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Flow from a nozzle (slice) with inclined upper lip

Scope

The primary variables which govern the angle of outflow and contraction coefficient for a nozzle with inclined upper lip are shown in Fig. 1.

Information given in Figs. 2 and 3 was derived for a nonviscous, ideal fluid and can be used to predict high velocity outflows of dilute fiber suspensions in water, provided that the effects of gravity and surface tension are small and the flow is unobstructed for a distance of several times the slice opening b .

The angle of outflow and contraction coefficient have been obtained for a nozzle with an inclined upper lip from the parametric equations

$$\frac{L}{B} = \frac{c}{\pi} \ln \left[\left(\frac{1 - c^{\frac{\pi}{\alpha}}}{1 + c^{\frac{\pi}{\alpha}}} \right)^2 \left(\frac{1 + \cos \frac{\pi\beta}{\alpha}}{1 - \cos \frac{\pi\beta}{\alpha}} \right) \right] - c\beta \quad (1)$$

$$\frac{b}{B} = \frac{c\alpha}{\pi} \ln \left[\frac{2 \left(1 + \cos \frac{\pi\beta}{\alpha} \right)}{\left(1 + c^{\frac{\pi}{\alpha}} \right)^2} \right] + c \quad (2)$$

applicable for small angles of lips (α less than 10 degrees) in which

$$c = \frac{d}{B} = \frac{C_c b}{B}$$

is a geometric ratio related to the contraction coefficient C_c . These equations were derived by conformal transformations applicable to irrotational flow and are presented in a report by Appel and Yu (1).

Figs. 2 and 3 show theoretical curves for angle of outflow and contraction coefficient computed by equations (1) and (2) using values which approximate those used in a mill.

Safety Precautions

No safety precautions have been specified for use with this technical information paper.

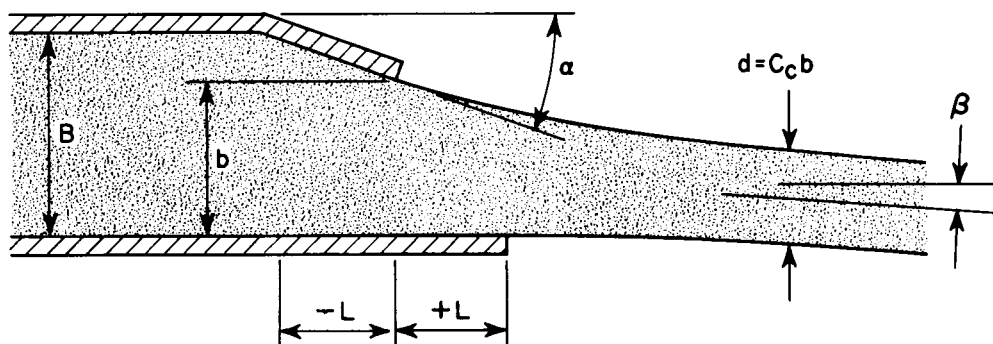


Figure 1. Dimensions for flow from a nozzle.

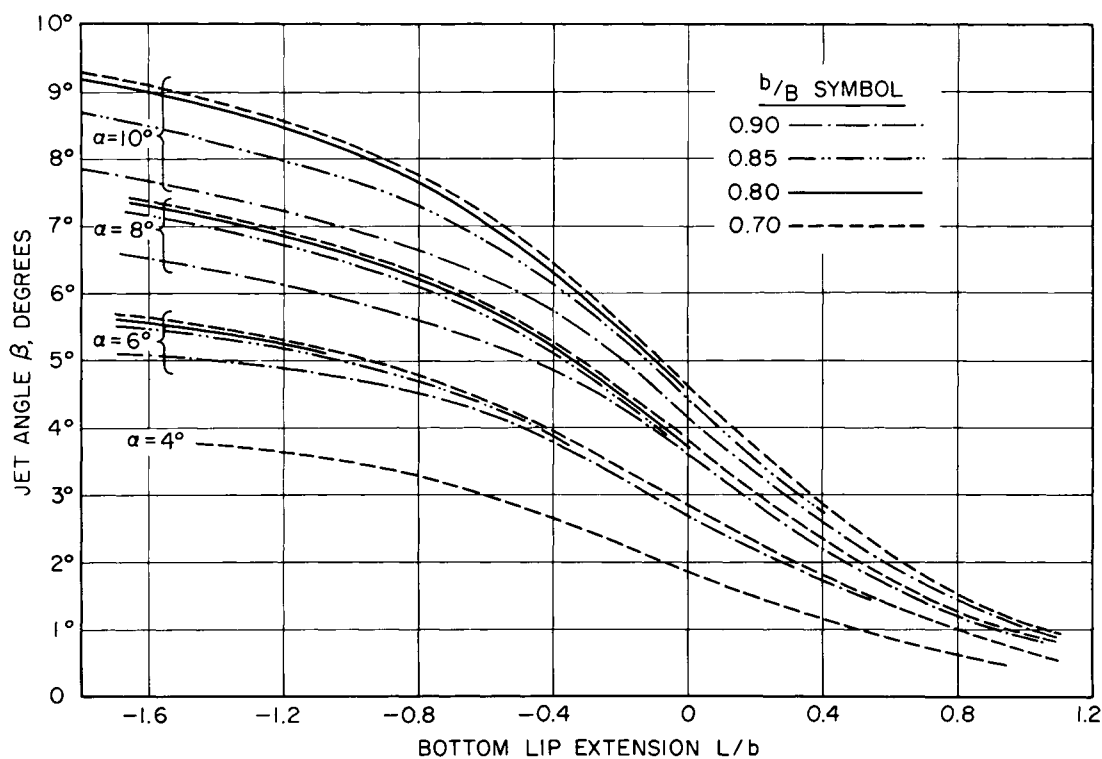


Figure 2 Theoretical angle of outflow from a nozzle with inclined top lip.