Fig. 8 are obtained by using two methods of calculation for sonic velocity C.

One is based on a simple expression of equation (8) and the other is more complicated expression by taking into account the thermodynamic effect [11].

(10) It is necessary to modify the measured vapour pressure p_s for the prediction of p_2^*/p_1 only in the case of kerosene because of the uncertainty of the measured vapour pressure.

Experimental results of desinent condition in kerosene advances in comparison with the prediction with equilibrium pressure p_s without modification.

Errata

in equation (8)	$= -\frac{1}{\rho_l}\left(\frac{d\alpha}{dp_l}\right)^{-1} = -\frac{1}{\rho_l}\left(\frac{d\alpha}{dr}\frac{dr}{dp_l}\right)^{-1}$	$\rightarrow = \left(-\rho_l \frac{d\alpha}{dp_l}\right)^{-1/2} = \left(-\rho_l \frac{d\alpha}{dr}\frac{dr}{dp_l}\right)^{-1/2}$
in equation (12)	$41\mathrm{Re}^*$	$\rightarrow 4/\mathrm{Re}^*$
	$\xi \frac{\mathrm{Re}^*}{16}$	$\rightarrow \xi \frac{\mathrm{Re}^*}{16\pi}$
in Fig. 5	equation (10)	$\rightarrow$ equation (12)
upper abscissa in Fig. 6	$11, \ldots . 18 \times 10^3$	$\rightarrow 1.1, \ldots . 1.8 \times 10^3$

Scrutinizing the k-ϵ Turbulence Model Under Adverse Pressure Gradient Conditions[1]

P. Bradshaw.[2] This useful paper incidentally reminds us that the standard model of the dissipation (ϵ) equation is based on a subtle interpretation of the terms in the equation, originally derived by Professor Rodi in unpublished work.

Most turbulence models are arranged to reproduce the mixing-length formula, rather than the logarithmic law as such, in the inner layer: that is, they reduce to turbulent energy production $P_k = \epsilon$, with $L \equiv k^{3/2}/\epsilon = (\kappa/c_\mu{}^{3/4})y$ as in equation (9) of the paper, leading to $\partial U/\partial y = (-\overline{uv})^{1/2}/(\kappa y)$. If we use these "local equilibrium" assumptions in Rodi and Scheuerer's analysis, their equation (10) is replaced by

$$c_{\epsilon 1} = c_{\epsilon 2} - \frac{\kappa^2}{\sigma_\epsilon \sqrt{c_\mu}}\left(1 - \frac{\alpha y}{\tau} + \frac{3}{2}\left(\frac{\alpha y}{\tau}\right)^2\right) \qquad (1)$$

where $\tau \equiv -\overline{uv}$ and $\alpha \equiv \partial\tau/\partial y$ (assumed independent of y). If $\alpha = 0$ (zero pressure gradient) this of course reduces to equation (8) of Rodi and Scheuerer. This formula is somewhat simpler than equation (10) which follows from assuming the logarithmic law, and it avoids the quite unphysical result that a *turbulence* parameter ($c_{\epsilon 1}$) depends on the *mean* pressure gradient. In principle the shear-stress gradient α is an extra unknown but in any numerical method it can be evaluated, as an average over the inner layer $0 < y/\delta < 0.1$ say, within the iterative loop needed to solve the main set of nonlinear equations.

Authors' Closure

The authors are grateful to Professor Bradshaw for his stimulating discussion in which he suggests to replace equation (10) in the paper by his equation (1). This is certainly a possible and useful alternative. The basic difference is that, in the derivation of the equation, Professor Bradshaw puts more emphasis on the assumption of local equilibrium while the authors assume the logarithmic velocity law to prevail in the inner layer. In both derivations, the length scale is assumed to vary linearly as in the mixing-length model. It is not entirely clear to the authors which of the two assumptions holds better under increasing adverse pressure gradients. There is, however, more experimental information available on the logarithmic law, which appears to hold quite well even for boundary layers approaching separation. It is for this reason that the authors prefer their derivation. Also, in a real calculation, the shear stress gradient α appearing in Professor Bradshaw's formula would have to be obtained from a straight-line approximation over the inner layer. This is probably not always easy to achieve, especially not for situations where the pressure gradient changes rapidly in the streamwise direction, causing relaxation phenomena in the boundary layer. It should be pointed out in this connection that equation (10) is also impractical for use in calculations and was not suggested for this purpose. Rather, the equation was presented in the paper to show qualitatively how the constant $c_{\epsilon 1}$ should change with increasing adverse pressure gradient.

Automatic Remeshing Scheme for Modeling Hot Forming Process[1]

Bruce Caswell.[2] This paper gives a concise account of how the finite element method can be applied on a mesh which moves with a fluid domain undergoing large changes. In the forming process described, a gob of molten glass is squeezed between mold and die with large changes in the free surface position. Furthermore, free surface elements eventually come into contact with the solid surfaces, and this gives rise to acute difficulties in the control of the moving mesh. The usual Galerkin formulation is altered by the introduction of time derivatives localized in the moving mesh. The main features of the problem are discussed as follows. At every time step, a new configuration of the boundary is computed from the velocity data on the boundary. In order for the interior domain to be reasonably discretized the interior nodes are recalculated on the basis of the updated boundary by means of algorithms described in the paper. Advancement to the next time step requires the most recently determined fields to be re-interpolated relative to the new nodal positions. This is a crucial step for er-

[1] By W. Rodi and G. Scheuerer, published in the June 1986 issue of the JOURNAL OF FLUIDS ENGINEERING, Vol. 108, pp. 174–179.
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[1] By H. P. Wang and R. T. McLay, published in the December 1986 issue of the JOURNAL OF FLUIDS ENGINEERING, Vol. 108, No. 4, pp. 465–469.
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