OS 03 – Performance and Noise of Fans and Compressors

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The compressors and fans are used in various industrial domains, from Aeronautics and Automotive industries to household applications. Their use, but also their manufacturing process, represents a significant energy consumption. The design of compressors and fans has evolved to get higher efficiencies, lower noise and extended ranges of efficient use. The different design parameters are becoming more numerous (skew/sweep, tandem machines, counter-rotating machines, ...). The interactions of these machines with their environment (for instance the heat exchanger in an automotive cooling fan system) and their influence on the performance and noise generation are more and more a constraint that has to be taken into account from the very conception. The characterization of their transient behavior is also a key parameter for system modeling. Moreover, in the case of compressors, the occurrence of instabilities known as rotating stall and surge limits the operating range. Such unstable phenomena induce a considerable drop of performance in terms of pressure ratio, efficiency and mass flow, also leading to serious mechanical failures. Consequently, a surge margin is usually imposed to prevent the compressor operation from these situations. Both the increase of the stable operating range and the decrease of the surge margin are crucial, and represent a real challenge for designers.

The session Performance and Noise of Fans and Compressors of the ISROMAC19 Conference is aimed at highlighting recent advances in development of compressors and fans, which include:

(1) experimental and CFD studies dedicated to the elucidation of unsteady flow phenomena and off-design behaviors; (2) prediction and understanding of aerodynamic noise;

Non-exhaustive list of suggested topics

- Technological improvements of surge margin
- Numerical methods for aerodynamic noise prediction
- Design methods coupling with optimization algorithm
- Rotating stall and surge mechanisms and control
- Advanced blade and stage configurations
- Experimental techniques for performance and noise characterization

Organizers

Kazutoyo Yamada is working as a Professor at Fukuoka University in Japan, teaching fluid mechanics and turbomachinery. His present research at Fukuoka University is dedicated to the clarification of unsteady flow phenomena in fans and compressors used for gas turbines, turbochargers and cooling fans in terms of aerodynamic performance improvement and noise reduction.

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