

## Resultatredovisning industriförankrade utvecklings- och förprojekt

Projekttitel	Diarienummer	Projektledare Organisation	Halvtids redovisning *	Slut redovisning
KOMASS TPK	2014-005062	Swerea IVF		

\* Gäller ej förprojekt

### B. Resultatredovisning , förprojekt

#### 1. Konkreta tekniska resultat

*Vilka resultat har erhållits i form av demonstratorer, tekniker, processer, tjänster etc?*

#### Preface

KOMASS TPK is a prestudy in cost efficient mass production of advanced thermoplastic composites made by preformed glass rowing in thermoplastic matrix. The project is funded by a joint call from the Swedish Energy Agency (Energimyndigheten) and LIGHTer the Swedish multisectorial light weight arena.

The ambition with this prestudy is to in an early phase investigate the potential, evaluate first tests and simple demonstrators, exchange knowledge as well as establish interest with potential partners for a full project application.

Partners in the project are Swerea IVF, Plastal and Swerea SICOMP.

#### Summary

The intention of this prestudy is to create early opportunities for mass producing high quality reinforced thermoplastic composites i.e. to enlarge the competitiveness and use of relatively cheap commodity plastics by improving the structural properties. This will enable light weight, strong and relatively inexpensive composites e.g. for automotive, construction and transportation industries. The composites are based on consolidated oriented and preformed glass rowing in thermoplastic matrix and the performs contributes with continuous glass fiber tows, adding strength and stiffness in desired directions. The project results verify the potential of the concept and seem very interesting for further research and development.

A study of published LCA analysis considering material, manufacturing and part application was made. The impact on greenhouse gasses (per part or weight) based on manufacturing and use phase was evaluated. The analysis show that the injection moulding process has a lower environmental impact (kg CO<sub>2</sub>/kg manufactured parts) compared to many traditional composite manufacturing techniques. A comparison on parts made of polypropylene and glass fibers versus metallic automotive parts was also performed considering use and it was found that the composites have a great potential in reducing the greenhouse gasses per part and that the compared with especially steel but also aluminum.

There are several types of performing techniques used for composites are based on textile manufacturing like knitting, weaving, stitching and braiding. The bonding and the fiber direction is very relevant for the composite potential. In this prestudy the consolidated glass rowing is difficult to form very narrow loops. Therefore the bonding could be made by a traditional glass fiber in a leno weave, knitted structures or stitching where the aim is to bond the flat consolidated fibers in a

strong network. Other forming techniques were also identified where the consolidation material is heated up to melting point during forming and when cooled the reinforcement structure remains its shapes.

Mechanical evaluation with consolidated fibers injection moulded in dog bone specimens show a great potential to increase the load at break and stiffness. In the demonstrator part the reinforcement was formed as a loop with a heated gun, placed around two 3D printed plastic discs. Three loops were used in each demonstrator. The increase of the loop compared without reinforcements were an increase in strength with 2 times and energy absorbance 5-10 times. These gains in performance can make this technique very competitive.

Early simulation in the prestudy performed with linear material models are not working properly and do not correspond to the real tests. Modeling with Plastals refined version (non-linear model) show a good correlation between simulation results and mechanical testing. The model can predict strength but cannot predict failure.

A workshop with potential partners for a full application was performed 10th June at Swerea IVF where the results in the prestudy were presented and suggestion for further research and development discussed.

## Milestones

	Milestones	Results	Fulfilled
M1	Concept ready for high speed manufacturing of polypropylene thermoplastic composites with preformed and polypropylene consolidated glass rowing	Performed and the results are reported within this report	✓
M2	Concept evaluated with respect to material, manufacturing and strength on a simple demonstrator in laboratory environment and with limited simulation studies	Performed and the results are reported within this report	✓
M3	Potential partners identified and an idea for further research application	Potential partners are identified and invited to workshop. A discussion of the content in the future project was made at the workshop. The work for application will be intensified after the end of	✓

		summer vacation.	
M4	Result dissemination to primarily construction, automotive, transport industry but also to aerospace through already established networks and channels	Dissemination is performed through open invitation to workshop and two publications within Swerea IVFs newspaper Teknik och Tillväxt	✓

## Leveranser

The deliverables are performed within this study except for Moldflow simulation that was planned but could not be met. The results within the project are although so interesting and the effect from traditional weld lines in injection moulded parts decreased with this consolidated fiber loop.

### 2. Fortsättningsprojekt

*På vilket sätt kommer projektet att utvecklas vidare i en större satsning eller annat program? Om det inte blir en fortsättning, förklara varför.*

Fortsättningen för KOMASS är osäker. En workshop genomfördes för att sprida information och kunskap om projektet och dess resultat. Resultaten togs väl emot och flera potentiella partners fanns närvarande och uttryckte sitt intresse. Ett fortsättningsprojekt planerades och flera företag deltog i arbetet. Arbetspaket och leveranser definierades. Projektansökan föll dock på ekonomiska frågor. Trots omfattande arbete med ansökan så samlade projektgruppen sammantaget in inkindarbete endast till delar av arbetet i det tänkta projektet och därtill ansåg sig flera av företagen vara i behov av att också få egna utbetalningar av forskningsmedel från Vinnova. Arbetet är relevant men forskningsaktörerna Swerea IVF och Swerea Sicom har inte fram till idag sett hur detta ska kunna lösas ännu.