The Swedish pioneers of modern water mist technology

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The objective of this paper

- Give credit to the people that pioneered the modern high-pressure technology long before the commercial break-through of water mist technology in the beginning of the 1990’s.

- Hopefully, this paper will inspire others to document the history of water mist technology in other parts of the world.
Two separate companies involved

- **Electrolux Euroclean AB (later HTC i Åmål AB).**
  Key people: Omar Vestli, Håkan Ungerth, Sten Hansen and Bengt Créner.

- **GIRO-Brand AB (later ULTRA FOG AB)**
  Key people: Krister Giselsson and Mats Rosander
The development by Electrolux Euroclean AB (later HTC i Åmål AB)

Omar Vestli had a background as a ship’s officer and Håkan Ungerth is a Naval Architect.

Electrolux Euroclean AB were specialist in high-pressure cleaning equipment.
Fire tests at the Norwegian Fire Protection Training Institute in 1981
Conclusions from the test in 1981

✓ The fires were rapidly suppressed but not completely extinguished.

✓ Water droplets and water vapour suspended in the air prevented the fire from re-developing, even after system shut-off.

✓ When the door to the test compartment was opened and air allowed to enter the compartment, the fire re-developed.
Fire tests at SP in 1983
Conclusions from the tests at SP in 1983

- The Class A wood crib fire was suppressed but the fire was not fully extinguished.

- Water only had limited effect on the gasoline pool fire.

- The use of AFFF with the water significantly improved the efficiency of the system against the pool fire.
Patent application in 1985
The formation of HTC i Åmål AB in 1987

After some years with no or limited economical return Electrolux Euroclean AB decided not to develop the water mist fire protection technology any further.

A separate company was formed in 1987, HTC i Åmål AB.
The development of nozzles (automatic)
The development of nozzles (open)

The system was given the name the “Micro-Fog system”
Fire tests at SP in 1991

- Tests in the ISO 9705 “Room-corner test” compartment, furnished to simulate a passenger ship cabin or a hotel room.
- An authentic ventilation system was installed.
- An automatic nozzle was installed at the ceiling.
- The nozzle had a standard response glass bulb with a nominal operating temperature of 68°C
- 6 liter/min at 100 bar.
Fire tests at SP in 1991
Fire tests at SP in 1991
Fire tests at SP in 1991
Fire tests at SP in 1991

Anders Ryderman (SP)

Omar Vestli

Gary Bergström (ABB Fläkt Marine AB)

Sven Brutsner
Conclusions from the fire tests at SP in 1991

✓ The gas temperatures were rapidly reduced with minimal fire and water damage.

✓ The fires were not completely extinguished.

✓ It was recommended that the nozzle be fitted with a fast response glass bulb in order to further decrease the activation time.
Fire tests conducted at SP in 1993

- Cabin and corridor fire tests.

- Automatic nozzles with a fast response 3 mm glass bulb, having a nominal operating temperature of 68°C.

- 8.7 liters/min at 100 bar.

- The system performed at an equivalent level or better than traditional sprinklers, with a fraction of the water flow rate.
Epilogue

Due to low returns on development costs, HTC i Åmål AB went out of business in 1993.

In 1994, Håkan Ungerth patented an automatic (with glass bulb) high-pressure multi-orifice water mist nozzle similar to the type of nozzle tested at SP in 1993.

The rights for the nozzle were sold to YAMATO PROTEC in Japan.

During the 1990’s Håkan Ungerth continued the development of both high- and low-pressure water mist nozzles together with the Swedish company SweFire AB.
Epilogue

Håkan Ungerth
The development by GIRO-Brand AB (later ULTRA FOG AB)

Key people: Krister Giselsson and Mats Rosander.

Krister Giselsson graduated as a fire protection engineer in 1969 and after a number of years at different fire departments, he was given a position as a teacher at the Swedish Fire School in Stockholm in 1974.

Mats Rosander graduated as a fire protection engineer in 1977 and established collaboration with Giselsson in the company GIRO-Brand AB that was started in 1978. Rosander also received employment as a teacher at the Swedish Fire School in Stockholm, responsible for active fire-fighting.
Investigating of flashover and fire spread phenomena
The lecture book “Fundamentals of fire”


“In the future a liquid, e.g. water, atomized to drops smaller than powder grains will be the most important extinguishing agent against flames indoor, so-called fine mist”.
The Fogfighter® nozzle (introduced in 1982)

175 or 450 liters/min at 6 bar
“Offensive fire-fighting”

Effective cooling of the combustion gases in the overhead without disrupting the thermal balance or creating large volumes of scalding steam.
Fire demonstration tests in Sollentuna in 1982
Conclusions from the tests in Sollentuna in 1982

✓ It is likely that a system using finely atomized water (7,5 liters/min) can be an alternative to traditional sprinklers.

✓ 7,5 liters/min was not sufficient to extinguish a severe Class A fire inside a ventilated room, i.e. with a large opening factor.

✓ The use of finely atomized water mist inside a compartment threatened by fire can prevent fire spread for a long period of time.
The formation of ULTRA FOG AB

In January 1990, Giselsson formed the company ULTRA FOG AB together with two other persons: Sven Brutsner and Stefan Forsström.

Stefan Forsström had been working as a sales representative for Electrolux Marine AB, a subsidiary of Electrolux AB and was familiar with water mist development work at Electrolux Euroclean AB.
The “Scandinavian Star” fire, April 7, 1990

Arsonist fire.
158 people lost their lives.
Fire demonstration tests in Bålsta in June 1990
Marketing of the ULTRA FOG system (mid-1990)

**PROTECTED BY ULTRA FOG**

The water mist equipment which prevents fire developing and spreading

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**ULTRA FOG - THE NEW WAY TO USE OF WATER FOR FIRE SUPPRESSION**

Without ULTRA FOG

ULTRA FOG is specially designed for large rooms, ships, cabins and passenger cabins and vital compartments in general.

ULTRA FOG can be used in any building to prevent fire spreading and protect the surroundings.

People in the burning room have a much better chance of escaping, and people in adjoining rooms are much more likely to be completely safe.

The ULTRA FOG system is very simple, and there is no water damage at all. In a small room ULTRA FOG uses less than two litres per minute.

Protected with ULTRA FOG

Water is provided by a high-pressure pump, typically above 2000 psi. Sheds already have the pumps for cleaning, have connect the piping and the ship is much safer!
Marketing of the ULTRA FOG system (mid-1990)

HOW ULTRA FOG WORKS

Water is ten times more heat-absorbent than dry powder and drops of water can wet solid particles.

1. EXTINGUISHING FLAMES

When a cold particle enters a flame, it puts out the flame in a zone approximately 1 cm thick around the cold particle. Dry powder extinguishers are of this type of extinguishing. Every grain of powder is surrounded by a zone where the flame cannot burn. All these zones together put out the flame.

2. PREVENTING FLASHOVER AND THE SPREAD OF FIRE

Initially a fire inside a building looks just like a fire at the open air. With indoor fires, however, large quantities of hot combustion gases containing entrained fuel are quickly built up. These accumulated gases can ignite, causing various types of flashover and fire spread.

A fire inside a room can either develop into flashover or consume the oxygen and die down to a smoldering fire. Which will it do depends on the flammability of the gases, the degree of cooling and the amount of moisture in the room.

The addition of small water droplets to the combustible gases drastically reduces their flammability. Particularly, in the early stages of a fire the flammability of the gases is dependent on the quantity of energy released. The vaporization heat of the water droplets acts quickly to reduce the small amount of energy involved.

This means that the fire is reduced to smoldering. There will be no flashover and the fire will not spread.

Between the droplets inside other rooms contains water droplets and vapor, and this makes them non-flammable. No gases will ignite in any other room, and the area of the fire is limited until it can finally be extinguished.

The specially designed nozzle, one to each cabin, provides approx. 2 litres/min, and protects up to 40 sq. m.

The high-pressure pump is a vital part of the system. It must be able to provide the necessary pressure and flow, even after a long period of use.
Fire tests at SP in 1992

Cabin, corridor and public space fire tests.

3,0 or 4,5 liters/min at a pressure of 180 bar. Activation via smoke detectors.
Epilogue

The first ULTRA FOG system was installed on the ro-pax ferry M/S Stena Danica in 1992.

Due to economical problems, ULTRA FOG AB went out of business in 1993.

The company was re-started with new owners and without the involvement of Krister Giselsson soon after.

The company is still active and one of the world-leaders in this area.

ULTRA FOG AB
FIRE EXTINGUISHING SYSTEM

SP Technical Research Institute of Sweden
Conclusions

✓ The very first commercial, fixed high-pressure water mist systems were developed in Sweden during the late 1970’s and early 1980’s.

✓ Very early, the companies saw the potential and benefits of water mist technology.

✓ The companies had limited commercial success due to low initial returns on high investments.

✓ The pioneers of high-pressure water mist technology have not often been given the credit they deserve. In actual fact they were at least ten years ahead of the companies that we see in the market place today and their efforts underline the truism that “if you are too early you are wrong”.

SP Technical Research Institute of Sweden
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