

Evaluation of Water Additives for Fire Control and Vapor Mitigation

*Phase I
Final Report*

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FOREWORD

Various water additives are available in today's marketplace that claim to provide advantageous performance characteristics for fire control and vapor mitigation. Of particular interest are additives that report to provide superior fire suppression capabilities through emulsification or encapsulation. However, a scientific assessment of these various additives is lacking, and the fire protection community would benefit from an evaluation of the various available water additives for fire control and vapor mitigation.

The goal of this project is to provide a comprehensive evaluation of water additives used for fire control and vapor mitigation, with the intent to clarify the fire protection benefit of using water with additives for fire suppression versus water without additives. The project objectives to achieve this goal include providing a comprehensive review of the literature, identification of key performance characteristics, review of candidate test agents, and formulation of a detailed test plan that would be implemented in a potential second phase (not included in the scope of this effort).

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The content, opinions and conclusions contained in this report are solely those of the author.

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Table 3 – Water Additives Agent Matrix

Product	UL Listed to NFPA 18	Application								Type of Agent		Description		
		Class A				Class B				Class D	Class K		Additive	Foam
		Structural	Wildland	Deep-Seated	Radiative Resistance	Pool/Spill	3D	Polar Solvents	Vapor Mitigation					
Biosolve		X				X			X			X		Encapsulator and emulsifier. "BioSolve is a proprietary, water-based, biodegradable formulation of surfactants and performance additives that work together to provide unique functionality encapsulating and emulsifying hydrocarbons, and suppressing harmful odors and vapors."
Bioversal QF		X				X						X	X	Encapsulator and emulsifier. Prevents flashback. - Uses a micelle encapsulating mechanism, but also foams to act on all areas – taking away the fuel, temperature and oxygen.
BlazeTamer			X											"the BlazeTamer solution undergoes an endothermic reaction that produces a rapid cooling effect."
Boldfoams		X				X		X						
Cold Fire	X	X				X		X		X	X	X	X	"Cold Fire cools 21 times faster than water, and works to remove heat and the fuel sources from the fire tetrahedron, preventing reignition."
Denko Emulsifier									X			X		Emulsifier.
drench		X				X						X		"drench is a blend of four distinctly different chemical technologies maximizing the performance of several element of the water. Penetration is increased up 400%, friction loss is reduced by as much as 45% and vaporization takes place twice as fast."
Emulsi Flash									X			X		Emulsifier. Breaks petroleum products down into a detergent type solution where small particles become trapped by a coat of the emulsifier.
F-500	X	X		X		X				X		X		Encapsulator. Additive of choice in PRB Coal Industry for deep-seated coal fires.
First Class	X	X	X	X		X							X	Class A foam which reduces surface tension of water, produces foam, can be used with medium expansion nozzles on Class B flammable liquids
Fire Blockade	X	X				X				X			X	"Blended with unique penetrating, cooling components and a proprietary food grade protein retardant that renders fires extinguished upon application."
Fire Cap Plus	X	X				X			X			X		"Fire Cap Plus acts as an emulsifier that separates the chemical make-up of a contaminant and then renders it non-volatile."
Fire Out!						X			X			X		Encapsulator and emulsifier. "Specifically formulated to deliver a 'quick knockdown' of fires while emulsifying and encapsulating the hydrocarbons...creating a non-flammable solution." "Not a foam, but applies like water."
FireAde 2000	X	X				X				X	X		X	"offers the simplicity of using one product to extinguish multiple classifications of fire."
FireIce			X		X							X		Gelling agent. "FireIce breaks the fire triangle by suffocating the oxygen from the fuel by cooling the heat source, thus breaking the thermal barriers of fire."
Flame Freeze		X				X		X		X	X	X	X	Foam along with encapsulator. "5-in-1 technology: hydrocarbon encapsulator, penetrating agent, foaming agent, cooling agent, wetting agent"
Flameout	X	X				X						X		Encapsulator that breaks down hydrocarbons. "Chemically shears the hydrocarbon strings, rendering the fuel source inert."
Fomtec Foams		X				X		X					X	
Hi Combat A	X	X			X	X						X	X	Emulsifier. "A coating of Class A foam may also be used for exposure protection to prevent fuels from igniting..."
Hydrex		X			X							X		Gelling agent.

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HydroLock Vapor Encapsulator									X			X		Encapsulator. "a unique encapsulator agent formulation that neutralizes flammable liquids and vapors, as well as emulsifying hydrocarbon sludge and residue."
KV Foams		X				X		X	X				X	
Micro-Blaze Out	X	X				X						X		Microbial agent that breaks down hydrocarbons and prevents reignition.
Novacool UEF	X	X				X	X		X	X				"The oxygen, heat, fuel, and chemical reaction (free radicals) are eliminated with Novacool UEF Foam."
Penetro Wet		X										X	X	"A mixture of wetting agents, foaming agents, emulsifiers, and rust inhibitors formulated expressly for the fire service." Can also be an emulsifier on light petroleum spills.
Petromist		X				X			X			X		Encapsulator. "...attack fires, the gases surrounding fires, and the fuel that perpetuates fires...FOS has the only quick, microencapsulating, nontoxic, fire-elimination products in the world..."
Phos-Chek Aquagel-K			X		X							X		Gelling agent. Absorbs water many times its own weight in water and forms a gel producing increased droplet sizes that reduce drift and evaporation
PinkWater						X			X					Encapsulator and emulsifier. "PinkWater plays a dual role in efficiently knocking down the flame and neutralizing the hydrocarbon source."
Pyrocool		X				X				X	X		X	
PMA-RTU						X			X			X		Encapsulator and emulsifier. "PMA-RTU's ability to solubilize and emulsify oils surpasses simple wetting agents and emulsifiers that reduce surface tension to fight a fire."
STHAMEX ultraWet		X										X		"extinguishes without foaming"
TetraKO		X	X									X		Gel. Smothers flame to prevent re ignition. - "TetraKO™ water enhancer transforms water into a liquid that sticks to vertical and ceiling surfaces and can be pumped through standard fire equipment."
uniMUL									X			X		Emulsifier.
Water Wetter		X										X		"Water Wetter is a special chemical additive that increases the wetting and penetrating ability of water...for use in fighting stubborn, smoldering fires, it reduces the surface tension of water to allow it to penetrate faster and reduced the total amount of water needed."

NOTE: Not all NFPA 18 Listed wetting agents included in this summary.