the mixtures

EP = epoxy-based;
PU = polyurethane-based

With RMM (blue)
Without RMM (red)

Test case „Construction Chemicals“

Sensitivity check regarding H372 component
(5% crystalline silica flour), PROC 5, professional



- Significant differences when a critical compound is added
- Important impacts by materials in the mixtures
- High importance of RMM

With RMM (blue)
Without RMM (red)

Application and use of ProScale™

Results

- The ProScale scores (PSS) for the defined formulations and relevant activities can be calculated for products including all upstream steps in an “easy-to-use” approach, relying on existing and easily available data (H-phrases, OEL,...)
- The results of the ProScale score calculations show which products, substances and life cycle steps have high contributions.
- Inhalative results are much more significant than dermal. Oral is not important for workers
- Changes of vapor pressure, RMM or PROC have significant influences to the result
- The system is sensible for changing time factors, material flows and changes from industrial worker to professional worker.
- Results are meaningful and useful.

ProScale consortium

Organization

- **Members**
 - BASF
 - Covestro
 - Deutsche Bauchemie
 - DSM
 - IVL
 - Kingspan
 - Solvay
- **Project manager**
 - Geneviève De Bauw (UetlibergPartners)

ProScale Conference

Get more details of the method and its application

ProScale Conference

Brussels, 5 October 2017

ProScale – a method to assess the toxicological potential of product systems in a life-cycle perspective

A conference organized by the ProScale consortium.

Open to industry stakeholders and experts.

Thursday 5 October 2017, Brussels, Hôtel Métropole, 10.00 to 16.00.

Free participation, number of seats limited.

Pre-registration by email to proscale@uetlibergpartners.com

A detailed agenda will be sent in early September.