Van Wees is the only company in the world offering turn-key production lines for the manufacture of thermoset prepreg materials and the upstream equipment such as Creels and the downstream equipment like Crossply machines and lamination lines.

Our customers are producing thermoset prepreg material for a wide range of applications. From wind turbine components to aerospace applications.

Resin content, constant thickness over the width and perfect impregnation are important properties of prepreg materials. The heart of the Van Wees UD machines for thermoset prepregs is a reverse roller coater unit in combination with the patented three roller main drive. The reverse roller coater accurately and consistently applies (hotmelt) resin onto a carrier paper. The rollers are made with micrometres precision, which allows accurate control of the opening between the rollers at various speeds and temperatures.

Being a one step process, the spread fibers or fabric are married with the coated paper after our three roller main drive system. This system is configured in such way that yarn- or fabric tension is equal to the paper tension when they pass over the heated section. In the heated section, the resin viscosity will drop (in case of hotmelt systems) and impregnates the fibers. In the calandering steps, the final thickness and evenness is guaranteed in a smooth and reproducible manner.

A state of the art control system lets the user control speeds, temperatures, pressures and tensions in the machine very precisely. A wide array of sensors provides feedback to the control system. The operators can control the machine through an intuitive, touch panel user interface.

Van Wees UD-machines are customarily fitted with thickness measurement. It is possible to use these measurements in a feedback loop that controls the resin content.

To optimize the logistics of production the machines are fitted with a double winding unit with an accumulator unit for quick change over. Edge trim cutters and creels are other common options.

With a two positions unwinding unit for fabric the machine can just as easily be used to impregnate fabrics and make carbon, glass or aramid prepregs. All in all, the Van Wees UD-machine for prepreg production is a versatile piece of equipment. Its flexibility lets our customers respond timely to the demand from the market(s) they are producing for.
**The Carbon fiber creel** is a post development of the Glass roving creel. In that creel we noticed that flat yarns should be guided in a different manner, without eyelets. Van Wees has equipped the carbon fiber creel creel with these guidings and it shows good performance. In the accompanying photo it is shown how each yarn follows the groove in which it was placed from a larger groove. In this large groove, the yarn can follow its spooling pattern without twisting or falling over.

The spool holders are equipped with the Van Wees design spreaders that allow cardboard tubes with different sizes to be mounted. Standard is 75 till 94 millimeters, but also smaller tubes are possible, down to 50 millimeter. The spreader can be adjusted according to the operators wish in how it grips the cardboard tube. This accommodates easy doffing of the spools and especially the removal of the empty tube. Van Wees has already made thousands of spool holders for the ballistics industry where very large creels are used, with over 1000 positions per creel. Each row can be equipped with a hand wheel for the tensioning of that row. The springs that operate the brake belts are mounted on a rod over the entire length of the creel and the handwheel is fitted on that shaft. By rotating the hand wheel, the tension of the springs is released or increased, thereby influencing the yarn tension downwards or upwards. The Carbon creel can also be equipped with central adjustment for the entire creel by hand or a fully automated version with either row or central adjustment. We are most happy to explain in detail.

The modular method of building makes the configuration of the creel very flexible. The spool holders are mounted on a high pressure laminate (HPL). The HPL laminate is white for good visibility of the yarns. The color can be chosen different from white in case that is the preference. The way the yarns travel through the Creel can also be changed, if needed with exit of the yarns at the top of the creel. As mentioned above, the Carbon creel is also suitable for glass fibers and rovings which are spooled on cardboard tubes. The configuration will be the same and all options are open to choose from.

**Glass roving creel**

As mentioned above, another van Wees design is the Glass roving Creel. This Creel also has rotating positions for tangential unwinding of glass roving. In most cases and up till this development, the majority of the glass rovings were unwound from the inside of the package. If the roving package is stationary this introduces a twist in the yarn, every circumference. It is clear that for a lot of applications, this twist is not a problem. However, for high performance laminates, UD tapes or Multi-axial laminates, the twist is not preferred or downright undesirable.

The specially designed spool holders on this creel can hold 25 kilogram packages. The package holders have a wide expanding range (160 – 175 millimeters) to compensate for the variation in core diameter that occurs in the roving packages. In this creel also, great care is taken to guide the fragile yarns through the creel. With the Glass roving Creel it is possible to make a product from yarn packages that are originally not even made for rotary unwinding.
Van Wees has developed a tape placement robot for the production of thermoplastic tailored blanks. Using UD or Crossply tape (produced on a Van Wees UD and/or Crossply machines) the robot is capable of manufacturing multilayer tailored blanks with thermoplastic composite material. The robot carefully picks up the tapes, by means of vacuum. It then accurately places the tapes to assemble them into a tailored blank. The tapes are fixed with heat welded spots. The temporary bonding allows handling of the blank for further processing, consolidation and in a next step, compression molding. The small spot welds leave the blank with some drape ability so that it can follow the shape of the mold, in case the blank is placed in a heated mold directly.

Being a relatively low-cost system, a number of robots can be used to provide blanks for a fast production line. In that case the majority of the material can be assembled from two layer oriented material with dedicated angles. These tapes are made on a Multi-axial UD Crossply machine and cut to the desired width. Each position in the production line will have two or three robots which will place the tapes in a sequence. The tapes are fed with a transport system with enough capacity to supply material to a number of robots.

On the other side of the spectrum, one single robot is very flexible in producing many different shapes and sizes of blanks and ideally suited for first prototypes. The robot is very user friendly and installation can be done in under an hour.

Constructing the blanks from tapes also ensures minimal loss of material during production. The tape placing arm is equipped with a motor that changes the position of the vacuum cups and enables the picking of different lengths of tape. The straightforward robot system provides a reliable, robust production method. The temporary bonding of the tapes provides levels of accuracy and reproducibility far beyond what is possible when laying and spot welding tapes by hand.

Although it is not the best example we could find, the crash member in the photo is being made from Crossply tapes as a tailored blank. The Crossply panel was made with the UD tapes at such an angle that, after cutting the panel by waterjet, the resulting angles were oriented in the desired manner. In this case mainly lengthwise and some plies in the plus/minus 45 degree direction. A perfect example would be an open frame (for example a window frame) in which a lot of material would be wasted by the cutting of the opening. The thickness of the laminate can be built with tailored UD tapes with orientation as on the photo, being 0 – 90 degree.

The next step in using this robot system can be with thermoset prepreg tapes. This will require relatively dry prepregs but in principle it is possible. We have used prepreg UD tapes that are dry enough to be handled on our Multi-axial UD Crossply machine and such a prepreg would be a good candidate.

There are suppliers of equipment for weaving this tape on the market and the output of these machines is expected to be high. Although this is not typical for weaving, it can be with this combination. Instead of making a prepreg out of a fabric, by means of for example film impregnation, the prepreg is formed by the UD tapes.

The second sample we present is a panel made from UD tape chips. These chips are cut from residues of the tape slitting. These high performance chips are of course an ideal material for these panels. The performance of the panel is in its nature orthotropic and the thermo formability is expected to be high. We were surprised by the performance of these panels. In comparison with Crossply panels, the performance of the Chips panel was more than 50 % in bending stiffness and strength.

In the near future we will make a product for a small series sports car out of the Chips panel, in carbon fiber PA6.

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**Tape placement robot**

**in different form than UD and Crossply**

It is no surprise for you that we are focused on UD and Crossply technology. It is not only in our name, but also visible in our Research and Technology Center. We can make thermoplastic UD and Crossply tapes and cut them on our slitting machine in widths from 12 millimeters upwards.

To show the possibilities with thermoplastic tapes, we have woven a fabric sample by hand. The appearance of this fabric is well known in the market and the quality is good due to the fully impregnated tapes. It can be combined with UD and Crossply panels for the best performance and this fabric as the outer layers for its appearance.
New management at van Wees

Late October 2013, Van Wees joined forces with control systems specialist, Eltra Engineering in Tilburg, the Netherlands. Henk Klijn, director at Eltra engineering BV and Rien van den Aker have worked together nearly 20 years on the development of UD and Crossply machines. Eltra has been a reliable partner for van Wees and the open mindedness of the company has led to many innovative solutions. To mention one, the Crossply machines are equipped with camera systems controlling the position of individual UD yarns. By choosing different light sources, critical selection of the camera and software tuning, this challenge has been solved and it is used on multiple machines in the (ballistics) market.

RvdA: “The cooperation between Van Wees and Eltra began to feel like a symbiosis and to join forces in building and developing solutions for the composite industry is a logical step. Eltra and van Wees will be working together even more as a team. The production will be streamlined and response time will be shortened due to the larger resource of the combined manpower. The investment in van Wees is done by the owners of the company, Eltra and Van Wees will remain separate companies as they have been”.

Henk Klijn will take over the day to day management of the company and Rien van den Aker will concentrate on sales and Research and Development of the machines for the automation of composite processes. This will lead to even more interesting developments in UD and Crossply technology in the future.