

Material:
Al 7075-T6

Machining times:

- Total 177'
- Rough 67'
- Finish 110'

Tools:

- Rough
 $\varnothing 40\text{mm}$
 nose radius 6mm
 $\varnothing 12\text{mm}$
 nose radius 1mm
- Finish
 $\varnothing 12\text{mm}$
 nose radius 1mm

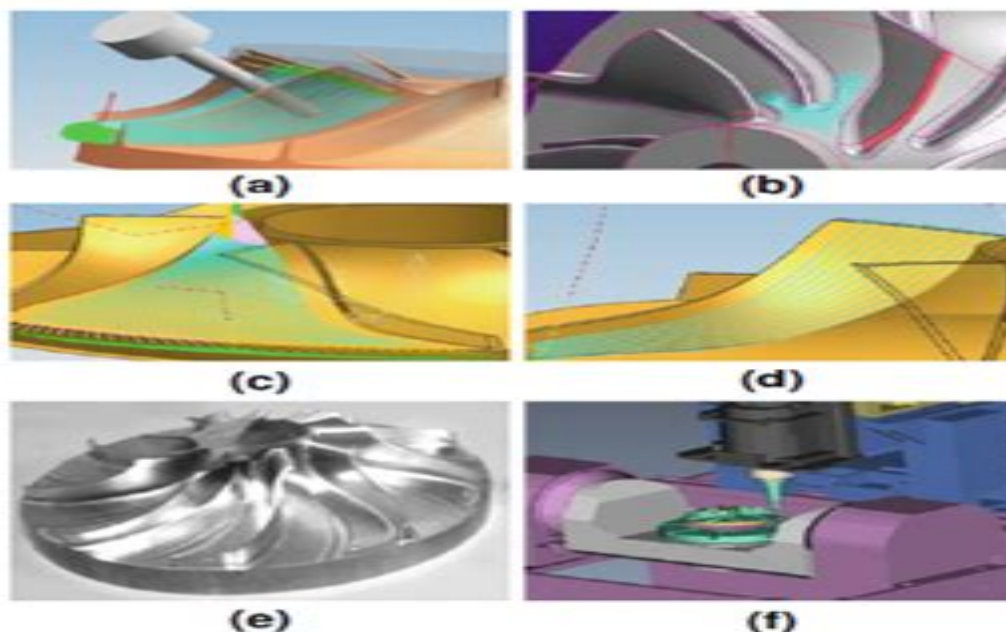


Fig. 1.27 A compressor disk detail of the virtual simulation and CAM strategies in a 5-axis centre and machining conditions. **a** Rough milling, **b** rest milling, **c** hub finishing, **d** blade finishing, **e** final piece, **f** virtual verification

compressor disk machining. They are rough milling operations, blade finish operations and hub finish operations. The rough milling is adopted to roughly cut out the shape of the impeller from initial dimensions of the stock material. It cuts out the material between the pressure surface and the suction surface. At this stage the efficiency of the removal rate is the main factor to be considered. In this case rough operations take 67 min and were carried out with an end mill $\varnothing 40$ and 6 mm nose radius and an end mill $\varnothing 12$ and 1 mm nose radius.

Generally, the blade and hub surfaces are machined using swarf milling, which provides a line contact between the tool and the workpiece. The periphery of the tool perfectly touches the workpiece geometry. Hence, very high surface quality in the direction of feed and the direction perpendicular to the feed is obtained. Head milling with a flat end mill, with appropriate lead angle, is highly recommended in this case because of technological and geometrical advantages of using a flat end mill [45]. Finish operations took 110 min and the tool used is an end mill $\varnothing 12\text{mm}$ and 1mm nose radius.

The software used for compressor disk virtual verification is Vericut. Taking into account the high probabilities of collision, virtual verification before real machining is of vital importance to prevent from part and machining collisions.

Machining Of Complex Sculptured Surfaces

**Xiu-Tian Yan, Cheng-Yu Jiang, Neal P.
Juster**



Machining Of Complex Sculptured Surfaces:

Machining of Complex Sculptured Surfaces, 2012-01-01 Machining of Complex Sculptured Surfaces J. Paulo Davim, 2012-01-03 The machining of complex sculptured surfaces is a global technological topic in modern manufacturing with relevance in both industrialized and emerging in countries particularly within the moulds and dies sector whose applications include highly technological industries such as the automotive and aircraft industry Machining of Complex Sculptured Surfaces considers new approaches to the manufacture of moulds and dies within these industries The traditional technology employed in the manufacture of moulds and dies combined conventional milling and electro discharge machining EDM but this has been replaced with high speed milling HSM which has been applied in roughing semi finishing and finishing of moulds and dies with great success Machining of Complex Sculptured Surfaces provides recent information on machining of complex sculptured surfaces including modern CAM systems and process planning for three and five axis machining as well as explanations of the advantages of HSM over traditional methods ranging from work piece precision and roughness to manual polishing following machining operations Whilst primarily intended for engineering students and post graduates particularly in the fields of mechanical manufacturing or materials Machining of Complex Sculptured Surfaces provides clear instructions on modern manufacturing serving as a practical resource for all academics researchers engineers and industry professionals with interest in the machining of complex sculptured surfaces Machining J. Paulo Davim, 2008-07-11 Machining is one of the most important manufacturing processes Parts manufactured by other processes often require further operations before the product is ready for application Machining Fundamentals and Recent Advances is divided into two parts Part I explains the fundamentals of machining with special emphasis on three important aspects mechanics of machining tools and work piece integrity Part II is dedicated to recent advances in machining including machining of hard materials machining of metal matrix composites drilling polymeric matrix composites ecological machining minimal quantity of lubrication high speed machining sculptured surfaces grinding technology and new grinding wheels micro and nano machining non traditional machining processes and intelligent machining computational methods and optimization Advanced students researchers and professionals interested or involved in modern manufacturing engineering will find the book a useful reference **Kinematic Geometry of Surface Machining** Stephen P. Radzevich, 2007-12-14 The principle of Occam s razor loosely translates to the simplest solution is often the best The author of Kinematic Geometry of Surface Machining utilizes this reductionist philosophy to provide a solution to the highly inefficient process of machining sculptured parts on multi axis NC machines He has developed a method to quickly calculate *The Mathematics of Surfaces IX* Roberto Cipolla, Ralph Martin, 2012-12-06 These proceedings collect the papers accepted for presentation at the biennial IMA Conference on the Mathematics of Surfaces held in the University of Cambridge 4-7 September 2000 While there are many international conferences in this fruitful borderland of mathematics computer graphics and engineering this is the

oldest the most frequent and the only one to concentrate on surfaces Contributors to this volume come from twelve different countries in Europe North America and Asia Their contributions reflect the wide diversity of present day applications which include modelling parts of the human body for medical purposes as well as the production of cars aircraft and engineering components Some applications involve design or construction of surfaces by interpolating or approximating data given at points or on curves Others consider the problem of reverse engineering giving a mathematical description of an already constructed object We are particularly grateful to Pamela Bye at the Institute of Mathematics and its Applications for help in making arrangements Stephanie Harding and Karen Barker at Springer Verlag London for publishing this volume and to Kwan Yee Kenneth Wong Cambridge for his heroic help with compiling the proceedings and for dealing with numerous technicalities arising from large and numerous computer files Following this Preface is a listing of the programme committee who with the help of their colleagues did much work in refereeing the papers for these proceedings

Hybrid Manufacturing Processes Wit Grzesik, Adam Ruszaj, 2021-07-03 This book explores in a systematic way both conventional and unconventional material shaping processes with various modes of hybridization in relation to theory modelling and industrial potential The demand for high productivity and high accuracy in manufacturing is continuously increasing based on improvement and optimization strategies Hybridization of manufacturing processes will play a crucial role and will be of a key importance in achieving environmental and economical sustainability Structured in three parts Hybrid Manufacturing Processes summarizes the state of the art hybrid manufacturing processes based on available literature sources and production reports The book begins by providing information on the physical fundamentals of the removal and non removal processes in macro micro and nanoscales It then follows with an overview of the possible ways of hybridization and the effects on the enhancement of process performance before concluding with a summary of production outputs related to surface integrity specifically with respect to difficult to machine materials Considering the applications of different sources of hybridization including mechanical thermal and chemical interactions or their combinations this book will be of interest to a range of researchers and practicing engineers within the field of manufacturing

Digital Manufacturing and Assembly Systems in Industry 4.0 Kaushik Kumar, Divya Zindani, J. Paulo Davim, 2019-07-03 Manufacturing like other industries is rising to the challenges imposed by aggressive consumer demands and the need for cost effective processing that delivers quality in the fastest possible time Fierce competition means that keeping abreast of new developments and applications in technology is essential if companies are to meet demands profitably and keep ahead of competitors This book investigates the design and management of digital manufacturing and assembly systems for an efficient flexible and modular production of customized products using the Industry 4.0 enabling technologies This book will also provide case studies covering modeling simulation and optimization eBook includes color figures Discusses how the advancement of data communication and storage through the Internet of Things IoT opens the possibilities of connecting sensors robots and devices Sheds light

on how the human role in industry is decreasing due to the development of connected manufacturing floors allowing them to take more control over the manufacturing processes decisions and even maintenance Covers the benefits from exploiting digital manufacturing manufacturing enterprises and what they expect to achieve Explains the important roles that modeling simulation and optimization play Investigates the design and management of digital manufacturing and assembly systems for an efficient flexible and modular production of customized products exploiting the I40 industry 4 0 enabling technologies

Innovating the Future Through Manufacturing Vivekanandu Shanmuganathan,K. Raja,P. Kuppan,2005 Attempts to provide a holistic view of the changing scenario and current research trends in manufacturing This volume can provide the necessary information to all researchers professionals and beginners alike in introducing innovating manufacturing practices and furthering research on newer and improved manufacturing technologies Geometric and Algorithmic Aspects of Computer-Aided Design and Manufacturing Ravi Janardan,Michiel Smid,Debasish Dutta,2005 Computer Aided Design and Manufacturing CAD CAM is concerned with all aspects of the process of designing prototyping manufacturing inspecting and maintaining complex geometric objects under computer control As such there is a natural synergy between this field and Computational Geometry CG which involves the design analysis implementation and testing of efficient algorithms and data representation techniques for geometric entities such as points polygons polyhedra curves and surfaces The DIMACS Center Piscataway NJ sponsored a workshop to further promote the interaction between these two fields Attendees from academia research laboratories and industry took part in the invited talks contributed presentations and informal discussions This volume is an outgrowth of that meeting *Intelligent Robotics and Applications* Honghai Liu,Han Ding,Zhenhua Xiong,Xiangyang Zhu,2010-11-10 The market demand for skills knowledge and adaptability have positioned robotics to be an important field in both engineering and science One of the most highly visible applications of robotics has been the robotic automation of many industrial tasks in factories In the future a new era will come in which we will see a greater success for robotics in non industrial environments In order to anticipate a wider deployment of intelligent and autonomous robots for tasks such as manufacturing healthcare entertainment search and rescue surveillance exploration and security missions it is essential to push the frontier of robotics into a new dimension one in which motion and intelligence play equally important roles The 2010 International Conference on Intelligent Robotics and Applications ICIRA 2010 was held in Shanghai China November 10 12 2010 The theme of the conference was Robotics Harmonizing Life a theme that reflects the ever growing interest in research development and applications in the dynamic and exciting areas of intelligent robotics These volumes of Springer's Lecture Notes in Artificial Intelligence and Lecture Notes in Computer Science contain 140 high quality papers which were selected at least for the papers in general sessions with a 62% acceptance rate Traditionally ICIRA 2010 holds a series of plenary talks and we were fortunate to have two such keynote speakers who shared their expertise with us in diverse topic areas spanning the range of intelligent robotics and application activities **Global Design to Gain a**

Competitive Edge Xiu-Tian Yan, Benoit Eynard, William J. Ion, 2008-07-30 Recent rapid globalisation of manufacturing industries leads to a drive and thirst for rapid advancements in technological development and expertise in the fields of advanced design and manufacturing especially at their interfaces This development results in many economical benefits to and improvement of quality of life for many people all over the world Technically speaking this rapid development also create many opportunities and challenges for both industrialists and academics as the design requirements and constraints have completely changed in this global design and manufacture environment Consequently the way to design manufacture and realise products have changed as well The days of designing for a local market and using local suppliers in manufacturing have gone if enterprises aim to maintain their competitiveness and global expansion leading to further success In this global context and scenario both industry and the academia have an urgent need to equip themselves with the latest knowledge technology and methods developed for engineering design and manufacture To address this shift in engineering design and manufacture supported by the European Commission under the Asia Link Programme with a project title FASTAHEAD A Framework Approach to Strengthening Asian Higher Education in Advanced Design and Manufacture three key project partners namely the University of Strathclyde of the United Kingdom Northwestern Polytechnical University of China and the Troyes University of Technology of France organised a third international conference *Perspectives from Europe and Asia on Engineering Design and Manufacture* Xiu-Tian Yan, Cheng-Yu Jiang, Neal P. Juster, 2004-04-30 With collaborative product development in a geographically distributed environment and global outsourcing becoming normal for many companies it is imperative to bring academics researchers and industrialists together to share research ideas and best practice The European Asia Symposium on Engineering Design and Manufacture EASED 2004 provides such a platform and aims to increase the exchange of ideas and best practice among practitioners and researchers from two major global regions Europe and Asia As the manufacturing activities associated with the design activities in European American and Japan are being transferred to Asia it is timely to organise this International Symposium The Symposium brings together research experts and industrialists to focus on the issues related to these global changes This geographical distribution of tasks involved in the whole engineering product realisation process brings great challenge as well as huge benefits This Symposium provides a platform for academic researchers and industrial practitioners to exchange ideas used to address the challenges presented by this new global economic development This book presents 75 papers from 185 accepted refereed papers presented at EASED2004 **Computational Methods for Optimizing Manufacturing Technology: Models and Techniques** Davim, J. Paulo, 2012-02-29 This book contains the latest research developments in manufacturing technology and its optimization and demonstrates the fundamentals of new computational approaches and the range of their potential application Provided by publisher *Cutting Tool Technology* Graham T. Smith, 2008-07-03 It is a well acknowledged fact that virtually all of our modern day components and assemblies rely to some extent on machining operations in their manufacturing process Thus

there is clearly a substantive machining requirement which will continue to be of prime importance for the foreseeable future Cutting Tool Technology provides a comprehensive guide to the latest developments in the use of cutting tool technology The book covers new machining and tooling topics such as high speed and hard part machining near dry and dry machining strategies multi functional tooling diamond like and atomically modified coatings plus many others Also covered are subjects important from a research perspective such as micro machining and artificial intelligence coupled to neural network tool condition monitoring A practical handbook complete with troubleshooting tables for common problems Cutting Tool Technology is an invaluable reference for researchers manufacturers and users of cutting tools *Advanced Manufacturing and Processing Technology* Chander Prakash, Sunpreet Singh, J. Paulo Davim, 2020-10-25 This book disseminates recent research theories and practices relevant to the areas of surface engineering and the processing of materials for functional applications in the aerospace automobile and biomedical industries The book focuses on the hidden technologies and advanced manufacturing methods that may not be standardized by research institutions but are greatly beneficial to material and manufacturing industrial engineers in many ways It details projects research activities and innovations in a global platform to strengthen the knowledge of the concerned community The book covers surface engineering including coating deposition cladding nanotechnology surface finishing precision machining processing and emerging advanced manufacturing technologies to enhance the performance of materials in terms of corrosion wear and fatigue The book captures the emerging areas of materials science and advanced manufacturing engineering and presents recent trends in research for researchers field engineers and academic professionals

Proceedings IECON. , 1997 Integrated Design and Manufacturing in Mechanical Engineering '98 Jean-Louis Batoz, Patrick Chedmail, Gérard Cognet, Clément Fortin, 2013-12-14 This volume contains the selected manuscripts of the papers presented at the Second IDMME Conference on Integrated Design and Manufacturing in Mechanical Engineering held in Compiègne France at the University of Technology of Compiègne May 27 29 1998 The purpose of the Conference was to present and discuss topics dealing with the optimization of product design and manufacturing processes with particular attention to 1 the analysis and optimum design of mechanical parts and mechanisms 2 the modeling of forming processes 3 the development of computer aided manufacturing tools 4 the methodological aspects of integrated design and manufacturing in adapted technical and human environments The initiative of the conference and the organization thereof is mainly due to the efforts of the french PRIMECA group Pool of Computer Resources for Mechanics The international Institution for Production Engineering Research CIRP was helpful to attract international participants The conference brought together three hundred and twenty worldwide participants

Geometric Design Tolerancing: Theories, Standards and Applications Hoda A. ElMaraghy, 2012-12-06 The importance of proper geometric dimensioning and tolerancing as a means of expressing the designer's functional intent and controlling the inevitable geometric and dimensional variations of mechanical parts and

assemblies is becoming well recognized. The research efforts and innovations in the field of tolerancing design, the development of supporting tools, techniques and algorithms, and the significant advances in computing software and hardware all have contributed to its recognition as a viable area of serious scholarly contributions. The field of tolerancing design is successfully making the transition to maturity where deeper insights and sound theories are being developed to offer explanations and reliable implementations are introduced to provide solutions. Machine designers realized very early that manufacturing processes do not produce the nominal dimensions of designed parts. The notion of associating a lower and an upper limit referred to as tolerances with each dimension was introduced. Tolerances were specified to ensure the proper function of mating features. Fits of mating features included clearances, location fits and interference fits with various sub grades in each category assigned a tolerance value depending on the nominal size of the mating features. During the inspection process a part is rejected if a dimension fell outside the specified range. As the accuracy requirements in assemblies became tighter, designers had to consider other critical dimensions and allocate tolerances to them in order to ensure the assembly's functionality.

AMST'05 Advanced Manufacturing Systems and Technology Elso Kuljanic, 2007-03-23

Manufacturing a product is not difficult; the difficulty consists in manufacturing a product of high quality at a low cost and rapidly. Drastic technological advances are changing global markets very rapidly. In such conditions, the ability to compete successfully must be based on innovative ideas and new products which have to be of high quality yet low in price. One way to achieve these objectives would be through massive investments in research of computer based technology and by applying the approaches presented in this book.

The First International Conference on Advanced Manufacturing Systems and Technology AMST87 was held in Opatija, Croatia in October 1987. The Second International Conference on Advanced Manufacturing Systems and Technology AMSV90 was held in Trento, Italy in June 1990. The Third, Fourth, Fifth and Sixth Conferences on Advanced Manufacturing Systems and Technology were all held in Udine, Italy as follows: AMST93 in April 1993, AMST96 in September 1996, AMST99 in June 1999 and AMST02 in June 2002.

Intelligent Systems, Technologies and Applications Sabu M. Thampi, Ljiljana Trajkovic, Sushmita Mitra, P. Nagabhushan, El-Sayed M. El-Alfy, Zoran Bojkovic, Deepak Mishra, 2020-05-05

This book explores and discusses various aspects of intelligent systems, technologies and their applications. Presenting the refereed post conference proceedings of the 5th International Symposium on Intelligent Systems Technologies and Applications ISTA 2019 held at the Indian Institute of Information Technology and Management Kerala IIITM K Trivandrum, India on December 18-21, 2019, it covers a variety of topics such as knowledge discovery, data mining, pattern recognition, signal processing, intelligent image processing, artificial vision, ad hoc and wireless sensor networks, business intelligence and big data analytics.

Machining Of Complex Sculptured Surfaces Book Review: Unveiling the Magic of Language

In an electronic era where connections and knowledge reign supreme, the enchanting power of language has become much more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Machining Of Complex Sculptured Surfaces**," compiled by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we will delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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