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DISCUSSION

Osborne Reynolds' turbulent flow resistance formulae

D. I. H. BARR

Mr M. J. Kenn, Imperial College of Science and Technology

It is now generally accepted that the Reynolds number effectively represents the ratio of inertia to viscous forces. Accordingly the number is dimensionless and the magnitude has significance.

20. When was this force ratio concept first contemplated and is there any evidence to show that this particular concept was ever appreciated by Osborne Reynolds?

Professor Barr

There has been some controversy regarding the origin of the force ratio method. Certainly, by the early 1930s, Prandtl was describing the force ratio method as a generalized approach to be contrasted with that of dimensional analysis. Previous usage known to me within the past century or so seems less generalized and more specific in application to individual problems. Before that, Newton certainly stated mass density times characteristic velocity squared times representative size squared to be the necessary basis of measure of resisting forces on a representative element (of volume) which would allow similarity of movement and actions to continue as between comparable accelerative systems. His further work can be interpreted as following through to so derive the practical consequences of the imposition of the similarity requirements of some of the standard non-dimensional groups on comparable systems.

22. My interpretation of Reynolds' 1883 paper² is that he did derive the Reynolds number as the ratio of viscous and inertial forces on representative elements in a wholly consistent manner, but that the physical interpretation of his definition of elements is more difficult than applies where the Newton representative volume or the Prandtl unit volume procedures are adopted.