

**Brief write-up on CFEES Technology Ready for Transfer –
Low Pressure Twin Fluid Water Mist Technology for Fire Suppression**

Water mist technology has emerged as the most viable alternative to ozone depleting Halons for fire suppression applications. Fine water mist relies on relatively small ($<100\ \mu\text{m}$) droplet sprays to extinguish fires. The fire suppression mechanism of water mist is attributed to rapid evaporation of fine water droplets in the flame zone resulting in cooling and inerting of the enclosed volume. It offers lower water demand (than standard water sprinkler systems) and is able to extinguish fires in obstructed spaces (a key feature of halons and other gaseous agents). Other advantages include low agent cost, non-toxicity, environmentally benign, effectiveness in suppression of flammable liquid pool and spray fires and potential efficacy as inerting or explosion suppression systems. The water mist fire suppression systems can be used in a wide range of applications, including Class B spray and pool fires, fires in aircraft cabins, shipboard machinery, engine rooms & accommodation spaces and computer and electronics applications.

The CFEES water mist system is a total flooding type of twin fluid water mist system to provide volume protection of a compartment. It utilizes an indigenously designed twin fluid internally mixing type nozzle which works at 2-4 bar pressure of water and 4-6 bar pressure of air or nitrogen gas for generation of water mist with Sauter mean diameter (SMD) less than $50\ \mu\text{m}$ and mist generation rate in the range 1-3 LPM. A Patent has been filed for the developed nozzle entitled "An atomizer and a total flooding twin fluid based fire Protection system comprising the same" (no. 509/DEL/2012).

Under an R&D project for development of this technology, CFEES has set-up extensive test and evaluation facilities and carried out experimental studies for optimization of various mist system parameters to achieve high fire suppression effectiveness, equal or better than Halon using the developed twin fluid nozzle. Based on series of experiments (>100 nos.) in different scale chambers at CFEES on fires ranging from $5\ \text{kW/m}^3$ to $20\ \text{kW/m}^3$, a methodology has been evolved for design of the water mist system which has been validated in a real scale chamber having height of 5 m and free volume of approx. $1000\ \text{m}^3$. The performance of water mist system in the chamber was evaluated as per the fire scenarios mentioned in IMO Circ 1165 and was demonstrated to suppress various types of Class A & Class B pool & spray fires within 120 s with thermal management (compartment temp. $\leq 60\ ^\circ\text{C}$) achieved within 60 s as against the IMO qualification criteria of 900 s and 300 s (for $100\ ^\circ\text{C}$), respectively.

Internally mixed twin fluid nozzle and its characterization (Fig 1 and Fig 2) and Inside view of $1000\ \text{m}^3$ chamber used for validation of performance of water system and schematic of water mist system (Fig 3 and Fig 4) are shown in the enclosed figures.