# STUDY ON THE DROPLET EJECTION OF AN ER-FLUID-CONTROLLED INKJET PRINTHEAD


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**ABSTRACT**

The demand for non-impact printers has grown considerably with the advent of the personal computer. At the low end, two drop-on-demand techniques predominate the market – piezoelectric impulse and thermal-bubble types. However, the high cost of piezoelectric printhead and the thermal problems encountered by thermal-bubble jet printhead restrain the use of these techniques in array-type printhead. In a new design of printhead with ER fluid acting as a working medium, the actuating element and the ER fluid valve control the ink ejection. In this thesis, the transient behavior of the ER valve printhead incorporated with ink chamber is investigated. The pattern of ink droplet ejected from the printhead is examined by using the digital optical system for visualization. A quasi-static modeling of the system based on the bulk compressibility of the fluid and the stiffness of the elastic membrane is performed. The fluid pressure in the ink chamber is investigated, both theoretically and experimentally under the following controlled parameters: the actuating voltage and frequency of the piezoelectric transducer, the controlled electric field strength of the ER value. It is found that the velocity of the ejected ink droplet is increased with the actuation voltage of the piezoelectric transducer. And the better ink droplet without satellite can be obtained with the voltage impulse of magnitude 4V, pulse width 6.5 ms. With the application of 200V/mm electric field on the ER valve, the ink ejection can be effectively stopped. Although the frequency of the ink ejection is limited to less than 10Hz, due to the dynamic resonance of the system, it is believed that the operating bandwidth can be further raised with the minimization of the dimensions of the system.



Keywords : Electro-Rheological Fluid ; ER Fluid Valve ; Inkjet Printhead


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