

## Assoc. Prof. Hamza Salih Erden

### Personal Information

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### International Researcher IDs

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Publons / Web Of Science ResearcherID: N-4023-2015

ScopusID: 55200709200

Yoksis Researcher ID: 236943

### Biography

Dr. Hamza Salih Erden received his B.S. degree from Istanbul Technical University in Mechanical Engineering; M.S. and Ph.D. degrees from Syracuse University in Mechanical and Aerospace Engineering. He is now a faculty member at Istanbul Technical University, where he leads graduate-level teaching track and research program titled "Thermal Systems in Cloud Infrastructure" at the Informatics Institute. His current research is on the thermodynamic modeling and optimization of data center thermal environment and cooling infrastructure. As an active member of ASHRAE and ASME, Dr. Erden authored and co-authored more than 30 journals and conference papers and received 2015 ASHRAE Willis H. Carrier Award.

### Education Information

Doctorate, Syracuse University, Mechanical And Aerospace Engineering, United States Of America 2009 - 2013

Postgraduate, Syracuse University, Mechanical And Aerospace Engineering, United States Of America 2007 - 2009

Undergraduate, Istanbul Technical University, Makine Fakültesi, Makine Mühendisliği Bölümü, Turkey 2002 - 2007

### Foreign Languages

English, C1 Advanced

### Dissertations

Doctorate, Experimental and analytical investigation of the transient thermal response of air cooled data centers, Syracuse University, Mechanical And Aerospace Engineering, 2013

### Research Areas

Mechanical Engineering, Energy, Thermodynamics, Heat and Mass Transfer, Heating, Refrigerating and Air Conditioning, Computational fluid dynamics, Thermal Systems, Engineering and Technology

## Academic Titles / Tasks

Assistant Professor, Istanbul Technical University, Biliřim Enstitüsü, Biliřim Uygulamaları, 2018 - Continues

Assistant Professor, Istanbul Technical University, Biliřim Enstitüsü, Biliřim Uygulamaları, 2015 - 2018

## Courses

Veri Merkezi Altyapısı ve Enerji Verimlilięi, Postgraduate, 2016 - 2017

## Advising Theses

Erden H. S., Töreyin B. U., CNN-based server state monitoring and fault diagnosis using infrared thermography, Postgraduate, B.NKWAWİR(Student), 2022

Erden H. S., Koç İ. M., Türkiye iklim koşullarındaki veri merkezlerinin soęutulmasında ekonomizer kullanımının enerji tasarrufu ve ekonomik potansiyel deęerlendirmesi, Postgraduate, O.GÖZCÜ(Student), 2019

Erden H. S., Çadırcı S., Numerical investigation of CRAH bypass in the air-cooled data centers, Postgraduate, V.EBRAHIMPOUR(Student), 2019

Erden H. S., Böke Y. E., UHEM veri merkezi ısıl profilinin deneysel incelemesi ve CFD analizi, Postgraduate, İ.TÜRKMEN(Student), 2019

## Published journal articles indexed by SCI, SSCI, and AHCI

- I. **Comprehensive energy and economic assessment of CRAH bypass method in air-cooled data centers**  
Salih Erden H. S.  
Sustainable Energy Technologies and Assessments, vol.52, 2022 (SCI-Expanded)
- II. **Optimal sizing of PV-BESS units for home energy management system-equipped households considering day-ahead load scheduling for demand response and self-consumption**  
Duman A. C., Erden H. S., Gonuel Ö., Güler Ö.  
ENERGY AND BUILDINGS, vol.267, 2022 (SCI-Expanded)
- III. **Energy and economic analysis of the bypass method for the computer room air conditionin g units of a small data center**  
Erden H. S., Türkmen I.  
Journal Of The Faculty Of Engineering And Architecture Of Gazi University, vol.37, no.4, pp.1883-1898, 2022 (SCI-Expanded)
- IV. **A home energy management system with an integrated smart thermostat for demand response in smart grids**  
Duman A. C., Erden H. S., Gönül Ö., Güler Ö.  
SUSTAINABLE CITIES AND SOCIETY, vol.65, 2021 (SCI-Expanded)
- V. **Experimental and Computational Investigations of the Thermal Environment in a Small Operational Data Center for Potential Energy Efficiency Improvements**  
Turkmen I., Mercan C. A., Erden H. S.  
JOURNAL OF ELECTRONIC PACKAGING, vol.142, no.3, 2020 (SCI-Expanded)
- VI. **A parametric CFD study of computer room air handling bypass in air-cooled data centers**  
Ahmadi V. E., Erden H. S.  
APPLIED THERMAL ENGINEERING, vol.166, 2020 (SCI-Expanded)
- VII. **Energy and economic assessment of major free cooling retrofits for data centers in Turkey**  
Gozcu O., Erden H. S.  
TURKISH JOURNAL OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCES, vol.27, no.3, pp.2197-2212, 2019

(SCI-Expanded)

- VIII. **Optimization of Enclosed Aisle Data Centers With Induced CRAH Bypass**  
Erden H. S., Koz M., Yildirim M. T., Khalifa H. E.  
IEEE TRANSACTIONS ON COMPONENTS PACKAGING AND MANUFACTURING TECHNOLOGY, vol.7, no.12, pp.1981-1989, 2017 (SCI-Expanded)
- IX. **Experimental Demonstration and Flow Network Model Verification of Induced CRAH Bypass for Cooling Optimization of Enclosed-Aisle Data Centers**  
Erden H. S., Koz M., Yildirim M. T., Khalifa H. E.  
IEEE TRANSACTIONS ON COMPONENTS PACKAGING AND MANUFACTURING TECHNOLOGY, vol.7, no.11, pp.1795-1803, 2017 (SCI-Expanded)
- X. **Determination of the Lumped-Capacitance Parameters of Air-Cooled Servers Through Air Temperature Measurements**  
Erden H. S., Khalifa H. E., SCHMIDT R. R.  
JOURNAL OF ELECTRONIC PACKAGING, vol.136, no.3, 2014 (SCI-Expanded)
- XI. **A hybrid lumped capacitance-CFD model for the simulation of data center transients**  
ERDEN H. S., KHALIFA H. E., SCHMIDT R. R.  
Hvac&R Research, vol.20, pp.688-702, 2014 (SCI-Expanded)
- XII. **Energy and environmental assessment of on-site power and cooling for data centers**  
ERDEN H. S., KHALIFA H. E.  
Hvac&R Research, vol.18, pp.51-66, 2012 (SCI-Expanded)

## Articles Published in Other Journals

- I. **Proposal for Standard Compact Server Model for Transient Data Center Simulations**  
PARDEY Z., DEMETRIOU D. W., ERDEN H. S., VANGILDER J., KHALIFA H. E., SCHMIDT R. R.  
ASHRAE Transactions, 2015 (Peer-Reviewed Journal)

## Refereed Congress / Symposium Publications in Proceedings

- I. **Data Center Energy Optimization Under Different Dynamic Pricing Schemes**  
Nkwawir B. W., Erden H. S., Duman A. C.  
2023 International Conference on Smart Energy Systems and Technologies, SEST 2023, Muğla, Turkey, 4 - 06 September 2023
- II. **IN THE SEARCH FOR THE FUTURE ENGINEER: THE EELISA DISCIPLINARY BROADENING WORKSHOP EXPERIENCE**  
GÖRGÜL E., ERDEN H. S.  
SEFI 2022, Barselona, Spain, 19 - 22 September 2022, pp.1206-1216
- III. **A Deep Learning Approach to Fault Detection and Classification in Datacenters**  
Wiysobunri B. N., ERDEN H. S., TÖREYİN B. U.  
6. Ulusal Yüksek Başarımlı Hesaplama Konferansı - BAŞARIM 2020, Turkey, 8 - 09 October 2020
- IV. **Thermal Profiling of a Small Operational Data Center**  
Türkmen İ., Mercan C. A., ERDEN H. S.  
ASME 2019 International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems, Anaheim, California, United States Of America, 7 - 09 October 2019
- V. **Investigation of CRAH Bypass for Air-Cooled Data Centers using Computational Fluid Dynamics**  
Ahmadi V. E., Erden H. S.  
IEEE International Telecommunications Energy Conference (INTELEC), Torino, Italy, 7 - 11 October 2018
- VI. **Veri Merkezi Serbest Soğutma Sistemlerinin Türkiye'nin İklim Şartlarındaki Enerji Analizi**  
GÖZCÜ O., ERDEN H. S.

1.Ulusal Bulut Bilişim ve Büyük Veri Sempozyumu B3S'17, Antalya, Turkey, 19 - 20 October 2017, pp.65-70

**VII. Investigation of induced CRAH bypass for air-cooled data centers using computational fluid dynamics**

Erden H. S.

25th International Conference on Software, Telecommunications and Computer Networks, SoftCOM 2017, Split, Croatia, 21 - 23 September 2017

**VIII. Worldwide energy analysis of major free cooling methods for data centers**

Gozcu O., ÖZADA B., CARFİ M. U., Erden H. S.

16th IEEE InterSociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, ITherm 2017, Florida, United States Of America, 30 May - 02 June 2017, pp.968-976

**IX. NUMERICAL INVESTIGATION OF THE MELTING OF A PHASE CHANGE MATERIAL IN A THERMAL STORAGE DEVICE WITH EMBEDDED AIR FLOW CHANNELS**

Koz M., Erden H. S., Khalifa H. E.

ASME Summer Heat Transfer Conference, Washington, Kiribati, 10 - 14 July 2016

**X. Energy Assessment of CRAH Bypass for Enclosed Aisle Data Centers**

Erden H. S., Yildirim M. T., Koz M., Khalifa H. E.

15th IEEE Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm), Nevada, United States Of America, 31 May - 03 June 2016, pp.433-439

**XI. Experimental Investigation of CRAH Bypass for Enclosed Aisle Data Centers**

Erden H. S., Yildirim M. T., Koz M., Khalifa H. E.

15th IEEE Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm), Nevada, United States Of America, 31 May - 03 June 2016, pp.1293-1299

**XII. PARAMETER ESTIMATION FOR LUMPED CAPACITANCE MODELING OF CRAH UNITS DURING CHILLED WATER INTERRUPTION**

Erden H. S., Khalifa H. E.

ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems (InterPACK), San-Francisco, Costa Rica, 6 - 09 July 2015

**XIII. Energy Saving Potential of Low-Temperature Cooling of Computers**

Khalifa H. E., Erden H. S., de Rouge R. B.

14th InterSociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm), Florida, United States Of America, 27 - 30 May 2014, pp.1121-1128

**XIV. Development of an IT Equipment Lumped Capacitance Parameter Database for Transient Data Center Simulations**

DEMETRIOU D. W., Erden H. S., Khalifa H. E., SCHMIDT R. R.

14th InterSociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITherm), Florida, United States Of America, 27 - 30 May 2014, pp.1330-1337

**XV. ASSESSMENT OF THE ENERGY PERFORMANCE OF COGENERATION SYSTEMS FOR POWERING AND COOLING DATA CENTERS**

Ringham D. C., Rice D. J., Granetz B. S., Erden H. S., Khalifa H. E., SCHMIDT R. R.

ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems, California, United States Of America, 16 - 18 July 2013

**XVI. TRANSIENT THERMAL RESPONSE OF SERVERS THROUGH AIR TEMPERATURE MEASUREMENTS**

Erden H. S., Khalifa H. E., SCHMIDT R. R.

ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems, California, United States Of America, 16 - 18 July 2013

**XVII. ROOM-LEVEL TRANSIENT CFD MODELING OF RACK SHUTDOWN**

Erden H. S., Khalifa H. E., SCHMIDT R. R.

ASME International Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Microsystems, California, United States Of America, 16 - 18 July 2013

**XVIII. DESIGN OF SIMULATED SERVER RACKS FOR DATA CENTER RESEARCH**

Smith J. F., Abdelmaksoud W. A., Erden H. S., Dannenhoffer J. F., Dang T. Q., Khalifa H. E., SCHMIDT R. R., IYENGAR M.

ASME Pacific Rim Technical Conference and Exhibition on Packaging and Integration of Electronic and Photonic Systems, MEMS and NEMS, Oregon, United States Of America, 6 - 08 July 2011, pp.415-417

**XIX. On Site Power Generation for Data Centers**

ERDEN H. S., KHALIFA H. E.

IAQVEC 2010, 16 - 18 September 2010

**XX. Energy analysis of dedicated outdoor air systems based on distributed environmental control in multi-zone buildings**

Erden H. S., KHALIFA H. E.

9th International Healthy Buildings Conference and Exhibition, HB 2009, Syracuse, NY, United States Of America, 13 - 17 September 2009

## **Supported Projects**

Demir M. E., Erden H. S., Project Supported by Higher Education Institutions, Veri Merkezlerinden Termoelektrik Malzemelerle Isı Geri Kazanımı ve Pasif Soğutma Uygulamaları, 2022 - Continues

Erden H. S., Güler Ö., Duman A. C., Gönül Ö., Deveci K., TUBITAK Project, Modeling and Optimization of Grid-Integrated Energy Systems for the Demand-Side Management of Data Centers, 2021 - 2023

Erden H. S., TUBITAK Project, CFD Analysis and Economic Assessment of CRAH Bypass Method for the Cooling Optimization of Data Centers, 2018 - 2020

Erden H. S., MERCAN A., Türkmen İ., Project Supported by Higher Education Institutions, UHEM Veri Merkezi Isıl Profilinin Deneysel İncelemesi ve CFD Analizi, 2017 - 2020

Erden H. S., Project Supported by Higher Education Institutions, Koridoru Kapatılmış Veri Merkezlerinde Klima Baypas Yönteminin Akış Ağı ve Enerji Sistem Modelleriyle İncelenmesi, 2016 - 2018

Erden H. S., TUBITAK Project, Türkiye İklim Koşullarındaki Veri Merkezlerinin Soğutulmasında Ekonomizer Kullanımının Enerji Tasarrufu ve Ekonomik Potansiyel Değerlendirmesi, 2016 - 2017

## **Memberships / Tasks in Scientific Organizations**

ASHRAE, Member, 2008 - Continues

ASME, Member, 2008 - Continues

## **Scientific Refereeing**

ASME Journal of Electronic Packaging, SCI Journal, May 2017

International Journal of Numerical Methods for Heat and Fluid Flow, Other Indexed Journal, January 2017

ASME Journal of Thermal Science and Engineering Applications, Other Indexed Journal, April 2016

ASME Journal of Thermal Science and Engineering Applications, Other Indexed Journal, April 2016

IEEE Transactions on Components, Packaging and Manufacturing Technology, SCI Journal, October 2015

International Journal of Heat and Mass Transfer, SCI Journal, March 2015

ASME Journal of Electronic Packaging, SCI Journal, December 2014

ASME Journal of Electronic Packaging, SCI Journal, March 2014

## **Metrics**

Publication: 36

Citation (WoS): 182

Citation (Scopus): 306

H-Index (WoS): 9

H-Index (Scopus): 10

## **Congress and Symposium Activities**

B3S, Attendee, Antalya, Turkey, 2017

SoftCOM 2017, Attendee, Split, Croatia, 2017

ITHERM 2017, Attendee, Florida, United States Of America, 2017

ITHERM 2016, Attendee, Nevada, United States Of America, 2016

ASME InterPACK 2015, Attendee, California, United States Of America, 2015

ITHERM 2014, Attendee, Florida, United States Of America, 2014

ASHRAE Winter Meeting, Attendee, New York, United States Of America, 2014

ASME InterPACK 2013, Attendee, California, United States Of America, 2013

12th Annual Symposium on Environmental and Energy Systems, Attendee, New York, United States Of America, 2012

11th Annual Symposium on Environmental and Energy Systems, Attendee, New York, United States Of America, 2011

IAQVEC 2010, Attendee, New York, United States Of America, 2010

Healthy Buildings 2009, Attendee, New York, United States Of America, 2009

8th Annual Symposium on Environmental and Energy Systems, Attendee, New York, United States Of America, 2008