

**IUTAM SYMPOSIUM ON LUBRICATED TRANSPORT OF
VISCOUS MATERIALS**

FLUID MECHANICS AND ITS APPLICATIONS

Volume 43

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Aims and Scope of the Series

The purpose of this series is to focus on subjects in which fluid mechanics plays a fundamental role.

As well as the more traditional applications of aeronautics, hydraulics, heat and mass transfer etc., books will be published dealing with topics which are currently in a state of rapid development, such as turbulence, suspensions and multiphase fluids, super and hypersonic flows and numerical modelling techniques.

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The median level of presentation is the first year graduate student. Some texts are monographs defining the current state of a field; others are accessible to final year undergraduates; but essentially the emphasis is on readability and clarity.

For a list of related mechanics titles, see final pages.

IUTAM Symposium on

Lubricated Transport of Viscous Materials

Proceedings of the IUTAM Symposium
held in Tobago, West Indies,
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Edited by

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PREFACE

The main objective of the First International Symposium on Lubricated Transport of Viscous Materials was to bring together scientists and engineers from academia and industry to discuss current research work and exchange ideas in this newly emerging field. It is an area of fluid dynamics devoted to laying bare the principles of the lubricated transport of viscous materials such as crude oil, concentrated oil/water emulsion, slurries and capsules. It encompasses several types of problem. Studies of migration of particulates away from walls, Segré-Silverberg effects, lubrication versus lift and shear-induced migration belong to one category. Some of the technological problems are the fluid dynamics of core flows emphasizing studies of stability, problems of start-up, lift-off and eccentric flow where gravity causes the core flow to stratify. Another category of problems deals with the fouling of pipe walls with oil, with undesirable increases in pressure gradients and even blocking. This study involves subjects like adhesion and dynamic contact angles. The topics of shear-induced diffusion of small particles and wall slip in slow flow are other appropriate subjects. Computer-intensive studies of flow-induced microstructures and moving interface problems are yet additional research directions.

The general consensus was that the Symposium was a tremendous success, although the number of presentations fell below expectations. Scientists from the petroleum industry, and this includes INTEVEP (Venezuela), Schlumberger and Syncrude Canada Ltd. , and consultants to oil companies actively participated in the Symposium. The meeting produced new insights which should lead to further interesting research work and established contacts for possible joint investigations.

This book, the Proceedings of the Symposium, represents some of the finest work to date in the field. The contributors are among the most innovative and imaginative. Most unfortunately, however, is the fact that some of the papers presented were, for one reason or another, not submitted for publication in the Proceedings. This is a disappointment to the organizers of the meeting and, I am sure, to those researchers who were unable to attend the meeting but nonetheless are looking forward to the release of the Proceedings.

I wish to thank all those who made this First Symposium a success, and this includes my co-Chairman Prof. D. Joseph, the contributors, the sponsors (particularly the University of the West Indies who made this publication possible), the members of the Scientific Committee and the members of the Organizing Committee - Dr. T. Jagai, Dr. W. Mellowes, Dr. K. Rahaman and Mr. G. Ramdath. Special mention must be made of the warm hospitality extended to us by the Tobago House of Assembly for which we are grateful.

August 6, 1997
Harold Ramkissoon.

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The Editor gratefully acknowledges the financial support of sponsors, local companies and institutions that made possible this “International Symposium on Lubricated Transport of Viscous Materials“ held in Tobago from January 7-10, 1997 that resulted in the publication of this Proceedings. In particular we thank the following :

- a) International Union of Theoretical and Applied Mechanics
- b) The University of the West Indies
- c) The Caribbean Congress of Fluid Dynamics and
- d) The Tobago House of Assembly.

INTRODUCTION

Lubricated transport of viscous materials is today becoming one of the more applicable areas of Fluid Dynamics. Although as a field with underlying principles it is relatively new, the concept of lubrication with its associated theory has been around some time. And, of course, one of the early applications has been in journal bearing. The interest in this new field is due mainly to its application in the petroleum industry. However, it is certainly not restricted to the transport of oil. Research work, for example, is being undertaken in the transportation of coal logs.

This Proceedings is a good reflection of the current research work being done on “Lubricated Transport of Viscous Materials“. In the first section of the book D. Joseph, a leading expert in the field, gives an introduction , punctuated with illustrations. The topics include “Types of Lubricated Flows“ and “Melt Fracture and Snakeskins“.

The second section covers flows through pipes. There are some notable contributions here in the areas of core-annular flow and transport of capsules. Parafin deposition in multiphase flowlines and well bores is a major problem encountered in the petroleum industry. A Joint Industrial Project was initiated in 1995 at the University of Tulsa to investigate this problem. The first part of this project is presented here.

In the third section, the focus is on suspensions and the contributions here are interesting. The work titled “Thoughts Old and New on Moving Contact Lines“ in the final section is very thought provoking.

I wish to express my deep appreciation to all those who made the publication of this Proceedings possible.

August 6th, 1997,
Dr. H. Ramkissoon.