

THE EFFECTS OF DISSIPATION ON THE TECHNOLOGICAL MODES OF VISCOUS LIQUIDS PROCESSING

ANDRII KURCH, PhD student

ALEKSANDR L. SOKOLSKIY, Associate Professor, Doctor of Science in Engineering, Scientific Adviser

SVITLANA M. MOISEIENKO, Associate Professor, PhD in Philology, Language Adviser

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

The scope of proposed research is the effects of viscous dissipation of laminar flow kinetic energy on the electric equipment exploitation modes in liquid processing industry.

Viscous dissipation, affecting the speed of processes, can cause an increase or decrease in energy consumption, and therefore, is an important factor in the transportation and processing of viscous liquids. Dissipation of viscous liquid flow's kinetic energy into thermal form can cause change of characteristics of processing equipment in any industry involving liquid transfer, because of what unpredictable changes in energy consumption and productivity of processing devices occur. Neglecting dissipation effects can lead to economically irrational design of pipelines, processing equipment and pumping systems, that would reduce their overall efficiency. Changes in temperature and viscosity can negatively affect the quality of outcome product, especially in the food and petroleum industries. Appropriate consideration of these factors would allow to reduce costs, increase efficiency and ensure proper product quality.

Our research work is aimed on finding previously neglected instant effects of viscous dissipation on electric energy consumption, speed of technological processes, quality of product and general productivity of equipment of chemical industry, particularly, equipment for pumping and mixing of viscous liquids. It is planned to create of theoretical framework which describes dependencies between physical characteristics of processed liquid (such as density and viscosity), speed and nature of flow, technological characteristics of equipment and its (equipment's) desirable operating mode for every combination of them. More specific objective is to prepare propositions for program of switching processing electric devices between various technological modes according to viscous liquid flow viscosity, speed and, first of all, temperature.

Following miniaturization of engineering equipment research of micro-scale heat and fluid flow has been intensified. Ho and Tai [4] and Gad-el-Hak [5] shows difference of thermal behavior in micro- and in macro-channels, having former the main area of their researches. Sheela-Francisca and Tso [1] further observe difference in thermal characteristics between flows via micro- and in macro-channels. According to them, the main reason for this phenomenon is viscous dissipation, they point particularly to the key role of the Brinkmann number. In that work analytical expressions for the Nusselt number for the case of flow between

parallel plates are given, the cases of steady flow through channels of simple geometry are systematically researched.

Tuckerman and Pease [2] and by Jun and Kim [3] describe interdependencies between dissipation and electric equipment operating modes for heat sinking in the VLSI and valveless pumping of viscous liquids accordingly. Both works focus on viscous dissipation in microchannels. Those works involve measuring of temperature, viscosity, and speed of laminar flows via microchannels.

So, the most results of research of dissipation in industry are in the field of liquid flows in microchannels or high velocity flows. There are no any published works on its effects on technological modes of electric equipment. Theoretical ground for energy optimization of liquid processing industries is almost absent.

Thus, in this work we propose to fill the gap in microchannel research by analyzing dependencies between dissipative processes in macrochannels and energy consumption and productivity of liquid processing equipment of chemical and food industry. Having that as theoretical framework, it is planned to create recommendations for regulating processing equipment's modes of operation and energy consumption according to observable physical characteristics of processed liquids.

References:

1. Morini G. L. *Viscous heating in liquid flows in micro-channels* / International Journal of Heat and Mass Transfer, (2005)
2. Tuckerman D., Pease R. *High-performance heat sinking for VLSI* / IEEE Electron Device Letters, (1981)
3. Jun T., Kim C. *Valveless pumping using traversing vapor bubbles in microchannels* / Journal of Applied Physics, (1998)
4. Ho C.M., Tai Y.C. *Micro-electronic systems (MEMS) and fluid flows* / Annual Review of Fluid Mechanics, (1998)
5. Gad-el-Hak M. *The fluid mechanics of microdevices* / The Freeman Scholar Lecture, Journal of Fluids Engineering, (1999)

LANDSCAPE DESIGN

LIZA KUZMENKO, student

VALENTINA PRYANITSKA, Senior Teacher, Language Adviser

O. M. Beketov National University of Urban Economy in Kharkiv

Landscape design is the process of planning and arranging outdoor spaces to create functional, aesthetic, and sustainable environments. Whether for a backyard, public park, or commercial property, good landscape design enhances natural beauty while meeting the practical needs of the space. Landscape design, landscape architecture, and landscape art are arts that combine three areas:

- 1 - Architecture, construction and design
- 2 - Botany and plant growing,
- 3 - Art design and culture.