Further Developments in Actuator Designs for Flashing Household Aerosols-Hair Spray

R. A. Sharief *
LionstarCorp. Ltd, England, UK

Abstract

There is an interest in either reducing the hydrocarbon content in aerosol cans or removing it completely, i.e. using inert compressed gas propellant. However both these approaches give relatively poor atomization unless improvements in atomization performance are made. Currently the propellants used are blends of liquefied hydrocarbon, mainly butane and these are classified as Volatile Organic Compounds (VOC's). Legislation controlling VOC use is becoming increasingly strict and is already affecting the household aerosol market in California. The key performance parameters of an aerosol are the discharge rate, the particle size and the cone angle. Safety is also a key requirement. The aims of this investigation are, to develop improved aerosol actuators, to reduce VOC content of existing aerosol cans, e.g. butane reduction and ethanol replacement by water, to achieve spray performance at least matching the characteristics of existing aerosols, to gain improved understanding of internal flashing flows. This paper describes experiments that have been carried out to explore the effects of shaped chambers, partition (various shapes), multiple passages and throttles on the spray quality of reduced VOC products causing pressure drops, turbulence, circulation, vaporization and consequently reducing particle sizes, also this paper explore the effects of flow control devices on the flashing flow and the quality of the spray and which are leading to new generation of household aerosols such as hair spray. Because of the ease of atomizing by using a flashing propellant, there has been remarkably little published research on how the internal geometry of the actuator affects performance. Partitions has also played a great role in having new designs working well with reduced VOC's products, none viscous products such as air fresheners, body spray and hair sprays, viscous products such as oil and polish also worked remarkably well with compress air products. The partitions create more turbulence and break up, consequently produces fine droplet. This paper is related to an innovation patents WO2005005053 (A1) and WO2005005055 (A1) and WO2007015062 (A1).The actuators in the research programme have been specially machined and a method of unit construction has been developed so that combinations of different shapes and sizes of internal passages and flow control devices may be tested systematically. Because consistency of spraying throughout can life is important, droplet sizes and flow rate are measured for full cans, and, typically, for 75%, 50%, and 25% full. Key features of the devices are inlet, shaped chambers and inserts, throttle(s), leading to the pre-chamber and exit. Complex designs of household aerosol can actuators have been made possible this has made feasible the use of various flow control devices, throttles(s) and pre throttles, and multiple orifice actuators, shaped chambers with no cost penalty. An experimental research programme has systematically applied these flow control devices in specially made actuator models for the cases of spraying those very different types of products, non viscous, anti-perspirant, hair spray, body spray, air-freshener and viscous products, polish, oil and paint and lotions. The experiments have shown that these flow control devices permit control of droplet size, control of flow rate, spray pattern manipulation, the production of narrower droplet size distributions, and reduction of can VOC content. From the experiments carried out by Raj designs on reduced VOC hair spray, body spray and oil. These designs improved the inhalables on anti-perspirants. It has proven that great improvements on reduction of drop sizes and crucial reduction on inhalables by keeping the flow rate the same with comparison to the original cap. More advanced designs of actuators have been made depending on the inventions related to shape chambers, multiple passages of flow and throttles. It is now possible to manufacture household can aerosols such as air fresheners, body sprays and hair sprays with massive reduction in hydrocarbons or volatile organic compounds (VOC). Also some of these designs can help to atomise viscous fluids such as oil, polish and paint. Also these designs can work with compress gas can products. From the experiments carried out it is obvious that these designs helped several products which was rather difficult not a long time ago. It is also helped to reduce the inhalable of these cans especially with the anti perspirant, oil and paint.

Key words; industrial spray

* rajab.sharief@yahooo.co.uk