| CONTENTS |
|-----------------------------------------------|---|
| HEAT TRANSFER: TRANSITION                      |   |
| **GT2004-53114** Surface Roughness Effects on External Heat Transfer of a HP Turbine Vane  |
| M. Stript, A. Schulz, and Sigmar Wittig        | 1 |
| **GT2004-53204** Numerical Investigation of Unsteady Boundary Layer Transition Induced by Periodically Passing Wakes With an Intermittency Transport Equation |
| Rene Pecnik, Wolfgang Sanz, and Paul Pieringer | 11|
| **GT2004-53305** Studies on Bypass Transition of a Boundary Layer Subjected to Localized Periodic External Disturbances |
| K. Funazaki, Y. Wakita, and T. Otsuki          | 21|
| **GT2004-53352** Transition on Concave Surfaces |
| Antonis Dris and Mark W. Johnson               | 33|
| **GT2004-53353** Predicting Transitional Separation Bubbles |
| John A. Redford and Mark W. Johnson            | 39|
| **GT2004-53360** Separated Flow Transition Mechanism and Prediction With High and Low Freestream Turbulence Under Low Pressure Turbine Conditions |
| Ralph J. Volino and Douglas G. Bohl            | 45|
| **GT2004-53452** A Correlation-Based Transition Model Using Local Variables: Part I — Model Formulation |
| F. R. Menter, R. B. Langtry, S. R. Likki, Y. B. Suzen, P. G. Huang, and S. Völker | 57|
| **GT2004-53454** A Correlation-Based Transition Model Using Local Variables: Part II — Test Cases and Industrial Applications |
| R. B. Langtry, F. R. Menter, S. R. Likki, Y. B. Suzen, P. G. Huang, and S. Völker | 69|
| **GT2004-53664** Modeling of Boundary-Layer Transition |
| S. K. Roberts and M. I. Yaras                   | 81|
| **GT2004-53667** Boundary-Layer Transition in Separation Bubbles Over Rough Surfaces |
| S. K. Roberts and M. I. Yaras                   | 93|
| **GT2004-53668** Boundary-Layer Transition Over Rough Surfaces With Elevated Free-Stream Turbulence |
| S. K. Roberts and M. I. Yaras                   | 105|
Prediction of Turbulence and Transition in Turbomachinery Flows Using an Innovative Second Moment Closure Modeling
  Domenico Borello, Franco Rispoli, and Kemal Hanjalic

Experimental Analysis and Prediction of Wake-Induced Transition in Turbomachinery
  Witold Elsner, Stephane Vilmin, Stanislaw Drobniaek, and Wladyslaw Piotrowski

Investigation of a High Lift LP Turbine Blade Submitted to Passing Wakes:
  Part 1 — Profile Loss and Heat Transfer
  Thomas Coton and Tony Arts

Investigation of a High Lift LP Turbine Blade Submitted to Passing Wakes:
  Part 2 — Boundary Layer Transition
  Thomas Coton and Tony Arts

Predicting Transition in Turbomachinery: Part I — A Review and New Model Development
  T. J. Praisner and J. P. Clark

Predicting Transition in Turbomachinery: Part II — Model Validation and Benchmarking
  T. J. Praisner, E. A. Grover, M. J. Rice, and J. P. Clark

High Frequency Surface Heat Flux Imaging of Bypass Transition
  Richard J. Anthony, Terry V. Jones, and John E. LaGraff

Evaluation of Algebraic Transition Models for Application to Unsteady Flows in Low-Pressure Turbines
  Nan Jiang and Terrence W. Simon

HEAT TRANSFER: INTERNAL AIR AND SEALS

A Novel Cooling Method for Turbine Rotor-Stator Rim Cavities Affected by Mainstream Ingress
  Y. Okita, M. Nishiura, S. Yamawaki, and Y. Hironaka

Development of Higher Temperature Abradable Seals for Gas Turbine Applications
  Raymond E. Chupp, Yuk-Chiu Lau, Farshad Ghasripoor, Donald J. Baldwin, Chek Ng, Tara McGovern, and Dalero Berkeley

Dust Separation in a Gas Turbine Pre-Swirl Cooling Air System: A Parameter Variation
  O. Schneider, H. J. Dohmen, F. K. Benra, and D. Brillert
Study of Airflow Features Through Step Seals in the Presence of Dis-Engagement Due to Axial Movement
Yi Wang, Colin Young, Guy Snowsill, and Tim Scanlon

Measurement and Analysis of an Efficient Turbine Rotor Pump Work Reduction System Incorporating Pre-Swirl Nozzles and a Free Vortex Pressure Augmentation Chamber
V. Laurello, M. Yuri, K. Fujii, K. Ishizaka, T. Nakamura, and H. Nishimura

T. Scanlon, J. Wilkes, D. Bohn, and O. Gentilhomme

Influence of Fluid-Dynamics on Heat Transfer in a Pre-Swirl Rotating-Disc System
Gary D. Lock, Michael Wilson, and J. Michael Owen

Numerical Simulation of 3D Bristle Bending in Brush Seals
Cesare Guardino and John W. Chew

Probabilistic Analysis of a Turbofan Secondary Flow System
David Cloud and Ethan Stearns

Buoyancy-Induced Flow in a Heated Rotating Cavity
J. Michael Owen and Jonathan Powell

The Influence of Incidence Angle on the Discharge Coefficient for Rotating Radial Orifices
A. Idris, K. R. Pullen, and R. Read

A Non-Coupled CFD-FE Procedure to Evaluate Windage and Heat Transfer in Rotor-Stator Cavities
Leo V. Lewis and James I. Provins

Wear Prediction of Strip Seals Through Conductance
Farshad Ghasripoor, Norman A Turnquist, Mark Kowalczyk, and Bernard Couture

On Fields Synergism and Convective Heat Transfer Enhancement and Control in Centrifugal Force Field
Honghu Ji

Experiments on Gas Ingestion Through Axial-Flow Turbine Rim Seals
<table>
<thead>
<tr>
<th>Paper Number</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>*GT2004-53406</td>
<td>Oil Pumping in High Speed and High Loaded Ball Bearings</td>
<td>359</td>
</tr>
<tr>
<td></td>
<td>Michael Flouros</td>
<td></td>
</tr>
<tr>
<td>GT2004-53519</td>
<td>Measurements of Surface Temperature Distribution in a Rotating Disk With Blade Cooling Holes Using Thermochromic Liquid Crystal</td>
<td>365</td>
</tr>
<tr>
<td></td>
<td>Chong Zhang, Guoqiang Xu, Shuiting Ding, and Zhi Tao</td>
<td></td>
</tr>
<tr>
<td>GT2004-53525</td>
<td>Investigation of Flow and Heat Transfer Instabilities in a Rotating Cavity With Axial Throughflow of Cooling Air</td>
<td>373</td>
</tr>
<tr>
<td></td>
<td>Shuqing Tian, Zhi Tao, Shuiting Ding, and Guoqiang Xu</td>
<td></td>
</tr>
<tr>
<td>GT2004-53528</td>
<td>Numerical Simulation of Natural Convection in Stationary and Rotating Cavities</td>
<td>381</td>
</tr>
<tr>
<td></td>
<td>Sun Zixiang, Alistair Kilfoil, John W. Chew, and Nicholas J. Hills</td>
<td></td>
</tr>
<tr>
<td>GT2004-53578</td>
<td>Advanced Transmission and Oil System Concepts for Modern Aero-Engines</td>
<td>391</td>
</tr>
<tr>
<td></td>
<td>M. Klingsporn</td>
<td></td>
</tr>
<tr>
<td>GT2004-53639</td>
<td>Prediction of Velocities and Heat Transfer Coefficients in a Rotor-Stator Cavity</td>
<td>399</td>
</tr>
<tr>
<td></td>
<td>Justin Evans, Lon M. Stevens, Clint Bodily, and Moon-Kyoo Brian Kang</td>
<td></td>
</tr>
<tr>
<td>*GT2004-53698</td>
<td>A Numerical Model for Oil Film Flow in an Aero-Engine Bearing Chamber and Comparison With Experimental Data</td>
<td>409</td>
</tr>
<tr>
<td></td>
<td>Mark Farrall, Kathy Simmons, Stephen Hibbert, Philippe Gorse</td>
<td></td>
</tr>
<tr>
<td>*GT2004-53708</td>
<td>Influence of Operating Condition and Geometry on the Oil Film Thickness in Aero-Engine Bearing Chambers</td>
<td>419</td>
</tr>
<tr>
<td></td>
<td>P. Gorse, S. Busam, and K. Dullenkopf</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ralf Jakoby, Thomas Zierer, Klas Lindblad, Jonas Larsson, Laurent DeVito, Dieter E. Bohn, Joachim Funcke, and Achim Decker</td>
<td></td>
</tr>
<tr>
<td>*GT2004-53935</td>
<td>Leakage and Power Loss Test Results for Competing Turbine Engine Seals</td>
<td>441</td>
</tr>
<tr>
<td></td>
<td>Margaret P. Proctor and Irebert R. Delgado</td>
<td></td>
</tr>
<tr>
<td>GT2004-54151</td>
<td>Investigation Into the Computational Analysis of Direct-Transfer Pre-Swirl Systems for Gas Turbine Cooling</td>
<td>453</td>
</tr>
<tr>
<td></td>
<td>A. C. Benim, D. Brillert, and M. Cagan</td>
<td></td>
</tr>
<tr>
<td>*GT2004-54279</td>
<td>Flow Characteristics and Stability Analysis of Variable-Density Rotating Flows in Compressor-Disk Cavities</td>
<td>461</td>
</tr>
<tr>
<td></td>
<td>Bruce V. Johnson, J. D. Lin, William A. Daniels, and Roger Paolillo</td>
<td></td>
</tr>
</tbody>
</table>
GT2004-54296 ................................................................. 473
Non-Metallic Brush Seals for Gas Turbine Bearings
Nitin Bhate, Anthony C. Thermos, Mahmut Aksit, Mehmet Demiroglu, and Huseyin Kizil

INDUSTRIAL AND COGENERATION

*GT2004-53040 ................................................................. 479
Flow Stability of Heat Recovery Steam Generators
Heimo Walter and Wladimir Linzer

GT2004-53042 ................................................................. 489
A Parametric Study of Interstage Injection on GE Frame 7EA Gas Turbine
M. Bagnoli, M. Bianchi, F. Melino, A. Peretto, P. R. Spina, R. Bhargava, and S. Ingistov

*GT2004-53122 ................................................................. 501
Technical and Economical Feasibility of Gas Turbine Inlet Cooling Using Evaporative Fogging System in Two Different Locations in Oman
Yousif H. Zurigat, Belal Dawoud, Jamal N. Al-Bortmany, and Sameh T. Al-Shihabi

*GT2004-53141 ................................................................. 509
Investigation of the Two-Phase Flow Field of the GTX100 Compressor Inlet During Off-Line Washing
Ulf Engdar, Raik C. Orbay, Magnus K. Genrup, and Jens Klingmann

GT2004-53224 ................................................................. 519
A Review of Gas Turbine Online Washing Systems
Friederike C. Mund and Pericles Pilidis

*GT2004-53312 ................................................................. 529
Performance of Integrated Combined and Cogeneration Cycles Using Latest Gas Turbines
Sanjay, Onkar Singh, and B. N Prasad

*GT2004-53411 ................................................................. 537
A Review of L20A Engine Design and Field Operating Experience
Takao Sugimoto, Katsushi Nagai, Masanori Ryu, Ryozo Tanaka, and Takeshi Kimura

GT2004-53421 ................................................................. 543
Set Up of a Robust Neural Network for Gas Turbine Simulation
R. Bettocchi, M. Pinelli, P. R. Spina, M. Venturini, and Michele Burgio

GT2004-53426 ................................................................. 553
Numerical Investigation of Different Stack Design Solutions in a Cogeneration Power Plant
M. Pinelli and G. Bucci

GT2004-53481 ................................................................. 561
Experimental Inlet Air Cooling of a 75 kW Gas Turbine
Andrew Banta

*GT2004-53551 ................................................................. 573
Effects of Spray Parameters and Operating Conditions on an Industrial Gas Turbine Washing System
Friederike C. Mund and Pericles Pilidis
Combined Heat and Power Technologies: Application Studies of Options Including Micro Gas Turbines

*Miguel Angel González, Róger Padilla, and Reinhard Willinger*

Wet Compression System Stability Analysis: Part I — Wet Compression Moore Greitzer Transient Model

*Minghong Li and Qun Zheng*

Wet Compression System Stability Analysis: Part II — Simulations and Bifurcation Analysis

*Qun Zheng and Minghong Li*

Design of a Gas Turbine Based Air Start Unit for Larger Aircraft Engine

*Li-Chieh Hsu, Wu-Chi Ho, and Chien-Ching Hsueh*

Thermodynamic Analysis of Intercooled Gas-Steam Combined and Steam Injected Gas Turbine Power Plants

*R. Yadav, Sunil Kumar Jumhare, Pradeep Kumar, and Samir Saraswati*

Thermodynamic Evaluation of Humidified Air Turbine (HAT) Cycles

*R. Yadav, Pawan Krishan Dwivedi, Pradeep Kumar, and Samir Saraswati*

A Parametric Analysis for Optimal Selection of Gas Turbine Cogeneration System

*K. Sarabchi and A. Ansari*

The Use of Acoustic Emission Technology in Coating Ductility Testing at Various Temperatures

*Xin-Hai Li and Johan Moverare*

Alloy Selection for Honeycomb Gas Path Seal Systems

*Dieter R. Sporer and Lawrence T. Shiembob*

Degradation Mechanism Characterization and Remaining Life Prediction for NiCoCrAlY Coatings

*K. S. Chan and N. S. Cheruvu*

The Influence of Metallurgical and Mechanical Pre-Damage on Creep-Crack and Fatigue-Crack Growth Rates of CrMoV Steel

*Masaru Sekihara and Shigeo Sakurai*
High Vacuum Brazing of Fe-Cr-Al-Y Honeycomb

Dieter R. Sporer and Ingo Reinkensmeier

Damage Analysis of Gas Turbine Vanes Using a Thermal Fluid Dynamic and Mechanical Approach

Enrico Marchegiano, Giancarlo Benelli, Paolo Gheri, and Donato Aquaro

Numerical Simulation of the Low Plasticity Burnishing Process for Fatigue Property Enhancement

W. Beres, J. Li, and P. C. Patnaik

Strain-Life Assessment of Grainex Mar-M 247 for NASA’s Turbine Seal Test Facility

Irebert R. Delgado, Gary R. Halford, Bruce M. Steinetz, and Clare M. Rimnac

CM 939 Weldable® Alloy

Ken Harris and Jacqueline B. Wahl

Improving Rough Cutting Efficiency for Machining of Impellers

Min Tsay and Chien-Wen Chen

Life-Refurbishment of Service-Degraded Gas Turbine Buckets

Yomei Yoshioka, Daizo Saito, Kazutoshi Ishibashi, Junji Ishii, Atsuhiko Izumi, Yasuhiro Aburatani, Akihiro Itou, Yukio Kagiya, Hirotaka Watanabe, and Seiichi Hyakudome

The Coarsening Kinetic of γ’ Particles in Nickel-Based Superalloys During Aging at High Temperatures

F. Mastromatteo, F. Niccolai, M. Giannozzi, and U. Bardi

Progress on Environmentally Compliant Aluminum Ceramic Compressor Coatings

Mark F. Mosser

Properties, Weldability, and Applications of Modern, Wrought, Heat-Resistant Alloys for Aerospace and Power Generation Industries

M. D. Rowe, V. R. Ishwar, and D. L. Klarstrom

TMF Crack Initiation Lifing of Austenitic Carbide Precipitating Alloys

Magnus Hasselqvist

Author Index

*Recommended for journal publication.