



# FOGMAKER

Fire suppression for all engine compartments

**TRIPLE ACTION<sup>3</sup>**  
with high-pressure water mist



# THE CHALLENGE

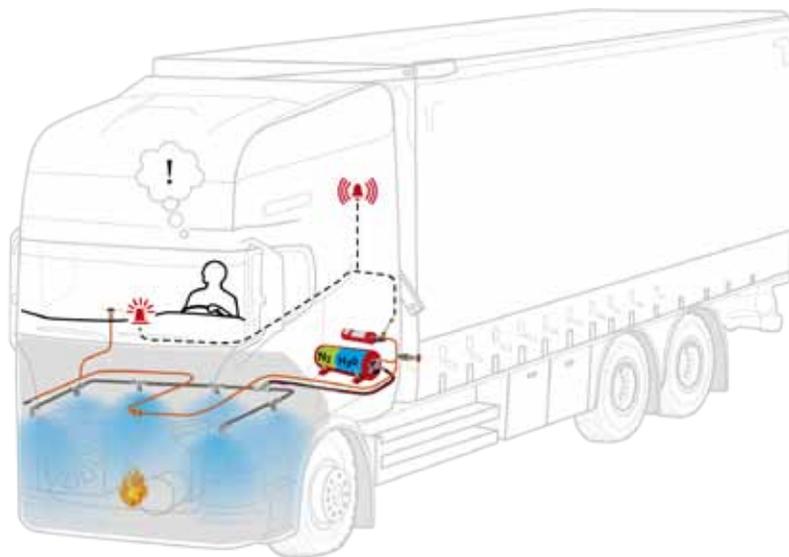
The complexities, dangers and physical aspects of engine fires.

It is well known that the increased demands on reduced emission levels, such as EuroVI, TIER 4F and EPA 2013, have led to higher fuel pressures and increasing temperatures in engine compartments. Combined with the high level of utilisation of machinery and vehicles in the forest industry, the risk of a fire starting in the engine compartment has increased dramatically.

Each year in Sweden a number of fires occur in forest machinery with the fire originating as a result of either a technical fault or the transfer of heat. Twenty per cent of all trucks on Swedish roads transport shipments of forest products, and on average around 140 trucks catch fire each year.<sup>1,2</sup>

Forest and truck operators are extremely sensitive to unscheduled **downtime**. A fire in the engine compartment can be devastating, as every minute of operation counts. A fire that flares up very quickly may also have devastating effects on the immediate surroundings which can lead to forest fires, road closures, traffic jams or fires at sawmills etc. The results of for example electrical failure or a ruptured hydraulic hose in an engine compartment may have **financial and operational consequences**, something that all wood chip operators, forest machine operators and manufacturers want to avoid.

Consideration must also be given to the most important resource in all companies, **a company's employees**, who may be exposed to great danger in the event of a fire.



A fire in an unprotected engine compartment is hard to detect in time and often develops in intensity extremely quickly. This type of fire is almost impossible to fight with a portable fire extinguisher. Because of this, the need for safety regulations has increased over the past years leading to the installation of completely automatic and permanent fire suppression systems in wood chip trucks and forestry machinery. This has spread to more and more countries, insurance agencies and manufacturers/operators throughout the world.

But an important point to bear in mind is what **the physical aspects** of a fire are.

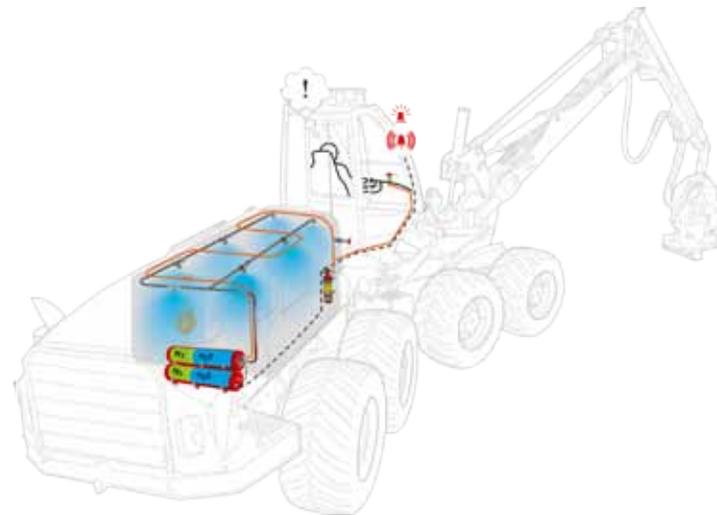
The impact of the heat, oxygen and fuel, all need to be anticipated and dealt with accordingly. These three elements of a fire are often symbolised by the fire triangle. Removing one side of the triangle may be sufficient to extinguish a fire, but because of the complicated nature of a fire in the engine compartment there are no guarantees, reignition may still occur. That is why a fire suppression system with a so-called triple effect that attacks all three sides of the fire triangle at the same time is the safest and most logical method that can be used to minimise downtime, improve service continuity and protect human life.

At the same time, the fire suppression system must always be ready to operate independently of human interaction, the vehicle's location and how the vehicle is being used.

Fogmaker's technology, using high-pressure water mist provides the right conditions to combat the complex conditions that may arise in an engine compartment.

<sup>1</sup> Hällberg, Stefan. 2016. Större är snällare och snällare. Skogen. 9 September. <http://www.skogen.se/> (Date: 25/04/2017)

<sup>2</sup> Statistikdatabasen (Statistics database) IDA. [year unknown]. MSA (the Swedish Civil Contingencies Agency). <https://ida.msb.se/ida2#page=a0232> (Date: 25/04/2017)



## WHY FOGMAKER?

- **Triple Action<sup>3</sup>** – attacks all three sides of the fire triangle
- **Simplicity** – no power supply, position independent, low weight, minimal obstruction
- **Low service cost** – annual inspection, 5 year service, minimal clean up after the system has been triggered
- **System monitoring** – activity, low pressure and fire alarm
- **Automatic engine shutdown optional**
- **Product development in-house**



# FOGMAKER

## A Triple Action<sup>3</sup> Fire Suppression System

Fogmaker's fire suppression system uses the purest form of extinguishing agent – water. The combination of high-pressure water mist and a small amount of foam additive simultaneously attack all three components of the chain reaction that cause a fire – heat, oxygen and fuel.

### HEAT - Cooling

Cooling is by far the most important factor when breaking the fire's chain reaction and water is a superior medium for this purpose. During the evaporation process, the water mist cools the fuel gases and the hot parts in the engine compartment.

When the liquid runs through the spray nozzles, a normal size droplet which is 1 mm in diameter is split into as many as 8,000 micro-droplets. The droplets evaporate easily, taking up the energy from the fire and cooling the fumes in the engine compartment

### OXYGEN - Oxygen displacement

During evaporation, up to 1,700 litres of water vapour is generated from one litre of water. This means that from a single 7.5 litre Fogmaker cylinder, up to 12 m<sup>3</sup> of water vapour are generated, providing an effective displacement of oxygen atoms in the air, supporting a "knockdown effect" on the fire.

### FUEL - Smothering

The small amount of AFFF surfactant creates a smothering effect on the fire thus preventing oxygen from coming into contact with hot surfaces or fuel. The fire is also prevented from reigniting.

That is how Fogmaker's Triple Action<sup>3</sup> suppresses a fire.

**"From 870 °C to 136 °C in 10 seconds!"**



+870 °C  
0 sec

5 sec

+136 °C  
10 sec

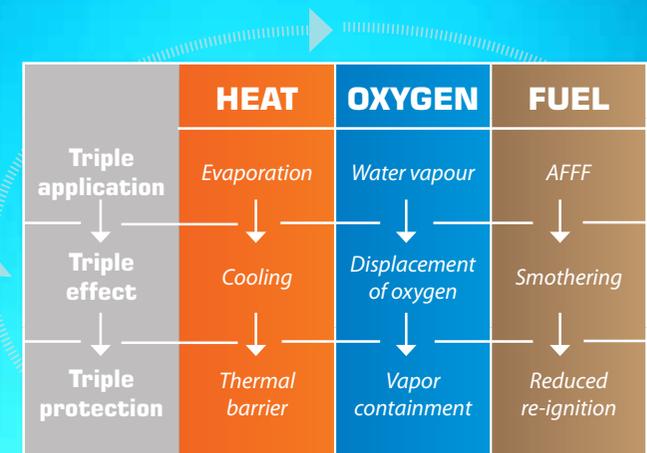
**Unique cooling effect, temperature reduction of 734 °C in 10 seconds!**

Fire suppression test in a simulated engine compartment with a volume of 2,5 m<sup>3</sup>. The fire source consists of four 20x40 cm trays filled with diesel. Diesel spray is also applied at a rate of 2 litres per minute at a pressure of 5 bar, which showers the engine. The heat effect reaches approximately 1,600kW. The pictures are taken with 2 second intervals. During the whole interval, 10 seconds, approximately 5 dl of extinguishant is used.

TRIPLE ACTION<sup>3</sup>



All three components of the fire triangle are attacked using Fogmaker's fire suppression system



# A proven fire suppression solution

Fogmaker is the holder of several qualification certificates and approvals. **We have provided the first fire suppression system ever homologated for UNECE Reg. 107** [standard for permanent fire suppression systems in buses throughout Europe].

Fogmaker also holds the following certifications: AS-5062 (Australia), SBF-127/128 (Scandinavia); Fogmaker is UL listed (UL 1384) and FM pending (FM 5970). Through our work processes, we ensure that we maintain the highest possible standards during the development of our products. Furthermore, following the latest re-certification of ISO 9001:2015 and 14001:2015 with a pending IATF 16949 certification, our organisational structure will be able to grow successfully.

This provides a stable foundation for our expanded organisation through our global network of distributors and partners, offering a complete service wherever our customers are. Today we are represented in more than 55 countries in Europe, North and South America, Africa, the Middle East, Asia and Oceania.

But first of all we are proud of the trust our customers around the world have shown us. Fogmaker's fire suppression system first saw the light of day in 1995. Today, more than 130,000 vehicles are equipped with Fogmaker's high-pressure water mist systems.

*"For more than 10 years, Rottne Industri has been using Fogmaker's suppression systems in its forest machinery. We have had a positive experience of Fogmaker's suppression systems using water mist, which is effective with its cooling and suffocating effect on a fire and which is also environmentally friendly. We have found that the suppression system, thanks to its simple and robust construction, is reliable and provides clear advantages because detection and activation takes place without the need of either a power supply or control electronics. The suppression system is simple to install and service providing a competitive lifecycle cost (LCC) for the system. Function, suppression capabilities and reliability in combination with excellent LCC means we will continue to use Fogmaker's fire suppression systems in our machinery."*

**Tobias Johansson, CEO Rottne Industri AB**

*"Fogmaker's suppression systems comply with many of the values that we ourselves as machine builders stand for, offering reliability, robustness, simplicity, service and installation-friendliness and low operating costs. Fogmaker's suppression systems are also easy to reset after a possible triggering of the system, and the cleaning of the engine compartment or other protected areas is straightforward due to the environmentally friendly water mist that effectively extinguishes a possible engine fire. We at Vimek feel we made the right choice when we chose Fogmaker."*

**Johannes Nilsson, Chief Technical Officer and Per-Anton Lundström, Purchaser. Vimek AB, Vindeln**

*"We have assembled and serviced Fogmaker's suppression systems for a number of years and we are of the opinion that the system is very easy to service, inspect and repair; and after the system has been triggered, reset, and the engine compartment has been cleaned, the vehicle can be out there in production once again after only a few hours. [...] With regard to purchase price and maintenance costs, function and performance, Fogmaker's suppression systems are very competitive compared to that available on the market. Altogether, this makes it an obvious choice on our part to use Fogmaker."*

**Peter Reinfors, Team Leader, Wist Last & Bus AB (Volvo), Gällivare**

# FOGMAKER



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**SBF-127**  
Swedish Fire Protection Association



**AS-5062**  
Australian Standard



**UL-1384 (UL listed)**  
Underwriter's Laboratories

**...and FM-5970 pending!**  
Factory Mutual