The bonding system selected is the bi-component paste adhesive LMB 6687-2 / LME 10449-4 from Huntsman Advanced Materials. This systems cures at 80 °C for 4 hours, allowing an acceleration of the curing process by a temperature increase. The heating method considered is induction heating, being flexible and efficient. The dominating effect to generate energy is based on the induction of Eddy currents on CFRP. Then, the energy is conducted to the adhesive. The energy generated depends on the magnetic field, controlled at the equipment by tuning the electrical current, the size of the area and the electrical conductivity of the susceptor.

The main approach to optimize the curing process consists on accelerating the process by increasing the curing temperature. However, this increase is limited by the void formation in the paste adhesive, which decreases the mechanical performance of the joint.

To deal with this limitation, the main hypothesis in this project considers that the degradation of the paste adhesive due to high temperatures is dependent on the degree of cure. Under this consideration, the paste adhesive would be more sensitive to high temperatures at the beginning of the curing process, where low temperatures should ideally be used.

COMSOL Multiphysics is the software used to simulate the behavior of the induction equipment. This tool allows calculating the theoretical degree of cure and void content of the adhesive after applying certain electrical current I(t) [A].

The program is divided in four modules: magnetic fields, heat transfer, kinetics of the chemical reaction and kinetics of the thermal degradation of the paste adhesive.

The void formation measured in 26 samples is 1.48 ± 0.47 %, always with a degree of cure over 95 %.

Finally, the process is applied to a real aircraft part, the aileron of the Dornier 228. The parts are bonded with the optimal curing process and the bondlines are validated by microscopy. The results show that all 21 bondlines have a void formation lower than 2 % and a degree of cure higher than 95 %.