

CFD ANALYSIS OF SCREW COMPRESSOR PERFORMANCE

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ABSTRACT

Modern manufacturing methods enable screw compressors to be constructed to such close tolerances that full 3-D numerical calculation of the heat and fluid flow through them is required to obtain the maximum possible improvements in their design. An independent stand-alone CAD-CFD interface program has therefore been developed by the authors in order to generate a numerical grid for this purpose. Modifications implemented to the CFD procedure improved solutions in complex domains with strong pressure gradients.

The interface employs a procedure to produce rotor profiles and an analytical transfinite interpolation method to obtain a fully structured 3-D numerical mesh, which is directly transferable to a CFD code. Some features, which include an adaptive meshing procedure, mesh orthogonalization and smoothing, are employed to generate a numerical mesh which can take advantage of the techniques used in recent finite volume numerical method solvers.

These were required to overcome problems associated with

- i) rotor domains which stretch and slide relative to each other and along the housing
- ii) robust calculations in domains with significantly different geometry ranges.
- iii) a grid moving technique with a constant number of vertices.

Some changes had to be made within the solver functions to increase the speed of calculation. These include a means to maintain constant pressures at the inlet and outlet ports and consideration of two-phase flow resulting from oil injection in the working chamber.

The pre-processor code and calculating method have been tested on a commercial CFD solver to obtain flow simulations and integral parameter calculations.

The results of calculations on an oil injected screw compressor are presented in this paper and compared with experimental results.

Cfd Analysis Of Screw Compressor Performance

RJ Shavelson



Cfd Analysis Of Screw Compressor Performance:

Compressors and Their Systems IMechE (Institution of Mechanical Engineers),2001-11-28 This text presents the interactions from an international conference organized by the Fluid Machinery Group of the IMechE The papers provide an up to date resume of compressors refrigeration energy efficiency lubrication and sealing oils and novel machines **8th International Conference on Compressors and their Systems** City University London,2013-12-19 This book contains the papers from the 2013 International Conference on Compressors and Their Systems held from 9 10 September at City University London The long running conference series is the ultimate global forum for reviewing the latest developments and novel approaches in compressor research High quality technical papers are sourced from around the globe covering technology development operation maintenance and reliability safety and environmental impact energy efficiency and carbon footprint system integration and behaviour upgrades and refurbishment design and manufacture education and professional development All the papers are previously unpublished and constitute leading edge research Presents leading edge developments in compressor technology Gives the latest prediction and modelling techniques Details the new technology and machinery **Advances of CFD in Fluid Machinery Design** Robin Elder,Antonios Tourlidakis,Martin Yates,2003-02-07 In the past Computational Fluid Dynamics CFD was confined to large organisations capable of developing and supporting their own codes But recently there has been a rapid increase in the availability of reasonably priced commercial codes and many more industrial organisations are now able to routinely use CFD *Advances of CFD in Fluid Machinery Design* provide the perfect opportunity to find out what industry is doing and this book addresses how CFD is now being increasingly used in the design process rather than as a post design analysis tool COMPLETE CONTENTS Trends in industrial use of CFD Challenges and methodologies in the design of axial flow fans for high bypass ratio gas turbine engines using steady and unsteady CFD A three dimensional inverse method based on pressure loading for the design of turbomachinery blades Application of CFD to the design and analysis of axial and centrifugal fans and compressors The design and performance of a transonic flow deswirling system an application of current CFD design techniques tested against model and full scale experiments Recent developments in unsteady flow modelling for turbomachinery aeroelasticity Computational investigation of flow in casing treatments for stall delay in axial flow fans Use of CFD for the three dimensional hydrodynamic design of vertical diffuser pumps Recommendations to designers for CFD pump impeller and diffuser simulations Three dimensional CFD a possibility to analyse piston pump flow dynamics CFD analysis of screw compressor performance Prediction of aerothermal phenomena in high speed discstator systems Use of CFD in the design of a shaft seal for high performance turbomachinery Users and potential users of CFD for the design of fluid machinery managers designers and researchers working in the field of industrial flows will all find *Advances of CFD in Fluid Machinery Design* a valuable volume discussing state of the art developments in CFD *Fluid Mechanics and Fluid Power (Vol. 2)* Suvanjan Bhattacharyya,Ali Cemal Benim,2023-05-20

This book presents the select proceedings of the 48th National Conference on Fluid Mechanics and Fluid Power FMFP 2021 held at BITS Pilani in December 2021 It covers the topics such as fluid mechanics measurement techniques in fluid flows computational fluid dynamics instability transition and turbulence fluid structure interaction multiphase flows micro and nanoscale transport bio fluid mechanics aerodynamics turbomachinery propulsion and power The book will be useful for researchers and professionals interested in the broad field of mechanics

14th International Conference on Compressors and Their Systems Ahmed Kovacevic, Matthew Read, Sham Rane, Ivona Ivkovic-Kihic, Halil Lacevic, 2026-02-07

This proceedings book discusses developments in air gas and refrigeration compressors vacuum pumps and expanders It is the 14th edition of the International Conference on Compressors and their Systems a three day conference organized by the Centre for Compressors Technology at City St George s University of London supported by among others IMechE IIR and IOR The International Conference on Compressors and their Systems series began in 1999 as a result of industrial consultation and need for academic collaboration At the time the conference was organized by the Fluid Machinery Group of the Institution of Mechanical Engineers IMechE with support from Holroyd From 2009 the Centre for Compressor Technology at City University of London took over its management and the conference is now one of the main conventions taking place biennially in the UK becoming world renowned for its place in industry and academia to gather and discuss a broad range of topical issues related to compressors and compression systems The theme of this conference is Emerging Technologies in Compressors and their Systems

Proceedings of the ASME Advanced Energy Systems Division American Society of Mechanical Engineers. Advanced Energy Systems Division, 2005 *Bulletin de L'Institut International Du Froid* ,2009 [A Theoretical, Experimental and CFD Analysis of Regenerative Flow Compressors and Pumps for Microturbine and Automotive Fuel Applications](#) Muhammad Mukarram Raheel, 2003

Proceedings of the ASME Fluids Engineering Division Summer Meeting American Society of Mechanical Engineers. Fluids Engineering Division. Summer Meeting, 2005

Government Reports Announcements & Index ,1996 *Chemical Engineering Progress* ,2002 **Proceedings of the Institution of Mechanical Engineers** ,1994 **Proceedings of the ASME Fluids Engineering Division** ,2003

Heat Pump and Refrigeration Systems Design, Analysis, and Applications, 1995 ,1995 **Screw Compressors** Ahmed Kovacevic, Nikola Stosic, Ian Smith, 2007-01-21 This book presents the most up to date methods of three dimensional modeling of the fluid dynamics and the solid fluid interaction within these machines which are still being developed Adding modeling to the design process makes it possible not only to predict flow patterns more accurately and also to determine distorting effects on rotors and casing of pressure and temperature distribution within the compressor Examples outline the scope of the applied mathematical model

13th International Conference on Compressors and Their Systems Matthew Read, Sham Rane, Ivona Ivkovic-Kihic, Ahmed Kovacevic, 2024-01-01 This new proceedings discusses developments in air gas and refrigeration compressors vacuum pumps and expanders It is the 13th edition of the International Conference on

Compressors and their Systems a three day conference organised by the Centre for Compressors Technology at City University of London in collaboration with among other the MEchE IIR and IOR The conference offers a platform to identify current challenges in the field and provide the essential content and direction to shape future research The International Conference on Compressors and their Systems series began in 1999 as a result of industrial consultation and a need for academic collaboration Initially the conference was organised by the Fluid Machinery Group of the Institution of Mechanical Engineers IMechE with the support of Holroyd From 2009 the Centre for Compressor Technology at City University of London took over its management and the conference is now one of the main conventions taking place biennially in the UK becoming world renowned for its place in industry and academia to gather and discuss a broad range of topical issues related to compressors and compression systems This year s conference has the theme Compressors and Expanders in Future Energy Systems and will be of interest to researchers and engineers in industry

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