

Fine Spray for Disinfection Purposes within Healthcare Environments

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Abstract

Hospital Acquires Infections (HAI's) are a major problem for both the UK's National Health Service (NHS) and other health services worldwide. The Spray Research Group (SRG) has been working with relevant industries to develop a product which can provide a delivery system for HAI combative disinfectant chemicals. A mobile fine spray unit, with spill return atomiser has thus been developed for the purpose of decontamination within healthcare environments. The unit must be able to spray uniformly onto any given surface, providing 'mist like' coverage. Any streaking patterns on the surface during or after spray application would jeopardise the efficiency of the spray system. Thus it is pertinent to understand the behaviour of droplets impacting on various surfaces, and particularly the occurrence of streaking.

Four sample surfaces (300mm x 300mm), (i.e. steel, acrylic, glass and laminated wood) will be sprayed separately using the spill return device and the substitute MRSA disinfectant liquid. This will provide information on the level of surface wetness using photographic images. The tests are to be conducted at steady conditions of room temperature, atmospheric pressure and relative humidity. Test results from similar work, which involved the use of an ultrasonic atomiser will be used as a benchmark and comparisons will be made. In each test the atomiser will be placed at two chosen distances (300mm and 700mm) relative to each corresponding surface. The surface will then be sprayed until the first signs of streaking are detected. The purpose of this investigation is to obtain information relating to the optimum combinations of spray input conditions (i.e. distance(s), time(s) and pressure(s)) required to uniformly 'mist' spray coat the surface(s) without the occurrence of streaking.

It was concluded that, the utilization of fine sprays ($15\mu\text{m} < D_{32} < 25\mu\text{m}$) at high liquid pressure ($< 110\text{bar}$) and low flow rates ($< 0.3\text{ l/min}$) is suitable for surface disinfection in healthcare applications (i.e. MRSA, VRSA etc.). At a distance of approximately 700mm between atomizer and target surface, using a spill diameter of 0.3mm with exit orifice diameter of 0.5mm and a pressure of 90bar, the most efficient coating can be achieved. Although results varied slightly between surface types, it has been demonstrated that the spill return atomizer can provide proficient cleaning on all surfaces commonly found within healthcare environments. Streaking as illustrated in the tests is a function of spray duration, distance, water supply pressure and material properties. There are however other factors that could be investigated that would also affect streaking, that being room temperature, material surface temperature and humidity. Furthermore if the disinfectant additive changes the surface tension of the liquid, this could affect drop size, streaking and ideal coating conditions.

Key words: fine spray, streaking, cleaning, disinfection, mist

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