Manufacturing Processes for Products made of Composites or Engineered Metallic Materials

ECOGEL-CRONOS: High productivity manufacturing process of composite parts based on zero emissions fast curing coatings and heated moulds

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Introduction

The **ECOGEL CRONOS project** aims to the development of an **ecological and innovative coating for composite parts which may be able to eliminate the styrene emissions from the workplace**.

Additionally, this type of coating will deliver improved production performance in terms of quality and dramatic reduction of associated operational costs which currently burden the progress of composite materials worldwide. Very much like the painting industry changed in the 1950's to the use of dry powders in order to replace existing liquid paints; the liquid gel coats used in the composites industry may be replaced likewise with a proper dry powder technology.

This project is meant to prove this fact as well as providing the tools to implement this novel material into a real production of composite parts. The combination of new developments in efficiently heated tools, mould design and reinforced preforms with this ecological coating will provide an excellent platform to modernizing current composites manufacturing technologies.

Aim of the Project

ECOGEL CRONOS project aims to develop an innovative and high productivity **Resin transfer Moulding** (RTM) process by means of the use of

I. fast curing "zero VOCs emissions" powder gel coats and
II. electrically conductive hot skin mould technologies based on laminates made of carbon-fiber- plastics (CFP laminates) to mass production parts for automotive and goods transport sector.

Different **resin modifications** will be done to:

I. improve developed powder gel-coat adhesion to different resins such as epoxy or vinylester,
II. to develop conductive gel-coats and
III. to improve the thermal resistance (up to 200ºC during long time) of the epoxy resins using in the manufacture of hot skins.

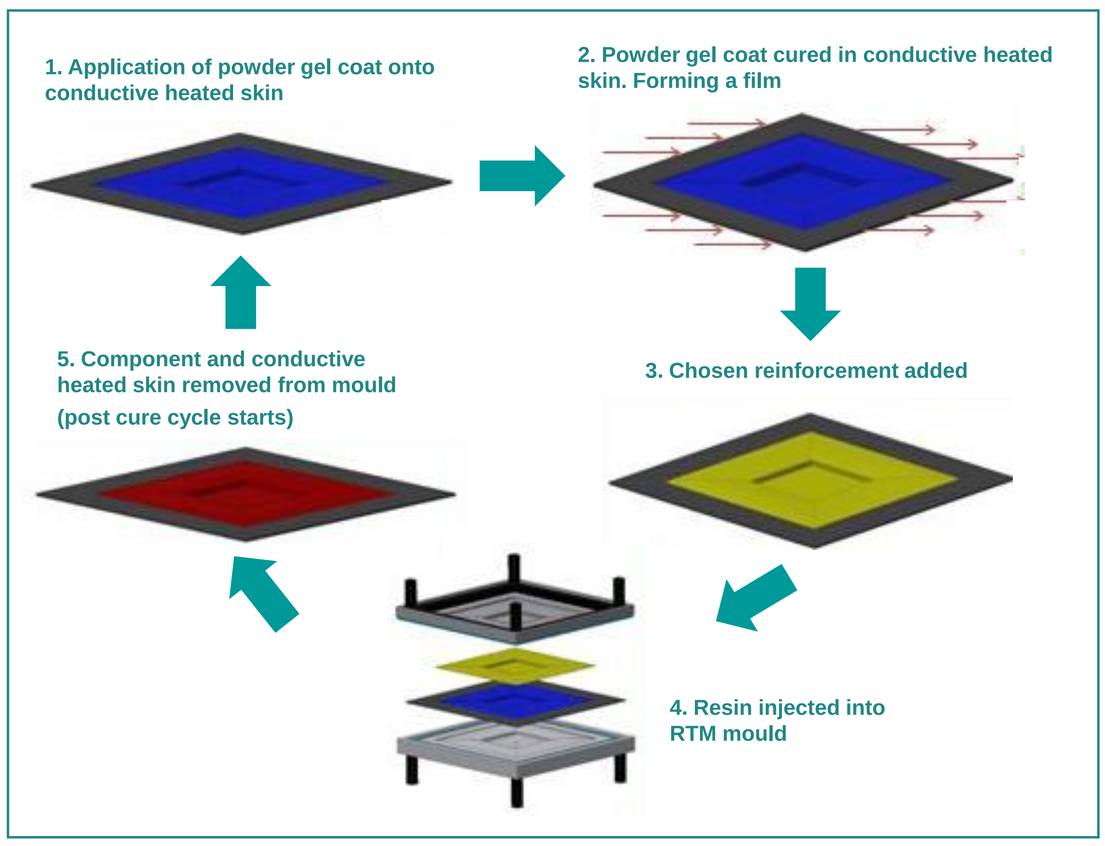
Two products, representatives of the advantages of this new production line, will be developed within the project as demonstrators: a **fully finished truck part and a composite automotive part ready for E-coating bath painting treatment.**

Powder gel coat

The first step in the development of the powder gel coat has been the **formulation of a powder resin system**. Different systems have been developed within the project and combined with the suitable additives in order to obtain highly reactive, stable, cost-effective and suitable for case studies requirements powder gel coat formulations. Modeling tasks has been employed to determine the electrical conductivity threshold in the formulations of electrically conductive powder gel coat. Promising results have been obtained with good results regarding gel time, storage stability, electrical conductivity and temperature to film formation.

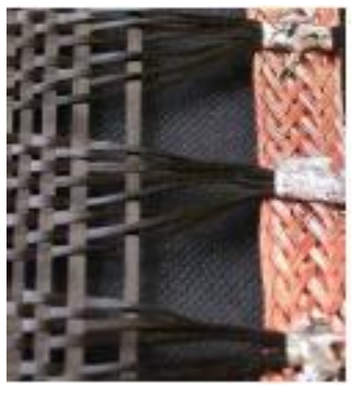
Resin Transfer Moulding Process

The use of innovative powder gel coat in the RTM production is only possible if new moulding technologies are developed. The proposed RTM process consist on the introduction of replaceable/reusable electrically conductive temperature controlled skins that can be prepared off line. This allows the release agent, gel coat and fibre to be applied to the skin whilst another one is being injected. In this way it is possible to increase production for a relatively small additional investment compared to RTM tooling. The skin design should include an electrically conductive surface and heated systems to fully optimise production allowing the introduction of powder gel coat in the RTM production.



Carbon Fibre as Resistive Heating Element

The system described comprises of an interwoven mesh of carbon fibres which have an electrical current and voltage applied to them such that they act as resistance heating elements. This then forms a heated skin which can be dropped into a standard RTM process along with a preform and injected with a resin in the usual manner.



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