The Lost Foam Casting Process

The Office of Industrial Technologies (OIT) of the U. S. Department of Energy commissioned the National Research Council (NRC) to undertake a study on required technologies for the Mining Industries of the Future Program to complement information provided to the program by the National Mining Association. Subsequently, the National Institute for Occupational Safety and Health also became a sponsor of this study, and the Statement of Task was expanded to include health and safety. The overall objectives of this study are: (a) to review available information on the U.S. mining industry; (b) to identify critical research and development needs related to the exploration, mining, and processing of coal, minerals, and metals; and (c) to examine the federal contribution to research and development in mining processes.

Campbell’s Complete Casting Handbook: Metal Casting Processes, Techniques and Design, Second Edition provides an update to the first single-volume guide to cover modern principles and processes in such breadth and depth, while also retaining a clear, practical focus. The work has a unique viewpoint, interpreting the behavior of castings, and metals as a whole, in terms of their biofilm content, the largely invisible casting defects which control much of the structure and behavior of metals. This new edition includes new findings, many from John Campbell’s own research, on crack initiation, contact pouring, vortex gates, and the Cosworth Process. Delivers the expert advice that engineers need to make successful and profitable casting decisions Ideal reference for those interested in solidification, vortex gates, nucleation, biofilm, remelting, and molding Follows a logical, two-part structure that covers both casting metallurgy and casting manufacture Contains established, must-have information, such as Campbell’s ‘10 Rules’ for successful casting manufacture Includes numerous updates and revisions based on recent breakthroughs in the industry

Aluminum is increasingly replacing steel in automotive applications due to its superior strength-to-weight ratio, equal or better stiffness and toughness properties, durability, and manufacturability considerations. Primer on Automotive Lightweighting Technologies introduces basic ideas and principles of designing and engineering automotive components with aluminum. Topics include application of the knowledge to understand how automotive body and structures are designed, as well as other major and smaller automotive components, such as engine blocks and their components, chassis systems, and wheels. Features Discusses material considerations in engineering design Describes mechanical and physical properties of aluminum Covers manufacturing methods and automotive and industrial applications of aluminum products Offers information on design for functional performance and cost optimization Includes coverage of extruded and rolled products and car body structure This practical book is aimed at professionals in the fields of materials and mechanical engineering, automotive engineering, and metals and alloys, as well as advanced students and researchers.

This project takes a fresh look at the "white side" of the lost foam casting process. We have developed the gel front hypothesis for foam pyrolysis behavior and the magnetic metal pump method for controlling lost foam casting metal fill event. The subject of this report is work done in the improvement of the Lost Foam Casting Process. The original objective of this project was to improve the control of metal fill by understanding the

influence of foam pattern and coating properties on the metal fill event. Relevant pattern properties could then be controlled, providing control of the metal fill event. One of the original premises of this project was that the process of metal fill was relatively well understood. Considerable previous work had been done to develop fluid mechanical and heat transfer models of the process. If we could just incorporate measured pattern properties into these models we would be able predict accurately the metal fill event. As we began to study the pyrolysis behavior of EPS during the metal fill event, we discovered that the chemical nature of this event had been completely overlooked in previous research. Styrene is the most prevalent breakdown product of EPS pyrolysis and it is a solvent for polystyrene. Much of the styrene generated by foam pyrolysis diffuses into intact foam, producing a molten gel of mechanically entangled polystyrene molecules. Much of the work of our project has centered on validation of this concept and producing a qualitative model of the behavior of EPS foam undergoing pyrolysis in a confined environment. A conclusion of this report is that styrene dissolution in EPS is a key phenomenon in the pyrolysis process and deserves considerable further study. While it is possible to continue to model the metal fill event parametrically using empirical data, we recommend that work be undertaken by qualified researchers to directly characterize and quantify this phenomenon for the benefit of modelers, researchers, and workers in the field. Another original premise of this project was that foam pattern and coating properties could be used to efficiently control metal fill. After studying the structure of EPS foam in detail for the period of this contract, we have come to the conclusion that EPS foam has an inherent variability at a scale that influences metal fill behavior. This does not allow for the detailed fine control of the process that we originally envisioned. We therefore have sought other methods for the control of the metal fill event. Of those, we now believe that the magnetic metal pump shows the most promise. We have conducted two casting trials using this method and preliminary results are very encouraging. A conclusion of our report is that, while every effort should continue to be made to produce uniform foam and coatings, the use of the magnetic metal pump should be encouraged and closed loop control mechanisms should be developed for this pouring method.

Lost FoamCasting Made SimpleAmerican Foundry SocietyMold Filling in the Lost Foam Casting ProcessModeling of Metal/pattern Replacement in the Lost Foam Casting ProcessFoseco Ferrous Foundryman's HandbookElsevier

Popular Mechanics inspires, instructs and influences readers to help them master the modern world. Whether it’s practical DIY home-improvement tips, gadgets and digital technology, information on the newest cars or the latest breakthroughs in science -- PM is the ultimate guide to our high-tech lifestyle.

The “2019 DigitalFUTURES — The 1st International Conference on Computational Design and Robotic Fabrication (CDRF 2019)” provides an international platform for advanced scientific research papers on the digital technology of architectural design and construction. The themes of the papers include, but are not limited to, architectural theories, tools, methods and procedures in material intelligence, data intelligence; computational intelligence, and robotic intelligence.

Build your own Metal Shaper. Exotic is a mild adjective when applied to this shaper. It will cut splines, keyways, gears, sprockets, dovetail slides, flat and angular surfaces and irregular profiles. And all of these with a simple hand-ground lathe tool bit. Obsolete in modern industry, of course, because milling machines do the work much faster and cheaper. But you can’t beat

a shaper for simplicity and economy in the home shop.The shaper has a 6" stroke and a mean capacity of 5" x 5", variable and adjustable stroke length, automatic variable cross feed and graduated collars. You will be proud to add this machine to your shop.

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.

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.

Reviewing an extensive array of procedures in hot and cold forming, casting, heat treatment, machining, and surface engineering of steel and aluminum, this comprehensive reference explores a vast range of processes relating to metallurgical component design-enhancing the production and the properties of engineered components while reducing manufacturing costs. It surveys the role of computer simulation in alloy design and its impact on material structure and mechanical properties such as fatigue and wear. It also discusses alloy design for various materials, including steel, iron, aluminum, magnesium, titanium, super alloy compositions and copper.

"Lost foam casting process has been widely adopted to manufacture complex parts without the need for cores. Numeric modeling of expanded polystyrene (EPS) foam displacement is only recently reaching a point where it can provide useful insight in helping optimize design and process variables. The objective of this thesis study was to develop an understanding of the pattern replacement mechanism in the lost foam casting process in steels"--Abstract, leaf iii.

The Foseco Ferrous Foundryman's Handbook is a practical reference book for all those concerned with making castings in any of the commonly used alloys, by any of the usual moulding methods. International SI units are used throughout, but in almost all cases conversions to the more familiar Metric and Imperial units are given. Wherever possible, Casting Alloy Specifications include equivalent specifications for several countries as well as

international specifications. Individual chapters cover the casting of light alloys, copper-based alloys, all types of cast-iron and steel. For each group of alloys, specifications and typical applications are described, together with details of melting practice, metal treatment and casting practice. Sand moulding materials, including green sand and chemically bonded sands are also included.

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

Foundry engineering, Foundry equipment, Production metallurgy, Casting (process), Loams, Patterns, Machine tools

Manufacturing, reduced to its simplest form, involves the sequencing of product forms through a number of different processes. Each individual step, known as an unit manufacturing process, can be viewed as the fundamental building block of a nation's manufacturing capability. A committee of the National Research Council has prepared a report to help define national priorities for research in unit processes. It contains an organizing framework for unit process families, criteria for determining the criticality of a process or manufacturing technology, examples of research opportunities, and a prioritized list of enabling technologies that can lead to the manufacture of products of superior quality at competitive costs. The study was performed under the sponsorship of the National Science Foundation and the Defense Department's Manufacturing Technology Program.

With the increased emphasis on vehicle weight reduction, production of near-net shape components by lost foam casting will make significant inroad into the next-generation of engineering component designs. The lost foam casting process is a cost effective method for producing complex castings using an expandable polystyrene pattern and un-bonded sand. The use of un-bonded molding media in the lost foam process will impose less constraint on the solidifying casting, making hot tearing less prevalent. This is especially true in Al-Mg and Al-Cu alloy systems that are prone to hot tearing when poured in rigid molds partially due to their long freezing range. Some of the unique advantages of using the lost foam casting process are closer dimensional tolerance, higher casting yield, and the elimination of sand cores and binders. Most of the aluminum alloys poured using the lost foam process are based on the Al-Si system. Very limited research work has been performed with Al-Mg and Al-Cu type alloys. With the increased emphasis on vehicle weight reduction, and given the high-strength-to-weight-ratio of magnesium, significant weight savings can be achieved by casting thin-wall (? 3 mm) engineering components from both aluminum- and magnesium-base alloys.

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.

"The thermal decomposition products and kinetic behavior of foam patterns constructed with expanded polystyrene (EPS) and expanded polystyrene/polymethylmethacrylate (EPS/PMMA) copolymers were evaluated in support of the lost foam casting (LFC) process development. This research specifically investigated the effects of high temperature and radiant heat transfer to the foamed polymer patterns that are exposed to the molten metal during the steel casting process"--Abstract, leaf iii.