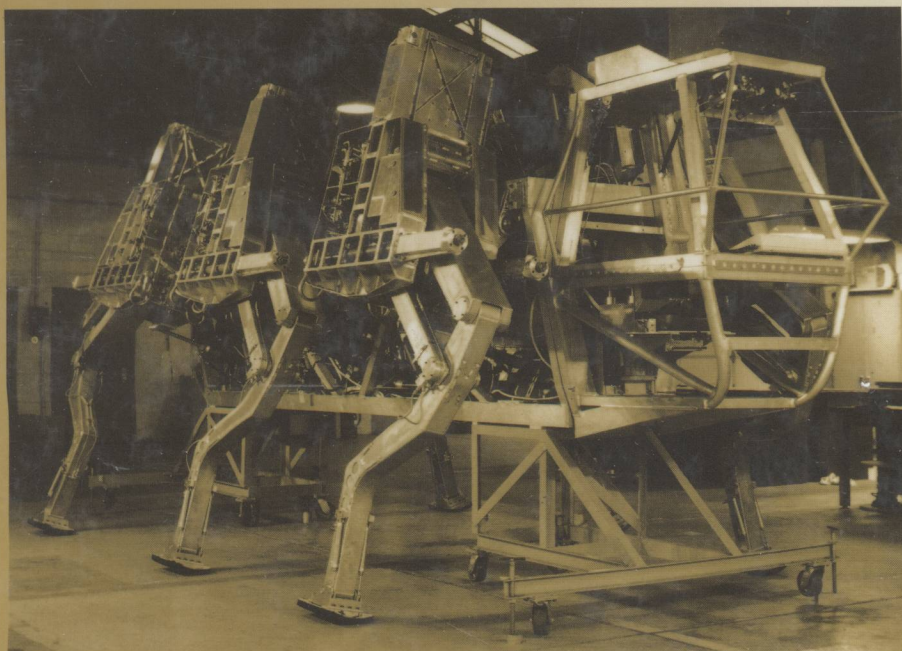


Selection of Engineering Materials and Adhesives



Lawrence W. Fisher, P.E.



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E200501697



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A CRC title, part of the Taylor & Francis imprint, a member of the
Taylor & Francis Group, the academic division of T&F Informa plc.

Published in 2005 by
CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

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CRC Press is an imprint of Taylor & Francis Group

No claim to original U.S. Government works
Printed in the United States of America on acid-free paper
10 9 8 7 6 5 4 3 2 1

International Standard Book Number-10: 0-8247-4047-5 (Hardcover)
International Standard Book Number-13: 978-0-8247-4047-4 (Hardcover)
Library of Congress Card Number 2004058288

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Library of Congress Cataloging-in-Publication Data

Fisher, Lawrence W.

Selection of engineering materials and adhesive / [Lawrence W. Fisher]
p. cm. -- (Mechanical engineering ; 155)

Includes bibliographical references and index.

ISBN 0-8247-4047-5

I. Strength of materials. [I. Adhesive.] I. Title. II. Mechanical engineering (Marcel Dekker, Inc.) ; 155.

TA405.F4975 2004
620.1'1--dc22

2004058288



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Selection of Engineering Materials and Adhesives

Preface

The ability to select and apply the appropriate material or adhesive is as important to the success of a design as the concept itself. The most creative ideas often require equally creative material formulations and application. Electromechanical products that fail prematurely in a mechanical fashion often do so as the result of poor material selection and implementation rather than defective materials. The rapid product development cycles of today's economy necessitate the ability to properly select the correct materials and adhesives quickly, the first time itself, leaving little room for error or time for redesign.

Why are poor material choices made? There is no single answer to this question, but there is little doubt the reason lies somewhere between demanding market requirements and engineering education. Time to market and cost considerations often pressure engineers into making decisions without all the desired facts and verification necessary prior to product release, resulting in unanticipated performance. Many successful designs are often developed with only 60–80% of the design requirements identified for the application. For most engineers this translates into an unacceptably low level of confidence in the design, leaving too much uncertainty over the resulting performance. Unfortunately, most engineers operate in an environment that necessitates this approach because the first to market is rewarded by greater market share and higher profits.

The need to prepare engineers for this environment by providing them with the necessary tools to be successful is paramount. Typical undergraduate mechanical engineering programs provide at least one course in materials and several involving their use in conjunction with engineering analysis-related topics. Upon graduation, design engineers need to be well-informed regarding the range of materials and adhesives available to them and how to select them if they expect to be successful. Unfortunately, this knowledge base is often entirely learned on the job through formal or informal

mentoring and without the aid of a reasonably brief, concise reference course book to guide them. The objective of this book is to fill that void.

This book has been arranged by material family and includes a section devoted to adhesives. It is not the intent of this book to be all-encompassing in any of the areas presented, but it is intended to provide the engineer with relevant details regarding the broad base of materials and adhesives available. It is also expected that the information here will provide a foundation suitable to support further investigation into the desired level of detail required by practicing engineers to successfully complete their design work.

Ultimately, material selection is driven and controlled by a design engineer's ability to research and obtain the most appropriate material for an application, after taking into consideration both the engineering and business climate for which it is to be used. Periodic assessment and reselection of the material is not uncommon and is often the best method of learning what is successful. The content of this text is intended to support the design engineer in this activity.

Lawrence W. Fisher, P.E.

June 2004
Torrance, California

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