

A Description of Some Future Research

Problems of Fluid Machinery

There are many challenges in the field of fluid machinery for the next decade due to the energy transition and climate change. Efficient fluid machines are needed for the energy production and transportation of fluids like LNG, hydrogen, vitreous carbon etc. Additionally, water must be pumped efficiently over long distances making regions fertile. The question arises what the research tasks for fluid machinery are for the next decade and which problems have not been solved completely until now. In the present contribution some research topics are presented and discussed as well as solution strategies are worked out. Components of fluid machinery like inducers, radial impellers, journal bearings etc. are considered and it is worked out how these components can be improved. The flow structure in some components is described. For example, it is shown that the three-dimensional boundary layer on the hub of inducers is separated and that this is the reason why the work is added to the flow on the outer radii. A working hypothesis is that the length of classical designed inducer can be shortened. Reason for this working hypothesis is given and it is described what kind of work must be done to prove or disapprove this working hypothesis, respectively. A streamline curvature method is presented making it possible to design impellers more accurately as before. Some new design ideas for radial impellers are depicted and scientific questions concerning the flow structure inside radial impellers are pointed out. For many fluid machines journal bearings are applied. Especially, journal bearings with gaseous fluids are of interest for many fluid machines like compressors, heat pumps etc. It is described how this kind of journal bearings can be designed by solving the Reynolds Equation for lubrication. At the end of the lecture it is pointed that software tools are needed for designing fluid machines more accurately as before and some ideas must be integrated into the education system at universities.