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Editors

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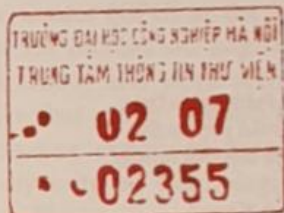
An Industrial Perspective


 Springer

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Preface

Congratulations and thank you for reading this book! You hold in your hand perhaps the first book solely written on mechanical reverse engineering from an industry perspective. The motivation for this book originates from the needs of today's global industry.

We recall an incident during one of our industrial trips to a local manufacturing company. The office secretary was photocopying documents for this meeting, when the manufacturing manager remarked, "Wouldn't it be nice if I could do the same with mechanical parts, it would save me and my team a lot of time and money." "Have you not heard of reverse engineering?" we asked him. "Reverse engineering, isn't that something to do with programming computers?" "No," we replied. "Reverse engineering (RE) refers to creating a computer-aided design (CAD) model from an existing physical object, which can be used as a design tool for producing a copy of an object, extracting the design concept of an existing model, or reengineering an existing part." His eyes lit up. Such situations are not uncommon in today's manufacturing arena.

With globalization and trade liberalization, manufacturing companies face increasing competition from goods and services produced in lower wage economies. Countries in the West cannot compete against low wages and must therefore depend on raising innovation and best practices to create better products. In an attempt to compete in such a volatile environment, companies are looking to lean and agile strategies to compete and survive. Lean or world class manufacturing is principally aimed at reducing waste and controlling things that can be measured and controlled. On the other hand, agility deals with things that cannot be controlled.

To be agile and lean, companies cannot apply traditional approaches that often result in problems with inventories, overhead, and inefficiencies. Companies need to create small quantities of highly customized, designed-to-order parts that meet the needs of the global customer. The swift trend toward a multiplicity of finished products with short development and production lead times has led many companies into problems with inventories, overhead, and inefficiencies. They are trying to apply the traditional mass-production approach

without realizing that the whole environment has changed. Mass production does not apply to products where the customers require small quantities of highly custom, designed-to-order products, and where additional services and value-added benefits such as product upgrades and future reconfigurations are as important as the product itself. Approaches such as rapid prototyping (RP) and reverse engineering (RE) are helping to solve some of these problems.

Rapid Prototyping - Rapid prototyping is a relatively new class of technology used for building physical models and prototype parts from 3-D computer-aided design (CAD) data. Unlike milling machines (which are subtractive), RP systems join liquid, powder, and sheet materials together to form complex parts. Layer-by-layer, RP machines fabricate plastic, wood, ceramic, and metal objects based on thin horizontal cross sections taken from computer models.

Reverse Engineering - Reverse engineering encompasses a variety of approaches to reproduce a physical object with the aid of drawings, documentation, or computer model data. In the broadest sense, reverse engineering is whatever it takes—manual or under computer control—to reproduce something.

This is a book for people interested in RE from an industrial perspective. Several journal papers have discussed issues related to RE, but from our conversations with industrialists and our personal experience, there is a huge gap in practical literature in this field, especially in manufacturing. Hence, this book is written for the benefit of the industrialist, who might not have the time to "scramble" through libraries and other sources to read journal papers. Although this book is written for such "novice" engineers, we expect the reader to be familiar with basic computer-aided design and manufacturing principles. The main theme of the book is to get you started using RE as quickly as possible. We have provided examples from the aerospace, automotive, and medical equipment industries to familiarize you with the principles and techniques of reverse engineering.

Probably the most unusual thing about this book is that we start with practical examples from industry. This approach has worked well in the classroom when we teach our course to industrial students. We expect the same results with this book. Many of the examples used in the later chapters depend on the principles and techniques of RE, so, it is essential that you read the first few chapters.

Having taught reverse engineering to industrial managers and engineers for a number of years, we are beginning to see that RE is finally receiving the respect it deserves.

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