

Towards performance-based dimensioning of water mist sprinkler systems

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Dr. Maarit Tuomisaari has a background in engineering physics and has 27 years of experience in active fire protection. She has been closely involved in the development of high pressure water mist technology and in water mist standardization both in marine and land organizations (IMO, NFPA, CEN) since early 1990's. She joined Marioff Corporation 20 years ago and acts as Senior Manager for Research, Testing and Approvals.

The design and installation parameters of water mist sprinkler systems are defined in full scale fire tests, and the coverage area per sprinkler may vary hugely from below 10 m² up to some 40 m² in an application where traditional sprinklers have a fixed nominal coverage area of 12 m². The European prescriptive sprinkler system dimensioning rules are linked to the fixed coverage area of traditional sprinklers but it is a common practice to apply the prescribed sprinkler design areas in water mist system dimensioning as well. On one hand this may lead to under dimensioned systems and on the other hand to over dimensioned systems. Performance-based design and prescriptive dimensioning simply do not match.

The mismatch has been recognized in lower hazard category applications where the risk of under dimensioned systems is high, and additional restrictions have been set in some European water mist guidelines to prevent inadequate installations. But the mismatch works both ways: When it leads to largely over dimensioned systems the prescriptive area requirements should be reconsidered to the opposite direction. However, rather than tuning the fixed area requirements on a case-by-case basis it would be more reasonable to define alternative dimensioning methods to be applied in all cases. A few standard fire test protocols already exist for water mist sprinkler systems where the suppression performance and hydraulic dimensioning of the system are unambiguously coupled but the resulting *quantitative* dimensioning rules are entirely system specific.

Experimental results will be presented to demonstrate effects of prescriptive dimensioning on water mist systems with performance-based design parameters. The ways the dimensioning is addressed in different standards will be discussed.

Keywords: performance-based, system dimensioning, design parameters