Nederlands Instituut Publieke Veiligheid

Exchange of Experts
Field report

Smoke Cooling Experiments

April 29th and 30th 2025

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Het Nederlands Instituut Publieke Veiligheid is bij wet vastgelegd onder de naam Instituut Fysieke Veiligheid.

Content

1 Objectives

NIPV strongly believes in sharing and collecting knowledge with international institutions, because a lot of practical knowledge is in the minds of experts. On some subjects we have practical experience as NIPV, but we are a small country who needs and likes to learn from others. Therefore, we gladly organize exchanges of experts. The subject of this exchange was smoke cooling in firefighting. We conducted participative practical (full scale) experiments into methods of smoke cooling. These experiments are unique for Europe and even in the rest of the world.

Earlier experiments (2019) regarding smoke cooling techniques have received a lot of interest internationally. Multiple countries have shown interest in implementing changes to their tactics due to the results of the research. On the other side of the spectrum there have been critiques and questions left that still had to be answered. For that reason het NIPV has chosen to perform a second series of full scale smoke cooling experiments. The strength of our valorization is the involvement of firefighters in the experiments. To add to that strength we choose to invite international experts to join the experiments. Experts (of fire safety and civil protection) were invited to discuss and exchange their knowledge on this topic and other related firefighting tactics.

For the Netherlands Institute Public Safety (NIPV) the main objective of the Exchange of Experts in April 2025 is to exchange developments, experiences and ideas between the participating countries.

We anticipate the following results:

1. Participants have exchanged the most recent (practical) knowledge about smoke cooking techniques.
2. Participants gathered knowledge from each other about smoke cooling and carrying out practical experiments.
3. Participants gain knowledge on how to increase valorization of knowledge into practice.
4. Participants from member states have an opportunity to network and create new alliances.
5. Member states can collaborate and have insight in each other’s knowledge and ideas.
6. Member states can make proposals for more intense collaboration in the future.

The aim of this field report is to establish the insights gained during the Hopefully many other fire safety experts can benefit from this knowledge through the use of this field report.

The Exchange of Experts Programme is funded by the European Commission.
CN-APELL RO, Romania, is the programme coordinator, being supported by its consortium partner - the General Inspectorate for Emergency Situation - IGSU, Romanian Ministry of Internal Affairs.

2 General program

The Exchange of Experts took place at the Safety Campus Twente in Enschede. Twente Safety Campus was born out of an enthusiastic collaboration to establish a fire training centre at the former site of Twente Airfield in 2008. The Campus has since evolved into the meeting place for safety innovation and development. Here, the fire brigade, police, emergency services (GHOR), educational organisations and businesses work with a number of partners. They offer realistic simulations and exam settings, professional research and experienced-orientated education. They also teach primary and high school children and the elderly how to react in dangerous situations.

The NIPV have a close collaboration with the Safety Campus Twente and made use of their facilities for the smoke cooling experiments and the exchange. The program of the Exchange of Experts took place on April 29th and April 30th. Per day 4 experiments were conducted. Besides the experiments the group also visited the training facilities and the Risk Factory.

Image 2.1. All participants of the Exchange of Experts on April 30th, including the UK participant.

From Left to right: Ricardo Weewer (NIPV), Simon Strießnig, Tomáš Gajdičiar, Kristían Slašťan, Yurii Tereshchenko, Michal Kříž, Lieuwe de Witte (NIPV), Kristjan Siiroja, Pete Wakefield, Tamara Van der Coer (NIPV), Stanislav Vynohrado and Michael Novak.

3 Report

3.1 Tuesday April 29th | Exchange of Experts

We started of the day with a presentation by lector Ricardo Weewer. He talked about the smoke cooling experiments from 2019 and the results that were published and the reasoning behind the new set of experiments. These will be conducted with the door closed unlike the 2019 experiments which were carried out with the door open.
The presentation has been shared with the experts.

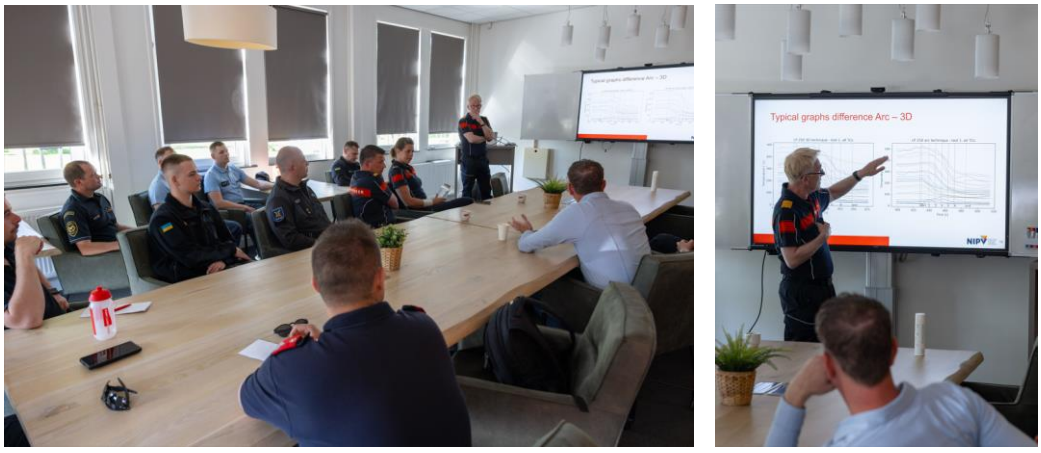

Image 3.1. The opening presentation by Ricardo Weewer

3.1.1 Experiments

All the fire fighters that are involved in the experiments practiced the Arc technique straight stream with the guidance of the research team to make sure the results will be valid.

Image 3.2. Practice of the arc technique

Before every experiment the setup with the thermocouples was checked and the fire load prepared. During the day 4 experiments were conducted.

Image 3.3. Overview of the hallway built for the experiments

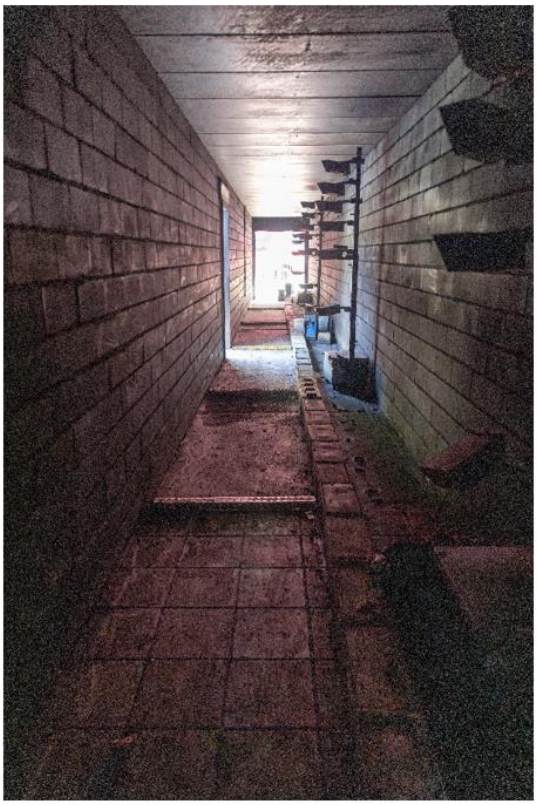

Image 3.4. and 3.5.Overview of the hallway on the inside.

Image 3.6. Thermocouples being putting in place, ready for the next experiment.

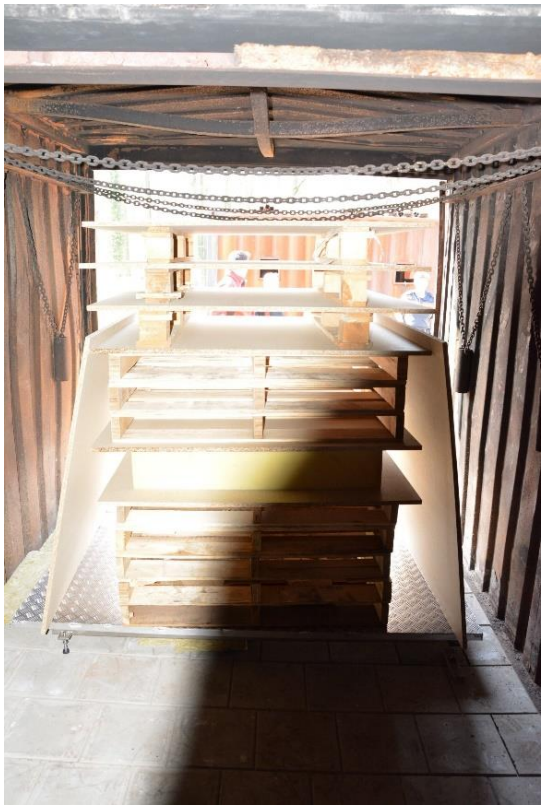

Image 3.7 ad 3.8. The fire load used per experiment.

Image 3.10. The experiment being executed.

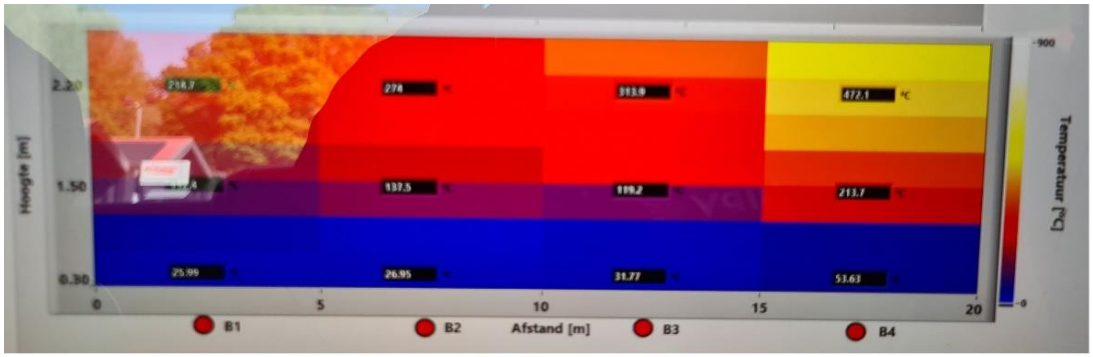

Image 3.11. The real time sensor readings during the experiment.

3.1.2 Training facilities

The group had a guided tour through the training facilities. Multiple buildings and containers to simulate different types of scenarios that can be used for training and exams.

Image 3.12. Map of Twenty Safety Campus. Source: https://troned.nl/.

Image 3.13. A building used to simulate a variety of fires.

3.1.3 Group discussion

At the beginning and at the end of both days the experiments were discussed and evaluated. This was also a moment to share procedures and knowledge between the participants of various the participating countries.

Image 3.14. All the experts participating in the group discussion.

3.2 Wednesday April 30th | Exchange of Experts

The day started with have a look at the video and thermal images of the experiments of the day before. We were able to discuss the preliminary results of the experiments and share the organisational aspects of performing such realistic experiments, involving real fire and real firefighters.

Image 3.15. Example of video and thermal images available during the experiments.

3.2.1 Experiments

The group witnessed the morning experiments. During the breaks, while the setup was prepared for the next experiment there was ample time to talk to the firefighting instructors who performed the experiments and share experiences with them about the experiments as well as about the equipment in use by the Dutch fire service.

Image 3.16 and 3.17. A member of the research team providing information seen on the screens and answering questions.

3.2.2 Risk Factory

Risk Factory Twente is the safety education centre where visitors become aware of safety risks and solutions. Safety is in your own hands, that starts with self-reliance. In the Risk Factory, pupils from group 8, second-year high school pupils and seniors in Twente are made aware of risks. In simulated practical situations, they experience (un)safety and learn how to act. This is done with interactive safety scenarios with the motto: 'Learning by doing'. Real-life experiences change risk perceptions. That gives both young people and seniors the self-confidence to make the right decisions when it comes down to it. For example they can practice calling the emergency services, they are challenged to identify fire risks in the house and experience how subtle online scamming can be done. Through virtual reality participants get a sense of how quickly a fire can spread in a bedroom and more.

The group was shown around by one of the 75 volunteers involved in this project. Most of them are retired and have a background with in one of the emergency services and want to keep sharing their experience and knowledge. Therefore we considered it a fitting addition to the exchange.

Image 3.18 Front façade of the Rick Factory. Source: Twente Safety Campus

Image 3.19 One of the areas inside the Rick Factory. *Source: Twente Safety Campus*

3.2.3 Rounding off

During the two days we shared knowledge with the experts and had in depth discussions about firefighting techniques, and specifically about smoke cooling. All participants expressed their thanks for being able to take part in the exchange. The feeling is mutual. When available, graphs and photo's will be shared with the participants. A full report will be written which will be published on our website and shared with other universities and the experts in the exchange of expert program.

Image 3.20 and 3.21. All involved in the exchange of experts in the conference room.

Besides all that we also had a chance to make a short stop at a Dutch windmill and a farm shop that sells local products to buy some Dutch cheese.

Image 3.21. The Lonneker Molen in Enschede

4 Conclusions

4.1 Evaluation of objectives

As the host of the Exchange of Experts we are proud to say that the results that have been anticipated before the start of the exchange are achieved. New alliances have been created and the opportunity to network has been successfully taken by the participants. This could possibly be the start of new proposals for collaboration in experiments or future research.

4.2 General conclusions

> All participants shared their knowledge and experience regarding smoke cooling techniques.
> In this exchange participants were involved in experiments that are unique in its objective and organization. Performing these kind of experiments is very important and also very difficult.
> It was worthwhile to witness the experiments, follow the sensor readings real time and discuss preliminary results.
> Practical experience and knowledge was shared about the different techniques of smoke cooling in the participating member states.
> Practical experience and knowledge about educating firefighters to use smoke cooling techniques were shared.
> Common challenges with educating fire fighters were discussed and similarities found.
> The results of these experiments need to be shared.

4.3 Other conclusions and takeaways

> For NIPV as a host it was interesting to learn from other countries what kind of tactics and techniques they apply for interior firefighting. They have shown us that we should look into our own current practice in more detail.
> We have learnt about firefighting tactics with less staff which we can apply for our future firefighting education.
> Also the methods used to educate firefighters to act safely during interior attack gave us insights we will take with us and where possible apply in our own trainings.

5 List of participants

Participants Exchange of Experts	Country/Alliance
Simon Strießnig	Austria
Michael Novak	Austria
Tomáš Gajdičiar,	Slovak Republic
Kristían Slašťan	Slovak Republic
Michal Kříž,	Czech Republic
Kristjan Siiroja	Estonia
Stanislav Vynohrado	Ukraine
Yurii Tereshchenko	Ukraine
Pete Wakefield	United Kingdom
Ricardo Weewer	NIPV
Lieuwe de Witte	NIPV
Tamara Van der Coer	NIPV
Caren Mertens	NIPV

The research team and participating firefighters have been available for questions and discussions throughout the exchange even though they did not formally take part.

6 Program

Program April 29th 2025

08.45	Pick-up from hotel
09.00 - 09.15	Welcome and introduction
09.15 - 10.00	Explanation of the experiments (past and present)
10.00 - 10.45	**Experiment 1:** Arc technique straight stream Low pressure 250l/min Door closed Nozzle continuously open
10.45 - 11.15	Break / discussion
11.15 - 12.00	**Experiment 2:** Arc technique straight stream Low pressure 250l/min Door closed Nozzle continuously open
12.00 - 13.00	Lunch
13.00 - 13.45	**Experiment 3:** 3D long Pulse (3s) Low pressure 250l/min Door closed
13.45 - 14.15	Break / discussion
14.15 - 15.00	Tour around the training facility
15.00 - 16.00	Discussion / rounding off the day
16:00	Transfer to hotel
18.30	Dinner at the hotel

Program April 30th 2025

09:30	Pick-up from hotel
10.00 - 10.45	**Experiment 1:** Arc technique straight stream Low pressure 250l/min Door closed Nozzle intermittent open
10.45 - 11.15	Break / discussion
11.15 - 12.00	**Experiment 2:** Arc technique straight stream Low pressure 250l/min Door closed Nozzle intermittent open
12.00 - 13.00	Lunch
13.00 - 13.45	**Experiment 3:** Arc technique straight stream Low pressure 250l/min Door closed Nozzle intermittent open
13.45 - 14.15	Break / discussion
14.15 - 15.00	Tour around the Rick Factory
15.00 - 16.00	Discussion / rounding off the day
16:00	Transfer to hotel
18.30	Dinner at the hotel