

**Seminarium Zakładu Energetyki Jądrowej i Analiz Środowiska (UZ3)
Departament Badań Układów Złożonych (DUZ)**

Wtorek: 02.04.2019, 11:30

CYFRONET (bud. 39), sala 172 (III piętro)

dr inż. Maciej Kulig

Constrained Optimization Methods In The Design Problems Of Thermal-Hydraulic Systems

Abstract:

The subject of the presentation is related to the research project conducted a long time ago at the Institute of Nuclear Research (IBJ) and Atomic Energy (IEA), Świerk, devoted to modeling and optimization of thermal hydraulic systems/installations. Specific features of engineering problems in the design of thermal hydraulic systems will be discussed, illustrated by an example of a design problem considered within the framework of IEA projects. Mathematical formulation of the related nonlinear optimization problems will be given, difficulties and challenges associated with practical applications will be discussed. Overview of the numerical methods available at that time will be made, and research work on the development/implementation of the most suitable analytical tools will be described, including the results of numerical experiments with the optimization solver developed within the framework of this project.

Significant advances in the field of nonlinear optimization achieved since that time and future prospects will be summarized. Finally, a brief overview will be provided of the recent algorithms considered relevant for the subject of NLP optimization that are available in the public domain.

The author believes that effective and reliable NLP solvers should be one of the relevant elements of the analytical, High Performance Computing (HPC) tools being made available at NCBJ and CIŚ, in particular. Resuming the research/implementation work in this field at NCBJ/CIŚ would be desirable, consistently with the NCBJ/CIŚ profile and its mission to support a vast variety of analytical services, not only in the area of energy and power industry, but also in many other fields.

Serdecznie zapraszamy,
M. Dąbrowski, T. Kwiatkowski

***Information about the author**

Dr inż. Maciej Kulig was graduated in 1962 from the Faculty of Power and Aeronautical Engineering of Warsaw University of Technology (speciality: nuclear energy). His professional career started at the Institute of Nuclear Research (IBJ) and Atomic Energy (IEA), Świerk (1962-1988), where he defended his PhD thesis in Mechanical Engineering ("Use of numerical optimization methods in the design of complex heat transfer systems"). In 1988 he started to work for regulatory authorities – the Central Laboratory for Radiological Protection (1988-1992) and the National Inspectorate for Radiation and Nuclear Safety (1992-1993). He was a Technical Officer at the International Atomic Energy Agency (1993-1997), and a Senior Consultant at Enconet Consulting GmbH, Vienna (1998-2010 as permanent staff, since 2010 - till now, as a freelance consultant).

He has over 48 years experience in the nuclear power sector – including the reactor thermal-hydraulic analyses, modelling and optimization of thermal-hydraulic installations, reactor accident analysis, severe accident management (SAM), nuclear safety and risk assessment / engineering (including PSA), and root cause analysis (RCA) of operational events/ problems. As IAEA staff, he was responsible for the development of several IAEA documents, including guidelines for computer-based systems important to safety, fire hazard analysis, fire PSA, and use of operational experience in fire safety assessment. At the Enconet Consulting he participated in various safety assessment projects including the development and review of PSA studies (Level 1 and 2), fire hazard analysis / fire PSA, safety performance indicators, preparation of guidelines and providing staff training for nuclear plant operators and/or regulators (devoted to Periodic Safety Review of NPPs, PSA applications in regulatory activities, operating experience feedback / RCA, and other).