

# COMPOSLEEVE

## Development of a composite sleeve for spatial separation of rotor and stator in an electric motor

### State of the art – Background

Due to electrical systems increase, in example landing gear, in future Aircraft, the need for more electrical power on board is envisioned.

But, the weight associated to electrical rotating machine increase can be a drawback for More Electric Aircraft (MEA) architectures. Consequently the rotating electrical machine manufacturers are looking for solutions to reduce the mass of these assemblies.

This brings to the need of innovative composite sleeve solutions to be developed to withstand the mechanical stresses and at the same time the harsh environmental operation conditions.

Indeed, currently, the usual metallic rotor and stator sleeve solution (for instance: Inconel 718) are being replaced by fibres reinforced composite sleeve, in several applications and markets, as well complex construction of plastic and metal sleeve go towards composite sleeve solutions.

### Objectives

The objectives of COMPOSLEEVE are:

- To find out the right materials and techniques for manufacturing a slim composite sleeve which is compliant with the constraints and requirements concerning pressure, temperature and chemical stability
- To carry out design activities (included material characterization) to get a design compliant with main constraints
- To manufacture 10 sleeves for testing
- To test the resulting sleeve, alone against the requirements ((pressure, heat) in initial state) and ((pressure, heat) in chemically aged conditions)

### Description of work

To accomplish the project objectives, the consortium assumes the responsibility for:

- The selection of the materials for the composite sleeve (resin, fiber ...)
- The selection of the detailed manufacturing process
- The Composite sleeve design
- The development of a manufacturing process for the sleeve
- The manufacturing of 10 prototypes for stand-alone tests
- The performing of test concerning the requirements (temp., pressure, chemical), fatigue and endurance
- The proposal of optimization of design, materials and manufacturing process concerning quality and cost
- A cost analysis (RC / NRC) concerning serial production

### Results

#### a) Timeline & main milestones

The project has been carried out in 20 months with main milestones related with:

Material and process selection

Test matrix definition

Material test campaign

Sleeve design and validation by analysis

Sleeve manufacturing

Test bench design and manufacturing

Sleeve testing on a pressure test bench

#### b) Environmental benefits

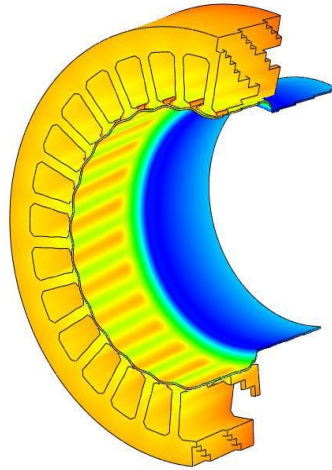
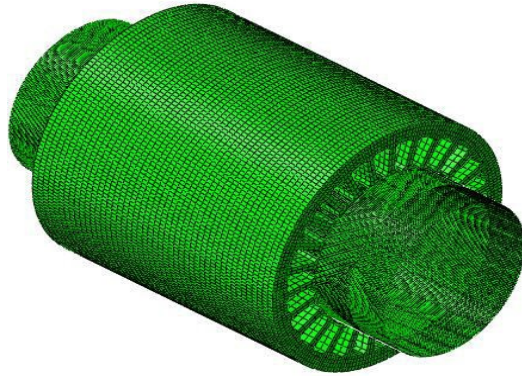
The environmental benefits of COMPOSLEEVE are related to the main CLEANSKY streams which are:

- Save weight
- Reduce fuel consumption
- Reduce CO<sub>2</sub> and NO<sub>x</sub> generation

Additionally, to contribute to the improvement of recyclability using reusable composite

c) Maturity of works performed

The work carried out in COMPOSLEEVE has been matured from TRL3 to TRL 5-. With the test to be carried out by Topic Manager in full motor test bench the sleeve will reach TRL5 ready to be introduced into a further tests to TRL6.



## Project Summary

Acronym: COMPOSLEEVE

Name of proposal: Development of a composite sleeve for spatial separation of rotor and stator in an electric motor

Technical domain: Composite/Electrical Motor

Involved ITD: SYSTEMS

Grant Agreement: 641559

Instrument: Clean Sky JU

Total Cost: 298.808,77 €

Clean Sky contribution: 193.375,39 €

Call: SP1-JTI-CS-2013-03

Starting date: 01/10/2014

Ending date: 31/05/2016

Duration: 20 Months

Coordinator contact details: Angel Lagraña  
[angel.lagrana@eurecat.org](mailto:angel.lagrana@eurecat.org)  
Phone: +34935944700 / Mobile: +34648725077

Project Officer: Antonio Vecchio  
[Antonio.Vecchio@cleansky.eu](mailto:Antonio.Vecchio@cleansky.eu)

Participating members  
EURECAT TECHNOLOGY CENTRE – Barcelona - Spain  
AIRBORNE TECHNOLOGY CENTRE – The Hague – The Netherlands  
AMADE-University of Girona – Girona - Spain