

## 래피드 염색기용 소프트 노즐의 유동특성

이호준<sup>†</sup> · 이권희\* · 장효준\* · 노석홍\*(한국섬유기계연) · 이창호\*\*(우양기계)

### Flow Characteristics of Soft Nozzle in Rapid Dyeing Machinery

Ho-June Lee, Kwon-Heuy Lee, Chang-Ho Lee, Hyo-June Jang and Seok-Hong Noh

**Key Words:** Dyeing nozzle(염색노즐), Rapid dyeing machinery(래피드 염색기), Bath ratio(욕비), Volume Of Fluid(VOF),

**Abstract :** The inclined jet issued from a soft nozzle has been used to dye and transfer the fabric in dyeing machinery. The efficiency of these dyeing machines is dependent on the jet characteristics such as jet angle, flow rate, velocity, pressure distributions, etc. In this study, We carried out experiment and computational analysis to understand the dyeing jet characteristics in the rapid dyeing machinery. An axi-symmetric incompressible Navier-Stokes equation with k- $\epsilon$  turbulence model and implicit VOF method. are used in computation. The pressure ratio applied in nozzle operation is in the range of 1.5 and 2.5, the diameter of nozzle exit is in the range of 1.74 mm ~ 3.71 mm. Computational results are compared with experimental results.

## 다단형 실린더를 가지는 가변형 임계노즐 유동에 관한 연구

이준희<sup>†</sup>(안동대 원) · 김희동\*(안동대) · 박경암\*\*(KRISS)

### A Study of a Variable Critical Nozzle Flow with a Multiple-Stage Cylinder

Jun-Hee Lee, Heuy-Dong Kim and Kyung-Am Park

**Key Words:** Critical Nozzle(임계 노즐), Internal Flow(내부 유동), Discharge Coefficient(유출 계수), Compressible Flow(압축성 유동), Supersonic Nozzle(초음속 노즐)

**Abstract :** For improving the measurement of mass flow rate of a critical nozzle, a multiple-stage cylinder is inserted into a conventional critical nozzle thereby obtaining the variable operations by changing the effective cross-sectional area at the nozzle throat. A computational work is carried out using the 2-dimensional, axisymmetric, compressible, Navier-Stokes equations using a fully implicit finite volume method. The multiple-stage cylinder is moved along the flow axis in wide range of critical nozzle operation pressures. The results show that the multiple-stage cylinder effectively control the discharge coefficient of the variable critical nozzle flow.