

**CURRICULUM VITAE  
EMAD TANBOUR, Ph.D.**

**Work Address**

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**CURRENT POSITION: Director of Quality Center and A. Professor of Mechanical Engineering, Prince Mohammad Bin Fahd University, Al-Khobar, Kingdom of Saudi Arabia**

**CITIZENSHIP: USA**

**ACADEMIC POSITIONS:**

**2000-2005:**

**Adjunct Professor** of Mechanical Engineering. *The University of Iowa, College of Engineering, Department of Mechanical and Industrial Engineering, Iowa City, Iowa 52241, USA*

**2005-Present:**

**Research Scholar.** *The University of Iowa, College of Engineering, Center for Computer Aided Design (CCAD), Iowa City, Iowa 52241, USA*

**EDUCATION:**

**Ph.D.**, Mechanical Engineering The University of Iowa, Iowa City, IA (1997)

**MBA**, Executive MBA program The University of Iowa, Iowa City, IA, *Courses: Managerial Economics, Managerial Accounting, Organizational Behavior, Data and Decision (Managerial Data, Decision and Statistical Analysis), Marketing Management, Human Resource Management and International Economic Environment of the Firm (Managerial Macroeconomics).*

**M.Sc.**, Mechanical Engineering Jordan Univ. of Science and Technology (1990)

**B.Sc.**, Mechanical Engineering Jordan Univ. of Science and Technology (1987)

**HIGHLIGHTS OF PROFESSIONAL EMPLOYMENT (MAJOR POSITIONS)**

• **INDUSTRY Experience (15+ years experience in USA industry with global operation)**

1993-1997 Director of Engineering, Gail Industries, Cedar Rapids, Iowa, USA

1997-2005 Senior R&D Manager, S. M. Howe Tech Center, HNI Corporation, Muscatine, Iowa, USA

2005-August 2009 Manager, Product Development Engineering, A. O. Smith Corporation, Water Product Company, Johnson City, Tennessee, USA  
*(Second Largest Manufacturer of Residential and Commercial water Heaters in North America with brands like Whirlpool and Sears Water Heaters)*

- **ACADEMIC Experience:**

- 1987-1990 **Teaching/Research Assistant**-Jordan Univ. of Science & Technology, Irbid, Jordan. Taught and assisted in teaching undergraduate Mechanical Engineering classes including manufacturing processes, fluid mechanics lab, heat transfer lab, instrumentation lab, Engineering and Mechanical Engineering Drawing.
- 1990-1992 **Lecturer in Mechanical Engineering**, National College, a technical community college in Amman Jordan. Courses taught are later in this CV.
- 1992-1997 **Teaching/Research** @ Univ. of Iowa, Iowa City, Iowa, Mechanical Engineering Department, USA. This is during my doctorate program.
- 2000-2005 **Adjunct Assistant Professor** of Mechanical Engineering, The University of Iowa, Department of Mechanical Engineering, Iowa city, Iowa 52242, USA
- 2005-present **Affiliate Research Scholar**, The University of Iowa, Center for Computer Aided Design, Iowa City, Iowa, USA

## **DETAILED TEACHING/RESEARCH EXPERIENCE**

1. (1989-1991) Lecturer in Mechanical Engineering, National College, Amman, Jordan. Taught quarterly system classes in Calculus, Engineering I, Engineering Drawing, Mechanical Engineering Drawing, Machine Design, Fluid Mechanics, Heat Transfer, Statics, Dynamics and Strength of Materials.
2. (1992-1997) Graduate teaching assistant during Ph.D. program, The University of Iowa, Iowa City, Iowa. Assisted and taught classes in Thermodynamics, Heat Transfer, Fluid Mechanics, Experimental Engineering, Fluid Mechanics Lab, Finite Element Analysis 1
3. (1993-1997) Research Assistantship, Mechanical Engineering Department, The University of Iowa, Iowa City, Iowa. Conducted research in the area of combustion engineering and heat transfer in porous media
4. (2000-2005): Adjunct Assistant Professor of Mechanical Engineering, The University of Iowa, Iowa City, Iowa. Taught both graduate and undergraduate classes in core engineering and mechanical engineering.

## **DETAILED INDUSTRIAL EXPERIENCE**

5. (1988-1989) **Technical Support Engineer**, Dar-Al-Riyadh Engineering, Dhahran. Conducted field-training sessions for customers on instrumentations and gas detection equipment. Held weekly seminars at customer locations on gas detection technology, maintenance and operation of various gas detection instruments. Collaborated with manufacturers of equipment to enhance, develop and troubleshoot gas detection equipment.
6. (1993-1997) **Director of Engineering**, Gail Industries, Cedar Rapids, Iowa, USA. Managed the engineering department of Gail Industries, a major manufacturer of light weight, energy efficient high-pressure triplex pumps. Implemented CAD introduction and applied CAM to three new generation high-pressure light weight pumps. Top-down designed and managed

the launch of Model 10000 and Model 20000 high-pressure triplex pumps for oil drilling applications. Designed a new-concept injection pump for the use in process applications. Designed and managed the manufacturing of 500hp mud pumps (Gail model 80) for the use in oil-well grouting application and oil drilling industry in Bakersfield, California. Model 80 is a light weight and high efficiency family of mud pumps designed for helicopter delivered pumps for offshore oil drilling applications.

7. (1997-2005) **Senior Project Manager (R&D)**, HNI Technologies, Stanley M. Howe Technical Center. Muscatine, Iowa, USA. Managing research and development projects for six company divisions (Allsteel<sup>®</sup>, Hon Company<sup>®</sup>, Gunlocke<sup>®</sup>, Maxon<sup>®</sup>, Quadra Fire<sup>®</sup>, Heat-N-Glo<sup>®</sup> and Heatilator<sup>®</sup>). HNI is a global company with operation in North America, China and Europe. HNI is a mid-cap blue chip company with annual revenue of over \$2.6 Billion. Company is a USA major producer of energy solutions and high efficiency hearth products, gas and wood fired fireplaces, stoves and has a major division manufacturing high and medium end office and institutional furniture.
8. (2005-Present): **Manager, Product Development Engineering**, A. O. Smith Corporation, Johnson City, Tennessee, USA. A. O. Smith is the second largest manufacturer of residential and commercial high efficiency energy star<sup>®</sup> water heaters in North America with global operations in USA, Mexico, Canada, Europe and China. Currently, managing the product development engineering department for residential water heater division. My department group is responsible for designing new water heaters and improvement/development projects for existing water heating technologies. The department is responsible for providing design and engineering leadership to 4.5 million residential water heating products produced annually across the globe. The group employs the state of the art experimental lab and cutting edge computational fluid dynamics and computational mechanics techniques. Computer Aided Design and CAM is fully deployed for all product platforms. Company produces energy star<sup>®</sup> water heaters for industry under the brand names of Whirlpool<sup>®</sup>, A. O. Smith<sup>®</sup>, State<sup>®</sup> and American Water Heaters<sup>®</sup> and other brands. A. O. Smith is a mid-cap blue chip company with annual revenue of over \$2.3 Billion

## **HIGHLIGHTS OF DESIGN EXPERIENCE:**

### Energy Systems Experience:

- Over 11 years of experience managing cross-functional teams of product development engineering, serving residential energy efficient fireplaces, stoves, water heaters (Gas fired, wood fired and Electric).
- Development of new generation of FVIR (flammable vapor ignition resistant) Water Heaters.
- Experience in developing and manufacturing of Power-Vented residential water heaters and methods of improved combustion.
- Managed and implemented the production of the world first Ultra Low NOX residential water heater compliant to California, USA emission requirements.
- Managed and designed a high efficiency Combustion Water Heater. US DOE designated Energy Star<sup>®</sup> water heater.

- Developed a patent-pending combustion air diverting system for power vented residential water heaters. System is in production and successfully achieved cost effectiveness and performance improvement goals. System was recently qualified for the Department of Energy program of Energy Star designation for meeting high energy factor required for water heating equipment.
- Managed and implemented into production the Energy-Smart Gas® water heater. An intelligent gas water heater that utilizes control algorithms enabling water heaters to adapt to household hot water consumption pattern. This product is in production and is sold under Whirlpool Brand throughout North America.
- Designed and implemented into production a new manifold door and burner assemblies for sealed combustion flammable vapor resistant water heaters.
- Thermal Analyst, NASA Cassini Space Mission to Saturn, Physics Department, The Univ. of Iowa, Iowa City, Iowa (1993-1996)

*Other Interdisciplinary Mechanical Engineering Experience:*

- Seating design, seating mechanism design, seating structural optimization, seating comfort and ergonomics applications in seating. Major seating projects: Allsteel #19 Chair® (*award winning signature product*) and Allsteel Sum® Chair (*award winning ergonomic signature office product*).
- Storage systems design and sheet-metal applications in office storage systems. Alternative materials for office furniture.
- Office system design and development. Major projects: Allsteel Concensys, Terrace 2.6, Reach and HON Initiate systems.
- Finite Element Analysis of seating, storage and office systems.
- Acoustics testing and optimization of office systems.
- Material development and inventiveness for green buildings of the future. A major project to utilize sustainable and renewable natural fiber to develop paneling alternative materials for construction applications. This panel system is in production since 2005.

**CAREER EXPERTISE AND SKILLS**

***Industrial, Business & Management***

- Managerial Financial Analysis
- R&D Project management
- Strategic planning, Institution Building
- New product end user research
- Engineering-Marketing interfacing
- Presentation/public speaking
- Competitive strategies/cost effectiveness
- Product launch and introduction
- Business negotiation skills
- Coaching/Mentoring and training
- Organizational Behavior
- Engineering/Business supervision
- Managing product development cross-functional teams

***Technical***

- Design and Product Development
- Sheet Metal Forming and Production Processes
- Manufacturing Engineering
- Finite Element Analysis: Structural and Thermal/Fluids applications.
- Computational Fluid Dynamics
- Virtual Reality Engineering Applications
- Digital Human Modeling
- Alternative materials/sustainability
- Engineering Education
- Computer Aided Design/Consumer Products
- Engineering mechanics and materials
- Industrial Applications of Thermo-fluids
- Data and Decision (Statistical Analysis)

## **COMPUTING AND CAD SKILLS**

- PDM (product data management), PDMWorks®
- Enterprise Software, production mainframe software, strategic planning and implementation.
- Solid Works® 2004-present
- Cosmos Works® 2004-Present
- PRO/ENGINEER, 1996-Present
- PRO/MECHANICA, 1997-Present
- AUTOCAD, 1994-Present
- ANSYS: FEA Commercial Software: 1995-Present
- ANSYS-FLOTTRAN: Commercial CFD Software: 1998-Present
- Fortran Programming 1984-present
- Working knowledge in Lab View data acquisition software, 3DSTUDIO MAX and Maya
- Microsoft Office, Word, Excel, Power Point 1994-Present
- Microsoft Project 1998-Present

## **CONSULTING EXPERIENCE:**

1. (1993-1996) Thermal analyst, Cassini Spacecraft, NASA's Mission to Saturn, Jet Propulsion Lab and The University of Iowa Physics and Astronomy Department. Applied my Ph.D. thesis research code to simulate cooling of electronic components of Cassini Spacecraft. Won JPL's Award of outstanding thermal analysis application to electronic packaging. Cassini was launched in 1998. This is a three year consulting work conducting electronic packaging (cooling) of components under vacuum conditions for space applications. Theoretical and experimental approaches were utilized. This work spanned over three years during my Ph.D. study at the University of Iowa. While working as a consulting graduate engineer at the physics department. The work was funded by NASA to develop electronic controls for the CASSINI probe that was launched to Saturn in the late 1998. My responsibilities were in the area of thermal management of electronic controls under vacuum. I engineered experimental heat transfer (conduction and radiation) under vacuum conditions. I also utilized FORTRAN numerical code to simulate heat dissipation in electronic controls of CASSINI space craft.
2. Swirling Mixer Design, MiT-M Corporation, Peosta, IA, USA. This was a design and development of a swirling pre-mixer for oil-fired portable boilers that are used on pressure washing equipment. Flame stabilization mechanisms were optimized to provide customer needs.
3. Combustion Aerodynamics Design of Water Boilers For High Pressure Washers, MiT-M Corporation, Peosta, IA, USA. This was another design consultation for another MiT-M pressure washing system.
4. Several consulting services for Gail Industries (former employer) since 1997 in the areas of high pressure triplex water pumps.
5. Structural analysis and failure diagnosis of aluminum extrusions for use in high-end office tables. The Gunlocke Company, New York , May-August 2005

## SCIENTIFIC AND PROFESSIONAL SOCIETIES, CERTIFICATIONS

- ASME, American Society of Mechanical Engineers, professional member, since (1992)
- Combustion Institute, USA, member since (1998)
- EIT, State of Iowa, USA (1998)
- Jordan Society of Engineers, Mechanical Engineering Chapter, since (1987)
- OSHA, USA, Occupational Safety and Health Administration, Certified Safety Manager, since (2001)
- ASM (American Society of Metals) professional member, since (2004)
- American Red Cross First Aid Certified and Current since (1999)
- American Red Cross Adult CPR Certified and Current since (1999)

## SCHOLARSHIPS, RECOGNITIONS PATENTS AND AWARDS

- Ph.D. Scholarship Award Sponsored by Jordan University of Science and Technology, Jordan 1992-1997
- Teaching/Research assistantship through M.Sc. and Ph.D. programs 1990-1997
- ***Arch T. Colwell Merit Award***, Society of Automotive Engineers (SAE), Author of best paper voted among over 3000 papers in the field of dynamics and ergonomics in the proceedings of SAE
- **PATENTS (Issued and Pending):**
  1. "Apparatus and method for cooling a surface of a fireplace" United States Patent number 6848441
  2. "Air Intake For A Water Heater" US Patent Office Ref. Number:010121-2114-00 US
  3. "Water Heater With Forced Draft Air Inlet" US Patent Office Ref. Number: MBF 010121-2113-00
  4. "Water Heaters With Combustion Air Inlet "US Patent Office # US 2009/0084328 A1
  5. "Water Heater Burner Tube And Door Assembly" US Patent Office Ref. Number: 010121-8231-01
  6. "Burner Door Assembly With LOCK-RING", US Patent Office Application # 61140483,
  7. "Water Heater With Fuel Line And Door Assembly", US Patent Office Ref. Number: AWH-08-1160
  8. "Sealable Water Heater Manifold Door", US Patent Office Ref. Number: AWH-08-1155
  9. "Water Heaters With Sealed Door Assembly", US Patent Office Ref. Number: AWH-08-1177
  10. "Water Heaters With Sealed Door Assembly", US Patent Office Ref. Number: AWH-08-1178
  11. "Water Heaters With Sealed Door Assemblies", US Patent Office Ref. Number: AWH-08-1179
  12. "Water Heater Flame Trap And Assembly Of The Same", US Patent Office Ref. Number: 010121-8238-00
  13. "Sight Glass And Frame" US Patent Office Ref. Number: 010121-8260-00
  14. "Sight Glass" US Patent Office Ref. Number: 010121-8240

## **INSTITUTIONAL, PROFESSIONAL AND VOLUNTEER SERVICES**

1. Co-Chair, *Advanced Technology Board*, State of Iowa, USA, Department of Economic Development. 1999-2001
2. Chair of “*Practical Combustion*” session of the Combustion Institute, George Washington University, Washington DC 1998
3. Industry Consultant to **ABET**, Accreditation Board of Engineering and Technology, 2000-2005
4. Session Chair, Engineering Criteria 2000 workshop of **ABET EC2000**, Accreditation Board of Engineering and Technology, Newton, Iowa, Sept. 23-24, 2000
5. Keynote Speaker, *Davinci Conference*, Iowa Department of Economic Development, Des Moines, Iowa Feb 2001
6. Member of the *Pioneers’ Committee*, American Institute of Sustainable Science and Technology, UI Oakdale Research Campus, Iowa City, Iowa. Since 1999
7. Member of the Advisory Board of the *Digital Human Lab*-Center for Computer Aided Design (CCAD), The University of Iowa, Iowa City, Iowa 2000-present
8. *Habitat for Humanity*, Volunteer Home Builder, Muscatine, Iowa 1998.

## **SELECTED RECENT AND PAST R&D PROJECTS AND RESEARCH INTERESTS (1997-present)**

1. Mechanism Designs for Seating Products: This project was conducted during my past industry experience at HNI Technical Center. The research was aimed at developing highly featured alternative chair mechanisms made of die-cast aluminum alloy. Finite element analysis and CAD using Pro-Engineer was used to develop the optimal chair mechanism. Mechanism provided features to allow ergonomic adjustment of the office chair for height, back tilt, seat tilt and slide and an innovative mechanism to adjust lumbar support in the back. The mechanism is based on user-weight activation principle developed at HNI and utilized in family of high-end office chairs.
2. Large-scale deformation modeling of irregular shaped cast aluminum parts. ANSYS® commercial finite element analysis software was utilized to predict failure and optimize components of office and storage mechanisms and platforms.
3. Computational modeling of fluid flow and heat transfer in 3D complex passages and applications to fireplace venting. FLOTRAN module of ANSYS software was used to predict flow and heat transfer in co-axial vent pipe and vent connections of stoves and fireplaces. Experimental measurements were used to validate modeling. This project developed a baffled co-axial vent elbow for direct-vented fireplaces that meets building standards for zero-clearance construction requirements.
4. Waste heat recovery from supplemental heating system. This project was sponsored in part by the Iowa Energy Center, Energy Research Station, Ankeny, Iowa.

5. Design, prototyping and testing of cross-flow compact heat exchangers for waste heat recovery from gas-fired fireplaces. This research developed a finned-tube heat exchanger that recovers waste heat from residential heating devices such as gas fired fireplaces and stoves. The recovery heat exchanger reduces flue temperature and allows the utilization of PVC/CPVC as venting pipe material.
6. Heat transfer and fluid flow in co-axial fireplace chimney pipes. Experimental work that was conducted in the HNI heart lab in Muscatine, Iowa. The work was aimed at characterizing flow and heat transfer in co-axial vent pipes for direct vent fireplaces and stoves. This experimental testing utilized the state-of-art data acquisition software and hardware to develop minimum and maximum vent lengths. Wind effect on direct-vented stoves was also studied and venting guidelines were established and used for agency certification and product literature development.
7. Optimal design of insulated flue pipes for fireplaces and stoves. Ceramic fiber blanket material was utilized to provide insulation for vent pipes.
8. The use of recycled engineered plastic to replace aluminum components for office systems applications. Connectors traditionally used for office cubical walls were replaced by plastic components that were extruded from recycled materials. The project aimed at cost reduction that achieved \$4 million annual savings during my industrial experience at HNI in Iowa.
9. Design and manufacturing of integrated mobile data acquisition systems for industrial hearth systems testing and applications. Data acquisition kiosks that houses hardware to enable large number of data logging channels and equipped with PC were manufactured for HNI hearth divisions Heatilator® and Heat-N-Glo®. These kiosks were used in agency certification labs and production lines to test fireplaces and stoves in real installation simulations.
10. Numerous FEA studies and applications to optimize the design of various industrial mechanical components. During my work at HNI (1997-2005) I lead numerous finite element analyses of components used in office systems and hearth products. These simulations treated stress analysis due to mechanical loading and thermal effects. This represented a day-to-day design support activity and hundreds of FEA cases were completed annually.
11. CFD and heat transfer field applications for office environment
12. Virtual Reality (VR) Simulation and applications to ergonomic design of office furniture. This project was in collaboration with the University of Iowa Center for computer Aided Design (CCAD). The technology of virtual reality was utilized for product development visualization as well as for marketing purposes. The outcome of this project was a joint effort that built two VR facilities, one at HNI and one at CCAD. Each VR facility provided a 3-wall environment that enabled immersive VR experience. Work included developing stereoscopic CAD models of office equipment that was VR enabled and animated in these VR facilities. The HNI facility is still used to date as a product development and visualization tool and a powerful marketing demonstration tool for showing future products to major customers. Photo-realistic and high fidelity renderings enabled the company to show future products to customers before going into

production. The University of Iowa facility was used as a seed to attract funding for VR research. This seed attracted a multimillion (\$17million) grant that was awarded to CCAD over 5 years. The VR facility at the CCAD now houses the world first 6-wall PC-based VR environment.

13. Digital Human Modeling for ergonomic studies. This effort was in collaboration with the University of Iowa and HNI Technical Center. Digital human modeling was utilized to optimize workplace ergonomics and VR technology was used to visualize designs.
14. Thermal and acoustical simulation of comfort in office spaces. Thermal comfort experimental studies were conducted on HNI cubical workplaces. The testing was conducted by engineering interns from the University of Iowa College of engineering inside the university offices. Acoustical testing of noise propagation inside cubical office systems was conducted inside the labs of HNI Technical Center.
15. Combustion and Heat transfer simulation inside storage-tank gas fired water heaters, utilizing commercial CFD code Fluent®.
16. Finite Element Analysis of hydrostatically pressurized water heater tanks. This work is aimed at simulation of pressurization of water heater tanks to meet ANSI requirements on one hand and to optimize vessel wall thickness achieving cost reduction on the other hand.
17. Fatigue analysis of pulsation loaded water heater tanks. This work utilized Solidworks® COSMOS® FEA module to conduct fatigue analysis of water heater tanks. Water heater tanks experience pressure spikes due to water hammering and the use of other household devices that generate sudden pressure waves. This study provided in-depth analysis and characterization of the behavior of water heater tanks under cyclic loading. The outcome was implemented to predict reliability and to establish life expectancy of water heaters for warrantee purposes.
18. CAD design of sheet metal and plastic components and assemblies of residential water heaters, using Solid Works®

## **INDUSTRY-ACADEMIA COLLABORATIVE ACHIEVEMENTS**

1. Co-chair of Advanced Technology Board, Department of Economic Development, State of Iowa, USA. The board mission is to deploy mechanisms and establish clusters of collaboration within the State of Iowa manufacturers to enable advanced technologies utilization. Board leadership constitutes of representatives from major Iowa industry and research and development institutions. The outcome of the Board efforts was translated into many successful establishments of rapid prototyping clusters within the state. These clusters were operated by major Iowa industry players but were made available to all regional manufacturers. Board has also succeeded in leading regular advanced manufacturing training programs with the state that targeted industry leadership to deploy state of the art manufacturing and process techniques. The outcome of these programs was translated into collaborative efforts between major industry players to disseminate the know-how of Rapid Continuous Improvement (RCI) process. RCI is a version of the TOYOTA production system tailored for small to medium manufacturers that is

solely based on Lean Manufacturing principles. The Board provided leadership and strategic planning services to industry clusters and established metrics to measure the progress of each initiative within the state.

2. Leading the research and development efforts at HNI Corporation in the areas related to Virtual Reality (VR) Simulation and Ergonomic Design of Consumer Products/Office Furniture. VR Projects were collaborated with the Digital Human Modeling Lab at the University of Iowa (2001-2005)
3. Collaborative research in the area of energy optimization of hearth systems (fireplaces and stoves) was conducted with Iowa Energy Center, Ankeny, Iowa (1999-2000)
4. Lead Engineer, Program for Enhanced Design Experience (PEDE), a collaboration program between HNI Corporation and The University of Iowa College of Engineering Senior Design Projects. (1998-2002)
5. Leading research projects at HNI Corporation related to personal climate control in office spaces and systems. Lead engineer from HNI Corporation in the Virtual International Design (VID) program collaborated between HNI Corporation, The University of Iowa and IUSTI – France (1999-2001)
6. Several lead engineer role in University-Industry initiatives and undergraduate senior design projects (1997-2005)
7. Project Manager of Allsteel Virtual Reality Facility (2001-2003). Allsteel, a division of HNI Corporation, Collaborated with The University of Iowa Center for Computer Aided Design to build the industry first virtual reality facility. The facility is used for visualization applications for product development and for marketing purposes.

**COURSES TAUGHT - TEACHING EXPERIENCE:  
Mechanical Engineering Courses Taught, since 1990**

*The University of Iowa: (2000-2005) Adjunct Professor of Mechanical engineering*

- Principle of Design 1 (Optimization)
- Dynamics
- Intermediate Thermodynamics (*Graduate course*)

*The University of Iowa: (1992-1997) Graduate Teaching Assistant*

- Thermodynamics 1
- Heat Transfer
- Fluid Mechanics
- Fluid Mechanics Lab
- Experimental Engineering

*National College – Jordan :( 1990-1992) (technical community college)*

- Air-Conditioning Engineering

- Refrigeration Technology
- Heat Transfer
- Fluid Mechanics and Hydraulic Machinery
- Service of HRA Systems
- Calculus for Engineers
- Engineering Mechanics, Statics and Dynamics
- Strength of Materials
- Engineering Drawing
- Mechanical Engineering Drawing

#### **REFEREED JOURNAL/CONFERENCE PUBLICATIONS:**

1. **Emad Y. Tanbour**, Ramin K. Rahmani and Anahita Ayasoufi (2009), "Large-Eddy Simulation of Turbulent Flow Through Small Gage Gas Appliance Orifice," *Proceedings of IMECE 2009, 2009 ASME International Mechanical Engineering and Exposition, November 13-19, 2009, Lake Buena Vista, Florida, USA*
2. **Emad Y. Tanbour** and Ramin K. Rahmani, (2009), "Enhancement of Temperature Blending in Convective Heat Transfer by Motionless Inserts with Variable Segment Length," *Proceedings of IMECE 2009, 2009 ASME International Mechanical Engineering and Exposition, November 13-19, 2009, Lake Buena Vista, Florida, USA*
3. **Emad Y. Tanbour** and Ramin K. Rahmani, (2009), "A Numerical Study of The Thermal Performance of Two Stationary Insert Design in Internal Compressible Flow," *Proceedings of 2009 ASME Summer Heat Transfer Conference, HT2009, July 19-23, 2009, San Francisco, Ca, USA*
4. **Emad Y. Tanbour** and Ramin K. Rahmani, (2008), "Enhancement Of Natural Convection Heat Transfer Rate In Internal Compressible Flows By Inserting Stationary Inserts," *Proceedings of 2008 ASME Summer Heat Transfer Conference, HT2008, August 10-14, 2008, Jacksonville, Florida USA*
5. **Emad Y. Tanbour** and Ramin K. Rahmani, (2008), "Experimental Study Of Convective Heat Transfer In A Vertical Pipe With Stationary Inserts," *Proceedings of 2008 ASME Summer Heat Transfer Conference, HT2008, August 10-14, 2008, Jacksonville, Florida USA*
6. K. Abdel-Malek, J. Yang, R. Brand, M. Vannier, and **E. Tanbour**. Towards understanding the workspace of human limbs. *International Journal of Ergonomics, Oct 22, 2004; 47(13): pp. 1386-1405*
7. Butler, P. B., **Tanbour, E.**, Rahman, S., and Smith, T. F., "Virtual International Design Teams," *Proceedings of 2002 ASEE Midwest Section Meeting, Madison, WI, September 2002*
8. Abdel-Malek, K., Yang, J., Brand, R., and **Tanbour, E.**, (2002), "Towards Understanding the Workspace of The Upper Extremities," *2001 SAE Transactions, Journal of Passenger Cars: Mechanical Systems, Vol. 110, Section 6, pages 2198-2206.*
9. Mi, Z., Kim, J., and Abdel-Malek, K., Nebel, K., **Tanbour, E.**, "Optimization Based Posture Prediction", *Seventh International Symposium on the 3-D Analysis of Human Movement, Newcastle, United Kingdom, July 10 - 12 2002*
10. Abdel-Malek, K., Yang, J., Brand, R., and **Tanbour, E.**, "Towards Understanding the Workspace of the Upper Extremities," *Proceedings of SAE Digital Human Modeling for*

*Design and Engineering*, 2001-01-2095, June 26-28, Arlington, VA, USA. [2001 Arch T. Colwell Merit Best Paper Award]

11. Abdel-Malek, K., Yu, W., **Tanbour, E.**, Jaber, M., (2001), "Posture Prediction versus Inverse Kinematics", *Proceedings of the ASME 27th Design Automation Conference*, 2001 ASME Design Engineering Technical Conferences, Pittsburgh, Pennsylvania, U.S.A. September 9-12, 2001
12. K. Abdel-Malek, Y. Wei and **E. Tanbour**, "Inverse Kinematics using Cost Functions", IASTED International Conference, Robotics and Manufacturing (RM 2001), Cancun, Mexico, May 2001
13. **Tanbour, E. Y.** and Rahmani, R. K., "Enhancement of Natural Convection Heat Transfer Rate in Internal compressible Flows by Inserting Stationary Inserts", submitted to the International Communications in Heat and Mass Transfer.
14. Rahmani, R. K., Ayasoufi, A., and **Tanbour, E. Y.** "Simulation of Turbulent Flow in a KOMAX Static Mixer", submitted to the International Journal of Numerical Methods for Heat and Fluid Flow.

#### **OTHER PUBLICATIONS:**

1. Tanbour, E. Y., and Ahmarow, M. E., "Design and Optimization of Fire-tube Boilers for Large Dairy Processing Plants," Caroline Dairy Company, Amman, Jordan, Final Report, ME Department, Yarmouk University, Irbid Jordan, 1987.
2. Tanbour, E. Y. and Ahmarow, M. E., "Design Calculations for Cooling Systems of Industrial Gas Turbines," ME final Report, Yarmouk University, Irbid, Jordan, 1987.
3. Tanbour, E. Y., "Pressure Distribution on Rotating Cylinders in cross flows," ME final Report, Graduation Project, ME department, Jordan University of Science and Technology, Irbid, Jordan, 1987.
4. Tanbour, E. Y., "Design and manufacturing of new pressure measurement mechanism on rotating bodies in cross flows," Final Report, ME Department, Jordan University of Science and Technologies, Irbid, Jordan, 1988.
5. Tanbour, E. Y., "Wind Energy in Jordan," Department of Energy, Jordan, and Jordan University of Science and Technology, Irbid, Jordan, 1989.
6. Tanbour, E. Y., "Heat Transfer to Gas-Solid Suspension Flows in Vertical Pipes," M. S. Thesis, Jordan University of Science and Technologies, Irbid, Jordan, 1990.
7. Tanbour, E. Y., "Modeling non-isothermal multiphase-multicomponent flow and transport in porous media using the two phase mixture approach", Ph.D. Thesis, The University of Iowa, Iowa City, Iowa, USA, 1997.
8. Tanbour, E. Y., "Modeling spillage from an open door gas fired fire place using ANSYS Flotran module", Final Report - HNI Corporation, Muscatine, Iowa, USA, 2001
9. Tanbour, E. Y., "CFD and Heat Transfer Simulation of flow in co-axial elbows with internal baffles. Application to venting of zero-clearance fireplace chimney pipes." Hearth and Home Inc., Lakeville, MN, USA, 2000
10. Tanbour, E. Y., Ryan B. and Smith, T., "Development of a Waste Heat Recovery Heat Exchanger for Supplemental Heaters", Technical Report ME-01-002, Department of Mechanical Engineering, The University of Iowa, Iowa City, Iowa, 52242, USA, Feb. 2001
11. Tanbour, E. Y, Hu, J. and Smith T., "Waste Heat Recovery Heat Exchanger for Supplemental Heaters", Technical Report ME-01-006, Department of Mechanical Engineering, The University of Iowa, Iowa City, Iowa, 52242, USA, July 2001

12. Tanbour, E. Y., Yu, X. and Smith, T., “ *Literature Review of Flexible and Adaptive HVAC Distribution Systems for Office Buildings*”, Technical Report ME-01-005, Department of Mechanical Engineering, The University of Iowa, Iowa City, Iowa, 52242, USA, July 2001

## REFERENCES

1. Dr. Karim Malek, Professor of Biomedical Engineering *and Director, Center for Computer Aided Design* The University of Iowa, Iowa City Iowa 52240, USA. Tel.: 319- 335 6163  
[amalek@engineering.uiowa.edu](mailto:amalek@engineering.uiowa.edu)
2. Dr. I. Khattat, President, American Institute of Sustainable Science and Technology, 720 Ninth Ave., Coralville, IA 52241-1917, USA, Tel.: 319-338-4528 email:  
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