Andreas Gebhardt

Understanding Additive Manufacturing

Rapid Prototyping - Rapid Tooling - Rapid Manufacturing

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Rapid Prototyping • Rapid Tooling • Rapid Manufacturing

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Hanser Publishers, Munich

Hanser Publications, Cincinnati

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Distributed in North and South America by:
Hanser Publications
6915 Valley Avenue, Cincinnati, Ohio 45244-3029, USA
Fax: (513) 527-8801
Phone: (513) 527-8977
www.hanserpublications.com

Distributed in all other countries by
Carl Hanser Verlag
Postfach 86 04 20, 81631 München, Germany
Fax: +49 (89) 98 48 09
www.hanser.de

Library of Congress Cataloging-in-Publication Data

Gebhardt, Andreas.
Understanding additive manufacturing / Andreas Gebhardt.
p. cm.
ISBN-13: 978-1-56990-507-4 (hardcover)
ISBN-10: 1-56990-507-X (hardcover)
1. Three-dimensional printing. 2. Manufacturing processes. I. Title.
TS171.8.G43 2011
658.5--dc23

2011040743

Bibliografische Information Der Deutschen Bibliothek
Die Deutsche Bibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie;
detaillierte bibliografische Daten sind im Internet über <http://dnb.d-nb.de> abrufbar.

ISBN 978-3-446-42552-1
E-Book-ISBN 978-3-446-43162-1

Production Management: Steffen Jörg
Coverconcept: Marc Müller-Bremer, www.rebranding.de, München
Coverdesign: Stephan Rönigk
Typeset: Manuela Treindl, Fürth
Printed and bound by Kösel, Krugzell
Printed in Germany

Acknowledgements

The interdisciplinary character of additive manufacturing technology as well as the tremendous speed of its development make it almost impossible for an individual to present it completely, accurately, and topically. Therefore, I am very thankful for the help and support provided by friends, colleagues, and companies involved in the field.

Special thanks go to my colleagues of the Center of Prototyping, Erkelenz, Germany, who provided the continuous contact to the "shop floor" that is the basis for the practical orientation of this book. Personal thanks go to Besima Sümer, Christoph Schwarz and Michael Wolf.

The preparation of the background material was supported in conjunction with the EU TEMPUS Project "Development of Master's Studies in Industrial Design and Marketing", JEP-41128-2006 (MK). Thanks to my colleagues Tatjana Kandikjan and Sofija Sidorenko, Ss. Cyril and Methodius University, Faculty of Mechanical Engineering, Skopje, Macedonia.

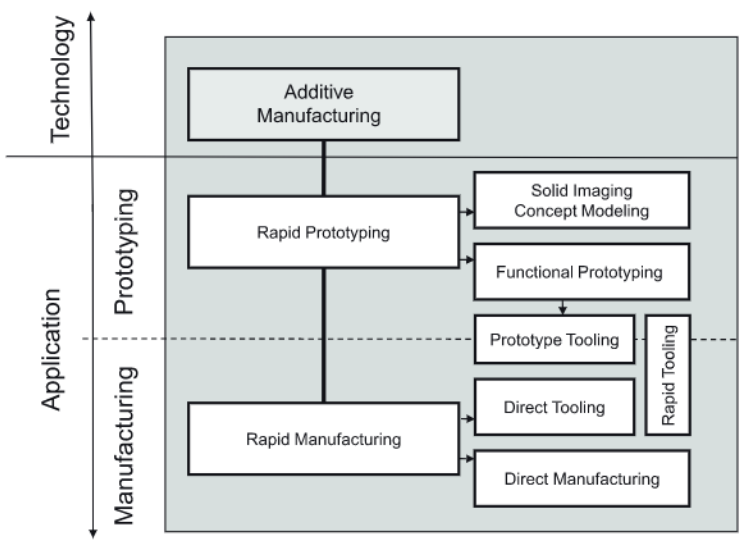
Personal thanks to my chief editor, Dr. Christine Strohm, who provided help with organizing my ideas in a well structured format and polishing my English language skills.

Table of Contents

1 Basics, Definitions, and Application Levels

Chapter 1 will provide a brief overview of what is called Additive Manufacturing (AM) and the principle of layer-based technology including the main definitions. Throughout this book we will approach the topic from the viewpoint of the applicator and will focus on the industrial applications of AM. Process details will be discussed in Chapter 2.

All definitions are linked to a step-by-step elaboration of the "AM Application Sheet" which summarizes the definitions and interdependencies of the various applications, all of which will be illustrated by typical examples. The final version of the "AM Application Sheet" (identical with Fig. 1.19) is shown below.



Additive Manufacturing (AM) Application Sheet: Technology – and Application Level Definitions

1.1 Basics and Definitions

1.1.1 Additive Manufacturing – Layer Manufacturing

"Additive Manufacturing" (AM) is a layer-based automated fabrication process for making scaled 3-dimensional physical objects directly from 3D-CAD data without using part-depending tools. It was originally called "3D Printing" and is still frequently called that.

Together with the well established "Subtractive Manufacturing", such as milling or turning, and the "Formative Manufacturing", such as casting or forging, Additive Manufacturing provides the third supporting pillar of the entire manufacturing technology /Bur93/.

When the first approaches to "Additive Manufacturing" entered the market in 1987, it was called "Rapid Prototyping" or "Generative Manufacturing". Both terms are still in use and in the past years many different names have been presented and frequently more are added. Although each of the names is perfect from the special viewpoint of its creator, many of them cause confusion. Often, this is one reason why newcomers to the industry in particular sometimes feel lost in the field of AM.

To obtain a brief overview, a small selection of the mostly used terms are structured according to a few families of key words. Often used terms include:

- "additive" Additive Manufacturing (AM)
  Additive Layer Manufacturing (ALM)
  Additive Digital Manufacturing (DM)
- "layer" Layer Based Manufacturing
  Layer Oriented Manufacturing
  Layer Manufacturing
- "rapid" Rapid Technology
  Rapid Prototyping, Rapid Tooling, Rapid Manufacturing
- "digital" Digital Fabrication
  Digital Mock-Up
- "direct" Direct Manufacturing, Direct Tooling
- "3D" 3D Printing, 3D Modeling

Any and all imaginable (and even not imaginable) combinations of these keywords are existing too.

Attention: Some of these terms are under copyright protection!

There are additional terms in use that are created according to new and innovative manufacturing technologies, they include: