Standardisation – one way for better protection of operators against pesticides

Hinz T.

Johann Heinrich von Thünen-Institut
Federal Research Institute for Rural Areas, Forestry and Fisheries

E-mail: torsten.hinz@vti.bund.de

Outline

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Introduction

Protection by PPE, personal protective equipment

- Performance and test methods

Protection by cabs

- Performance and test methods

Summary and conclusion

Introduction

- To secure human nutrition cultivated plants must be protected.
- Means for it are mechanical and chemical: plant protection products (PPP).
- PPP are connected with risk potentials for the environment and human beings.
- All possible loads must keep given levels by reduction or farmers protection.
- Means of protection are cabs and personal protective equipment PPE.

- This talk is focussed on the state of standardisation of CPC and cabs used during the application of in-use-diluted PPP.

Steps of risk assessment

Chemical protection demands legislative considerations and comprehensive knowledge of:

- nature of chemical hazard → gases, liquids (jets or splashes), particles (solid or liquid (spray))
- specific effects of present chemical depending on the way of uptake – hazard designation
- exposure scenarios → level, duration, frequency, sudden events or long term

Skin related classification of PPP, Germany 2006

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Risk phrases	Hazard designation	Number of authorised PPP
R 21	Harmful in contact with skin	17
R 24	Toxic in contact with skin	1
R 27	Very toxic in contact with skin	0
R 34	Burns caused	2
R 35	Serious burns caused	0
R 38	Irritating to skin	81
R 43	Possible sensitisation	154
R 66	Dryness or cracking by repeated exposure	16

These classifications concern the active agent, the chemical and not necessarily the spray ready mixture during application.

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Exposure scenarios handling PPP - examples

Scenario	Produce	Hazards	Exposure	Protection
Spray application tractor bound or self propelled	field crops, viniculture, vegetable gardening,	drift	+/++	cab PPE
Air-assisted spray application, tractor bound or, selfpropelled	bush and tree cultures field crops, viniculture gardening orchard crops	drift	+/++	cab PPE
Spray application hand – held with Knapsack lance	field crops, vegetable gardening	drift, direct	++	Suits, PB
Air-assisted pray application hand – held motorised knapsack mist blowers	bush, tree cul-tures, viniculture field crops, gardening orchard crops	drift, direct	++/+++	Suits, PB
Application in greenhouses with hand-held hydraulic or CDA sprayer	low and tall plants vegetables, orchard crops	drift, direct	+/+++	Suits, PB
Follow-up work with plant contact		direct	+/++	Suits, PB

Exposure scenarios handling PPP - examples

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Standards for applicators´protection by PPE

– **Respirators and gloves**

EN 143, EN 14387 and
EN 374, ISO 6529
fully cover the requirements of agriculture.

– **Chemical Protective Clothing CPC**

For performance and testing CPC against PPP are in force:

- DIN 32781 : 2010
- ISO 27065 : 2011

Main data of the DIN 32781:2010

Criterion	Category	Limit value	Test method
Penetration of atomised PPP	Degree of penetration	5%	EN 14786
Penetration of water	resistance to water penetration	≥ 8 kPa	DIN EN 20811 (ISO 811)
Strength	Maximum tensile load Tear resistance	500 N (30 N) 20 N (10 N)	EN ISO 13934-1 EN ISO 9073-4
Ergonomics	Water vapour restistance	$20 \frac{m^2 * Pa}{W}$	EN 31092
Acceptance	Design and price	-	-

ISO 27065, April 2011, levels of protection definitions

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- Level 1a the potential risk of contamination is *relatively low*, in view of spray drift e.g. from tractor boom sprayers.

  Level 1b is based on the performance of cotton and polyester/cotton garments.

  Level 2 the potential risk of contamination is *higher* but not so *high* as to require the use of liquid-tight materials.

- Level 3 the potential risk of contamination requires liquid-tight materials for *high-exposure* scenarios."

ISO 27065: 2011 levels of protection
Material requirements and tests

The limit values for penetration are given for garments of

Level 1a	to 5%	→ atomizer test
Level 1b	to <= 40%	→ pipette test A
Level 2	to 5 %	→ pipette test B

Level 3 garments must pass a pressure test with > 14 kPa and shall have a normalized breakthrough time > = 30 min for the active ingredient (permeation test).

Essential differences between DIN and ISO

- numbers of performance levels or classes of protection
- definition of performance levels or classes of protection
- limit values for penetration and permeation
- consideration of thermal comfort and wearing time limitation
- requirements and methods for testing

Performance requirements on a cab

- fully closed structure
- force-ventilated (air-conditioned)
- over pressurized - tight against leakages
- tight against particles
- tight against gases and vapours

to substitute PPE, cabs must be tested and certified

Standards for applicators´protection by cabs

EN 15695 Agricultural tractors and self-propelled sprayers- Protection of the operator(driver) against hazardous substances-

Part 1: cabs classification, requirements and test procedures

Part 2: filter classification, requirements and test procedures

ISO 14269 Tractors and self-propelled machinery for agriculture and forestry- operator enclosure environment

Part 4: Air filter element test method

Part 5: Pressurization system test method

Performance categories acc. to EN 15695

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Category

1: without defined protection

2: protection against dust

3: protection against aerosols

4: protection against aerosols , vapours and gases

prescribed for spraying pesticides by the Commission Regulation Directive 2010/52/EU, 11 August 2010

Cabs requirements acc. to EN 15695

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For category 2-4

Minimum air flow of 30 m^3/h

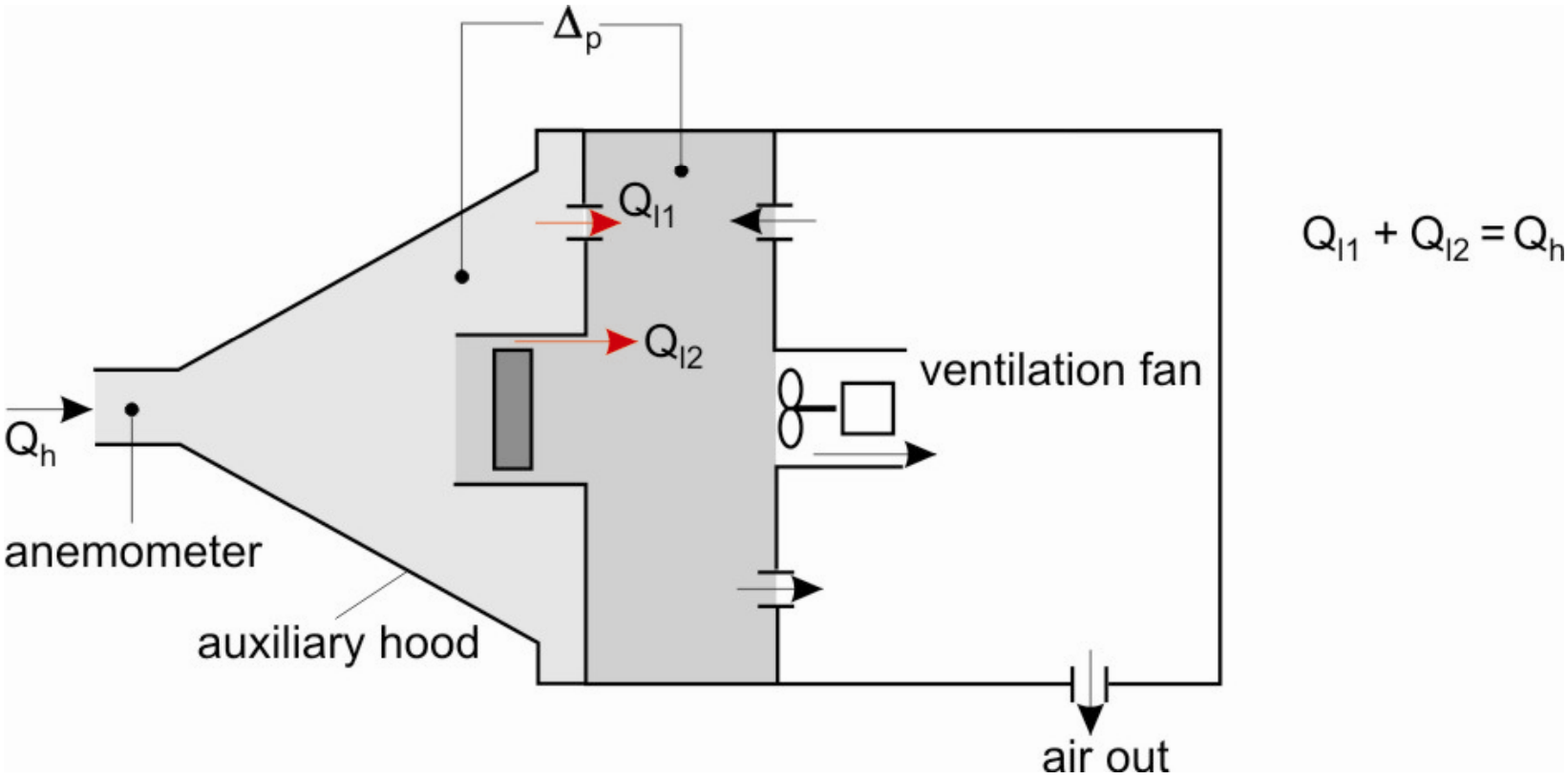
Overpressurized with 50 Pa in test or 20 Pa with control instrument during operation.

For category 3 and 4

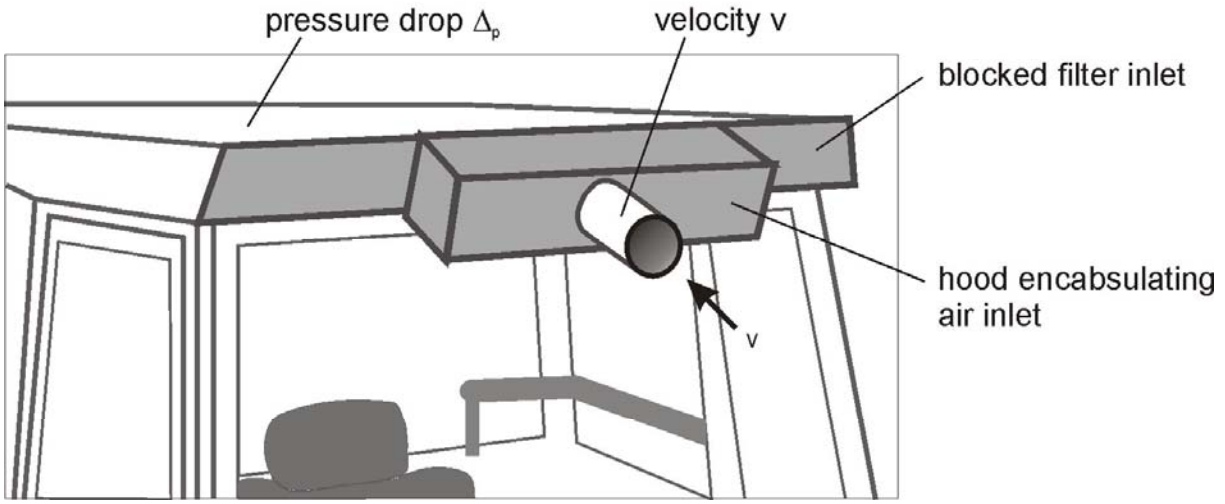
Lekage flow below 2 % tested by blind filter method.

Cabs effiency > 98 % tested by particle counting method

Test assembly for determination of leakage flow -blind filter method-

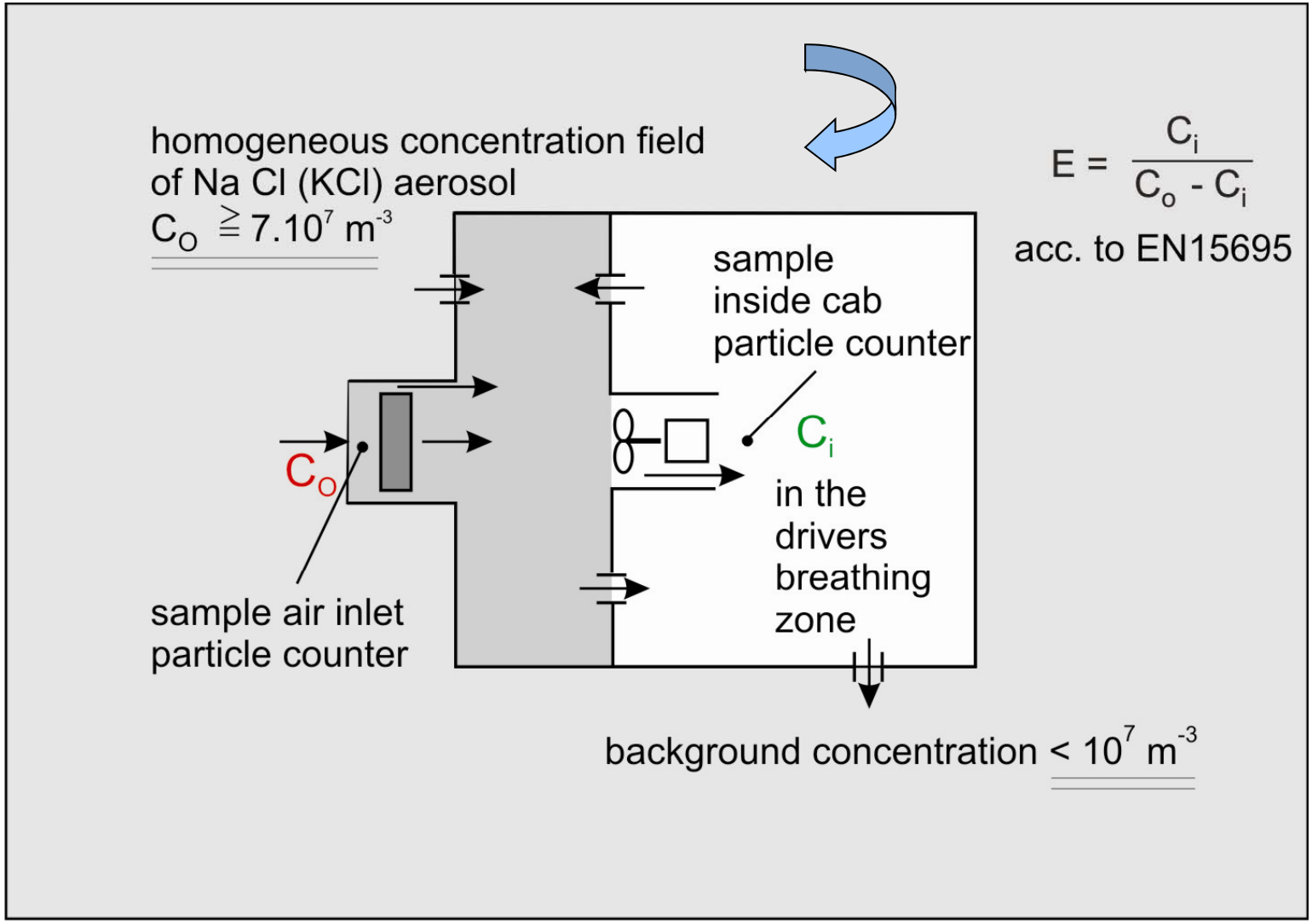


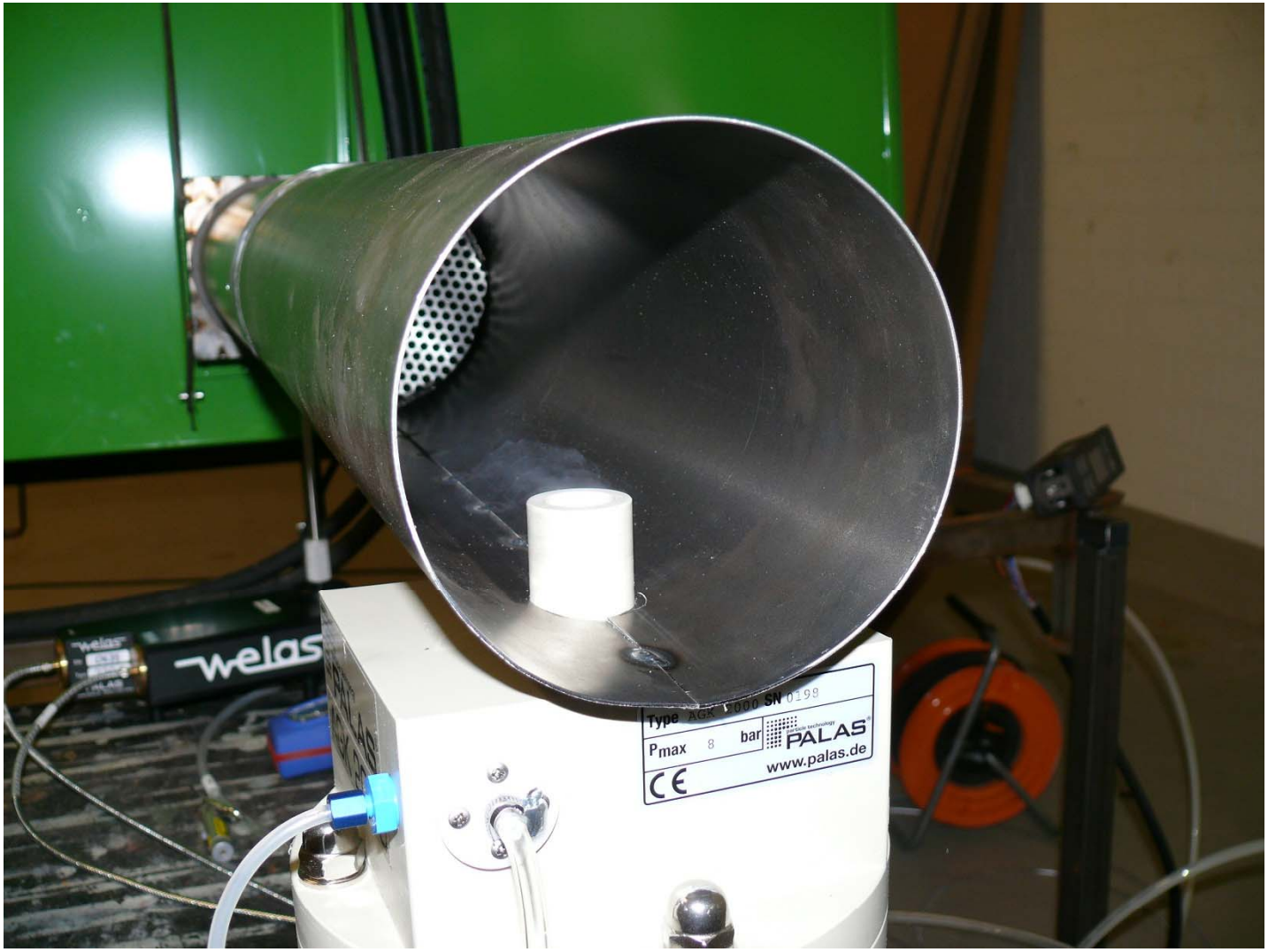
Example for a blocked filter unit with a hood encabsulating nominal air inlet – array to measure air flow velocity and pressure drop



Test assembly to measure the protection efficiency of cabs

Closed test chamber

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Conclusion

- Pesticide applicators need protection by PPE or cabs
- PPE must be tested and certified
- This rule must be also applied if cabs shall substitute PP
- For respirators and gloves no special need for agriculture
- For suits a special solution should be found - DIN 32781 and ISO 27065 – no European standard

- Performance requirements and test for cabs are given in EN 15695-1/2

All papers have lacks and are not always applicable - a critical review is recommended.


Thank You for Your Attention!