

Casting Defect Analysis

International conference supported by Indian Statistical Institute, held at Bangalore, 20-22 December, 2011; selected papers.

This book deals with various science and technology factors that need careful consideration in producing a casting. It consists of 11 chapters contributed by experts in their respective fields. The topics include simulation of continuous casting process, control of solidification of continuous castings, influence of mold flux in continuous casting, segregation in strip casting of steel, developments in shell and solid investment mold processes, innovative pressure control during filling of sand molds, fracture toughness specifically of castings, permanent molding of cast iron, wear resistant castings and improvement of accuracy in estimating graphite nodularity in ductile iron castings.

"Handbook of Production of Ductile Iron through Case Studies & Practical Tips." This Handbook is for reference for the Practicing Foundry Engineers and workers to solve their troubleshooting during Production of Ductile Iron Castings as per global specifications. ThisHandbookis givingCase Studies and Practical Tips during five main stages 1. Selection of raw materials 2. Melting of metal in Induction Furnaceto give good metallurgical quality of metal. 3. Magnesium Treatment Processes 4. Actual Magnesium Treatment-Mechanism of Nodule formation 5. Inoculation Processes- Purpose of this stage.6. Concept of Hardenability and various Heat Treatments given to Ductile Iron7. Compacted Graphite Cast Iron 8. Metallographic Analysis 9. Casting Defect Analysis through case studies. 10.More than 100 Tables.Please note that each chapter contains number of actual case studies solved by the author and Questions & Answers.

Analysis of Casting Defects

Principles of Foundry Technology

Predicting and Validating Multiple Defects in Metal Casting Processes Using an Integrated Computational Materials Engineering Approach

A Case Study

Part 2

Complete Investigative Toolkit for Metal Failure-Design or Process Whether the problem is corrosion on the working surfaces of valuable or life-essential machinery, breakdowns in linchpin equipment, or life-threatening faults in air- or spacecraft, the causes must be found so that future disasters may be prevented. Metallurgy of Failure Analysis puts the tools for finding the answers in your hands. A complete guide to all types of metal failure, both design and process, it features: coverage of faults due to casting, forging, welding, machining, and heat treatment; analysis of the concepts and mechanisms of fatigue, stress corrosion, hydrogen embrittlement, and more; remedial measure for corrosion, overload, fatigue, and wear; investigative proceduras including destructive, nondestructive, and fractographic analysis. This volume of the book contains a collection of chapters selected from the papers which originally (in shortened form) have been presented at the 3rd International Conference on Human-Systems Interaction held in Rzeszow, Poland, in 2010. The chapters are divided into five sections concerning: IV. Environment monitoring and robotic systems, V. Diagnostic systems, VI. Educational Systems, and VII. General Problems. The novel concepts and realizations of humanoid robots, talking robots and orthopedic surgical robots, as well as those of direct brain-computer interface are examples of particularly interesting topics presented in Sec. VI. In Sec. V the problems of skin cancer recognition, colonoscopy diagnosis, and brain strokes diagnosis as well as more general problems of ontology design for medical diagnostic knowledge are presented. Example of an industrial diagnostic system and a concept of new algorithm for edges detection in computer-analyzed images are also presented in this Section. Among the educational systems, in Sec. VII the remote teaching and testing methods in higher education, a neurophysiological approach to aiding the learning process, an entrepreneurship education system and a magnetic levitation laboratory systems are presented. Sec. VII contains papers devoted to selected general human-computer systems interaction problems. Among them the problems of rules formulation for automatic reasoning, creation of ontologies, Boolean recommenders in decision systems and languages for proteins structural similarity description can be mentioned. The chapters included into both, I and II volumes of the book illustrate a large variety of problems arising and methods used in the rapidly developing Human-System Interaction research domain.

This book helps foundrymen eliminate or minimize inherent casting problems, imprrove casting quality and reduce cleaning and finishing costs.

Metallurgical Failure Analysis

Use of Tracer Method for Casting Defect Analysis

Techniques and Case Studies

Proceedings of the National Conference on Investment Casting

Handbook of Production of Ductile Iron

The volume contains latest research on software reliability assessment, testing, quality management, inventory management, mathematical modeling, analysis using soft computing techniques and management analytics. It links researcher and practitioner perspectives from different branches of engineering and management, and from around the world for a bird's eye view on the topics. The interdisciplinarity of engineering and management research is widely recognized and considered to be the most appropriate and companies looking to drive decision making are provided actionable insight on each level and for every role using key indicators, to generate mobile-enabled scorecards, time-series based analysis using charts, and dashboards. At the same time, the book provides scholars with a platform to derive maximum utility in the area by subscribing to the Idea of managing business through performance and business analytics.

Contributed papers presented at the conference held at Central Mechanical Engineering Research Institute, Durgapur.

This book presents a scientific approach to metal casting design and analysis supported by software tools. Unlike other books in metal casting focused only on the process know-how, this book uncovers the know-why as well. Besides serving the needs of students of mechanical, production and metallurgical engineering, this book is equally meant to benefit practicing engineers involved or interested in casting development, including product designers, toolmakers, foundry engineers, supply chain managers, engineering applicable to all types of castings: ferrous and non-ferrous, produced in sand and metal moulds. By gaining a better understanding of the theory and logic involved through creating, analysing and optimizing virtual castings, the readers will learn how to Design process-friendly cast products, leading to shorter development time Manufacture assured quality castings, leading to fewer rejections and 'surprises' Manage material and energy utilization, leading to higher yield and lower costs.

Principles of Metal Casting, Third Edition

METAL CASTING

Quality and Reliability Engineering: Recent Trends and Future Directions

Casting Defect Analysis Expert System

Casting Defects Handbook

Metallurgical Failure Analysis: Techniques and Case Studies explores how components fail and what measures should be taken to avoid future failures. The book introduces the subject of failure analysis; covers the fundamentals and methodology of failure analysis, including fracture and fractography of metals and alloys and the tools and techniques used in a failure investigation; examines 37 case studies on high performance engineering components; features experimental results comprised of visual-, fractographic-, or metallographic- examination, hardness measurements and chemical analysis; includes illustrations and evidence obtained through test results to enhance understanding; and suggests suitable remedial measures when possible. The various case studies are classified according to the major causes of failures. The case studies pertain to: Improper Material Selection, Manufacturing Defects, Casting Defects, Overload, Fatigue, Corrosion Induced Failures, Hydrogen Embrittlement and Stress Corrosion Cracking, Wear and Elevated Temperature Failures. The book contains information gathered over three decades of the author's experience handling a variety of failure cases and will go a long way toward inspiring practicing failure analysts. The book is designed for scientists, metallurgists, engineers, quality control inspectors, professors and students alike. Explores the fundamentals and methodology of failure analysis Examines the major causes of component failures Teaches a systematic approach to investigation to determine the cause of a failure Features 37 case studies on high performance engineering components

This book contains a collection of papers on the science, engineering, and technology of shape casting, with contributions from researchers worldwide. Among the topics that are addressed are the structure-property-performance relationships, modeling of casting processes, and the effect of casting defects on the mechanical properties of cast alloys.

This book describes systematically the theory and technology of the precision forming of large, complex and thin-walled superalloy castings for aircraft engines, covering all the important basic aspects of the manufacturing process, including process design, wax pattern, ceramic molds, casting and solidification, heat treatment, repair casting and dimension precision control. The correlation of casting defects, structural characteristics and performance of castings is revealed through a range of tests. It also discusses the latest technologies and advances in this field – such as imaging the solidification process by means of synchrotron radiography, 3D computerized tomography and reconstruction of microporosity defects, analysis and diagnosis of error sources for dimension over-tolerance and adjusted pressure casting technology – which are of particular interest. Providing essential insights, the book offers a valuable guide to the design and manufacture of superalloy casting parts for aircraft engines.

Principles of Metal Casting

Casting defects handbook : Aluminium and Aluminium alloys

Failure Analysis of Heat Treated Steel Components

Advances in Interdisciplinary Research in Engineering and Business Management

COMPUTER-AIDED DESIGN AND ANALYSIS

All machining process are dependent on a number of inherent process parameters. It is of the utmost importance to find suitable combinations to all the process parameters so that the desired output response is optimized. While doing so may be nearly impossible or too expensive by carrying out experiments at all possible combinations, it may be done quickly and efficiently by using computational intelligence techniques. Due to the versatile nature of computational intelligence techniques, they can be used at different phases of the machining process design and optimization process. While powerful machine-learning methods like gene expression programming (GEP), artificial neural network (ANN), support vector regression (SVM), and more can be used at an early phase of the design and optimization process to act as predictive models for the actual experiments, other metaheuristics-based methods like cuckoo search, ant colony optimization, particle swarm optimization, and others can be used to optimize these predictive models and find the optimal process parameter combination. These machining and optimization processes are the future of manufacturing. Data-Driven Optimization of Manufacturing Processes contains the latest research on the application of state-of-the-art computational intelligence techniques from both predictive modeling and optimization viewpoint in both soft computing approaches and machining processes. The chapters provide solutions applicable to machining or manufacturing process problems and for optimizing the problems involved in other areas of mechanical, civil, and electrical engineering, making it a valuable reference tool. This book is addressed to engineers, scientists, practitioners, stakeholders, researchers, academicians, and students interested in the potential of recently developed powerful computational intelligence techniques towards improving the performance of machining processes.

The definitive metal casting resource--fully updated Written by prominent industry experts, Principles of Metal Casting, Third Edition, addresses the latest advances in the field such as melting, casting processes, sand systems, alloy development, heat treatment, and processing technologies. New chapters cover solidification modeling, casting defects, and zinc and zinc alloys. Detailed photographs, illustrations, tables, and equations are included throughout. Ideal for students and researchers in metallurgy and foundry science as well as foundry industry professionals, this authoritative guide provides all of the information needed to produce premium-quality castings. Comprehensive coverage includes: Patterns Casting processes Solidification of metals and alloys Gating and rising of castings Casting process simulation Aluminum and aluminum alloys Copper and copper alloys Magnesium and magnesium alloys Zinc and zinc alloys Cast Irons Steel castings Cleaning and inspection Casting defects

This book, Casting Processes and Modelling of Metallic Materials, explores the various casting and modelling activities related to metallic alloy systems. The book provides results of research work conducted by experts from all over the globe to add to the research community in the era of the casting process and modelling. The book was edited by two experts in the field of materials science and modelling, Dr. Abdallah and Dr. Aldoumani, whom both have several publications in peer-reviewed journals, worldwide conferences and scientific books. The book introduces the casting processes and then discusses the various issues and possible solutions. Over the past years, various models have been proposed and utilized to predict the performance of castings. Some of these models proved to be accurate whereas others failed to predict the casting performance. The strength of any predictive tool depends on the employment of physically meaningful parameters that replicate the real-life conditions. This has been illustrated in the current book such predictive models and finite element (FE) modelling to illustrate the behaviour of castings in real-life conditions.

Precision Forming Technology of Large Superalloy Castings for Aircraft Engines

Casting Design and Performance

Modeling for Casting and Solidification Processing

Human – Computer Systems Interaction: Backgrounds and Applications 2

This collection explores computational fluid dynamics (CFD) modeling and simulation of engineering processes, with contributions from researchers and engineers involved in the modeling of multiscale and multiphase phenomena in material processing systems. The papers cover the following processes: Iron and Steelmaking (Tundish, Casting, Converter, Blast Furnace); Microstructure Evolution; Casting with External Field Interaction; and Smelting, Degassing, Ladle Processing, Mechanical Mixing, and Ingot Casting. The collection also covers applications of CFD to engineering processes, and demonstrates how CFD can help scientists and engineers to better understand the fundamentals of engineering processes.

Comprehensive Materials Processing provides students and professionals with a one-stop resource consolidating and enhancing the literature of the materials processing and manufacturing universe. It provides authoritative analysis of all processes, technologies, and techniques for converting industrial materials from a raw state into finished parts or products. Assisting scientists and engineers in the selection, design, and use of materials, whether in the lab or in industry, it matches the adaptive complexity of emergent materials and processing technologies. Extensive traditional article-level academic discussion of core theories and applications is supplemented by applied case studies and advanced multimedia features. Coverage encompasses the general categories of solidification, powder, deposition, and deformation processing, and includes discussion on plant and tool design, analysis and characterization of processing techniques, high-temperatures studies, and the influence of process scale on component characteristics and behavior. Authored and reviewed by world-class academic and industrial specialists in each subject field Practical tools such as integrated case studies, user-defined process schemata, and multimedia modeling and functionality Maximizes research efficiency by collating the most important and established information in one place with integrated applets linking to relevant outside sources Examines the types, microstructures and attributes of AHSSAlso reviews the current and future applications, the benefits, trends and environmental and sustainability issues.

Casting Processes and Modelling of Metallic Materials

Comprehensive Materials Processing

A Symposium Sponsored by ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys, Bal Harbour, Fla., 12-13 Nov. 1980

Metallurgy of Failure Analysis

Science, Technology, and Applications

This text seeks to provide a comprehensive technical foundation and practical examples for casting process modelling technology. It highlights fundamental theory for solidification and useful applications for industrial production. It also details shape and ingot castings, semi-solid metalworking, and spray forming.

This proceeding constitutes the thoroughly refereed proceedings of the 1st International Conference on Combinatorial and Optimization, ICCAP 2021, December 7-8, 2021. This event was organized by the group of Professors in Chennai. The Conference aims to provide the opportunities for informal conversations, have proven to be of great interest to other scientists and analysts employing these mathematical sciences in their professional work in business, industry, and government. The Conference continues to promote better understanding of the roles of modern applied mathematics, combinatorics, and computer science to acquaint the investigator in each of these areas with the various techniques and algorithms which are available to assist in his or her research. We selected 257 papers were carefully reviewed and selected from 741 submissions. The presentations covered multiple research fields like Computer Science, Artificial Intelligence, internet technology, smart health care etc., brought the discussion on how to shape optimization methods around human and social needs.

Major casting processing advancements have been made in experimental and simulation areas. Newly developed advanced casting technologies allow foundry researchers to explore detailed phenomena associated with new casting process parameters helping to produce defect-free castings with good quality. Moreover, increased computational power allows foundry technologists to simulate advanced casting processes to reduce casting defects. In view of rapid expansion of knowledge and capability in the exciting field of casting technology, it is possible to develop new casting techniques. This book is intended to discuss many casting processing technologies. It is devoted to advanced casting processing technologies like ductile casting production and thermal analysis, casting of metal matrix composites by vortex stir casting technique, aluminum DC casting, evaporative casting process, and so on. This book entitled Advanced Casting Technologies has been organized into seven chapters and categorized into four sections. Section 1 discusses the production of ductile iron casting and thermal analysis. Section 2 depicts aluminum casting. Section 3 describes the casting manufacturing aspects of functionally graded materials and evaporative casting process. Section 4 explains about the vortex stir casting technique to process metal matrix composite castings. All the chapters discussed in detail the processing steps, process parameters involved in the individual casting technique, and also its applications. The goal of the book is to provide details on the recent casting technologies.

Advanced High-Strength Steels

Defect Analysis and Data Collection Software for an Iron Foundry

Science and Technology of Casting Processes

NCIC 2003

Through Case Studies and Practical Tips

Torrance Casting is an iron foundry located in La Crosse, Wisconsin. The foundry produces castings by melting raw materials into molten iron, which are then poured into molds created from compressed sand. While creating castings from molten iron is a considerably low tech endeavor, there are many opportunities to improve the efficiency of their business through computer software. The process of creating castings produces a large array of data that must be recorded for accounting, defect analysis and process control. Currently this data is recorded manually on paper forms and filed away for future reference. This manuscript describes the design and development of a software application for an iron foundry in process control, data collection, and defect identification. The application allows the foundry workers to replace current paper processes with a flexible interactive process to record data produced in the casting process. It also replaces manual data collection with intuitive graphical data entry screens. This data can later be easily analyzed to determine the cause of casting defects.

Metal casting is a manufacturing process of solidifying molten metal in a mold to make a product with a desired shape. Based on its own unique fabrication benefits, it is one of the most widely used manufacturing processes to economically produce parts with complex geometries in modern industry, especially for transportation and heavy equipment industries where mass production is needed. However, various types of defects typically exist in the as-cast components during the casting processes, which may make it difficult for post-processing and limit the service life and further application of products. It becomes imperative to analyze the processes in actual manufacturing conditions to predict and prevent those casting defects. Since it can be quite time consuming and costly to assess the processes experimentally, a computer-aided approach is highly desirable for product development and process optimization. In recent decades, computer-aided engineering (CAE) techniques have been rapidly developed to simulate different casting processes, which have great benefits to tackle casting defects in a more practical and efficient way. This work focuses on using ProCAST®, a finite element analysis (FEA) software, together with other necessary simulation and modeling techniques, including Computer-Aided Design (CAD), Calculation of Phase Diagrams (CALPHAD) and Cellular Automaton (CA), to study relevant defects in actual metal casting foundries. Specifically, three different cases have been mainly investigated, including (i) veining defect caused by thermal cracking in resin-bonded silica sand molds/inserts for sand casting process; (ii) thermal fatigue cracking in H13 steel dies/inserts for high pressure die casting process; and (iii) Hydrogen-induced gas porosity in A356 castings for gravity casting process with permanent molds. For each case, CAD model was designed and FEA model was constructed with validated materials database based on CALPHAD simulation, experiment tests and/or literature references. Coupled calculations of heat transfer, fluid flow for mold filling, and/or stresses and strains were run to obtain thermal and structural data for subsequent defects analyses and predictions. More importantly, key experiments at laboratory scale were designed and performed to reproduce those defects. Test results were employed to correlate and validate the predictions from simulation. The highlight of this dissertation is that an improved model and/or prediction criterion is proposed for each defect case and is dedicated to engineering applications, including (i) a statistics-based cracking criterion of resin-bonded silica sand molds or inserts in casting processes; (ii) a temperature-based fatigue life prediction criterion for thermally-induced cracking in H13 steel dies for die casting; and (iii) a coupled CA-FE model for location-specific prediction of gas porosity in A356 gravity castings with permanent molds. This research is aiming at demonstrating that the integration of different CAE techniques and key experimental validations can help tackle the defects in various casting processes in a time-efficient and cost-effective manner. The results and the approach may be of great benefits to casting engineers for defect assessments and design optimizations in different casting processes.

Introduction; Liquid Metals and the Gating of Castings; Solidification 1 -- Crystallization and the development of cast structure; Solidification 2 -- the Feeding of Castings; The Moulding Material -- Properties, Preparation and Testing; Defects in Castings; Quality Assessment and Control; Casting Design; Production Techniques 1 -- the Manufacture of Sand Castings; Mould Production; Melting and Casting; Finishing Operations; Production Techniques 2 -- Shell, Investment and Die Casting Techniques; Production Techniques 3 -- Further Casting techniques; Environmental Protection, Health and Safety; Appendix; Index.

Defect Analysis on Investment Casting

7th International Symposium Celebrating Prof. John Campbell's 80th Birthday

International Atlas of Casting Defects

Effects of Core Aggregates on White Iron Casting Defects

Proceedings of the First International Conference on Combinatorial and Optimization, ICCAP 2021, December 7-8 2021, Chennai, India