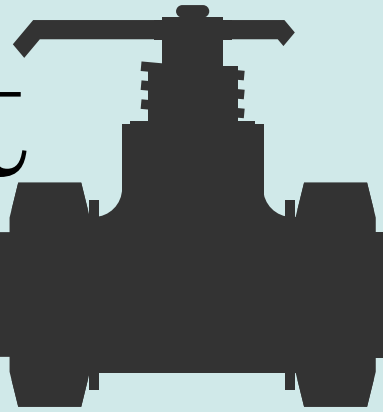
The science behind consistent dosing



Per Aredal, International Sales Director at Firemiks AB, discusses innovative pump proportioning systems for fluorine-free foams and high-viscosity concentrates

Firemiks AB, originally established in 1979 as a Swedish family-owned business, is now operated by the third generation in collaboration with strong industrial partners. Over the years, our focus has been on developing, manufacturing and distributing our proprietary water-driven volumetric pump proportioning systems globally.

We pride ourselves on offering custom solutions tailored to the unique needs of each client's project while also delivering standardised models that meet rigorous international certifications, such as FM Approvals.

Proportioning innovation

The Firemiks proportioning system operates on the principle of positive displacement for both the water motor and the concentrate pump. The water motor, driven solely by the extinguishing water flow, powers the concentrate pump, which injects the concentrate into the water flow. The dosing is determined by the volumetric relationship between the water motor and the concentrate pump. This ratio is unaffected by viscosity, within specified limits as outlined in the unit's data sheet.

The volumetric water motor design, conceived by the grandfather of the current management in the late 1970s, is notably compact for the flow it can handle. For example, on a typical 3% unit, the water motor can process approximately 30 times the volume of the concentrate pump, yet its size remains only slightly larger.

Since its inception, we have continuously refined the design to enhance performance and reliability. As with any pump design, attention to detail and precise execution are key. Additionally, our system's flexibility allows us to quickly adapt and match the water motor with a wide range of high-end concentrate pumps, each with its own unique specifications to consider.

Customised systems

We offer a wide range of models to meet various flow capacities and proportioning needs. Our smallest model has a maximum flow rate of 150 liters per minute (lpm), while the largest single model can handle up to 10,000 lpm. For flows exceeding this, we provide parallel-installed FIREMIKS systems, either on a base skid or as "double-decker" units, capable of reaching up to 20,000 lpm.

Our three standard skid models include: 12,000 lpm (2 x 6,000 lpm),

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16,000 lpm (2 x 8,000 lpm) and 20,000 lpm (2 x 10,000 lpm). For fixed proportioning, we typically offer 1% and 3%, with the option to customise dosing rates such as 0.1%, 0.3%, 2%, or 6% upon request. Additionally, models with selectable proportioning are available, including combinations like 0.3-0.6-1% and 1-2-3%, or, for selected flow sizes, 0.5-1-3%.

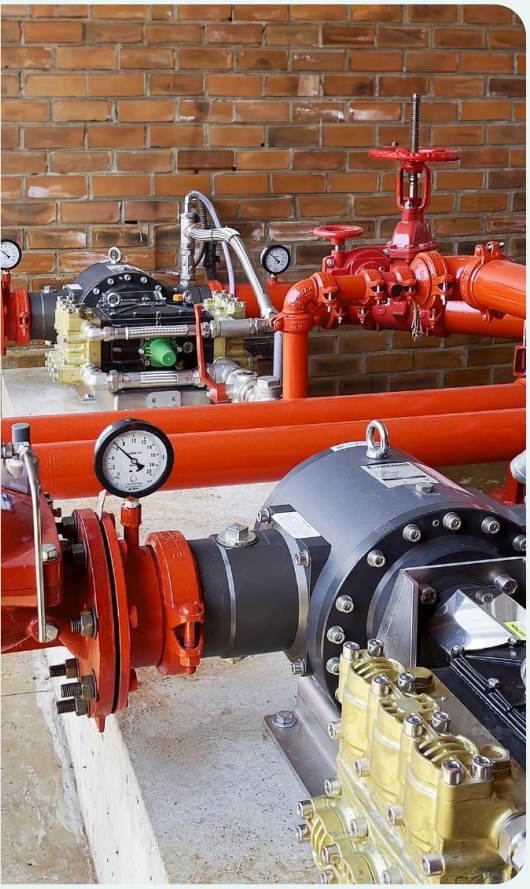
Ensuring accuracy

FM approval designates our system as the "Variable Viscosity Pump Proportioner," meaning that as long as the specified minimum and maximum flow rates in the data sheet are followed, FIREMIKS can accommodate viscosity changes across a wide flow and pressure range. The dosing remains within the approved tolerance limits specified in the standards (e.g., 3.0-3.9%). This offers the significant advantage of eliminating the need for recalibration whenever there is a change in concentrate or viscosity—unlike bladder tanks, which often require recalibration and create critical downtime during replacement.

The FM approval we have received (Standard: 5130 - May 2021) for eight of our 3% models, across three flow sizes—1800, 2400 and 4000 lpm—confirms that the FM-approved FIREMIKS units provide accurate dosing and can handle concentrates ranging from 1 cP to high-viscosity concentrates (up to 6422 cP at a shear rate of 5 1/s).

This means that if a concentrate has a shear rate curve that aligns with or falls below the specified figures, it will perform well with our FM-approved FIREMIKS models. This applies even to the new generation of fluorine-free SFFF concentrates, which are often non-Newtonian.

To ensure optimal dosing performance at maximum viscosity for the three FM-approved sizes, the required concentrate delivery hose/pipe dimensions and ▸



height are as follows: a maximum length of 2.5 meters, a diameter of DN 65 or larger and a gravity feed height of 0.5 meters or higher.

Addressing regulatory shifts

Regulatory bodies are driving the transition from PFAS-containing concentrates to SFFF concentrates, prompting a re-evaluation of many proportioning systems for compatibility. Manufacturers offer SFFF foams with a broad range of viscosities, including very high-viscosity concentrates. To select the right proportioner, understanding the concentrate's properties is essential.

In the past, engineers could calculate concentrate flow with confidence, but with the new SFFF concentrates, which are often non-Newtonian, accurately predicting flow behaviour has become more complex.

For proportioners that require calibration, the dosing may be accurate under specific conditions, but even small changes in variables can cause the system to fall out of calibration. In such cases, it's better to rely on a system, like FIREMIKS, that is designed to handle a wide viscosity range without the need for recalibration.

Catering to all viscosities

FIREMIKS distinguishes itself by offering two types of dosing pumps—Piston and Gear pumps—coupled with a robust multi-vane motor, built on over 35 years of market experience. When working with clients, we prioritise understanding the concentrate type and viscosity, in addition to considering flow and pressure, before recommending the most suitable pump type and providing tailored installation advice.

> **"It's better to rely on a system that is designed to handle a wide viscosity range without the need for recalibration."**

It's important to note that all Piston pump systems on the market have a viscosity limit due to the reciprocating principle of the Piston pump. During each revolution, the plunger sucks in concentrate and then presses it out, causing the concentrate to go from zero to full speed twice per revolution. If the static viscosity of non-Newtonian concentrates is too high, the concentrate may not flow smoothly, resulting in an inaccurate dosing rate.

Our Piston pump models typically excel in systems with low start-up flows relative to their maximum flow rate, making them ideal for applications like sprinkler systems and offering versatility across a wide flow range.

On the other hand, our Gear pump units are highly effective for handling high-viscosity fluids. Their counter-rotating gears create a consistent, non-agitating flow, ensuring reliable sealing with such fluids. Gear pump models are also particularly efficient in applications operating at the higher end of the maximum flow rate, such as deluge and large fire monitor systems.

What's next for firefighting foam?

The ongoing market shift from AFFF (Aqueous Film Forming Foam) to SFFF (Synthetic Fluorine-Free Foam) concentrates, which is expected to continue for at least the next 10 years, presents challenges for both existing and new foam systems. This transition will drive the need to upgrade many current systems.

We are also seeing increased interest in lower dosing rates, such as 1% and even lower concentrations like 0.3% or 0.5%. Additionally, developing effective systems for extinguishing Li-Ion battery fires remains a significant challenge for the entire firefighting industry. Firemiks AB is well-positioned to support this shift and is prepared to further develop our systems as needed to meet varying concentration requirements.

About the Author

Per Aredal is International Sales Director at Firemiks AB, with + 35 years of experience of producing and delivering water driven volumetric pump proportioners worldwide. For more information contact Per Aredal vie email: per.aredal@firemiks.com, phone : +46-76-139 70 34, or visit www.firemiks.com. ■

Shear rate 1/s	Viscosity (cP)
5	6422
10	3545
20	1945
50	882
100	497
600	128

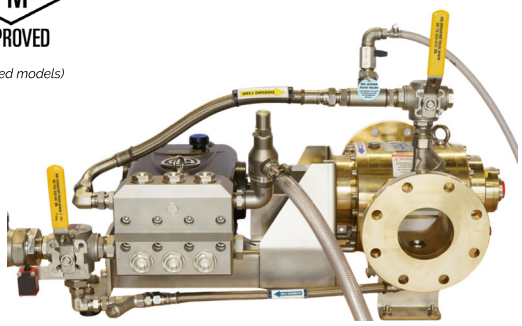
The table above is the specific curve approved for our FM-approved models

FIREMIKS®

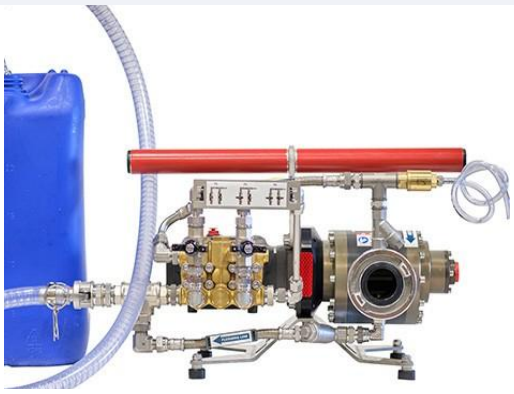
WATER DRIVEN PUMP PROPORTIONERS FOR FLUORINE-FREE FOAMS (SFFF)

FM APPROVED

(Selected models)



FIREMIKS For Industrial and Sprinkler Firefighting
Piston pumps (-PP) are well suited for systems with wide flow range, for example sprinkler systems.
Gear pumps (-GP) are particularly suited for working in deluge installations and with large flow monitors.



FIREMIKS Mobile unit for Fire Brigades
With a FIREMIKS the firefighters get a flexible resource, easy to adapt to different firefighting situations. FIREMIKS works within a wide pressure and flow range giving a precise and steady dosing rate.

EASY TO INSTALL

COMPACT DOSING SYSTEM, NO NEED FOR PRESSURE TANK OR ADDITIONAL ENERGY SUPPLY.

EASY TO OPERATE

RELIABLE MECHANICAL PROPORTIONER, DRIVEN BY THE WATER FLOW ONLY, NO NEED FOR PRESSURE BALANCING OR CALIBRATION

EASY TO TEST

ECONOMICAL AND ENVIRONMENTALLY BENEFICIAL TESTING WITH A DOSING RETURN VALVE AND TWO SEPARATE FLOW METERS

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