

FUNDAMENTALS OF METAL FORMING

Metal Forming

- Large group of manufacturing processes in which plastic deformation is used to change the shape of metal workpieces
- The tool, usually called a die, applies stresses that exceed yield strength of metal
- The metal takes a shape determined by the geometry of the die

Stresses in Metal Forming

- Stresses to plastically deform the metal are usually **compressive**
Examples: forging, rolling, extrusion
- However, some forming processes:
 - Stretch the metal (**tensile** stresses)
 - Others bend the metal (tensile and compressive)
 - Still others apply **shear** stresses

*Tensile - capable of being stretched or extended; ductile.
 *Shear stress - exists when two parts of a material tend to slide across each other in any typical plane of shear upon application of force parallel to that plane.

Material Properties in Metal Forming

Desirable material properties:

- **Low yield strength and high ductility**

*Yield strength refers to an indication of maximum stress that can be developed in a material without causing plastic deformation.

These properties are affected by temperature:

Ductility increases and yield strength decreases when work temperature is raised

Other factors:

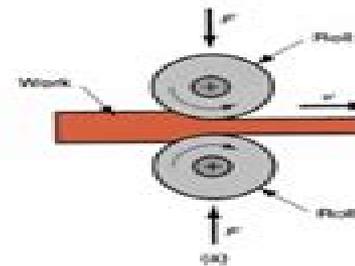
Strain rate and friction

Bulk Deformation Processes

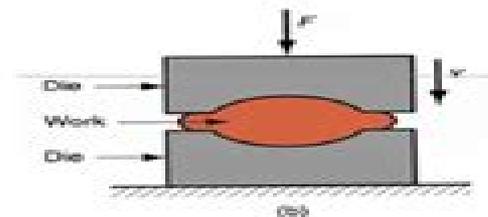
- Characterized by significant deformations and massive shape changes
- "Bulk" refers to workparts with relatively low surface area-to-volume ratios
- Starting work shapes include cylindrical billets and rectangular bars

BASIC PROCESSES BULK DEFORMATION

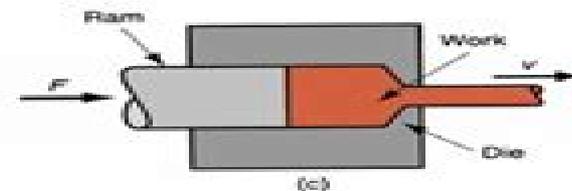
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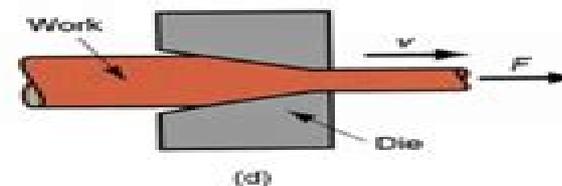
B. Forging



C. Extrusion



D. Drawing



Handbook Of Metal Forming Processes

SJ Ball



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Handbook of Metal-forming Processes Betzalel Avitzur,1983 Handbook of Metalforming Processes Henry Ericsson Theis,1999-05-26 Reflecting hands on experience of materials equipment tooling and processes used in the industry this work provides up to date information on flat rolled sheet metal products It addresses the processing and forming of light to medium gauge flat rolled sheet metal illustrating the versatility and myriad uses of this material Metal Forming Handbook Schuler,1998 This chinese edition of the Metal Forming Handbook presents the fundamentals of metal forming processes and press design As a textbook and reference work in one it provides an in depth study of the major metal forming technologies sheet metal forming cutting hydroforming and solid forming Written by qualified practically oriented experts for practical implementation supplemented by sample calculations and illustrated throughout by clearly presented color figures and diagrams this book provides fundamental information on the state of the art in the field of metal forming technology

Handbook of Fabrication Processes Orville D. Lascoe,1988-01-01 This book is a valuable reference for the materials engineer the manufacturing engineer or the technician who wants a practical description of fabrication processes Sheet metal fabrication processes are receiving greater attention and are more widely applied by the metalworking industries because of the savings in cost and material This book compiles the proven theories and operations tested in industrial applications Focus is on the non chip producing machine tools that shape metals by shearing pressing and forming New materials and advances in tooling are discussed as well as the need for applied science in optimizing the operations for sheet metal fabrication processes Examples of each of these forming processes are given and the text also describes the mechanics of each process so that a logical decision can be made concerning the best operation for a specific result The volume is divided into five sections each consisting of a series of chapters The major sections cover fabricating presses stamping and forming operations plastics for tooling structural shapes and non traditional machining A section on definitions and terminology is also included The book is profusely illustrated and indexed making it easy to find references to specific forming topics Written by an expert with 40 years of hands on practical engineering experience this Handbook contains the essential information you need on forming methods machinery and the response of materials Handbook of Metalforming Processes Henry Ericsson Theis,1999-05-26 Reflecting hands on experience of materials equipment tooling and processes used in the industry this work provides up to date information on flat rolled sheet metal products It addresses the processing and forming of light to medium gauge flat rolled sheet metal illustrating the versatility and myriad uses of this material

Handbook of Metal Forming Kurt Lange,Klaus Pöhlandt,1985 Handbook of Workability and Process Design George E. Dieter,Howard A. Kuhn,S. Lee Semiatin,2003-01-01 **Handbook of Metal Forming Process** Darren Wang,2015-01-21 This book discusses various characteristics of metal forming and its process tools and design The various chapters within this book discuss advanced processes and analysis of these processes keeping in mind the aspects of the materials The book also

includes chapters on machine tools and their structures Strategies for a programmable metal forming press and procedures for calculating forming limits of sheet metal are also discussed *Metal Forming Handbook* Göppingen Schuler GmbH, Schuler, Gmbh Schuler Gmbh, 2001 The Metal Forming Handbook presents the fundamentals of metal forming processes and press design As a textbook and reference work in one it provides an in depth study of the major metal forming technologies sheet metal forming cutting hydroforming and solid forming Written by qualified practically oriented experts for practical implementation supplemented by sample calculations and illustrated all through by clearly presented color figures and diagrams this book supplies fundamental information and solutions on the latest metal forming technology *Sheet Metal Forming Processes and Die Design* Vukota Boljanovic, 2004 This book is a complete modern guide to sheet metal forming processes and die design still the most commonly used methodology for the mass production manufacture of aircraft automobiles and complex high precision parts It illustrates several different approaches to this intricate field by taking the reader through the hows and whys of product analysis as well as the techniques for blanking punching bending deep drawing stretching material economy strip design movement of metal during stamping and tooling **DeGarmo's Materials and Processes in Manufacturing, Global Edition** J. T. Black, Ronald A. Kohser, 2017-12-04 Newly revised DeGarmo's Materials and Processes in Manufacturing has been the market leading text on manufacturing and manufacturing processes courses for over fifty years Authors J T Black and Ron Kohser have continued this book's long and distinguished tradition of exceedingly clear presentation and highly practical approach to materials and processes presenting mathematical models and analytical equations only when they enhance the basic understanding of the material Updated to reflect all current practices standards and materials this edition has new coverage of additive manufacturing lean engineering and processes related to ceramics polymers and plastics *DeGarmo's Materials and Processes in Manufacturing* Ernest Paul DeGarmo, J. T. Black, Ronald A. Kohser, 2011-08-30 Now in its eleventh edition DeGarmo's Materials and Processes in Manufacturing has been a market leading text on manufacturing and manufacturing processes courses for more than fifty years Authors J T Black and Ron Kohser have continued this book's long and distinguished tradition of exceedingly clear presentation and highly practical approach to materials and processes presenting mathematical models and analytical equations only when they enhance the basic understanding of the material Completely revised and updated to reflect all current practices standards and materials the eleventh edition has new coverage of additive manufacturing lean engineering and processes related to ceramics polymers and plastics [Handbook of Industrial Engineering](#) Gavriel Salvendy, 2001-05-25 Unrivaled coverage of a broad spectrum of industrial engineering concepts and applications The Handbook of Industrial Engineering Third Edition contains a vast array of timely and useful methodologies for achieving increased productivity quality and competitiveness and improving the quality of working life in manufacturing and service industries This astoundingly comprehensive resource also provides a cohesive structure to the discipline of industrial engineering with four major

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