



- 新闻动态
- 通知公告
- 学术动态
- 学生园地

Energy Fundamentals and Future Outlook

By M. Kostic, PhD, PE,
Professor of Mechanical Engineering,
NORTHERN ILLINOIS UNIVERSITY USA

Date: January 6, 2009

Time: 10:00 am

Place: Room F 310, Mechanical Engineering Building

School of Mechanical Engineering
Shanghai Jiaotong University

Abstract

Energy is a fundamental property of a physical system and refers to its potential to maintain a material system identity or structure (forced field in space) and to influence changes (via forced-displacement interactions, i.e. systems' re-structuring) with other systems by imparting work (forced directional displacement) or heat (forced chaotic displacement/motion of a system molecular or related structures). Energy exists in many forms: electromagnetic (including light), electrical, magnetic, nuclear, chemical, thermal, and mechanical (including kinetic, elastic, gravitational, and sound); where, for example, electro-mechanical energy may be kinetic or potential, while thermal energy represents overall potential and chaotic motion energy of molecules and/or related micro structure. Energy is the "building block" and fundamental property of matter and space and, thus, the fundamental property of existence. Energy exchanges or transfers are associated with all processes (or changes) and, thus, are indivisible from time.

At present, most of the World energy consumption is supplied by the fossil fuels (about 85%). However, the proven fossil fuel reserves are limited, and if continued to be used at the present rates, they will be depleted in relatively short period of time. At present, a substantial amount of World electricity is obtained from nuclear and hydro energy (close to 20% each), respectively, and use of other renewable energy resources is increasing, namely geothermal, wind, biomass and solar, as well as development of alternative synthetic fuels, including hydrogen, etc. It is worth noting that some countries produce almost all or most of their electricity from hydro energy (like Norway, Brazil, New Zealand, Austria and Switzerland), and France produces most of its electricity from nuclear fuel (close to 80%). The nuclear fuel reserves are orders of magnitude higher than fossil fuels, and nuclear plants do not contribute to CO₂ green-house pollution. Furthermore, advances in energy conversion and utilization technologies and increase in efficiency, including computerized control and management, contribute to energy conservation, increase in safety, and reduction of related environmental pollution. Actually, per capita energy use in the U.S. and other developed countries is being reduced in recent years. However, the increase of World's population and development of many underdeveloped and very populated countries, like China, India and others, will influence continuous increase of the World energy consumption.

The two things are certain in not distant future: (1) the world population and their living-standard expectations will substantially increase, and (2) fossil fuels' economical reserves, particularly oil and natural gas, will substantially decrease. The difficulties that will face every nation and the world in meeting energy needs over the next several decades will be more challenging than what we anticipate now. The traditional

solutions and approaches will not solve the global energy problem. New knowledge, new technology, and new living habits and expectations must be developed to address both the quantity of energy needed to increase the standard of living world-wide and to preserve and enhance the quality of our environment. However, regardless of imminent shortages of fossil fuels, the outlook for future energy needs is encouraging. There are many diverse and abundant energy sources with promising future potentials, so that mankind should be able to enhance its activities, standard and quality of living, by diversifying energy sources, and by improving energy conversion and utilization efficiencies, while at the same time increasing safety and reducing environmental pollution. After all, the life may be happier after the fossil fuel era!

About the Speaker:

Professor Kostic's teaching and research interests are in Thermodynamics (a science of energy, the Mother of All Sciences), Fluid Mechanics, Heat Transfer and related fluid-thermal-energy sciences; with emphases on physical comprehension and creative design, experimental methods with computerized data acquisition, and CFD simulation; including nanotechnology and development of new-hybrid, POLY-nanofluids with enhanced properties, as well as design, analysis and optimization of fluids-thermal-energy components and systems in power-conversion, utilizations, manufacturing and material processing. Dr. Kostic came to Northern Illinois University from the University of Illinois at Chicago, where he supervised and conducted a two-year research program in heat transfer and viscoelastic fluid flows, after working for some time in industry.

Dr. Kostic has received recognized professional fellowships and awards, including multiple citations in Marquis' "Who's Who in the World" and "Who's Who in Science and Engineering."; the Fulbright Grant; NASA Faculty Fellowship; Sabbatical Semester at Fermilab as a Guest Scientist; and the summer Faculty Research Participation Program at Argonne National Laboratory. He is a frequent reviewer of professional works and books in Thermodynamics and Experimental Methods. Dr. Kostic is a licensed professional engineer (PE) in Illinois and a member of the ASME, ASEE, and AIP's Society of Rheology. He has a number of publications in refereed journals, including invited state-of-the-art chapters in the Academic Press series Advances in Heat Transfer, Volume 19, and "Viscosity" in CRC Press' Measurement, Instrumentation and Sensors Handbook; as well as invited reference articles: Work, Power, and Energy in Academic Press/Elsevier's Encyclopedia of Energy; Extrusion Die Design in Dekker's Encyclopedia of Chemical Processing; and Energy: Global and Historical Background and Physics of Energy in Taylor & Francis/CRC Press Encyclopedia of Energy Engineering and Technology. Professor Kostic is a member of the Graduate Faculty at Northern Illinois University.

[【返回】](#)

© 2008 CopyRight 上海交通大学机械与动力工程学院 版权所有

地址: 上海市东川路800号闵行机械楼群 邮编: 200240 E-mail: qwzhou@sjtu.edu.cn