SHIMTEQ

NCF NEW PRODUCT APPLICABLE TO PRESS MOLDING SUCH AS CONTINUOUS COMPRESSION MOLDING

SHINDO IM COMPANY

Fig. 1 A fabric comprising a thermoplastic layer embedded between noncrimp fabric (NCF) layers.

ABSTRACT

Our noncrimp fabrics (NCFs) have been used for various products in the aerospace, marine, civil construction, and repair and reinforcement fields.

We are proud to present a new fabric comprising a thermoplastic nonwoven fabric or film embedded between NCF layers with stitch bonding. This type of fabric exhibits good drape properties, comparable to those of prepregs, and already contains a resin layer, thereby obsoleting the act of feeding resins after laminating the layers. The end user can obtain a mold after simply laminating the NCF-Resinply, followed by heating and pressurization.

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ABOUT US

Headquartered in Fukui, Japan, SHINDO IM Company is a global company premised on textile manufacturing. Current products of focus include noncrimp fabrics (NCFs), carbon-/glass-fiber-reinforced thin prepregs containing thermoplastic resins, and functional knitting textiles (flame-resistant and 3D fabrics).

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OUR CONTACT

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FEATURES

There are four features that characterize this new NCF-Resinply:

1. Design flexibility. 2. Grant drapability. 3. Labor economy during the molding process. 4. Stable molding quality (Fig. 2)

In terms of design flexibility, the product can be adapted to various specifications regarding material selection, layered structure, and stitch design. Also, a continuous fabric can be produced in machine direction (0°), transverse direction (90°), and diagonal direction (+30°–90°/ –30°–90°) that can be customized by the user.

Regarding the drape properties, the deformation characteristics of the material are facilitated by fabric-fiber reinforcement, appropriate resin selection, areal weight design, the use of a layered composition, and a suitable stitch-condition design. On the other hand, the product can also be adjusted as a material with shape stability against the load. The S–S diagram in Fig. 3, which shows the tensile properties of the NCF-Resinply material, demonstrates that the product exhibits drape properties and excellent deformation characteristics when used as an NCF. Furthermore, the material can be adjusted to an NCF prepreg for difficult deformations.

The time and labor economy of the molding process has been improved by making the insertion and lamination of a resin layer into the fabric layer unnecessary, as is the case for general NCFs. End users can make the molding by just laminating the NCF-Resinply on the mold after cutting the fabric followed by heating/pressurization. Because of this simplicity, the laminating time can be shortened by 40%–60% as compared to that required for unidirectional

FIGURES

Fig. 2 Product features

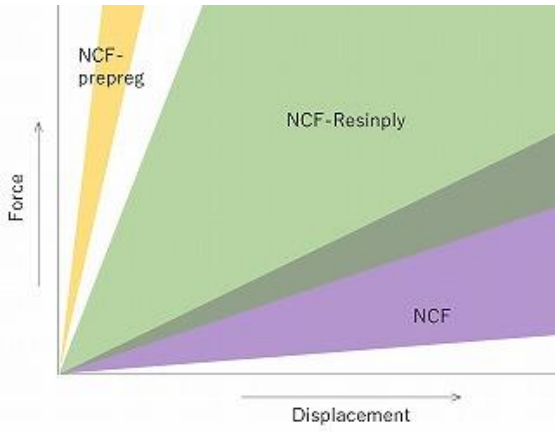

Fig. 3 S–S diagram of the material.

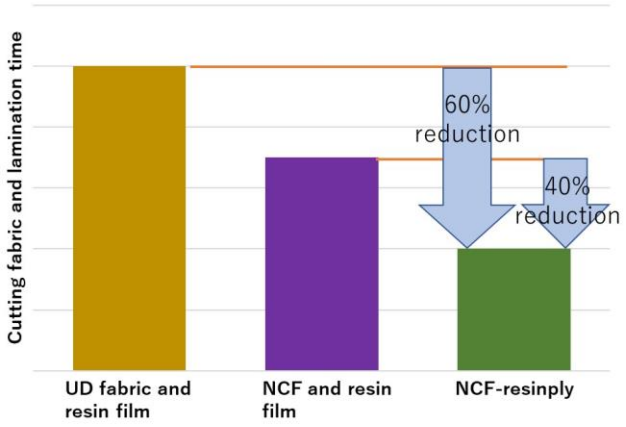

Fig. 4 Shortening the lamination time.

materials and general NCFs without using resin films, as shown in Fig. 4.

With respect to stable molding quality, NCF-Resinply is a material in which NCF (as reinforcing fibers) and resin sheets are integrated by stitch bonding. Therefore, it is possible to increase the fiber-orientation accuracy by reducing disturbances in the reinforcing-fiber orientation to a minimum due to resin flow after heating/pressurization. Because of this, the end users can realize a molding that has various physical properties, including strength and rigidity, in accordance with the required design.

DESIGN FLEXIBILITY

Our NCF-Resinply has many design possibilities that meet the customer's needs. These include the following:

◆Fiber selection

Carbon fiber, glass fiber, aramid fiber, etc.

◆Thermoplastic resin selection

Types of resin available are polyamide (PA), polyethylene (PE), polypropylene (PP), polyethylene terephthalate (PET), and so on.

Form of the resin: nonwoven fabric or film.

◆Areal weight

NCF layer areal weight: 75–300 g/m^2

Thermoplastic resin areal weight: total 20–400 g/m^2

◆Layered structure

NCF orientation angle: +30°–90°, –30°–90°, 0°

The thermoplastic resin layer is insertable within

FIGURES

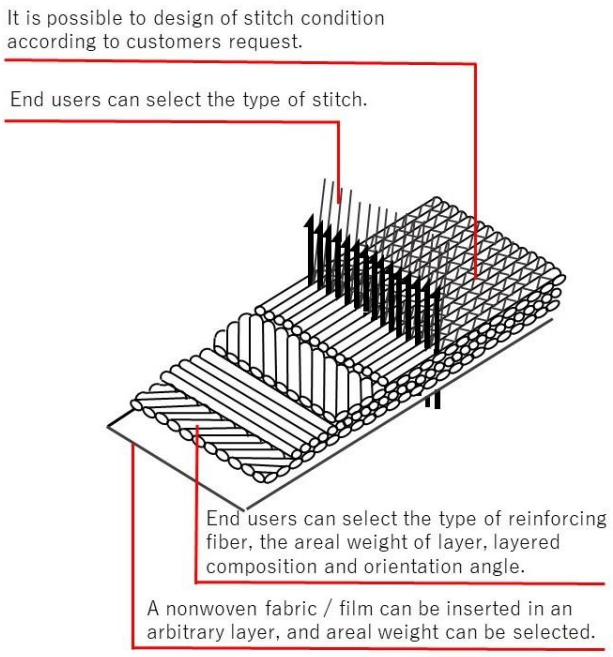

Fig. 5 Material design

any layer (but if a reinforcing fiber is inserted at 0° into the NCF, the thermoplastic resin layer will not be inserted into the upper layer of the 0° sheet).

◆Stitch selection

PET, PA, polyetherimide (PEI), glass fiber (GF), and so on.

◆Stitch design

The stitch pattern, stitch length, and stitch pitch can be customized in accordance with customer requests and applications.

APPLICATIONS

The new material has been studied for the continuous production of moldings with the same cross-sectional shape, but it can also be used for molding three-dimensional curved surface shapes.

Moreover, the material can be used in various fields because it has several desirable physical properties including mechanical stability, impact resistance, low water-absorption tendency, and heat resistance.

The reinforcing fibers of the NCF-Resinply material can be configured to a state of continuous fibers; therefore, it is possible to achieve a high strength development, speed up the molded-product cycle, and increase the toughness of the molded product by using a thermoplastic resin such that the resin layer will serve as a matrix. For this reason, it is expected that the material will be used in the aerospace and automotive fields, which require materials with such physical properties (including the parts for which a cost balance is required as well). In addition, considering the high corrosion resistance of NCFs, the product has also been

FIGURES

Fig. 6 Draping example for the same cross-sectional shape.

Reinforcing fiber	Layered composition	Areal weight [g/m²]
Carbon	(CF0° /PA6-NWF/CF90°)	(150/200/150)
	(CF+45° /PA6-NWF/CF-45°)	(150/200/150)
Glass	(GF0° /PP-NWF/GF90°)	(230/140/200)
	(GF+45° /PP-NWF/GF-45°)	(220/140/220)

※ NWF : Non Woven Fabric

Fig. 7 Specification examples for representative materials.

studied as an alternative for materials made of metals and concrete, which suffer from corrosion. There is concern about durability, or strength and rigidity is missing due to it composed only of resin in the fields of tubular structure is embed in the ground such as a drain pipe.

To enable NCF-Resinply to solve a wide variety of problems, we propose products according to the customers' requests. Please contact us if you have any questions or requests.