Light Composite Solutions

The Crossfire-CMT vision for high throughput demands

March 2017

We are ….

The Strategic Partners to Samyang EP

- European affiliate of SAMYANG Corp, Korea
- Leader, fully integrated producer of Technical Engineering Plastics and Composite Laminates
- Leader, fully integrated developer and producer of Bio-sourced Plastics
- Holds 2 large R&D Centres worth of more than 400 Phd Researchers
- Make Tricap® in cooperation with Crossfire/CMT:
  - We are responsible of the Tricap® resin tuning and development to the final transformation needs
  - We are responsible of the Tricap@ laminates Marketing

Crossfire

cmt
swiss composite materials & technologies

Lightweight technology

- **Traditional Fabric Composites**
  - Autoclave; RTM; RIM; SMC; OOA, ……..
    - Low productive capacity = Low throughput
    - Labour intensive = high cost/part
    - Thermoset technology = NOT recyclable
    - Autoclave is mostly the only High Structural Technology

- **New Generation Fabric Composites**
  - Press Moulding
    - High repeatability and high productive capacity = High throughput
    - Robot intensive and fast cycles = low cost/part
    - Thermoplastic behaving = Recyclable
    - High Structural technology

New Generation technology

- **Crossfire/CMT are Specialists to take your idea and bring it to industrial**
  - **By tuning the whole process on:**
    - **your high throughput necessity**
    - **Your part target cost**
  - **By prototyping your parts and process**
    - **Initially on a small scale**
    - **Finally to the real scale**
  - **By offering you the process technology to adopt**
    - **To produce shaped parts**
    - **To produce structural panels without glues**

New Generation Technology

- Tricap@P
  - The Samyang EP unique Hybrid resin PREPREG
  - Stable at RT (no fridge storage) and very long shelf life
  - The lowest resin viscosity at molten stage = impregnation by capillarity
  - Mould technology at isothermal conditions (180-210°C)
  - Curing time of very few minutes depending on the part thickness
  - Stage B easy opportunity
  - Sandwich building easy opportunity
  - Mass colouring and Powder in Mould Coating
  - Functional films In Mould Coating
  - Thermoplastic over moulding

New Generation Technology

- Tricap@L
  - The Samyang EP unique Hybrid resin thermo formable laminate
  - Fully impregnated fabrics
    - Single or Multiplies
    - Any fabric design and orientation
  - Shapes in RT moulds after IR heating
  - Few seconds time shaping at relatively low pressure
    - The cheapest investment
    - The fastest throughput
  - Functional films in Mould Coating
  - Compounded Scraps over moulding
  - Recyclable

New Generation Technology

- **The cheapest Composites technology**
  - **The Highest fabric impregnation**
    - **» the highest mechanical properties**
    - **» The lowest RM weight**
  - **The Lowest Mould pressure conditions**
    - **» The lowest investment**
    - **» The lowest energy consumption**
  - **Sandwich instead of full laminate parts**
    - **» The lowest weight**
    - **» The lowest RM cost**
    - **» At equal moulding time and conditions**

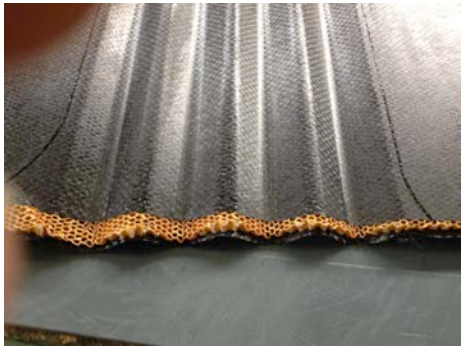
When Tricap®L ?

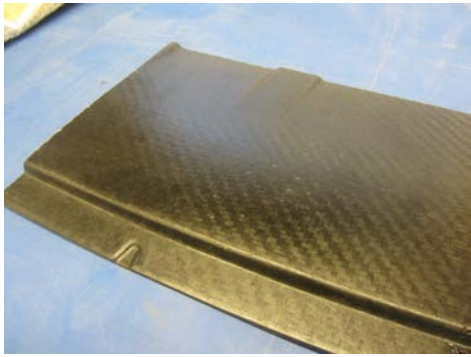
- **For a Steel like production :**
  - **Cut/Heat up/Press/… eventually Over Mould**
  - **More than 1 piece/min**
  - **Can dress up a Functional film**

Crossfire

cmt
swiss composite materials & technologies

When Tricap®P ?



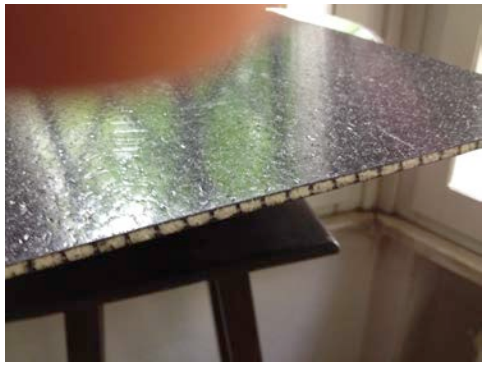


- For a Composite style production :
  - No size/layup limitation
    - From manual to robotic layup
  - Sandwich buildup without any glue usage
    - Variable section without core pre-cut
  - In Mould Insert addition without glues
  - In Mold Powder Coating
  - In Mould Functional films Coating

- To the "ready to assemble" part making !

When Tricap®P ?

- **For a Composite Structural Panel making:**
  - No Glue usage; the resin is the glue !
  - Various cores
    - PET foam
    - Aluminum HC
    - Paper HC
    - Polyester Non woven cores
    - Nomex
  - Various functional films
    - Si-PC for FR very high protection and no brake issues
    - Triel® elastomeric copoliesther for soft touch
    - PET for Gelcoat like surface
    - ……..



- **To the very light and thin Structural panels**

Crossfire

cmt
swiss composite materials & technologies

Fabrics

- Tricap®.. Laminates are feasible with:
  - Glass Fabric
    - Standards available
  - Carbon Fabric
    - On customer demand
  - Aramid Fabric
    - On customer demand
  - Basalt Fabric
    - On customer demand
- New Tricap®.. developments:
  - Natural fibres
  - Polyesther fibres

Functional films

- **Fire Resistance:**
  - Si-PC film from Samyang
- **Brake Resistance**
  - Si-PC film from Samyang
- **Soft touch**
  - Triel elastomeric Copoliester from Samyang
  - Polyester fabrics
- **Transparent, Coloured and UV resistant :**
  - PET films from Samyang

Crossfire

cmt
swiss composite materials & technologies

Powder Coating

- **In Mold Powder Coating Technology :**
  - From Frei Lacke
  - High aesthetic effect
  - High scratch resistance
  - Reacts and chemically bonds to Tricap®P while curing
  - Any colour is possible
  - Robotic application in a sequential process

Crossfire

cmt

swiss composite materials & technologies

Working together

- By NDA contracts
- We develop your Project from the idea to Pre-series
- We can propose you the industrial series parts supplier
- We could build up your Structural panels supply line
  - Standards and over standards
  - Tailored product definitions

- All in all: **Ideas turned into reality !**

Samyang Chemical Business Operations

cmt
swiss composite materials & technologies

Crossfire

Chemical Plants

Company
Main products

AMBU	Samyang Kasei	Samyang Innochem	Samnam Petrochemical	Huvis
>100,000 (MT/Y)	120,000 (MT/Y)	150,000 (MT/Y)	1,700,000 (MT/Y)	800,000 (MT/Y)
EP Plant (Jeonju) 40,000 (MT/Y)	Polycarbonate	BPA	TPA	PET
TPEE (Jeonju) 8,000 (MT/Y)				
EP Plant (Shanghai) 25,000 (MT/Y)				
EP Plant (Hungary) 15,000 (MT/Y)				
LFT (Korea) 5,000 (MT/Y)				
EP compounds & TPEE B/R				

Samyang Kasei

Samyang AM BU

Samyang R&D Center

Samyang EP (Korea, Jeonju)

Samyang EP (China)

Samyang EP (Hungary)

samyang

Samyang Chemical Business at a Glance

cmt
swiss composite materials & technologies

Crossfire

Oils

Crude Oil

Naphtha

Petrochem

BPA

Polycarbonate

SYIC

SYK

TPEE

Super EP

Composites

Bio-chemical

TPA

Polyester

SNC

Processing

Compound

SYC

Sophisticated Materials
- Smart Solutions
- Eco-friendly Material
- Materials for Light Vehicle
- High Performance Material

Fibers

Huvis

Indus. Fibers

SYC

PET Bottle

SYC

PET Recycle

SYC

samyang

Samyang R&D Center

- "always ahead in technology"

Crossfire Srl

via Corona 1, 48027 Solarolo (RA)
Italy

Swiss CMT

Bahnofstrasse 35, 8854 Siebnen
(CH)