

## Curriculum Vitae

### Owen Asher

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#### OBJECTIVE

To provide solutions for sustainable energy production and utilization through innovative research.

#### EDUCATION

**Ph.D. Mechanical Engineering**, Expected: July 2009

University of Maryland, College Park, MD

**GPA:** 4.0

**Focus:** Thermal Fluid Sciences, Energy Systems

**Dissertation:**

"Development of Multi-Scale, Multi-Physics, Analysis Capability and its Application to Novel Heat Exchangers Design and Optimization"

**Faculty Advisor:** Dr. Reinhard Radermacher (raderm@umd.edu)

**M.S. Mechanical Power Engineering**, October 2005

Cairo University, Giza, Egypt

**Grade:** 91% – Ranked first in a class of ~ 30 students

**Focus:** Thermal Fluid Sciences, CFD simulations

**Thesis:**

"Flow Regimes, Thermal and Humidity Patterns in Ventilated Archaeological Tombs, Valley of the Kings, Luxor"

**Faculty Advisor:** Dr. Essam E. Khalil (khalile1@asme.org)

**B.S. Mechanical Power Engineering**, July 2003

Cairo University, Giza, Egypt

**Grade:** 94% – Ranked second in a class of ~ 280 students

**Graduation Project:** Heat Exchanger Design and Control

**Faculty Advisor:** Dr. Essam E. Khalil (khalile1@asme.org)

#### RESEARCH EXPERTISE

- Multi-scale and multi-physics heat exchangers simulation and optimization (CFD/e-NTU/refrigerant headers/structural analysis).
- Approximation techniques: Design of Experiment, Metamodeling.
- Multi-objective multi-disciplinary optimization.
- CFD simulations of heat exchangers.
- Transient and steady state modeling of vapor compression systems and components.
- Two-phase flow: Experimental/Analytical Techniques.
- Indoor air quality.
- CFD simulations of room air flow.

#### EXPERIENCE

**Graduate Research Assistant**, 2006 - Present

Center for Environmental Energy Engineering, University of Maryland, College Park, MD

**Next Generation Heat Exchanger (NGHX)**

- Engaged in brainstorming sessions and workshops to define the potential geometries for the next generation of heat exchangers resulting in 23 novel heat exchanger (HX) ideas.
- Researched available literature and patents for new heat exchanger designs, geometries, and materials.
- Mastered CFD simulations, analysis, and modeling automation for heat exchangers.
- Introduced a new integrated approach for heat exchangers design and optimization using multi-scale, multi-physics approximation assisted optimization.
- Assessed the performance of various approximation techniques.
- Critically reviewed single phase heat transfer and fluid flow literature and verified conventional correlations using CFD simulations.
- Designed a prototype heat exchanger design based on available manufacturing technologies and findings from optimization results.
- Successfully designed heat exchangers with a potential of 50% reduction in volume and 66% reduction in materials compared with state-of-the-art in-heat exchanger designs with at least 90% computational time reduction.
- Extended the analysis framework to conventional heat exchangers and developed optimized designs with tradeoff between heat exchanger volume and material cost; optimum designs showed up to 40% volume reduction and up to 30% material cost reduction.
- Examined several manufacturing techniques for microtube cutting and developed an approach to avoid tube pinching.
- Supervised manufacturing of the prototype and solved header sealing problems using innovative ideas.
- Designed the experimental setup for the novel HX prototype.

**TransRef: Transient Refrigeration Systems Simulation Tool**

- Improved and upgraded TransRef user interface to comply with other UMD CEEE software.
- Developed new system component models to extend TransRef capability for predicting trans-critical systems, heat pump systems, cycles with PID variable speed compressors, and psychrometric loads.
- Successfully simulated the trans-critical CO2 refrigeration cycle for household refrigeration application, and extended TransRef capabilities to handle binary mixture applications.
- Developed help files and product documentation.

**Refrigerant Charge Inventory in Household Refrigerators with Multiple Evaporators**

- Designed and built a test facility for charge migration study in multi-evaporator household refrigeration applications.
- Studied the two phase phenomenon and void fraction models and analyzed their effect on the HX charge inventory models.
- Coordinated project progress with sponsors and prepared progress reports.
- Developed refrigeration system charge estimation tool using Excel VBA with the modified void fraction model.

**Workshops**

- Participated in teaching and educational materials preparation for a 2-day short course for heat exchanger design.
- Taught a day-long seminar on the features of the software developed at CEEE.

**Additional Activities**

- Provided user support for UMCP CEEE software users - CoilDesigner, TransRef, and VapCyc resulting in higher software usage.
- Implemented flow regime based heat transfer coefficient and pressure drop correlations for CoilDesigner for improved accuracy of heat transfer and pressure drop performance evaluation in the two-phase region.
- Participated in the CEEE spring and fall meetings and provided hands-on training for sponsors on UMCP CEEE simulation tools.
- Engaged in various brainstorming sessions: tube-to-tube conduction in finned HX, cascaded refrigeration cycles simulation, new generation HX, and water condensate numerical and experimental simulations.
- Trained engineers on the use of TransRef and provided advanced training for system component development using the component based programming approach.

**Research Proposals and Funding Opportunities**

- Publicized for the UMD CEEE software suits in the HVAC&R industry through private communications, seminar presentations, and conference participation.
- Persuaded a European company to join the ISOC consortium through personal communication with one of the lead research engineers and demonstration of the center modeling capabilities. Followed up with support requests and provided adequate information about the benefits they would get by joining the ISOC consortium. Joining the ISOC consortium provides an additional funding opportunity within the group and extends research opportunities.
- Wrote a research proposal for The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) to apply the tools developed in the NGHX project to develop plastic heat exchangers.
- Wrote an accepted Research Topic Acceptance Request (RTAR) to the American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE), and in the process of writing the work statement.

**Mentorship****Graduate Student Advising**

- Mentored new CEEE graduate students and provided support with regard to time management, research ethics, and skills.
- Held regular weekly meeting with them to discuss their progress and difficulties.

**Undergraduate Student Advising**

- Supervised 3 undergraduate students working on different projects (experimental/numerical).

**Teaching**

- Taught a graduate course as a teaching practicum in partial fulfillment of the Future Faculty Program (ENME 808D: "Sustainable Energy Production and Utilization"; Spring 2008).
- Developed course syllabus and educational materials. Conducted office hours for students.
- Applied active teaching skills in class and promoted students discussion and participation.

**Teaching and Research Assistant, 2003 - 2005**

Department of Mechanical Power Engineering, Cairo University, Giza, Egypt

**Teaching**

- Conducted weekly classes and held consistent office hours, graded weekly homework assignments, held oral examinations, and graded mid term examination for: Refrigeration and Air Conditioning, Thermodynamics, Conventional Power Plants, and Engineering Economy courses and Measurement Laboratory.
- Improved lab performance and fixed experiments.
- Participated in video production to demonstrate experiments.

**Research**

- Provided innovative designs for the ventilation of the historical tombs of the kings in Luxor to minimize mold growth and extend artifacts preservation through CFD simulations.
- Developed educational materials for the electronics cooling course developed through the HEEP program and Engineering economy course (VISION project) granted by TEMPUS.

**Research Engineer, 2003 - 2004**

Dr. Ezz Mechanical Engineering Consultancy, Giza, Egypt

- Designed and implemented a PLC based controller for AMADA CNC resulting in a replacement part cost savings of \$10,000.
- Installed PLC and Motor controllers, sensors and actuators.
- Developed a Ladder diagram model for the CNC control and developed a graphical user interface wrapper using .Net framework.

**ADDITIONAL EXPERIENCE****Summer Intern, August 2002**

Commercial Buildings Mechanical System Design Dept., Dar-Alhandasha, Cairo, Egypt

**Summer Intern, July 2002**

Mechanical Design Dept., Consulting Engineering Bureau, Cairo, Egypt

**Team Leader -Automated Guided Vehicle, May 2002**

RoboCon Contest, Cairo, Egypt

**Property Operation Intern/HVAC/BMS/Domestic Water System Maintenance, Summer 2001**

Conrad International Cairo, Cairo, Egypt

**Building Management System Design Summer Intern, August 2000**

Petrokima Co., Giza, Egypt

**Automotive Maintenance Summer Intern, June 2000**

Peugot Service Center, Ghamrah, Cairo Egypt

**Electric Battery Management, Test Data Analysis Summer Intern, Summer 1999**

New Generation Motors Corporation, Ashburn, Virginia

**INVENTION DISCLOSURES**

1. Flexible-Actively Controlled Heat Exchanger Based on Thin-Film Technology; University of Maryland Invention Disclosure PS-2007-051.
2. Compact Mini-Channel Heat Exchangers; University of Maryland Invention Disclosure PS-2007-116.
3. A New Multiscale Approach to Design Novel Heat Exchangers; University of Maryland Invention Disclosure PS-2008-033.

**HONORS AND AWARDS**

- Research Assistantship, Center of Environmental Energy Engineering (CEEE); 2006 - Present
- A. James Clark School of Engineering Future Faculty Fellowship; 2007 - Present
- A. James Clark School of Engineering Fellowship; 2006 - Present
- Best Paper Award in Terrestrial Energy, AIAA; January 2005
- Cairo University Teaching and Research Assistantship; 2003 - 2005
- Cairo University Excellence Assistantship Award; 1998 - 2003
- Schlumberger Sponsorship; 2001 - 2002, 2002 - 2003

**SKILLS****Programming:**

C#, Visual Basic, MATLAB, LabVIEW, Engineering Equation Solver

**Software packages:**

FLUENT, ANSYS, GAMBIT, SolidWorks, Microsoft Visual Studio .NET @, Microsoft Project, Microsoft Office Suite, UMD CEEB Modeling Tools, TRNSYS

**Air conditioning system design:**

Load estimation, Sound analysis, HVAC system design, Direct Digital Control and Building Management System Design

**Automation:**

PLC based control systems, MCC design, and DDC system designs

**Experimental:**

Data acquisition (LabVIEW/MATLAB), Design and Manufacturing of Test Facilities, Testing Standards

**Languages:**

English, Arabic, and French

**JOURNAL ARTICLES AND EDITORIAL**

1. Radermacher, R., Asher, O., "Optimization" and HVAC&R.", HVAC and R Research, v 14, n 6, November, 2008, pp. 817-818.
  2. Aute, V., Asher, O., Saleh, K., Azarm, S., Radermacher, R. 2008, "Space-Filling Cross-Validation Trade-Off Based Adaptive Design of Experiments", AIAA.
- In review/preparation:**
3. Asher, O., Aute Vikrant, Radermacher, R., "Multi-Scale Simulation for Novel Heat Exchanger Designs", ASME Journal of Heat Transfer, HT-08-1509.
  4. Asher, O., Aute Vikrant, Radermacher, R., "A-type Heat Exchanger hybrid CFD - Effectiveness-NTU Simulation and Optimization", HVAC&R.
  5. Asher, O., Radermacher, R., Azarm, S., "Effect of Manufacturing Tolerances on Micro-Scale Heat Exchanger Performance" International Journal of Refrigeration.

6. Singh, V., Asher, O., Aute, V., Radermacher, R. "Heat Exchanger Model for Air-to-Refrigerant Fin-and-Tube Heat Exchanger With CFD-Based Air Propagation", International Journal of Refrigeration.

**REFEREED CONFERENCE PROCEEDINGS**

1. Aute, V., Asher, O., Azarm, S., and Radermacher, R., 2008, Cross-validation Based Single Response Adaptive Design of Experiments, *Proc. 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, September 10-12 2008, AIAA, Victoria, British Columbia, Canada, AIAA-2008-6067, pp.1-23.
2. Asher, O., Singh, V., Aute, V., and Radermacher, R., 2008, "A-Type Heat Exchanger Simulation using 2-D CFD for Airside Heat Transfer and Pressure Drop", *Proc. 12th International Refrigeration and Air Conditioning Conference at Purdue*, July 12-17, 2008, Purdue University, West Lafayette, IN, 2008, R2200, pp.1-8.
3. Asher, O., Aute, V., and Radermacher, R., 2008, "Effect of Void Fraction Model on the Dynamic Performance of Moving Boundary Heat Exchanger", *Proc. 12th International Refrigeration and Air Conditioning Conference at Purdue*, Purdue University, West Lafayette, IN, July 12-17, 2008, R2198, pp.1-8.
4. Asher, O., Winkler, J., Aute, V., and Radermacher, R., 2006, "Transient Simulation of a Transcritical Carbon Dioxide Refrigeration System", *Proc. 11th International Refrigeration and Air Conditioning Conference at Purdue*, Purdue University, West Lafayette, IN, July 15-20, 2006, R093, pp.1-8.
5. Asher, O., Khalil, E.E., and Ramadan, M., 2006, "Fluid flow regimes and thermal patterns in air conditioned transformers room", *Proc. 4th International Energy Conversion Engineering Conference*, AIAA, Vol. 1, San Diego, CA, Jun 26-29, 2006, AIAA-2006-4093, pp.702-710.
6. Asher, O., El-Hariry, G., and Khalil, E.E., 2006, "Relative Humidity Control inside Archaeological Facilities Using Fresh Air in Hot and Dry Areas", *Proc. Healthy Buildings 2006 conference*, June 4 - 8, 2006, International Society of Indoor Air Quality and Climate, Lisbon, Portugal, VEN4.6, pp.1-5.
7. Asher, O. and Khalil, E.E., 2006, "Proposed Preservation Index For Ventilation System Assessment In Archaeological Facilities", *Proc. Healthy Buildings 2006 Conference*, June 4 - 8, 2006, International Society of Indoor Air Quality and Climate, Lisbon, Portugal, VEN3.8, pp.1-6.
8. Asher, O. and Khalil, E.E., 2006, "Air Outlets locations Effect on Thermal and Humidity Patterns inside the Archaeological Tombs of the Kings", *Proc. Healthy Buildings 2006 Conference*, June 4 - 8, 2006, International Society of Indoor Air Quality and Climate, Lisbon, Portugal, VEN1.15, pp.1-6.
9. Asher, O. and Khalil, E.E., 2006, "LES versus k-ε turbulence modelling of large underground archaeological facilities", *Proc. 44th AIAA Aerospace Sciences Meeting*, January 9-12, 2006, AIAA, Reno, NV, Vol. 18, pp.13371-13380.
10. Asher, O. and Khalil, E.E., 2005, "Understanding Air Flow Patterns and Thermal Behaviour in king Tutankhamen tomb", *Proc. 2005 ASME International Mechanical Engineering Congress and Exposition, IMECE 2005*, November 5-11, 2005, IMECE2005-80465, ASME, Orlando, FL, pp.115-121.
11. Asher, O. and Khalil, E.E., 2005, "Predictions of Air Flow Patterns and Heat Transfer in the Tombs of the Valley of the Kings", *Proc. 8th REHVA World Congress, CLIMA 2005*, October 9-12, 2005, Paper 358.
12. Asher, O. and Khalil, E.E., 2005, "Mathematical Modeling of Air Flow and Heat Transfer- Predictions of Archaeological Tombs of the Valley of the Kings", *Proc. 10th International*

*Conference on Indoor Air Quality and Climate: Indoor Air 2005*, September 4-9, 2005, International Society of Indoor Air Quality and Climate, Beijing, China, Paper 185.

13. Asher, O. and Khalil, E.E., 2005, "Modeling of Indoor Air Quality and Comfort in the Tombs of Valley of Kings", 2005 ASME Summer Heat Transfer Conference, Paper HT2005-72005, July 17-22, 2005, ASME, San Francisco, CA, pp. 513-519.
14. Asher, O. and Khalil, E.E., 2005, "CFD-Controlled Climate Design of the Archeological Tombs of Valley of Kings" Proc. 2nd Mediterranean Congress of Climatization, CLIMAMED 2005, February 24-25, 2005, Madrid, Spain, Paper 86, pp.1-8.
15. Khalil, E.E. and Asher, O., 2005, "CFD-controlled climate design of the archeological tombs of valley of kings", 11th International Air Conditioning, Heating, Ventilation and Refrigeration Exhibition, Madrid, Spain, February 23-26, 2005.
16. Asher, O. and Khalil, E.E., 2005, "Air Flow Regimes and Thermal Patterns in Climatized Tombs in Valley of Kings", 43rd AIAA Aerospace Sciences Meeting and Exhibit - Meeting Papers, 43rd AIAA Aerospace Sciences Meeting and Exhibit - Meeting Papers, January 10-13, 2005, pp.1209-1216 – **BEST TERRESTRIAL ENERGY SYSTEMS PAPER AWARD.**
17. Asher, O. and Khalil, E.E., 2004, "CFD-Controlled Climate Design of the Archeological Tombs of "Valley of Kings"", Proc. International Conference Indoor Climate of Buildings 2004, November 21-24, 2004, Slovakia, High Tatras, Štrbské Pleso.

#### ADDITIONAL CONFERENCE PROCEEDINGS AND ARTICLES

1. Khalil, E.E. and Asher, O., 2006, "A Dry Passage to the After Life", Fluent News, Spring 2006, pp. 28.
2. Asher, O. and Khalil, E.E., 2005, "Indoor Air Flow Regimes in the Tombs of Valley of Kings", Proc. of International Conference on Energy and Environment, Sharm El Sheikh, March 2005, EE9.
3. Asher, O. and Khalil, E.E., 2004, "CFD-Controlled Climate Design Of The Archaeological Tombs Of Valley Of Kings", Proc. of Sustaining Europe Cultural Heritage, London, England, September 2004.

#### CONFERENCE AND SEMINAR PRESENTATIONS

1. Asher, O., Aute, V., Azarm, S., Radermacher, R., "Approximation Assisted Air to Refrigerant Heat Exchangers Design and Optimization", Seminar 1, 2009 ASHRAE Winter Meeting Chicago, IL, January 24-28, 2009.

#### CONFERENCE AND SHORT COURSE PARTICIPATION

- ASHRAE Winter Meeting, Chicago, IL, January 24-28, 2009.
- World Energy Engineering Congress, Washington, DC, October 1-3, 2008.
- International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, IN, July 14-16, 2008.
- ASHRAE Annual Summer Meeting, Salt Lake City, UT, June 21-25, 2008.
- ASHRAE Winter Meeting, New York City, NY, January 19-23, 2008.
- ASHRAE Annual Summer Meeting, Long Beach, CA, June 23-27, 2007.
- Fundamentals of Microscale Heat Transfer: Boiling, Condensation, Single and Two-Phase Flows, A Five Day Short Course in EPFL, Lausanne, Switzerland, June 4-8, 2007.
- GLOBALCON 2007, Atlantic City Convention Center, Atlantic City, NJ, April 4-5, 2007.
- International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, IN, July 14-16, 2006.

- New Vision of Engineering Economy Teaching project, a four modules training (February 12<sup>th</sup>– September 14<sup>th</sup>, 2005) Cairo University, Giza, Egypt, February 12-14, 2005.
- Pathways to Higher Education, a 5 week short course on developing skills for higher education, Cairo University, Giza, Egypt, January 2004.

#### PROFESSIONAL MEMBERSHIPS AND ACTIVITIES

- American Society of Heating, Refrigerating and Air-Conditioning Engineers, March 2006 – Present.
  - Started a new task group within ASHRAE for Optimization in the HVAC&R industry.
  - Vice Chair for ASHRAE TG1-Optimization.
  - Corresponding member for ASHRAE Technical committees TC1.1, 1.3, 8.4, and 8.5.
  - Secretary for ASHRAE TC1.1.
  - Program sub-committee chair for ASHRAE TC8.5.
  - Reviewer for the HVAC&R journal.
- Association of Energy Engineers; February 2007 – Present.
  - Founder of student chapter for Association of Energy Engineers at the University of Maryland.
  - First president elect for AEE UMD student chapter.
    - Hosted a lecture series in energy production and utilization.
    - Hosted group discussions and field trips to solar PV manufacturing plant.
    - Participated in the production of a video submitted to Xprize for the "Crazy Green Idea" contest.
  - Monitor for GlobalCon 2007 and WEC 2008.
- American Society of Mechanical Engineers, August 2008 – Present.
- Egyptian Syndicate of Engineers, August 2003 – Present.
- Session Vice-Chair, 2008 Purdue International Refrigeration and Air Conditioning Conference.
- University of Maryland Leadership Network, Fall 2007 – Present.
- University of Maryland Sustainability Group, Spring 2008 – Present.

#### RELATED GRADUATE COURSE WORK

Sustainable Energy Production and Utilization, Energy Systems Analysis, Advanced Heat Transfer, Molecular Thermodynamics, Fundamentals of Fluid Mechanics, Physics of Turbulence, Numerical Methods for Engineering, Advanced Analytical Methods, Multidisciplinary Optimization