

Dr RAFAT AL-WAKED

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SUMMARY

A combination of up-to-date academic knowledge and engineering applied design skills. Years of research and development in the fields of energy efficient buildings, sustainable energy management and Computational Fluid Dynamics (CFD). Furthermore, years of experience in consulting services as a HVAC/ESD engineer. Advanced expertise in computer modelling that includes developing computer codes and using CFD packages such as FLUENT, +CFD ACE and FDS. Particular expertise has been acquired in developing training/course materials, in arranging and giving seminars and in writing and presenting papers at both local and international conferences and journals.

EDUCATION

PhD in Mechanical Engineering

Major: Thermo-Fluid Systems - CFD

University of New South Wales, Australia, March 2005

Thesis Title: Development of Performance-Improving Structures for Power Station Cooling Towers

MEngSc in Mechanical Engineering

Major: Manufacturing Engineering and Management

University of New South Wales, Australia, July 1998

BSc in Mechanical Engineering

Major: Thermal Power

Jordan University of Science and Technology, Jordan, July 1995

AWARDS

International Internship: The 21st Century COE of Flow Dynamics, Tohoku University, Japan, February. 2004 - April 2004

PhD Scholarship: The Australian Postgraduate Award (I), University of New South Wales, Australia, July 2000 - January 2004

Teaching Scholarship: The Supplementary Engineering Award, University of New South Wales, Australia, July 2000-January 2004.

TRAINING

- Autodesk Revit Building 9 and Systems 2- Introduction, Australia, October 2006
- Telstra and Coles site safety induction program, Australia, August 2006
- Green Star Accredited Professional Course, Green Building Council of Australia, Australia, October 2005
- OHS General Induction for Construction Work in NSW, TAFE NSW, Australia, July 2004
- Tutor Training Workshop, University of New South Wales, Sydney – Australia, July 2001
- Lifting and Manual Handling, University of New South Wales, Australia, March 2001
- Safety in Laboratories, University of New South Wales, Australia, March 2001
- Methods of Testing and Maintenance of Elevators and Escalators, Jordan Engineers Association, Jordan, March 1996.

EXPERIENCE

Assistant Professor in Mechanical Engineering

Prince Mohammad Bin Fahd University (**PMU**), Al-Khobar-KSA, September 2009 – present

Assistant Professor in Mechanical Engineering

Dhofar University (**DU**), Salalah - Oman, September 2007 – August 2009

Duties

- Preparing and delivering lectures to undergraduate Engineering students
- Participating in university/College committees
- Establishing experimental laboratories in the Thermo-Fluid fields
- Conducting scientific research
- Writing journal and conference technical papers.

Achievements

- Member of university accreditation committee and chair of college of engineering research committee
- Publishing 2 journal and 2 conference papers.

Mechanical Engineer

Umow Lai Enginuity, Sydney - Australia, April 2006 – July 2007

Duties

- Conducting CFD modelling
- Designing HVAC systems in compliance with Australian Standards and BCA
- Selecting and pricing mechanical systems
- Completing AutoCAD drawing and mechanical specifications
- Managing projects and Liaising with Contractors, Architects (on phone and in person).

Achievements

- Being a member of the design team for different projects where green slab cooling strategy and/or 3D Revit modelling been adopted
- Publishing 1 journal and 2 conference papers.

Research Engineer

Bassett Applied Research - Bassett Consulting Engineers, An AECOM Company, Sydney - Australia, April 2004 – January 2006

Duties

- Thermal energy and CFD modelling
- Liaising with clients from multi-cultural backgrounds
- Managing projects to achieve maximum profit margins
- Generating concepts for the preparation of Grant submission
- Preparing Grant submissions

Achievements

- Modifying the air-duct system of Macarthur Square shopping centre car park, Sydney (A\$50,000 savings)
- Contributing to the winning bid for the Royal Women's Hospital, Melbourne (A\$200 million project)
- Promoting the awareness of indoor air quality via state-of-the-art designs with the aid of CFD
- Publishing 1 journal paper, 3 conference papers and more than 17 technical reports.

Research Scholar

The 21st Century COE of Flow Dynamics, Institute of Fluid Science, Tohoku University, Japan,
February 2004 – March 2004

Duties

- Investigating the flow prediction of upwelling deep seawater.

Achievement

- Reporting an up-to-date literature review of upwelling deep seawater phenomenon
- Testing a CFD code capable of predicting the anisotropic turbulent viscosity of the seawater
- Establishing strong links with the research team at the Institute of Fluid Science.

PhD Research Scholar

School of Mechanical and Manufacturing Engineering
The University of New South Wales, Australia, July 2000 – January 2004

Description

My PhD research work deals with reducing the effect of crosswinds on the thermal performance of cooling towers by means of windbreak walls. The research consists of full-scale measurements, wind-tunnel experiments and numerical simulations of an operating cooling tower. Results have revealed an opportunity to save Aus\$200,000 per year for the power plant under investigation. Moreover, great amount of expertise have been developed in the areas of numerical modelling of two-phase heat, mass and momentum transfer and complex engineering systems.

Duties

- Conducting, analysing and interpreting experimental and full-scale measurements
- Simulating the airflow behaviour using the CFD technique
- Attending meetings with the industrial partner to present results and work plans
- Supervising undergraduate students in their final year projects
- Writing journal and conference technical papers.

Achievement

- Quantifying the effect of crosswind on the thermal performance of cooling towers
- Developing an validating a CFD code capable of simulating dry/wet cooling towers
- Recommending a windbreak wall capable of enhancing the performance of natural draught cooling towers subjected to windy conditions
- Developing links with the thermal power industry partners and researchers both in Australia and world wide such as South Africa
- Publishing 3 journal and 7 conference papers.

Teaching Assistant

School of Mechanical and Manufacturing Engineering
The University of New South Wales, Australia, July 2000 – January 2004

Subjects taught

- Engineering mechanics
- Fluid mechanics
- Heat transfer
- Thermodynamics
- Thermo-fluid systems
- Thermal power plants.

Production Supervisor

Skycrest Pty. Ltd., Sydney - Australia, September 1997 – July 2000.

Duties

- Running and maintaining production operations
- Supervising and motivating the production team
- Setting and up-dating production plans and inventory
- Inducting and training new and existing staff
- Conducting quality control and production analyses

Achievement

- Increasing the harmony and the teamwork spirit among a multi-cultural production team
- Reducing production wastage by 10%
- Creating a self-managed production team

Mechanical Engineer

Al-Sa'doun Factory, Irbid – Jordan, July 1995 – October 1996

Duties

- Reporting to the factory manager
- Organizing people and resources
- Designing production, manufacturing and assembly processes

Mechanical Engineer, Trainee

Petra-Hitachi for Engineering Industries, Amman – Jordan, July 1994 – September 1994

Duties

- Reporting to the assembly manager
- Monitoring material flow of products
- Drawing product features

AFFILIATIONS

- Green Building Council of Australia (GBCA) - Green Star Accredited Professional
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE, Member, 07965774)
- University of New South Wales Alumni Association (UNSWAlumni, 2184699)

PROFESSIONAL ACTIVITIES

- Chairman of the Energy Management CFD: Part II session at the 2nd ICTEA conference, Al-Ain – UAE, Jan 2006-01-1
- Member of the 12th IAHR in Cooling Tower and Heat Exchangers organising committee, Sydney – Australia, November 2001
- Reviewer for International Journals (Numerical Heat Transfer, Applied Energy, International Journal of Energy Research, Journal of Applied Membrane Science & Technology, International Journal of Thermal Sciences), 2005 - present
- Member of DU university self-study committees for accreditation purpose (faculty research and student coursework committees), 2007-2008
- Member of DU college of engineering standing committees (the scientific research and the library committees)

SKILLS

Computing

Operating systems: MS-Windows

Languages: FORTRAN, C

Software: MS-Office, MATLAB, EES

Drafting and Modelling: AutoCAD, Revit

Thermal modelling: IES package (Apache, HVAC, Suncast), E20, DOE-eQuest

CFD: FLUENT, CFD-ACE+, FDS, FLOWLAB

Languages

English: orally and written

Arabic: orally and written

RESEARCH INTERESTS

- Energy efficient and sustainable buildings
- Computational fluid dynamics and heat transfer
- Cooling towers
- Indoor air quality

TEACHING AREAS

Mechanical Engineering

- Introduction to engineering, engineering drawing
- Engineering instrumentations and measurements
- Engineering mechanics, fluid mechanics
- Refrigeration and air conditioning, thermo-fluid systems
- Thermodynamics, heat transfer, thermal power plants
- Building automation and sustainable energy

Engineering Management

- Industrial and production management
- Total quality management (TQM)
- Factory automation, CAD/CAM
- Concurrent process and product design (CPPD)

Postgraduate

- Advanced thermodynamics and heat transfer
- Computational fluid dynamics (CFD)
- Two-phase flow.

PROJECTS (Australia)

Application	Name	Role	Tasks
Car park	Musk Avenue	R&D Engineer	IAQ studies and CFD simulation
Car park	MacArthur Square	R&D Engineer	IAQ studies and CFD simulation
Car park	Rhode Watersid	R&D Engineer	IAQ studies and CFD simulation
Car Park	Earlwood office complex	HVAC Engineer	Natural and mechanical ventilation
Commercial	Department of housing- Cavill	HVAC Engineer	Tenancy fit out and energy auditing
Commercial	Woolworth RDC - Brisbane	R&D Engineer	IAQ studies and CFD simulation
Commercial	Woolworth RDC – GEPPS Cross, Adelaide	R&D Engineer	Thermal analysis and CFD simulation
Commercial	Rhodes Retail Development	R&D Engineer	IAQ studies and CFD simulation
Commercial	Citrix-Sydney	Project Manager	Upgrading the communication room including Mech., Elect. and fire services.
Commercial	Coffey - Chatswood	HVAC Engineer	Tenancy fit out
Commercial	TELSTRA	HVAC Engineer	Mech., Elec. and fire services auditing
Educational	Faculty of Law, UNSW	R&D Engineer	IAQ studies and CFD simulation
Educational	Bonython hall - Adelaide	R&D Engineer	Human comfort and CFD simulation
Educational	Ultimo TAFE Library	HVAC Engineer	Energy auditing and mechanical services design
Education	Bethany College	HVAC Engineer	CFD simulation and natural ventilation
Education	Ultimo Library	HVAC Engineer	Energy auditing
Education	Berry Sport Hall	CFD engineer	CFD simulation and natural ventilation
Hospitals / Laboratories	Johnson Medical	R&D Engineer	Energy management and CFD simulation
Hospitals / Laboratories	Royal Women Hospital - Melbourne	R&D Engineer	IAQ studies and CFD simulation
Hospitals / Laboratories	Sonic Healthcare	R&D Engineer	Thermal analysis and energy management
Hospitals / Laboratories	Tauranga Hospital -Auckland	R&D Engineer	IAQ, cross infection studies and CFD simulation
Hospitals / Laboratories	New Caledonia Accommodation	HVAC Engineer	Design mechanical services and modelling it using REVIT
Research and development	Intelligent Building Facade	R&D Engineer	Product improvement
Residential	Red Head	HVAC Engineer	Split system design and costing
Residential	Brown Head	HVAC Engineer	Central system design and costing
Residential	Resitech	HVAC Engineer	Fire services auditing
Shopping centre	Windsor Shopping Centre	CFD Engineer	CFD simulation and IAQ
Shopping centre	Woolworth Shopping Centre	CFD Engineer	CFD simulation
Thermal modelling	Perth Seawater Desalination Plant - Perth	R&D Engineer	CFD simulation and natural ventilation
Thermal modelling	Bethany College	HVAC Engineer	HVAC design and CFD simulation
Thermal modelling	Saint Gobain Abrasives	Project Manager	CFD simulation, evaporation analysis, product development and cost reduction
Thermal modelling	413 - 421 George Street	ESD Engineer	ESD and ABGR analysis in addition to CFD simulation
Thermal modelling	Climate Control	ESD Engineer	Educational materials development
Thermal modelling	Glenmore Park	ESD Engineer	NatHERS thermal analysis

PRESENTATIONS

Conferences

1. *Operating theatre, IAQ and ventilation strategies - CFD analysis*, presented at the 2nd International Conference on Thermal Engineering Theory and Applications, ICTEA 2006, Al Ain, United Arab Emirates, 2006.
2. *Natural ventilation of Perth seawater desalination plant - CFD analysis*, presented at the 2nd International Conference on Thermal Engineering Theory and Applications, ICTEA 2006, Al Ain, United Arab Emirates, 2006.
3. *Enhancing the performance of natural draft dry cooling towers*, presented at the 2nd International Conference on Thermal Engineering Theory and Applications, ICTEA 2006, Al Ain, United Arab Emirates, 2006.
4. *Simulation of two-phase heat and mass transfer inside natural draft wet cooling towers*, presented at the 5th International Conference on Multiphase Flow, Yokohama - Japan, June-2004
5. *Effect of windbreak walls on the performance of natural draft dry cooling towers under crosswind: CFD study*, presented at the 2nd International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, Victoria Falls - Zambia, June-2003.
6. *Numerical modelling and validation of natural draught cooling towers under crosswind*, presented at the 12th IAHR Symposium in Cooling Tower and Heat Exchangers, Sydney - Australia, November-2001.
7. *Development of Performance-Improving Structures for Power Station Cooling Towers*, presented at the annual Postgraduate Conference of the School of Mechanical and Manufacturing Engineering – UNSW, Sydney, Australia, July-2000: July-2004.

Lectures

1. *CFD research on natural draft cooling towers at UNSW*, presented at Tohoku University, Sendai - Japan, February - 2004.
2. *Effect of crosswinds on the performance of natural draft dry cooling towers*, presented at the University of Stellenbosch, Stellenbosch - South Africa, June-2003.

PUBLICATIONS

International Journal Papers

1. **Al-Waked R.**, "Crosswinds effect on the performance of natural draft wet cooling towers," *International Journal of Thermal Sciences*, (available online, 14th of August 2009).
2. **Al-Waked R.** and Behnia M., "Enhancing the Performance of wet cooling towers," *Journal of Energy Conversion and Management*, vol. 48 (10), pp. 2638-2648, 2007.
3. **Al-Waked R.** and Behnia M., "CFD simulation of wet cooling towers," *Thermal Applied Engineering – International Journal*, vol. 26 (4), pp. 382-395, 2006.
4. **Al-Waked R.** and Behnia M., "Windbreak walls effect on thermal performance of natural draft dry cooling towers," *Heat Transfer Engineering-An International Journal*, vol 26 (8), pp. 50-62, 2005.
5. **Al-Waked R.** and Behnia M., "The performance of natural draft dry cooling towers under crosswind: CFD study," *International Journal of Energy Research*, vol. 28, pp. 147-161, 2004.

Regional Journal Papers

1. Partridge L., Groenhout N and **Al-Waked R.**, "Comparative CFD analysis of hospital ward ventilation systems on reducing cross infection rates," *The Australian Hospital Engineer*, vol. 28 (2), pp. 27-38, 2005. *Republished* in *Ecolobrium: An AIRAH Publication*, vol. 4 (6), pp. 26-31, 2005.

Conference Papers, Peer Reviewed

1. **Al-Waked R.**, "Hybrid cooling of a hospital award – CFD analysis," Proc. the 3rd International Conference on Experiments/Process/System Modelling/Simulation & Optimization, Athens Greece, 2009.

2. **Al-Waked R.**, "Effect of Surgical Lights on the IAQ of Operating Theatres," Proc. the First International Conference on Building Energy and Environment (COBEE 2008), Dalian - China, 2008.
3. **Al-Waked R.** and Behnia M., "Wet cooling towers, power plant structures and crosswinds – CFD analysis," Proc. the 3rd International Conference on Thermal Engineering Theory and Applications, ICTEA 2007, Amman - Jordan, 2007.
4. Williamson N., **Al-Waked R.**, Behnia M. and Armfield S., "Thermal performance of natural draft cooling towers," Proc. the 18th International Symposium on Transport Phenomena, Daejeon - Korea, 2007. (*Keynote Paper*)
5. **Al-Waked R.**, Lester P. and Behnia M., "Operating theatre, IAQ and ventilation strategies - CFD analysis," Proc. the 2nd International Conference on Thermal Engineering Theory and Applications, ICTEA 2006, Al Ain - United Arab Emirates, 2006.
6. **Al-Waked R.**, Lester P. and Behnia M., "Natural ventilation of Perth seawater desalination plant - CFD analysis," Proc. the 2nd International Conference on Thermal Engineering Theory and Applications, ICTEA 2006, Al Ain - United Arab Emirates, 2006.
7. **Al-Waked R.** and Behnia M., "Enhancing the performance of natural draft dry cooling towers," Proc. the 2nd International Conference on Thermal Engineering Theory and Applications, ICTEA 2006, Al Ain - United Arab Emirates, 2006.
8. **Al-Waked R.** and Behnia M., "Simulation of heat and mass transfer inside a natural draft wet cooling tower under crosswind conditions," Proc. the 4th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, Cairo - Egypt, 2005.
9. Williamson N., **Al-Waked R.**, Behnia M. and Armfield S., "Simulation of two-phase heat and mass transfer inside natural draft wet cooling towers under crosswind conditions," Proc. of the 3rd International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, Cape Town - South Africa, 2004.
10. **Al-Waked R.** and Behnia M., "Simulation of two-phase heat and mass transfer inside natural draft wet cooling towers," Proc. of the 5th International Conference on Multiphase Flow, Yokohama - Japan, 2004
11. **Al-Waked R.** and Behnia M., "Effect of windbreak walls on the performance of natural draft dry cooling towers under crosswind: CFD study," Proc. of the 2nd International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, Victoria Falls - Zambia, 2003.
12. **Al-Waked R.**, Behnia M. and Madadnia J., "Numerical modelling and validation of natural draught cooling towers under crosswind," Proc. of the 12th IAHR Symposium in Cooling Tower and Heat Exchangers, Sydney - Australia, 2001.
13. Madadnia J., Koosha H., Bonjnordi M. and **Al-Waked R.**, "An overview of experimental and numerical studies in power station cooling towers," Proc. of the 12th IAHR Symposium in Cooling Tower and Heat Exchangers, Sydney - Australia, 2001.
14. Madadnia J., Reizes J., Behnia M., Coombes P., Koosha H., Hill W., Bonjnordi M. and **Al-Waked R.**, "Wind effect on the operation of natural draught wet cooling tower: a) Performance analysis," Proc. of the 12th IAHR Symposium in Cooling Tower and Heat Exchangers, Sydney - Australia, 2001.