Reda Ragab, PhD

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Current Position: Associate Professor, Mechanical Power Engineering Dept., Zagazig University, Zagazig 44519, Egypt.

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https://www.researchgate.net/profile/Reda-Ragab-4/research

Education

- Ph.D. Mechanical Engineering, Univ. of New Orleans, New Orleans, Louisiana, USA, December 2013, GPA: 3.9/4.0.
- M.Sc. Mechanical Engineering, Zagazig Univ., Egypt, 2008.
- B.Sc. Mechanical Engineering, Zagazig Univ., Egypt, 2000.

Research Interests

Design of Hybrid Renewable Energy Systems, Energy Auditing & Efficiency, Wind Resource Assessment, Wind Farm Design, Computational Fluid Dynamics (CFD), Gas Turbine Cooling (Wet compression and Mist/Air film cooling), Experimental Fluid Dynamics and Heat Transfer, Turbomachinery, Multiphase flow.

Professional History

2024- -----	**Associate Professor, Mechanical Power Engineering Dept., Zagazig University, Egypt.**
2017- 2024	Assistant Professor, Mechanical Power Engineering Dept., Zagazig University, Egypt.
2016- 2017	Postdoctoral Research Associate, Energy Conversion & Conservation Center (ECCC), Mechanical Engineering Dept., University of New Orleans, New Orleans, LA, USA.
2015-2016	Postdoctoral Researcher, Mechanical Engineering Dept., University of Memphis, Memphis, TN., USA (Joint with Louisiana State University, LSU).
2014-2015	Postdoctoral Researcher, Turbine Innovation & Energy Research Center (TIER), Mechanical &Industrial Engineering Dept, Louisiana State University (LSU), Baton Rouge, LA, USA.
2009-2013	Research Assistant, Mechanical Eng. Dept., Univ. of New Orleans, New Orleans, LA, USA.
2010-2011	Maintenance Engineer (Part time), S&I Automotive Inc., Metairie, Louisiana, USA.
2002-2009	RA/TA , Mechanical Power Engineering Dept., Zagazig University, Egypt.
2001-2002	Military Service, Egypt.
2000	Graduation, B.Sc. Mechanical Engineering.

Technical Skills Summary

- **Consultancy:** Senior Consultant in Energy Efficiency at Human Dynamics Inc. (DAI), UNIDO Pump System Expert
- **Academic Experience:** Teaching undergraduate & post-graduate mechanical engineering classes & labs, supervising senior projects & M.Sc. and PhD Students.

- **Process design/analysis**: Wind Resource Assessment and Design of Wind farms (WAsP, SAM, HOMER PRO), Hybrid RE Systems (HOMER), Solar Systems (SAM, PVSys, RETScreen) HVAC loads, Power plants performance analysis, programming in C++ and FORTRAN.
- **Computational Fluid Dynamics**: 20+ years CFD experience (FLUENT/ANSYS, GAMBIT, ICEM CFD, TURBOGRID, BLADEGEN) with focus on turbomachinery aerodynamics, cooling, and Heat Transfer (Compressors and turbines), Multiphase Flow, Renewable Energy Systems, and Steam Power Plants.
- **Instrumentation & Experimental technologies**: 4 years designing, manufacturing, and operating a mist/air film cooling wind tunnel rig. Using PDPA laser measurements, hot wire, Pressure transducers and probes, Infrared Thermography.
- **Gas Turbine Industry:** Inlet Air Cooling**,** Power Augmentation, Energy saving, and Efficiency Improvement.
- **Automotive Industry Experience:** A year of experience in the automotive industry (maintenance and troubleshooting.

Dissertation

"**Experimental Investigation of Mist Film Cooling and Feasibility Study of Mist Transport in Gas Turbines,**" PhD Dissertation, University of New Orleans, LA, USA, December 2013 (Advisor Dr. Ting Wang).

Master's Thesis

"Numerical Simulation for the Impact of Wet Compression on the Performance and Erosion of an Axial Compressor" M.Sc. Thesis, Zagazig university, Egypt, May 2008 (Advisor Dr. Hafez A. El-Salmawy).

Current Research & Projects

1. Optimization of a Mobile Multi-Stage Distillation Unit
2. Optimization of a Combined Solar and Waste Heat-Assisted Membrane Distillation Unit.
3. Combustion of Liquid Hydrogen as an Alternative Fuel for Jet Engines (Thesis Supervision)
4. Modeling and Simulation of Hydraulic Braking Systems (Thesis Supervision)
5. Planning and Reliability Analysis for Fully Renewable Egyptian Power System by 2050 (Thesis Supervision)
6. Smart Alternative Electric Traction Approaches Using Renewable Energy in Railway.

Previous Research Projects

7. Support the Technical and Financial Sustainability of the Renewable Energy and Energy Efficiency: EuropeAid/138795/DH/SER/EG, Senior Consultant in Energy Efficiency at Human Dynamics Inc. (DAI)
8. Investigation of Energy Harvesting by Water Wheels at Low-head Heading-up Structures.
9. Computational Study of the Windbreak Effect in the Desert Environment (Thesis Supervision)
10. Optimization of Hybrid Renewable Energy System using Artificial Intelligence (Thesis Supervision)
11. Impact Study for the Conversion to Electric Mobility on Energy and Environment in Egypt.
12. Optimized Energy Supply System and Control Strategy towards a Sustainable Zagazig University Campus
13. Thermal Control System Design of Zagazig University's Cube Satellite (ZUSAT) in Collaboration with Egyptian Space Agency (EgSA)
14. Techno-Economic Assessment of Renewables to Fuel Technology
15. Energy Recovery from Natural Gas Transmission Networks using Turbo-Expanders
16. Numerical Simulation of Vortical Flow in Pump Intakes (Thesis Supervision)
17. Techno-Feasibility Study for 200 Megawatts PV/Wind/Fuel Cell Grid Connected Baseload Hybrid Renewable System
18. Techno-Economic Assessment of Wind Farm Repowering: A case Study of Zafaranah Station, G. of Suez, Egypt.
19. **Numerical Investigation of Fluid Flow and Heat Transfer in a Tangentially-Fired Furnace of a Super-Critical Steam Boiler (USA, Jan 2016- Feb2017)**
    - The Supercritical Boiler (**Entergy of New Orleans Ninemile Point Steam Electric Station**) is analyzed numerically to solve operational problems and reduce NOx emissions.

- Performed high accuracy three dimensional CFD computations for the flow and heat Transfer in the boiler including Combustion, Species Transport, Radiation, NOx Emissions, and NOx Reduction Techniques.
- Communicated with plant engineers to validate the CFD model and propose solutions.
- The project is funded by **Entergy New Orleans**, Inc.

20. Experimental and Numerical Investigation of Film Cooling in a Heated Vane Cascade (USA, March 2014- 2016)

- Experimental Investigations on a high pressure, combustor heated wind tunnel rig for film cooling.
- Calibrated and used different lab instruments including various pressure, velocity, and temperature measurement.
- Perform high accuracy CFD computations for the flow in the heated vane cascade
- The project is funded by DOE and GE.

21. Experimental and CFD Investigations of Mist Cooling Scheme over HPT Airfoils (USA, Aug. 2010- Dec. 2013)

- Designed and manufactured a wind tunnel driven test rig for mist/film cooling experiments.
- Calibrated and used different lab instruments including various pressure, velocity, and temperature measurement devices. Advanced methods like PDPA, Infrared Thermography, hot wire and pressure transducers.
- Conducted CFD simulations for fluid flow, heat transfer, and fluid solid interaction (FSI) (FLUENT, ANSYS Workbench, Gambit, ICEM)
- Published 5 technical papers in the Journal of Heat Transfer and ASME Turbo Expo 2014

22. Applicability of Transporting Water Mist for Cooling High Pressure Turbine(HPT) Components (USA, Aug 2009- Dec 2013)

- Conducted CFD simulations to study the applicability of transporting water mist through the hot engine parts like turbine rotors, turbine stators, and turbine secondary cooling ducts.
- Prepared 2 presentations and published two technical papers in the ASME Turbo Expo 2012 and the ASME Summer Heat Transfer conference.

23. Numerical Simulation for the Impact of Wet Compression on the Performance and Erosion of an Axial Compressor (Egypt, 2004 -2008, Master's Thesis)

- 3-D, unsteady and turbulent flow simulation of a three stage axial flow compressor was performed. Methanol droplets were introduced as a dispersed phase and are tracked in a Lagrangian frame to simulate the wet compression process. A technical paper was presented and published in the ASME Turbo Expo 2010.

Teaching Experience

1. As a tenure Assistant Professor at Mechanical Power Eng. Dept., Zagazig University, Egypt

- Power Plant Technology, Energy Efficiency, Computational Fluid Dynamics, Aerodynamics, Turbomachinery, Gas Dynamics, Fluid Mechanics, Renewable Energy, Energy Resources and Economics & Post-Graduate: Fluid Mechanics, Advanced Aerodynamics and Energy Sources.

2. Nile University, Sheikh Zayed City, Giza, Egypt. (PT Instructor 2019-Present)

- Fluid Mechanics I& II, Thermodynamics I& II, and Renewable Energy Intro. (Fall2019)
- Heat Transfer I, Turbomachinery, and Adv. Renewable Energy System Design (Spring 2020)
- Fluid Mechanics II , Renewable Energy Intro. (Fall2020)
- Heat Transfer I, Turbomachinery, and Adv. Renewable Energy Systems Design (Spring 2021)
- Internal Combustion Engines, Renewable Energy Intro. (Fall2021)
- Turbomachinery, and Adv. Renewable Energy Systems Design (Spring 2022)
- Mechanical Behavior of Engineering Materials, Renewable Energy Systems Design (Fall 2022)
- Combustion (Spring 2023)
- Energy Conservation & Efficiency (Fall 2023)
- Combustion, Fluid Mechanics I (Spring 2024)
- Energy Conservation & Efficiency, Thermodynamics I (Fall 2024)

3. **Energy Department, Heliopolis University for Sustainable Development, Cairo, Egypt. (PT Instructor- 2017)**
   - Energy Auditing & Efficiency course (Fall 2017)
4. **As a Teaching Assistant at University of New Orleans, LA (2009- 2017)**
   - Fluid mechanics, Fluid mechanics Lab, and Thermodynamics.
5. **As a tenure lecturer assistant at Mechanical power Eng. Dept., Zagazig University, Egypt**
   - Fundamental Courses: Physics I, Engineering thermodynamics, Heat transfer I, and Fluid mechanics I.
   - Applied Courses: Power plant technology, internal combustion engines, Refrigeration & Air Conditioning.
   - Lab Courses: Thermodynamics, heat transfer, fluid mechanics, and HVAC labs.

Publications

1. Saber, M., Abdelall, G., Ezzeldin, R., Abdel Gawad, A.F., and **Ragab, R.,** 2024 "Techno-economic assessment of the dethridge waterwheel under sluice gates in a novel design for pico hydropower generation," **Renewable Energy**, Vol (234), Nov. 2024, 121206, **https://doi.org/10.1016/j.renene.2024.121206**

2. Hamdi, M.; El Salmawy, H. A.; and **Ragab, R.,** 2024,"Incorporating Operational Constraints into Long-Term Energy Planning: The Case of the Egyptian Power System Under High Share of Renewables," **Energy**, Vol 300, 2024, 131619. https://doi.org/10.1016/j.energy.2024.131619 .

3. **Ragab, R**., Hamdi, M., El Salmawy, H.A., and Ismail, M., 2024, "Optimized system for combined production of electricity/green hydrogen for multiple energy pathways: a case study of Egypt," **Clean Energy,** Vol. 8, Issue 4, August 2024, Pages 219–236**,** https://doi.org/10.1093/ce/zkae046

4. Hamed, I., AbdelGawad, A.F. & **Ragab, R.,** 2024," Computational study of reducing wind loads on solar-power plants using windbreaks." **J. Braz. Soc. Mech. Sci. Eng.** 46, 371 (2024). https://doi.org/10.1007/s40430-024-04787-0

5. Khass, T, **Ragab, R.,** El Salmawy, H. A., and Ismail, M., 2024" Stochastic Model for Predicting the Evolution of Electric Vehicles in Egypt and Their Impact on Energy and Environment up to 2040," **Journal of Southwest Jiaotong University**, Vol 59(2), April 2024. https://doi.org/10.35741/issn.0258-2724.59.2.9

6. Azab I. A., Khass T., El Salmawy H.A., & **Ragab R.,** 2023, "Design, Installation, and Performance Monitoring of a 105 kWp Rooftop Solar PV System," **Journal of Advanced Research in Fluid Mechanics and Thermal Sciences**, 111(2), 16–42. https://doi.org/10.37934/arfmts.111.2.1642

7. Hamdi M., **Ragab R**, El Salmawy H.A., 2023, "The value of diurnal and seasonal energy storage in baseload renewable energy systems: A case study of Ras Ghareb-Egypt," **J. Energy Storage** 61: 106764. https://doi.org/10.1016/j.est.2023.106764

8. Hamdi M., El Salmawy H.A., **Ragab R.,** 2023**, "**Optimum configuration of a dispatchable hybrid renewable energy plant using artificial neural networks: Case study of Ras Ghareb, Egypt," **AIMS Energy**, 2023, 11(1): 171-196. doi: 10.3934/energy.2023010

9. **Ragab, R**., Al Sawy, T., Hamdi, M., El Salmawy H. A., 2021, " Optimized Hybrid Renewable Energy System for a Baseload Plant, " Applied Energy Symposium: MIT A+B, Cambridge, USA, August 11-13, 2021. Energy Proceedings, Vol.17: Technology Innovation to Accelerate Energy Transitions, (https://www.energy-proceedings.org/optimized-hybrid-renewable-energy-system-for-a-baseload-) . DOI: (**https://doi.org/10.46855/energy-proceedings-8674**)

10. **Ragab, R.,** and El Salmawy, H. A., 2021, "Techno-Economic Assessment of Wind Farm Repowering : A case Study of Zafaranah Station, Gulf of Suez, Egypt," Applied Energy Symposium: MIT A+B , Cambridge, USA, August 11-13, 2021. Energy Proceedings, Vol. 17: Technology Innovation to Accelerate Energy Transitions, (https://www.energy-proceedings.org/techno-economic-assessment-of-wind-farm-repowering-a-case-study-of-zafarana-station-gulf-of-suez-egypt/) DOI: https://doi.org/10.46855/energy-proceedings-8624

11. Hamdi, M., **Ragab, R.,** and El Salmawy, H. A., 2021, "Design Optimization of a Utility-Scale Grid-Connected Solar PV System for Least Cost of Electricity," 2nd International Conference for Engineering Sciences and Applications (ICESA): Paper No. ICESA2021-MEC-206, Cairo, Egypt, October 22-23, 2021. (Best Paper Award)

12. Wang, T. and **Ragab, R**., 2020 "Investigation of Applicability of Transporting Water Mist for Cooling Turbine Blades," **ASME J. of Thermal Science and Engineering Applications**, Paper No: TSEA-18-1497, Feb. 2020, Vol. 12 / 011009-1~11, 2020; https://doi.org/10.1115/1.4042860

13. **Ragab, R.** and Wang, T., 2018,"An Experimental Study of Mist/Air Film Cooling with Fan-Shaped Holes on an Extended Flat Plate - Part 1: Heat Transfer," **ASME J. Heat Transfer** 140 (4), 042201-1~12, https://doi.org/10.1115/1.4037641, April, 2018

14. **Ragab, R.** and Wang, T., 2018,"An Experimental Study of Mist/Air Film Cooling with Fan-Shaped Holes on an Extended Flat Plate - Part 2: Two-Phase Flow Measurements and Droplet Dynamics," **ASME J. Heat Transfer** 140(4), 042202-1 ~11, https://doi.org/10.1115/1.4037642 , April, 2018 .

15. **Ragab, R.,** and Wang, T., 2014, "An Experimental Study of Mist Film Cooling with Fan-Shaped Holes on an Extended Flat Plate - Part 1: Heat Transfer," ASME Turbo Expo 2014: Turbine Technical Conference and Exposition (GT2014-26169), June 16-20, Düsseldorf, Germany, https://doi.org/10.1115/GT2014-26169

16. **Ragab, R.,** and Wang, T., 2014, "An Experimental Study of Mist/Air Film Cooling with Fan-Shaped Holes on an Extended Flat Plate - Part 2: Two-Phase Flow Measurements and Droplet Dynamics**,"** ASME Turbo Expo 2014: Turbine Technical Conference and Exposition (GT2014-26170), June 16-20, Düsseldorf, Germany, https://doi.org/10.1115/GT2014-26170

17. Ragab, R., and Wang, T., 2013, "Investigation of Applicability of Using Water Mist for Cooling High- Pressure Turbine Components via Rotor Cavity Feed Channels," HT2013-17150, Proceedings of the ASME 2013 Summer Heat Transfer Conference, July 14-19, 2013, Minneapolis, MN, USA, https://doi.org/10.1115/HT2013-17150

18. Wang, T., and Ragab, R., 2013," Investigation of Applicability of Transporting Water Mist for Cooling Turbine Blades," ASME GT2014-25818, ASME Turbo Expo, June 16-20, 2014, Dusseldorf, Germany, https://doi.org/10.1115/GT2014-25818

19. Ragab, R., and Wang, T., 2012," An Investigation of Applicability of Transporting Water Mist for Cooling Turbine Vanes," ASME Paper GT2012-70110. Proceedings of Turbo Expo 2012, June 11-15, 2012, Copenhagen, Denmark, https://doi.org/10.1115/GT2012-70110

20. Ragab, R., and Wang, T., 2012, " An Investigation of Liquid Droplet Evaporation Model Used in Multiphase Flow Simulation" IMECE2012- 87392, Proceedings of the ASME 2012 International Mechanical Engineering Congress & Exposition IMECE2012, November 9-15, 2012, Houston, Texas, USA., https://doi.org/10.1115/IMECE2012-87392

21. A. F. El-Sayed, H.A. El-Salmawy, M.H. Gobran, and Ragab, R., 2010, "Numerical Study of Wet Compression Using Methanol Injection in Axial Compressor," ASME Paper GT2010-22079. Proceedings of ASME Turbo Expo 2010: Power for Land, Sea and Air (GT2010), June 14-18, 2010, Glasgow, UK., https://doi.org/10.1115/GT2010-22079

22. Ragab, R., and Wang, T., 2023," Numerical Study of the Influence of the Firing System Optimization on Combustion and NOx Emissions in a Tangentially Fired Supercritical Steam Boiler," **Under Publication**

23. Ragab, R., and Acharya, S. "Numerical Simulation of Flow and Heat Transfer in a Hot Cascade with Film-Cooled Endwalls and Airfoils," Under Publication

Conference Participation

1. 3rd Egyptian Petroleum Sector Energy Efficiency Conference& Exhibition (EPEEC 2022): Energy Efficiency Measures for The Petroleum Sector, May 17th 2022, Triumph Hotel, New Cairo.
2. 2nd International Conference for Engineering Sciences and Applications (ICESA): Engineering Future to Ensure Sustainability, Holiday Inn Maadi Hotel, Cairo, Egypt, October 22-23, 2021. (Mechanical Track Session Chair, Scientific Committee Member, Best paper award)
3. 3rd Novel Intelligent and Leading Emerging Sciences Conference (NILES 2021), Nile University, Egypt, October 23-25,2021.
4. Applied Energy Symposium: MIT A+B, MIT, Cambridge, USA, August 11-13, 2021. https://applied-energy.org/mitab2021/index
5. University of New Orleans 2016 Engineering Forum, Sep. 16, 2016. New Orleans, Louisiana, USA.
6. ASME International Mechanical Eng. Congress & Exposition IMECE 2012, Nov. 9-15, 2012, Houston, TX, USA.
7. 34th Industrial Energy Technology Conference (IETC), May29-June1, 2012. New Orleans, Louisiana, USA.
8. 33rd Industrial Energy Technology Conference (IETC), May17-19, 2011. New Orleans, Louisiana, USA.
9. Clean Power & Energy Research Consortium (CEPREC) Annual Meeting, May 19, 2010, UNO.
10. Clean Power & Energy Research Consortium (CEPREC) Annual Meeting, Aug. 28, 2009, Southern University, Baton Rouge, Louisiana, USA.
11. Ninth International Congress of Fluid Dynamics & Propulsion (ICFDP 9), ASME, DEC. 18-21, 2008, Alex., Egypt.

Trainer

As a senior consultant at DAI, I delivered the following training courses in the project "Support the Technical and Financial Sustainability of the Renewable Energy and Energy Efficiency: EuropeAid/138795/DH/SER/EG"

1. Calculation and verification of energy consumption of significant energy using equipment (July 26, 2021- Sept. 16, 2021)
2. Energy data analysis and benchmarking in oil and gas plant (July 26, 2021- Sept. 16, 2021)
3. Pipelines and pumping system optimization (Specialized Training for Engineers/ Chemists - Course A8) (March 27, 2022- Sept. 2022)
4. Energy efficiency optimization in motor systems (Specialized Training for Engineers/ Chemists - Course A7) (March 27, 2022- Sept. 2022)

Training Courses Participation

1. Professional training on "**Pump System Optimization Expert Training**" the United Nations Industrial Development Organization (UNIDO) & the Ministry of Trade and Industry of the ARE, Dec 5-9, 2021.
2. Professional training on "**Pump System Optimization User Training**" the United Nations Industrial Development Organization (UNIDO) & the Ministry of Trade and Industry of the ARE, September 20-21, 2021.

3. Professional training on "**Wind Energy**" the British University in Egypt under Affordable Resources for Egypt's Industrial Growth (RIndustry) project, May 23-27, 2021
4. Professional training on "**Business Ideation and design thinking**" the British University in Egypt under Affordable Resources for Egypt's Industrial Growth (RIndustry) project, April 4-8, 2021
5. Professional training on "**Solar Technology**" the British University in Egypt under Affordable Resources for Egypt's Industrial Growth (RIndustry) project, March 28th-April 1st , 2021
6. Professional training on "**Energy and Renewable Energy Policies in Egypt**" the British University in Egypt under Affordable Resources for Egypt's Industrial Growth (RIndustry) project, March 7-11, 2021
7. Professional training on "**Occupational Health and Safety for General Industries in Accordance to OSHA Standards**" The Arab Academy for Science, Technology & Marine Transport, December 20-24, 2020.
8. **Renewable Energy Summer School**, Academy of Scientific Research& Technology (ASRT)& the Italian Embassy in Cairo, Egypt, July 6-11, 2019.
9. Programs & Courses Specification and Assessment of Intended Learning Outcomes for Higher Education Colleges and Institutes, National Authority for Quality Assurance and Accreditation of Education (NAQAAE), April 18-20, 2019.
10. Self-Evaluation and Quality Assurance of Education for Higher Education Institutions, National Authority for Quality Assurance and Accreditation of Education (NAQAAE), August 10-12, 2017
11. Faculty and Leadership Development Courses, FLDP Center, Zagazig University, Egypt.
    - Statical Analysis using SPSS Package, January 28-29, 2018
    - Using Technology in Education, January 16-17, 2018
    - Scientific Writing and Reference Management by "Endnote", December 10-11, 2017.
    - International Publishing, November 26-27, 2017.
    - Job Ethics and Attitudes of Academic Work, October 29-30, 2017.
    - Creative Thinking Skills, August 22-23, 2017.
    - Credit Hour System, August 8-9, 2017
    - Communication Skills in Various Education Modes, July 30-31, 2017
    - Strategic planning, July 25-26, 2017.
    - Crisis & Disaster Management, July 4-5, 2017.

References

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