NATURAL CONVECTION IN SHALLOW AND TALL ENCLOSURES

by
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Abstract:

Natural convection in enclosures which transfers heat without an external power source and therefore without moving parts, is passionately investigated numerically and experimentally, for laminar and turbulent flows by several researchers due to its wide range of engineering applications, such as electronic cooling, solar energy, nuclear energy, space systems, petroleum industry, cryogenics, design of buildings, manufacturing processes, and its being responsible for large scale science of oceanic thermohaline circulation and motion of the plates making up the Earths lithosphere in mantle convection. A variety of researchers have examined ways to optimize in regard to techniques that employ natural convection fluid flow and heat transfer. The shape and orientation of the enclosure change the flow patterns, and hence affect the convective fluid flow and heat transfer. Velocity and temperature distributions resulted in utilizing different numerical modeling techniques compared with existing experimental data, as a function of the dimensionless parameters will be discussed. As an example, the design and the performance of a couple of commonly utilized mitigation strategies of annual pressure build up due to natural convection heat transfer in subsea oil wells will be reviewed. To ensure the well integrity, how engineered annulus insulating packer fluids suppress the natural convection will be presented.

Yildiz Bayazitoglu- Bio

Bayazitoglu is the H.S. Cameron Chair Professor of Mechanical Engineering and Professor of Materials Science and Nanoengineering at Rice University, Houston Texas. She received all of her degrees in mechanical engineering, BS from the Middle East Technical University, Ankara, Turkey and MS and PhD from the University of Michigan, Ann Arbor, Michigan.

Bayazitoglu made original contributions to thermophysical property determination and material processing, electromagnetic and particle radiation heat transfer, forced and free convective heat transfer, phase-change heat transfer, oil well heat transfer, and cryogenic tank and fuel cells thermal design, human head and solar collector thermal analysis, microscale and nanoscale heat transfer, and molecular dynamics studies. She was a keynote lecturer in national and international conferences. She co-authored “Elements of Heat Transfer”, its revision published as “Textbook on Fundamentals of Heat Transfer”.

Bayazitoglu served as the chair of the Heat Transfer Division (HTD) and the chair of Committee of Awards (COH) of the American Society of Mechanical Engineers (ASME). She was an associate editor of ASME JHT and Editor-in-Chief of International Journal of Thermal Sciences (IJTS). Currently, she is the vice president of the International Center of Heat and Mass Transfer (ICHMT).

At Rice University, Bayazitoglu received Brown Superior Teaching Award, Outstanding College Associate Award, HM Rich Outstanding Invention Award, GSA Teaching-Mentoring Award, Chance Teaching Prize, University Faculty Impact Award and Presidential Mentoring Award. From the ASME, she received Heat Transfer Memorial Award and Heat Transfer Division Service Award. She is one of the ASME HTD 75^{th} Anniversary Medal recipient. She is a Fellow and Honorary Member of the ASME, a Fellow of the American Association of Advancement of Science (AAAS). She received the Distinguished Educator Award and the Achievement Award (the highest award) from the Society of Women Engineers (SWE). She is the recipient of the University of Michigan, Engineering Alumni Merit Award. She received ICHMT Fellowship Award, and elected honorary member of Turkish Academy of Sciences (TUBA).