UPGRADING PERFORMANCES AND SAFETY OF FIRE FIRST ATTACK SYSTEMS

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Bio: *Born in Genoa where , after Classic Lyceum, got a doctorate in Mechanical Engineering. Employed for ten years with Shell Italiana spa as Automotive Market Technical Advisor and then as Technical Director with Champion Spark Plugs spa, he acquired a participation and then became President of PTC Italiana srl, a company specialized in the production of waterjetting equipment up to 3000bar with professionality and performances internationally aknowledged . Now active as HP Water Mist specialist with Cristanini spa*

ABSTRACT

The fire control equipment market shows a growing interest for first attack systems in view of therir ability to offer suitable performances, easy mount on vehicles also of unconventional type such as motorcycles, small boats, helicopters and the likes suitable to respond quickly in the event of a fire.

Nevertheless this situation has prompted the request to enhance their water mist performances and in-use safety in order to further upgrade their degree of acceptance and customer satisfaction.

Many features of these units, such as portable Water Mist (WM) High Pressure (HP) systems (WMHP) and Fire Cutting Extinguishers (FCE), were evaluated with the purpose to optimize both their spray quality by offering Ultra Fine WM (UFWM) patterns with D_v 90%<50 μm as per NFPA 750 Norm and, even more important, the level of safety of the FCE units.

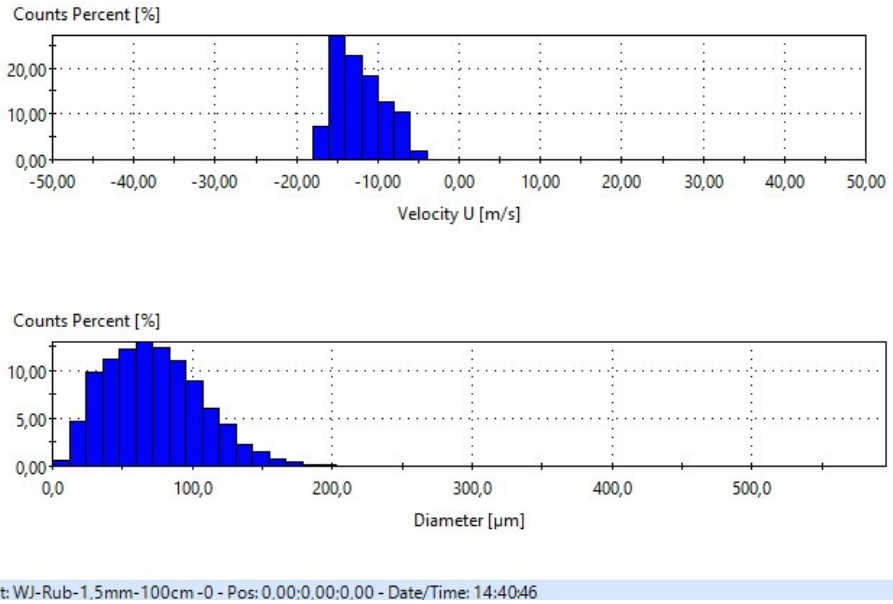
The purpose of the first study was to investigate different style of nozzles suitable to offer different spray patterns to optimize their selection by the team expert to match various fire scenarios.

Specific tests were carried out with an instrument following the PDA (Phase Doppler Analyzer), which represents an extension of Laser Doppler Anemometry (LDA or LDV).

Specifically this technique uses two incident laser beams, which reflection on the droplets surface is collected by two detectors and their form (angles of reflection, refraction and frequency) is used to identify droplets diametre and velocity by means of complex algorithms.

Three nozzles of different design, two with orifice made out of steel and one of rubis, were used with three different equipment monitoring spray patterns at distance between 500 and 3000mm with rubis orifice nozzle outperforming the steel made ones.

Also nozzle flow capacity was determined by collecting droplets in a catcher, with surface $S=0,18mm^2$, volume $V= 1,5mm^3$ to identify the spray concentration, i.e. number of droplets in the volume and transit of droplets by time through the catcher section.



One example of histograms collected during these tests is herewith included.

Concerning safety this mainly refers to a back-to-back comparisong between FCE systems using the Abrasive Suspension (ASWJ) method to turn water spray into a cutting jet vs. the Abrasive Entrained (AEWJ) types, where abrasive is added to the water flow just before the nozzle to obtain a cutting jet to pierce a hole before spraying WM to extinguish the fire.

As far as safety is concerned former ASWJ systems show serious flaws mainly related to the circulation of water-abrasive suspension in the hydraulic hose line and by the use of Radio Remote Control (RRC) systems to control the HP water jet, with RRC exposed to Radio Frequency Interference (RFI) without including any positive ON/OFF trigger control.

These problems have been not inly investigated during our tests, but also confirmed by University and Judicial bodies with the conclusions that systems based on ASWJ methods do not comply with EC Machine Directive.

Additionally their performances are challenged also by the new generation of FCE systems where the adoption of nozzles achieving an UFWM level of droplets, not possible with ASWJ types, improves their safety in case of uncontrolled waterjetting by a teammate , as shown here.

Keywords: Water Mist portable systems, Fire Cutting Extinguisher, Abrasive jet cutting