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Guest Editorial

Seven of the papers in this issue's special section were presented at the 4th International Symposium on Pumping Machinery in 2001. An additional four related papers are also included here. Together these papers summarize the progress that has been made in pump analysis and design since the earlier pumping machinery symposia in 1989, 1993 and 1997. There are still new and ongoing developments in many areas of the pump field, and this collection, which is representative of the advances in CFD and experimental applications. In these papers, it is evident that CFD is becoming commonplace in the analysis of both single- and two-phase flows in all types of pump geometry. This is in addition to experimental measurements via LDA and other techniques. Fundamental to the progress that has been made during this period is the extensive research and development that has been done by contributors from universities, pump manufacturers, and pump users.

Some of these papers deal with aspects of overall pump design and performance. Design systems with embedded CAD and CFD elements now utilize inverse methods of blade shape generation. CFD is now used routinely for performance prediction, as considerable progress in predicting the head curve shapes from shutoff to runout, has been made. In particular, there is progress made in the prediction of performance as influenced by cavitation. In this connection, progress is reported in the simulation of the impeller-volute interaction. Further, flow visualization is still used to aid the pump design process.

Experimental and analytical studies of the flow in pump components are treated in the papers on rotating cavitation in impellers, new discoveries relating to stall in vaned diffusers, and the rather obscure but profound influence of impeller ring leakage flows on hydrodynamic axial thrust. Additionally, the fluid induced rotordynamic forces and instabilities associated with unshrouded impellers have been addressed. New concepts for pumps and pump components are introduced, including a MEMS micropump.

What is clearly evident in all of the papers in this collection is the continuing creative application of fluids engineering expertise that is required to produce viable new concepts in both design and performance improvement.

Thanks go not only to reviewers of these papers, but also to their respective organizations for recognizing and supporting the continuous improvement of pumping machinery through application of the latest analytical and experimental methods, as well as the continual exercise of creative fluid dynamical insights that fuel the technology of these machines for the benefit of pump researchers, designers, and users. Finally, the authors themselves must be acknowledged for their major contribution to this collection of papers.

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