VITTORIO VERDA
Full Professor
Energy Department, Politecnico di Torino
c.so Duca degli Abruzzi 24, 10129 Torino, Italy
[redacted]
Email. vittorio.verda@polito.it

In 1996, Dr. Vittorio Verda received his B.S./M.S. in Mechanical Engineering from the Politecnico di Torino in Italy and in 2001 his Ph.D. in Energy Engineering in a dual degree from both the Politecnico di Torino and the University of Zaragoza in Spain. The subject of his dissertation work involved the thermoeconomic diagnosis of power plants.

In 2002, Dr. Verda obtained a position as assistant professor in the Department of Energy Engineering at the Politecnico di Torino. In 2004 he became a tenured assistant professor. In 2011 he obtained a position as associate professor in the Department of Energy Engineering. In 2017 he obtained a position as full professor in the Department of Energy Engineering.

Research activity

Dr. Verda's research covers a number of different fields of thermodynamics and heat transfer: the thermoeconomic analysis and diagnosis of energy conversion systems, the analysis and optimization of district heating networks, thermal storage systems and fuel cells (in general and high temperature in particular), the multi-scale modelling of fire events in tunnels, buildings and forests.

In the area of thermoeonomics, he has proposed a methodology which aims at detecting, locating and quantifying malfunctions affecting the efficiency of energy conversion processes. The approach proposes the filtration of the induced effects due to the control system and the non-flat efficiency curves of components. Previous works were based on a direct comparison of operating condition and a reference condition, which was suitable only for some type of plants, particularly steam power plants. The proposed method has extended the real capability of locating the malfunctions correctly, opening the door to further improvements to the diagnosis field. This method is based on the use of a reduced model of components, obtained through their productive structure, i.e. a plant structure where each component behavior is described through relations between resources and products, both expressed in terms of exergy flows. An additional feature of the method consists in the analysis of multiple operating conditions (anamnesis), in order to reduce the inaccuracies due to errors in measurements and to the selected model, thus improving the reliability of results.

In the area of district heating networks, he has proposed an effective modelling approach based on graph theory for both steady state and transient analysis of these systems. Typical applications are related with the optimal operation of pumping systems, the optimization of thermal profiles of the users, the optimization of centralized and distributed thermal storage systems and the optimal planning of district heating networks. The latter has been obtained by integrating a thermoeconomic approach with an optimization procedure, based on simulated annealing technique, directly acting on the network topology. More recently he has collaborated with the application of reduced modelling techniques (more specifically, the Proper Orthogonal Decomposition) to the fast/real time modelling of district heating networks.

Dr. Verda has also contributed to the development of optimization methods for energy system components, particularly high temperature fuel cells (SOFC and MCFC) and thermal storage systems. Investigations were mainly focused on the development and application of

heuristic approaches, based on the entropy generation analysis, as well as shape optimization using entropy generation minimization. The peculiar aspects related with the developed works refer to the analysis of devices operating in transient conditions (storage) and multi-physics systems where heat and mass transfer, chemical and electrochemical reactions and current transfer take place (fuel cells).

In the area of fire safety analysis, he has contributed to develop a multi-scale approach for the thermo-fluid dynamic modelling of fire events in long tunnels as well as the analysis of complex structures such as underground stations. In addition he has contributed to develop a reduced model for the fast prediction of the fire propagation in the case of forest fires.

He is the author of more than 190 papers published in international journals (84 papers) and conference proceedings (102 papers + 2 invited papers). According with Scopus, he has received 1846 citations. His H-Index is 24. Dr Verda has also published 2 book chapters.

He has been invited to speak in seminars in various international universities, such as the Ohio State University (US), the University of Guanajuato (Mexico), the University of Bacau (Romania), the Skoltech (Russia), the Denmark Technical University (Denmark), the University of Rome-La Sapienza (Italy).

Awards

In 2003 and in 2016 he was awarded the very prestigious ASME Edward F. Obert Award. In 2003 for the two-part paper for the two-part paper: Verda V., Serra L., Valero A., 2002. Thermoeconomic Diagnosis: Zooming Strategy Applied to Highly Complex Energy Systems. Part 1: Detection and Localization of Anomalies. Part 2: On the Choice of the Productive Structure, which was presented at the International Mechanical Engineering Conference and Exposition ASME IMECE 2002, New Orleans (USA). In 2016 for the paper Cosentino S., Sciacovelli A., Verda V., 2015. Thermoeconomic Design of Borehole Thermal Energy Storage Systems, which was presented at the International Mechanical Engineering Conference and Exposition ASME IMECE 2015, Houston, (USA).

In 2015 he was awarded with the title of ASME fellow.

In 2007 he was awarded with the best paper award for the paper Verda V., Kona A. (2012). Thermo-economic Approach for the Analysis of Low Temperature District Heating Systems, presented at the International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems ECOS 2012, Perugia (Italy).

Professional activity for the scientific community

He is associate editor of Energy, the ASME journal of Electrochemical Energy Conversion and Storage, the International Journal of Thermodynamics and the Journal of Power and Energy Engineering. In 2015 is has been invited as a guest editor for a special issue of the journal Entropy and in 2017 to a special issue of the journal Energy. He is regular reviewer for several international journals, such as Energy, Applied Thermal Engineering, Applied Energy, International Journal of Thermodynamics.

He is member of the international scientific committee of the following conferences: the biannual International Conference on Engineering Systems Design and Analysis (ESDA) of the American Society of Mechanical Engineers since 2006; the International Conference on Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS) since 2009; the International Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES) since 2009.

He has been chair and co-chair in various international conferences, such as the International Conference on Efficiency, Cost, Optimization, Simulation and Environmental

Impact of Energy Systems (in 2003, 2004 and from 2010 to the present), the biannual International Conference on Engineering Systems Design and Analysis (from 2006 to 2014), the ASME International Mechanical Engineering Congress and Exposition (in 2003, from 2005 to 2008, in 2014).

In 2006 he has organized the 8th edition of the International Conference on Engineering System Analysis and Design (ESDA) of the American Society of Mechanical Engineers held in Torino, with 330 participants and more than 450 papers presented.