Deliverable n°T.3.1.1

Bill of specification for non crimp fabrics
07/2019
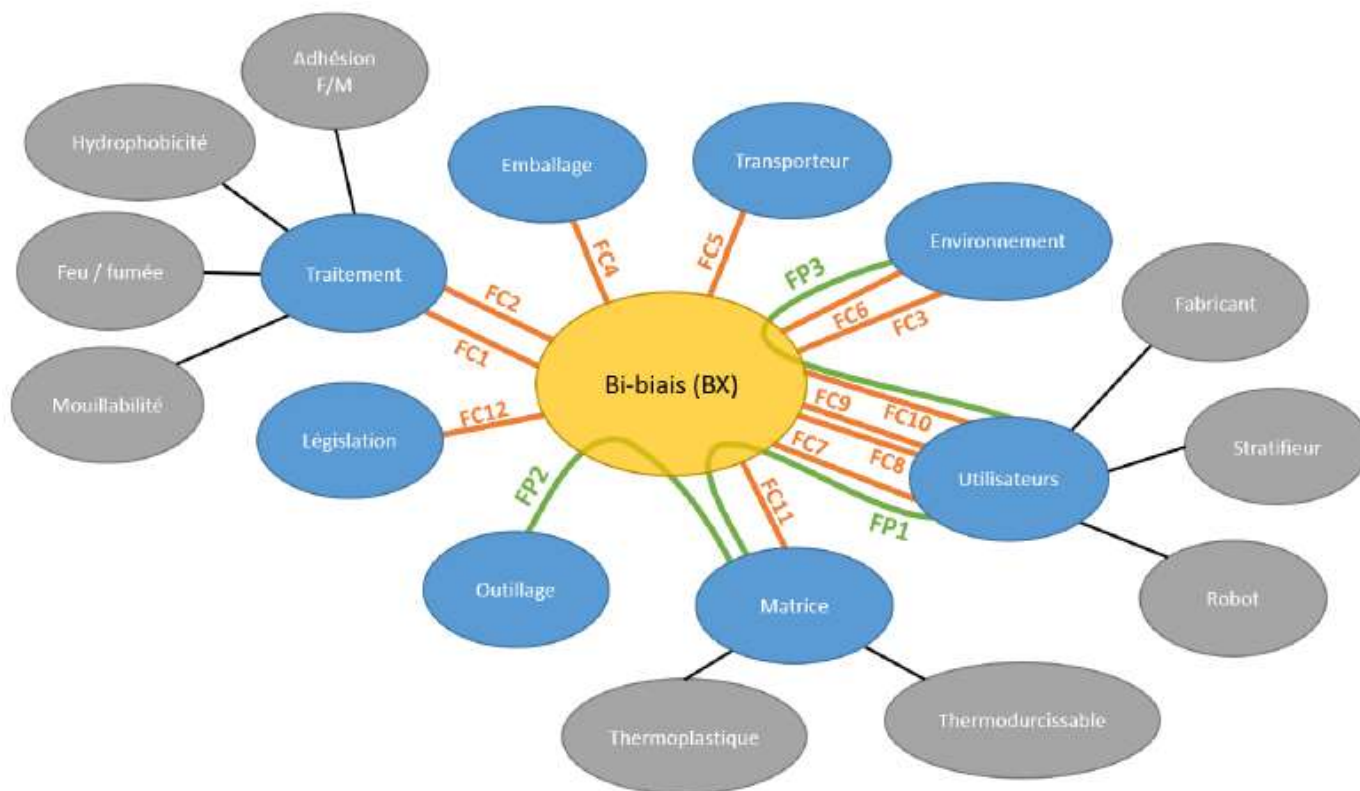
TVDC

Functional analysis

Principal functions	Description
FP1	Allow users to improve the properties of a matrix
FP2	Allow the use of existing tooling for implementation with a die
FP3	Enable the user to reduce his environmental footprint
Constraint functions	**Description**
FC1	Treatments must be able to be applied to the BX
FC2	Treatments must be compatible with BX
FC3	The BX must be able to be protected from its environment
FC4	The BX must not be degraded by the packaging
FC5	The BX must be transportable without degradation
FC6	The environmental impact of the BX must be modest
FC7	The BX must have no impact on the health of the user
FC8	The BX must be profitable for the user
FC9	The BX must be able to be manipulated by the user without degradation
FC10	The BX must have a good perceived value for the user
FC11	The BX must be compatible with the matrix
FC12	The BX must comply with the standards and legislation in force

SPECIFICATIONS

F0 = imperative and non-negotiable
F1 = necessary / negotiable
F2 = negotiable / low requirement

FUNCTIONAL SPECIFICATIONS				
Product: Bi-bias (BX) Reference: CdC_FLOWER_BX	Driver: Erwan GROSSMAN Date: 10/16/2018		Host: Davy Duriatti Index: 0	
Function	**Word group**	**Criteria**	**Level**	**Flex**
	Users	Stratifiers		
FP1: Allow users to improve the properties of a matrix	Improve properties	**Mechanics:**	**(Vf=35%)**	
		Composite UD tensile modulus	Min 20Gpa	F0
		Composite UD compression module	Min 20Gpa	F0
		UD composite tensile strength	200MPa	F0
		Compressive strength UD composite	100Mpa	F1
		UD composite tensile modulus 45° (G12)	To define	
		Composite strength UD plane shear	To define	
		Composite resistance BX plane shear	To define	F0
		Fiber volume rate	35%	
		Pore rate	Max Vv = 2%	F0
		Defrosting	0	F2
		Thread twist	< 20 turns/m	F0
		Reinforcement weight	Between 200 and 600 gsm	F1
			To be defined during the project	F2
		Vibration damping	< 10%	
		Relative humidity of the reinforcement	To be defined during the project	F0
		Impact resistance		
			50% at +45° and 50% at -45°	F0
			+/- 5°	F0
		Morphology:		
		Orientation of the fibers with respect to the warp	+/- 1°	F0
		Misalignment of flax wicks in the plane	+/- 4%	F0
		Out-of-plane flax roving misalignment	< 1mm	F1
		Weight variation in the fabric	max 1.2mm for 600gsm	F1
			Flat	F1

		Spacing between strands Thickness of BX (1 ply of impregnated BX) Section of the roving	max 5% of the grammage	F1 F3 F2

		Binding thread:
		Thread rate
		Materials:
		  Biobased
		  Thermoplastic
		
		Fatigue :
		Loss of UD tensile composite modulus
		Loss of composite modulus UD compression
		Loss of strength
		Loss of resistance composite UD compression
			To be defined during the project	

		Ageing: Sea water	caking max 2% (accelerated aging for 5 years)	F3
		UV Thermic	To be defined during the project	F3
	Matrix	**Thermoplastic**	PLA, PHA, PHB, PP, Elium, PA PCL	F1 F2
		Thermoset Exothermic peak	Polyester, Epoxy PFA, Acrodur Temperature max 30 min à 150°C	F0 F2 F0
FP2: **Allow the use of existing tools for implementation with a matrix**	Use existing tooling	**Width** **Drapability**: radius of curvature to pass with repositionable glue **Spacing of the wicks** during implementation	Between 100 and 300 cm Min 5mm No visible deformation under 1 bar	F0 F1 F1
	Implementation	**To impregnate, to permeate** : Permeability Wettability: high -> Vector AST Holding of the BX during impregnation Misalignment of the fibers with respect to the reference	To be defined during the project No separation of rovings or fibers +/- 1%	F1 F3 F1 F1
	Matrix	Thermoplastic	Idem FP1	FP1
		Thermoset	Idem FP1	FP1

FP3: Enable the user to reduce his environmental footprint	Users	Producer		
		Stratifier		
	Reduce environ mental footprint	See LCA criteria (FC6)	To quantify	
FC1: Treatments must be able to be applied to the BX	Treatments	Wettability (surface tension)	To be defined during the project	
		Fire / smoke	M1	F3
		Hydrophobicity	To be defined during the project	
		Fibre/matrix adhesion	To be defined during the project	
	Can be applied	To be defined during the project	To be defined during the project	
FC2: Treatments must be compatible with BX	Treatments	See FC1		
	Be compatible	Durability of the treatment	Min 6. months	F1
FC3: The BX must be able to be protected from its environment	Be protected	No degradation of performance. : • Mechanical • Drapability Relative humidity Duration	Degradation < 5% No degradation Between 8 and 10% > 6 months	F1 F1 F1 F0
	Environment	Humidity Temperature Dust	Unheated and non-temperature-controlled hangar Not dust regulated	F0 F0
FC4: The BX must not be degraded by the packaging	Be degraded	**Performance loss**: • Mechanical • Appearance • Drapability **Modification of the structure**: • Fiber alignment • NCF angles • … **Treatment efficacy**	To be defined during the project	
	Packaging	Film Cardboard		
FC5: The BX must be transportable without degradation	Be transportable			F0
	Degradation	See FC4		
FC6: The environmental	Environmen tal impact	LCA criteria : • Acidification • Eutrophisation	To be defined during the project	

impact of the BX must be modest		• Réchauffement global • ODP • Toxicité humaine • Oxydation photochimique • Energie non renouvelable • Consommation d'eau Taux de biosourcé	Min 95%	
	Modest	Modification compared to the values of the existing reinforcements	No increase 5% decrease	F0 F2
FC7: BX must not impact on the users' health	No impact on health	Rates of VOCs having a negative impact on health CMR rate Allergen Irritating	0% 0% No No	F0 F0 F0 F0
	User	Maker Laminator Warehouseman Final user	Null	F0 F0 F0 F0
FC8: The BX must be profitable for the user	Profitable	Purchase price Annual volumes	Max 20€/kg Cible 10€/kg Min 10000 m²/year (target : 16000 à 20000 m²)	F0 F2 F1
	User	Maker Laminator		
FC9: The BX must be able to be manipulated by the user without degradation	Manipulated	Moved Unrolled Draped Imbued	No visible modification of the BX	F1
	User	Maker Laminator Robot	Drapable with AFP robot	F0 F0 F3
	Degradation	See FC4		FC4
FC10: The BX must have a good perceived value for the user	Good perceived value	Morphology • Sewing thread: compliant appearance once the part has been implemented • Displacement of rovings in z (loops) • Disorientation in x and y (ripples)	To be defined during the project (prototypes) <1% <1%	
		Homogeneity of performances in time	Variation <5%	F0
	User	Maker Laminator Final user		
FC11:	Compatible	See FP2	To be defined during the project	FP2
	Matrix	See FP1		FP1

The BX must be compatible with the matrix				
FC12: The BX must comply with the standards and legislation in force	Respect Norms and legislation	Conformity rate	100%	F0