EUROMECH Colloquium 593

"Plasma -based actuators for flow control: recent developments and future directions"

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The meeting was well received and requests from many participants were expressed towards re-organising something similar.

The topics covered through the presentations were:

Characterisation of plasma-based actuators

Characterisation studies are essential towards elucidating the underlying physical processes governing the operation of plasma actuators. Additionally, they provide insight into the effect of operational parameters (geometry, materials, electrical power etc.) on the performance of the actuator. Contributions focused on recent characterisation studies, encompassing mechanical, electrical and thermal properties of plasma actuators.

- Mechanical (thrust and velocity) measurements (AC-DBD, DC corona, spark)
- Electrical (power, discharge regime, spectroscopy) (all types) characterisation studies
- Thermal characterisation (spark, ns-DBD)
- Body-force extraction techniques (AC-DBD, DC-corona)
- Influence of ambient conditions on performance (all types)
- Development of plasma-based actuators

  By extending the basic morphology of the different types of plasma actuators, several variations have been proposed, towards improving or altering the performance. Novel concepts based on new materials, geometries, power supplies etc. have been proposed. Additionally, attention was given to aspects such as reliability, robustness, and manufacturing techniques, which might not affect the performance of the actuators but certainly enhance their industrial application potential.

- New actuation concepts (configuration, geometry, waveforms, power supplies)
- New materials (electrodes, dielectrics)
- New manufacturing techniques (printed actuators, deposition techniques, materials)
- Modelling of plasma-based actuators
- Numerical and theoretical modelling of the operation of plasma actuators is necessary towards understanding the dynamic plasma formation processes.
- Additionally, simplified models of the actuators (i.e. body force distributions for ACDBD actuators) are indispensable for the account of their effect in CFD simulations. Work presented under this topic focused on a wide range of models spanning from analytical or phenomenological to highly complex first-principles models, for all types of plasma-based actuators.
- Analytical and phenomenological models
- Hybrid models
- First-principles models

- Application of plasma-based actuators

  Finally, plasma actuators are intended for active flow control. In this topic, focus was given on application cases in laboratory and industrial conditions. The session will be cover laboratory flow control objectives, such as lift enhancement or drag reduction. Additionally, industrial application efforts were presented.

- Lift and drag control
- Laminar-turbulent transition control
- Turbulent flow control
- Noise and jet control
- Wind energy applications
- Internal flow applications
- Industrial application cases.