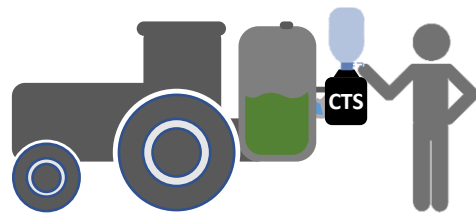




CropLife
EUROPE

Comprehensive Analysis of Closed Transfer Systems in Reducing Operator and Environmental Exposure in Europe



Juan Sasturain (BASF) / Christian Küster (Bayer) / Tirso Oteyza (Syngenta)
CropLife Europe

Scope of the study - Areas of interest

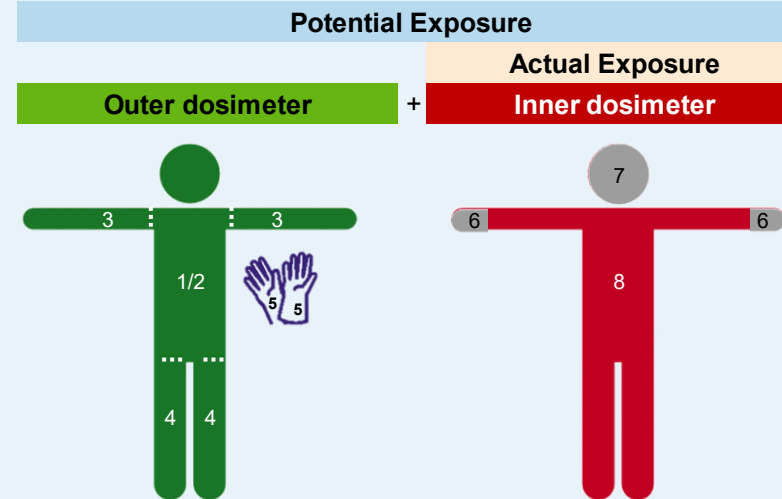
AOEM* calculation



Open pouring vs CTS



Full body dosimetry



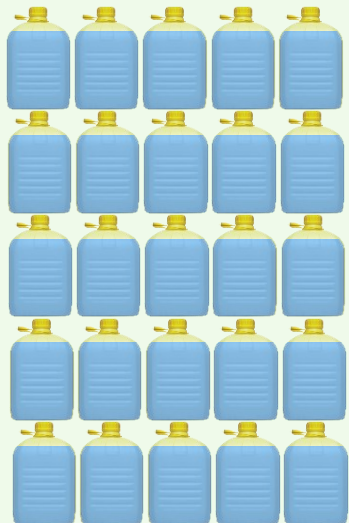
- Outer dosimeter**
1. Outer Torso, front
 2. Outer Torso, back
 3. Outer Arms
 4. Outer Legs
 5. Nitrile gloves

- Inner dosimeter**
6. Hand washes
 7. Face/neck wipes
 8. Inner dosimeter (undivided)

No measurement of inhalation exposure

*AOEM = Agricultural operator exposure model

Large vs small amounts



50 ha/d
800 g/L
5 L/ha
250 L
200 kg

Low viscosity



50 ha/d
200 g/L
0.25 L/ha
12.5 L
2.5 kg

High viscosity

Large vs small sprayers






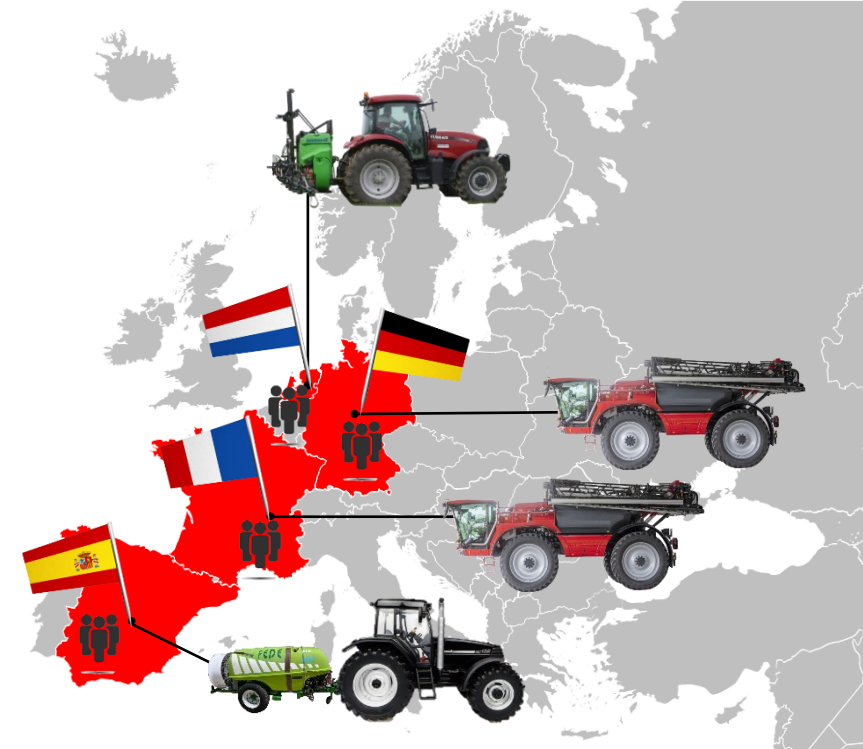
5000 L tank = 25 ha
30 connections
3 dosing operations
per operator



1000 L tank = 5 ha
40 connections
13 dosing operations
per operator

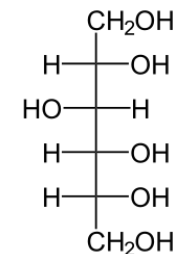
Study outline: CTS selection, test liquid, test location

	easyconnect	easyFlow M	GoatThroat®
Connector (CTS-Container)	Pre-fitted cap	Adapter	
Container needs foil seal?	No	Yes	
System Type	Inverted extraction		Probe extraction
Driving force for transfer	Negative pressure		Positive pressure
Cleaning process	Semi-mechanical rinsing		Manual rinsing
Each technical approach is represented by one system.			
Each of the selected systems has been part of the ISO 21191:2021 development.			



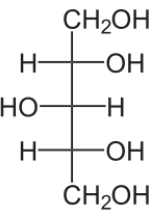
Sorbitol

in toothpaste, cosmetics and general in food as sweetener



Xylitol

Sweetener used for e.g. chewing gums



1008 filling operations

Two major malfunctions occurred during the study conduct

GoatThroat®

Pre-study ISO 21191 conformity test

Rigid dip tube

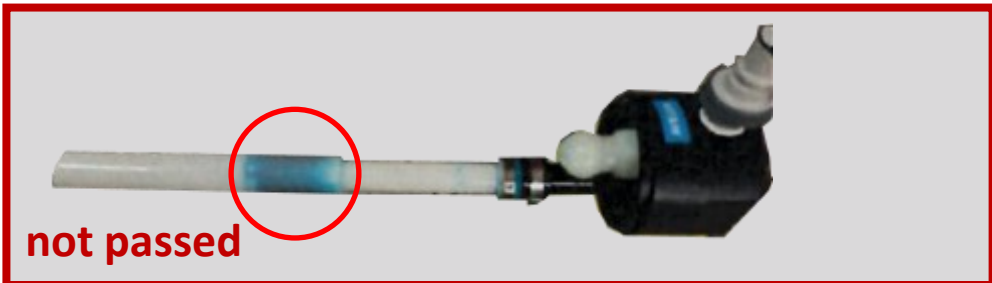


Modification used in the study

Telescopic dip tube



Post-study ISO 21191 conformity test repetition



easyconnect

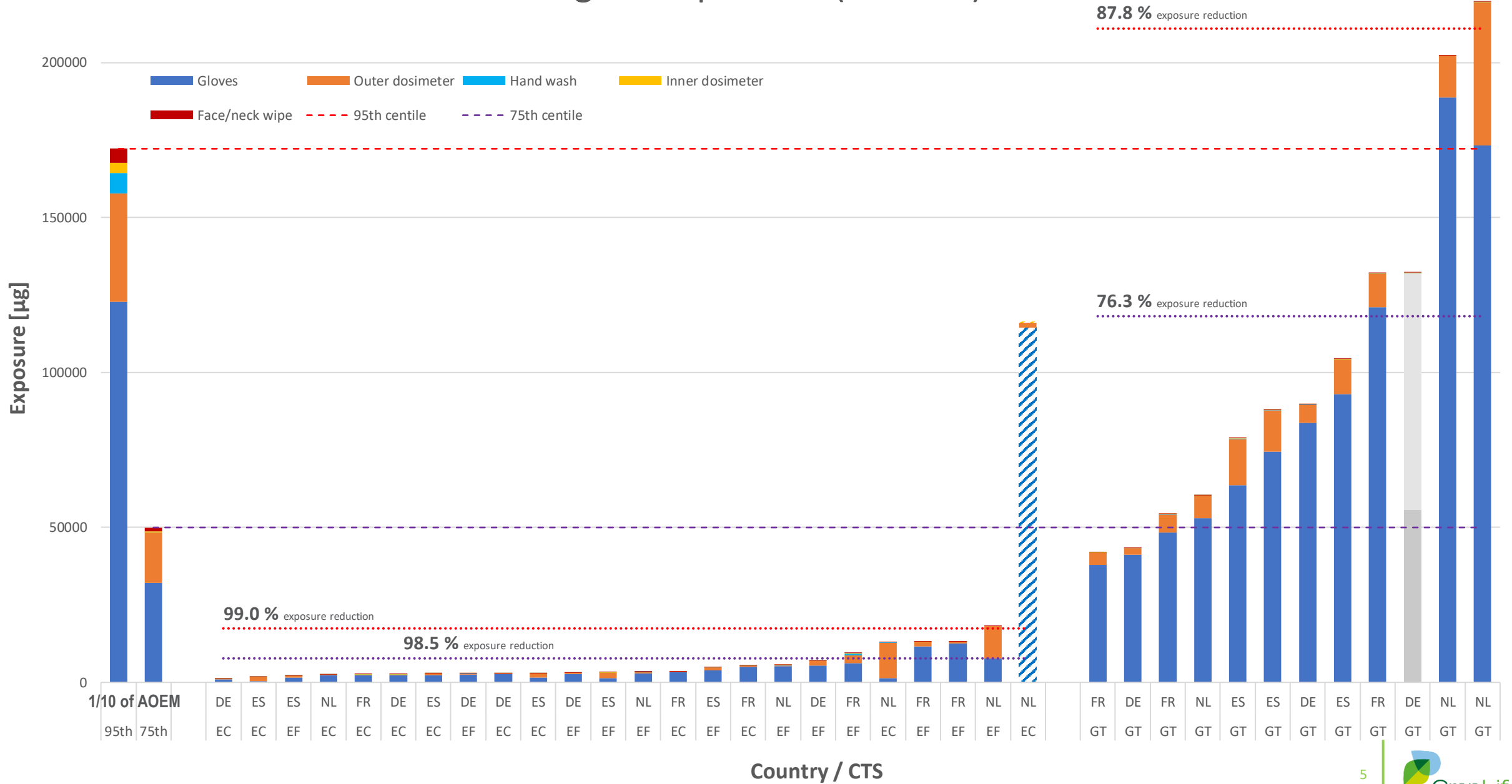
During the study, there was one event where the cap was partially unscrewed.



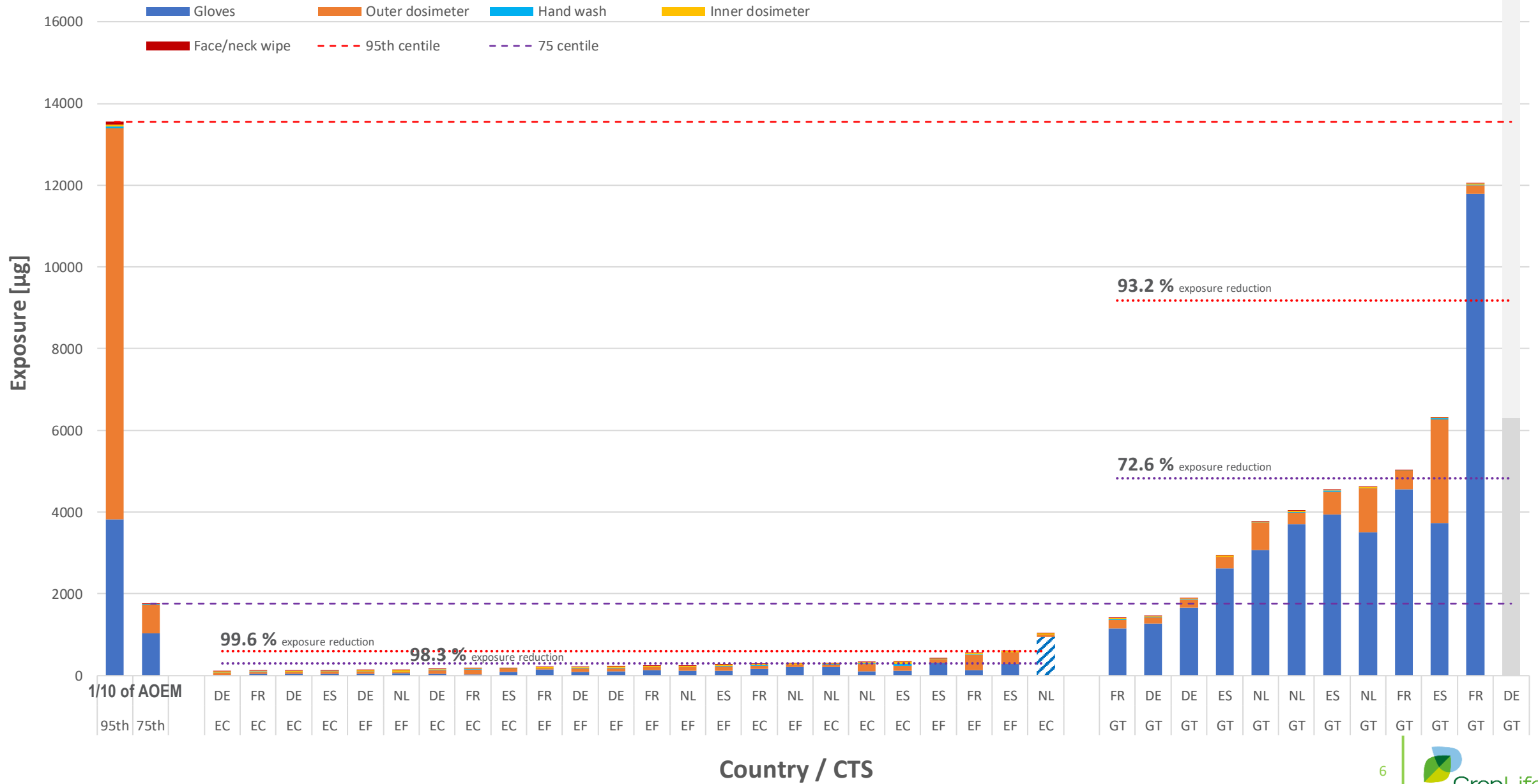
This was clearly visible on the container and equipment.

It had a quantifiable effect on operator exposure.

High rate product (Sorbitol)

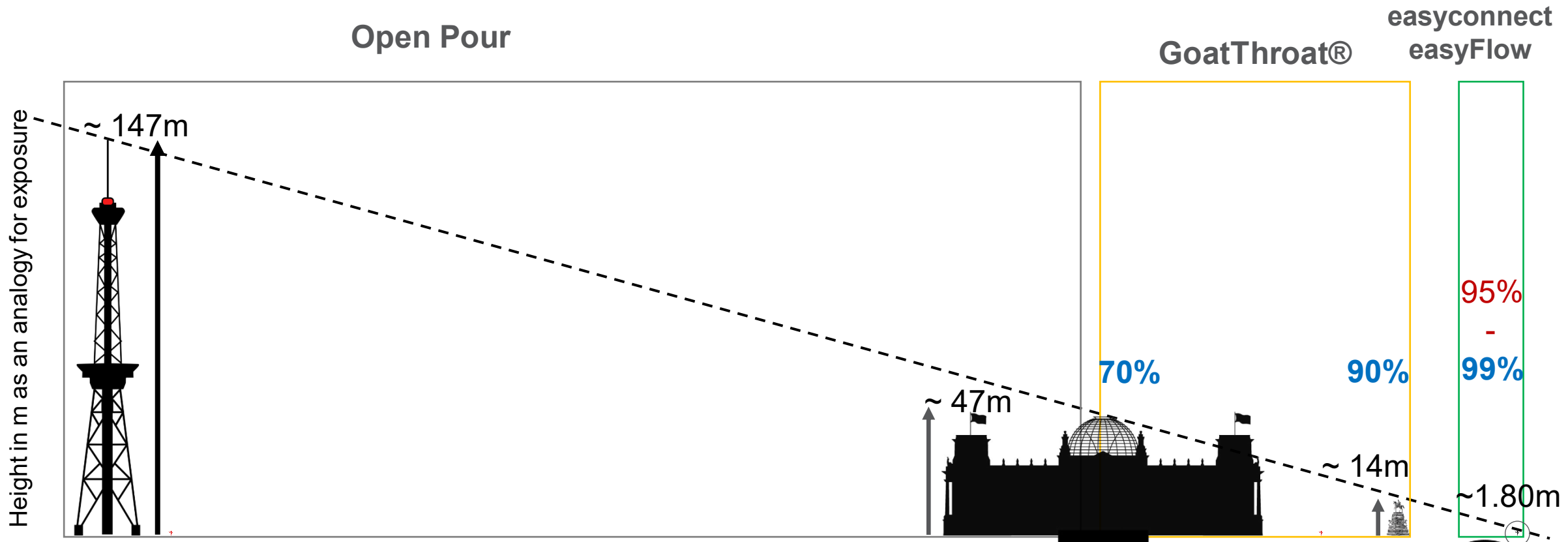


Low rate product (Xylitol)



Analogy to visualize the performance of exposure reduction

Operator exposure by open pour loading = Height of Berliner Funkturm



All three systems performed good in terms of OPEX reduction:

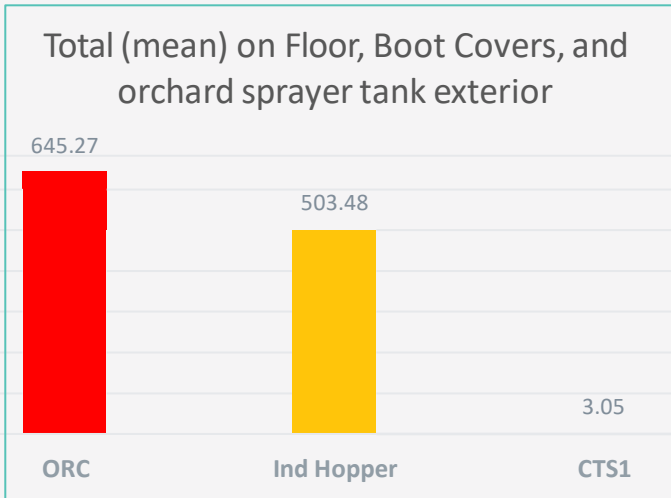
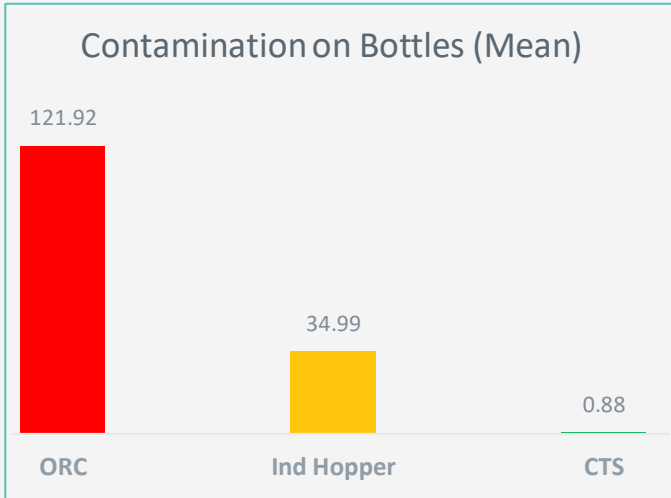
> 70% reduction for GT

> 95% reduction for EC and EF

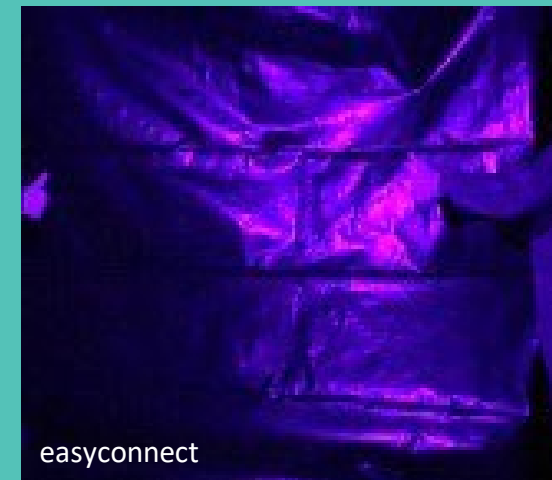


Environmental exposure studies with easyconnect

Two separate studies, comparing the filling of a sprayer by top loading, induction hopper and CTS show a clear reduction in exposure potential to the ground and the containers

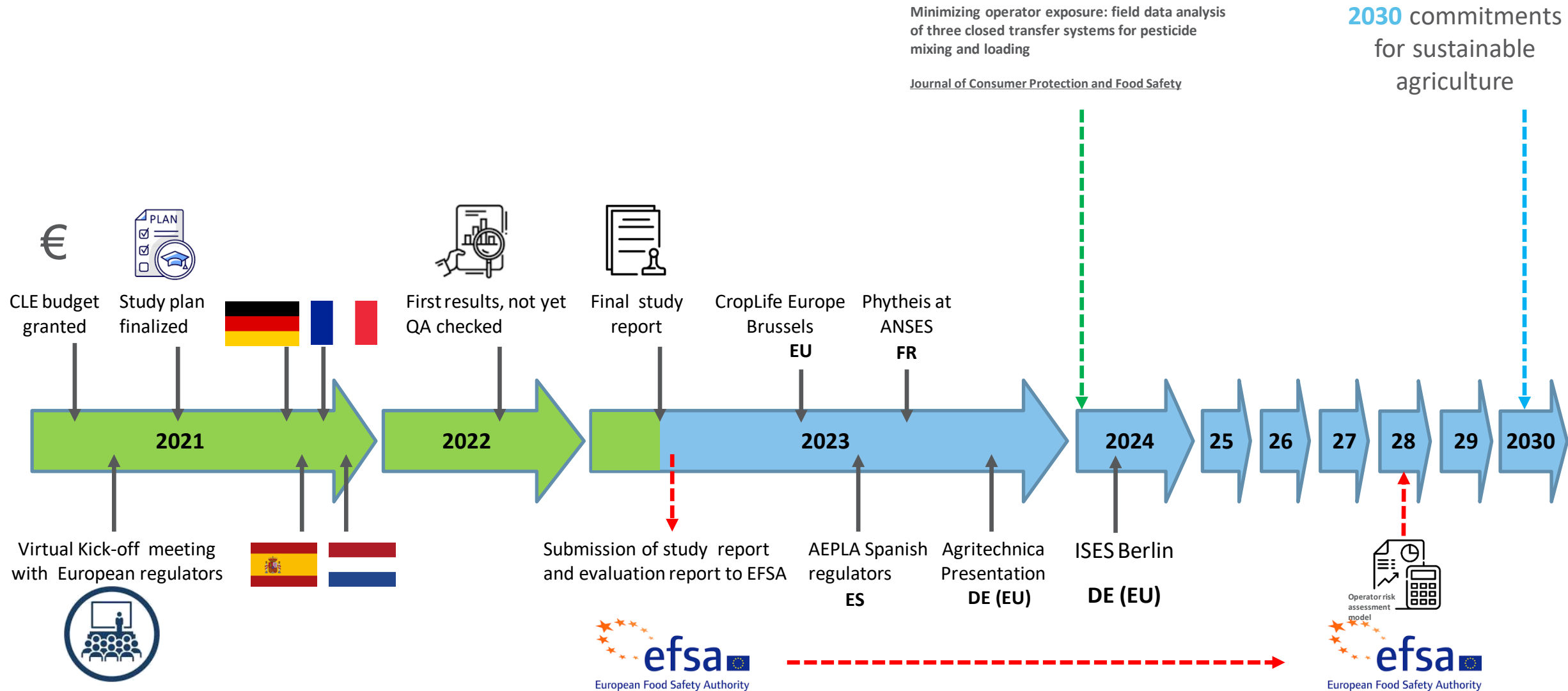


container outer surface



floor contamination

Study Timelines



2030 commitments for sustainable agriculture



Special thanks to the CTS manufacturers for their continuous support!



GoatThroat®



easyFlow M



easyconnect