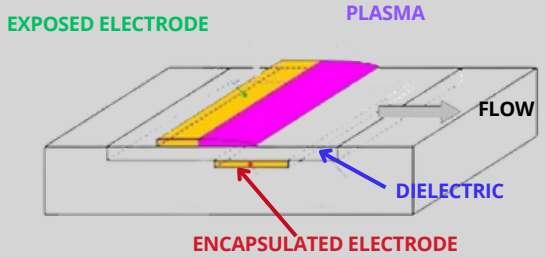
COOLING THROUGH PLASMA ACTUATORS

Controlled cooling by forced convection in areas where volume is a constraint

The Experimental Aerodynamics Area of the Spanish National Institute of Aerospace Technology (INTA) investigates the generation and control of plasma to adapt the aerodynamics and the conditions of the air that flows around the bodies.

Plasma, the fourth state of matter, can be conceived as an ionized gas that exhibits collective behavior and, therefore, can be used technically through the external application of electric and magnetic fields. This, in turn, interacts with the surrounding air, generating an air flow in the direction, intensity and with the amount of heat desired at any given time. This flow can be used to condition the film of air that surrounds a body at will, generating different technical effects.
So called, plasma actuators are used for this purpose. These are devices that transform electrical energy (high voltage) into a physical response, in this case, the creation of a flow with the required characteristics. There are different types of actuators: Corona, DBD,...

In the refrigeration application, the device used is of the DBD type, which consists of two electrodes of minimum thickness, connected to a high voltage power supply, and separated from each other by a dielectric material (*see side figure*). The result of the set is a device with practically negligible volume that barely modifies the surface of the body. For this application, the characteristics of the device must be selected in such a way that provides the least possible heat, which has implications both in the configuration of the device and in the way it is powered.

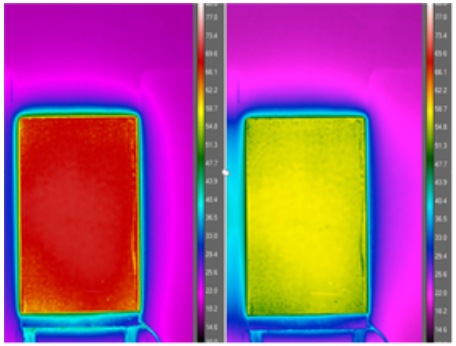


MARKET NEED

- Cooling of electronic components.
- Elimination of hot spots in mechanical systems.

ADVANTAGES

- Applicability in confined spaces
- Simplicity and flexibility in control, robustness, and reliability
- **Short response time (~ ms)**
- **Minimal weight and volume**
- Low energy consumption
- Adaptability to a wide range of industries



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STAGE OF DEVELOPEMENT

- **Patented, validated, and demonstrated** technology in an ice tunnel.
- Technology transferred to an INTA Spin-Off (***YPLASMA***).