

## Undergarments with activated carbon reduces carcinogenic fire gas against the skin

The undergarments have been purchased by the Rescue Service in Skellefteå. It is produced by CPP Garment, the technology is proven and has been used by the military to protect against chemical warfare gases.

Ola Lindström at the Rescue Service in Skellefteå talks about their experiences with the place.

The undergarment protects the skin against carcinogens fire gas while being well ventilated and releases moisture from the body. The protective clothing are three-piece and consist of a hood, sweater and a pair of trousers, they have developed it in collaboration with Firemen's Cancer Fund. The material used for the base has activated carbon sewn in and it adsorbs the smoke gases from fire.

Ola Lindström says that:

- We bought five undergarments about a year ago and that's the first one hand to all for smoke divers and those holding exercises. The idea is that when the firefighters start the working day, they bring an undergarment to its place and hangs it at the alarm point. We have determined that it is up to each one whether they will use it.

### **How have you experienced the place so far?**

- It works well, easy to put on and no one has complained mobility. We have wool underwear closest to the body for that should not be wet with sweat. Some think it feels a little more confined and warmer before use. It's not a perfect fit, but the main thing is that it closes completely tight.

Have you used them in sharp mode?

- Not in major fires, any apartment fire and car fire. There have not been that many alarms where the undercarriage came into use, but we have tried to have them during practice or planned events. And that's where I think it makes the most difference, when you standing in smoke for several hours.

### **Five-year recommended lifespan**

The absolute biggest impact on the life of the frame is flue gases and particles that are bound by the active carbon which then successively saturates. Washing has less effect on the life of the garment, if the instructions are followed and the function is basically unchanged as well at more than 100 washes, the Manufacturer provides a recommended lifespan of five years. Ola says that:

- We wash if you think they need to be washed and after that you have been in the smoke of a fire. We have given every part of the undergarment an ID number and keep a record of which alarms they have been on, how many times they have been used and washed.

It feels like it's quality but the garment must be used more to be properly evaluated, says Ola. But still so far no one has been disappointed.

Facts – this is how the undergarment works:

The fabric is made up of three layers that let air and water through while blocking gases, particles and odours.

The outer layer consists of 88% cotton and 12% elastane.

the middle layer consists of 100% polyurethane, with a fine fibre particle filter that reduces the skin's exposure to health-hazardous particles.

The third layer consists of 100% activated carbon, which adsorbs harmful gases. The layer with activated carbon is applied to a fabric made of 100% cotton that is closest to the body. The carbon is shaped as 0.3 mm small spheres, each sphere can withstand a pressure of 4 kg and thus can support a knee or elbow. The coal's total adsorptive surface for one undergarment is greater than 400,000 square meters.

If you are in the choice and the qualification to buy the undergarment, so Ola thinks that:

- Test with two or three racks and evaluate. Let then primarily smoke divers and those who hold exercises used them.

### **The firefighter profession and cancer**

This is a long-awaited product, the toxicity of flue gases is well known. In 2022, the WHO Cancer Research Institute ranked (IARC) the firefighting profession into Group 1, which is the highest the degree of certain association with cancer diagnoses.

The emergency service's regular undergarments have a protection factor of 10 against PAH (polycyclic aromatic hydrocarbons), the new undergarment has 1000 in protection factor. The undergarment therefore reduces the skin's exposure to toxic PAHs to one thousandth. The undergarment is CE-certified according to EN ISO 13982-1:2004 "Protective clothing for use against particles". CE certification has the highest possible category within personal protective equipment. The garmenty has undergone tests by Chalmers Industriteknik, Lund University and IVL Swedish Environmental Institute.

### **This is PAH**

PAH is an abbreviation for Polycyclic Aromatic Hydrocarbons. It's a group of chemicals consisting of several hundred compounds. They are formed when organic material is heated or incompletely burned.

The acute toxicity of PAHs is low to moderate. On the contrary, it shows studies that long-term exposure to excessive doses can cause damage to the immune system, liver and kidney and affect the hormone systems. It is of course important to keep it total exposure to carcinogens so low as possible.

The WHO agency International Agency for Research on Cancer claims that there is enough evidence to judge the substance as a human carcinogen. It is classified as a human carcinogen (group 1).

### **This favours the formation of PAHs:**

- If oxygen supply is incomplete during combustion.
- When the temperature is around 400-800° C.
- If there are aromatic and unsaturated hydrocarbons in the heated material.