



- 1 A vortex ring moving towards a test dummy
- 2 Ring generator and evaporator
- 3 Moving vortex ring structure

VORTEX AIR HUMIDIFIER

Background

There is often a need to supply specially conditioned air to objects in indoor spaces in a highly targeted and localized manner, for example to regulate air humidity. With this goal in mind, a group of indoor climate control experts at Fraunhofer IBP has developed a prototype system that uses a 'vortex ring effect' to achieve highly localized air conditioning. The aircraft cabin is a well-known example of an environment featuring this kind of localized air flow. Air humidity in aircraft cabins is kept very low to avoid the problem of condensation forming on the outer skin of the aircraft, and this increasingly causes passengers to complain that the air is too dry. Although it is unfeasible to raise the humidity throughout the aircraft, experts are keen to find ways of improving the cabin environment in passengers' individual breathing zones. This requires a method of bringing pre-conditioned air with a high moisture content directly to each passenger without implementing a generalized increase in air humidity through mixing ventilation.

Technical solution

The researchers' solution uses a vortex ring effect to generate an air vortex that can travel significant distances while exhibiting minimal interaction with the ambient air. Here the challenge is to condition the air vortex rapidly and precisely and find the best technical method of generating it. The solution involves an accelerated piston driven by a linear motor, which creates the required ring shape for the pre-conditioned air thanks to the friction between the piston and cylinder wall.

Future prospects

The current design demonstrates the technical feasibility of the effect by producing vortex rings in a controlled manner. Further studies are now being carried out with the addition of technical membranes to investigate the rapid and continuous humidification of the air vortex rings. It is hoped that differently shaped air outlets will make the vortex rings even more effective.

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