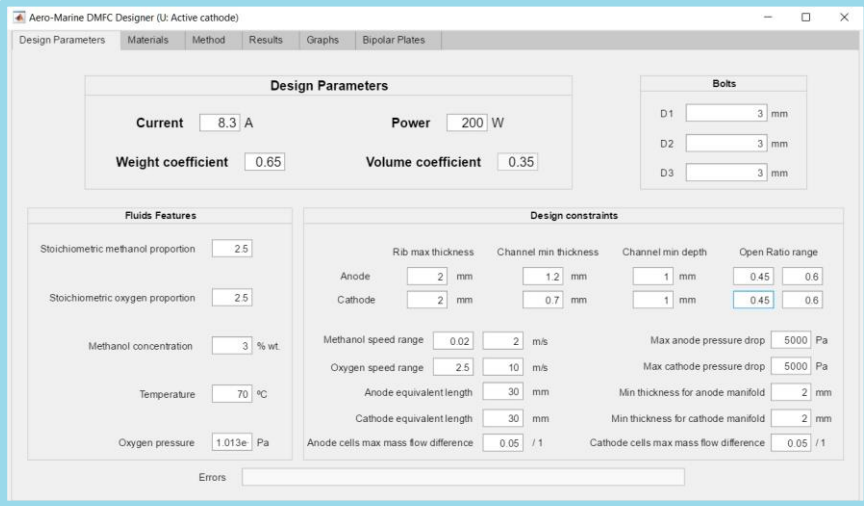
Aero-Marine DMFC Designer

MASS, VOLUME AND FUEL CONSUMPTION

Mass, volume and fuel consumption of fuel cells intended for onboard applications are key factors during its design and development. Volume may constraint vehicle shapes; additionally, mass and fuel consumption - which can be considered in terms of onboard fuel tanks - are directly related to the vehicle endurance, range and payload. All in all, these parameters are so critical that they can determine the technological viability of the proposed power solutions, making it essential to carry out a correct design of the fuel cell. However, the optimization of these three parameters is a trade-off.



INPUT VALUES

The designer must insert some input values in order to run the program:

- Nominal power and nominal current
- The weight (importance) of each factor, namely, mass, volume and fuel consumption
- Reference polarization curves
- Stack operation parameters
- Dimensional and fluid dynamic limitations

WHY AERO-MARINE DMFC DESIGNER?

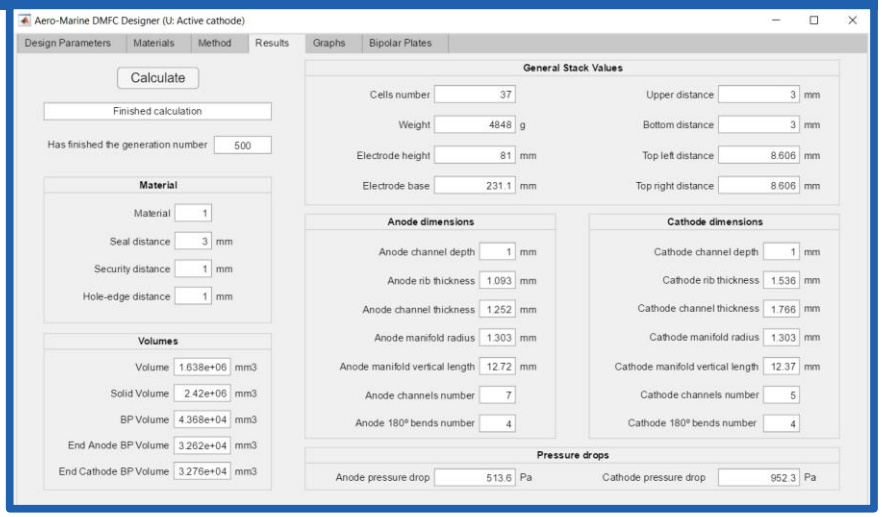
"Aero-Marine DMFC Designer" solves the preliminary design optimization and sizing of direct methanol fuel cells, given the nominal power and current of the stack, through a multiobjective function method. The software simultaneously evaluates the mass, the volume and the fuel consumption of the possible designs and obtains the optimal workable stack design according to the importance that the designer has given to each of the factors. "Aero-Marine DMFC Designer" provides the complete workable optimal preliminary design as solution of a DMFC that fulfils all designer requirements.

e-mail: oscar.santiago.carretero@upm.es

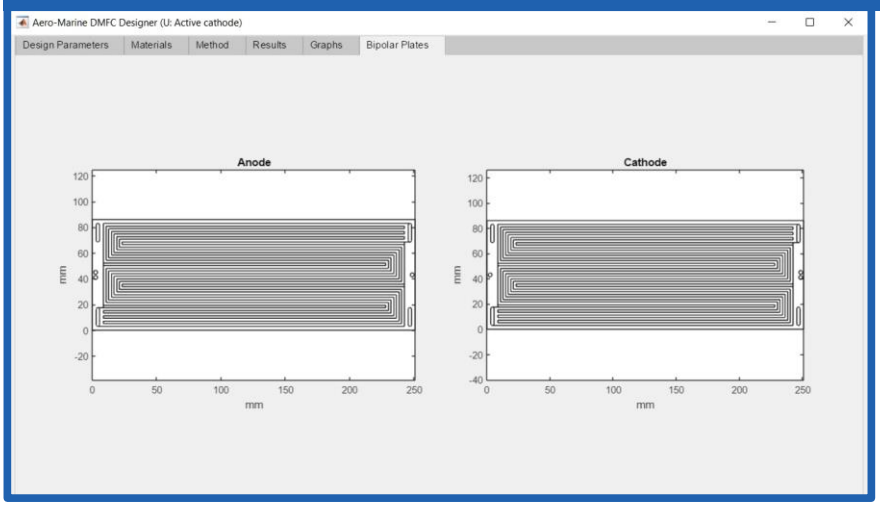
Aero-Marine DMFC Designer

SOFTWARE CAPABILITIES

This software is a very versatile tool that allows to analyze four different stack configurations, U and Z fluid dynamic configurations and open and closed cathode.
"Aero-Marine DMFC Designer" can work in a wide power range and obtain the optimal solutions in a few minutes, 3 – 10 min depending on the case. Thus, multiple tests can be carried out quickly.



SOFTWARE UTILITY



"Aero-Marine DMFC Designer" simplifies the design process of DMFC for portable and onboard applications, obtaining optimal preliminary designs on which to work in successive stages.
This tool aids engineers in the decision making process during the design and development of systems in which DMFC are included, such as aircrafts, ships, unmanned aerial vehicles, autonomous underwater vehicles…

FUTURE DEVELOPMENTS

The design software for the case of direct methanol fuel cells is already fully functional. Currently, we are including new features that also consider the storage of reactants. Similarly, we are working on implementing new fuels such as hydrogen and ethanol. In this way, it is expected to increase the software potential.

CREATORS

This software has been developed by O. Santiago, M. Aranda, M.A. Raso, T.J. Leo and E. Navarro within PiCoHiMA research group.

e-mail: oscar.santiago.carretero@upm.es