equipment

In-house prepreg slitting: what to consider before buying a machine

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Owning a prepreg slitting and rewinding machine can be a game-changer for business. For end-users of composite prepreg slit tape, benefits include reducing material costs, time-to-market, MOQ issues for slitting services, improving internal capabilities and gaining flexibility with new prepregs. For prepreg material suppliers, in-house slitting capabilities can increase market access, provide higher-value services to customers and reduce barriers to trial new materials.

The Macedonian company, Mikrosam, offers most innovative and scalable machines for slitting composite prepregs to different widths and form factors, combined with an inspection system for traceability and error detection (Figure 1).

Understanding the process

Composite prepregs come in many formats, but the easiest and fastest to obtain are wide rolls from prepreg manufacturers. These original mother rolls can be 600 mm or more. The end-use of the prepreg depends on the machines: very narrow widths for AFPs or wider for ATLs. The format of the end-use can also vary:

Fig. 1: Prepreg slitting and rewinding machine

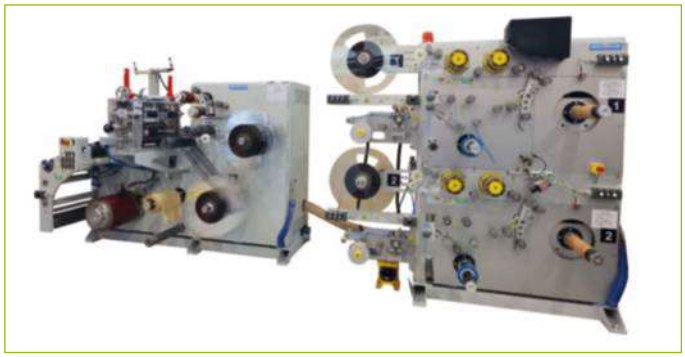

Fig. 2: Slitting cassettes

AFP machines require parallel format spools, some require cassettes (Figure 2); ATL machines require 50-, 75-, 150- or 300-mm wide spools with a release paper. Prepreg slitting and rewinding machines will cut the mother roll precisely into narrower widths for further processing and then rewind them on specific end-use spools, ready for the final application. This process can have at least 2 steps or more. Its organisation depends very much on the quantity demand, input material size and end-use formats.

Understanding production needs

Firstly, determine your monthly production quantities needed, the width and type of slit material, the end-use format. For example, if a material supply is needed for an AFP process, how many AFP-ready spools and what widths will it take? An intermediate step, in some cases, is the ability to supply prepared cassettes of slit composite prepregs for specific production needs or for intermediate storage. Finally, try to foresee the material demand growth, both for the company and customers.

Quality and precision

When evaluating potential machines, consider their ability to consistently produce uniform slit widths, to maintain tight tolerances, to minimise defects in the slitting process or to identify them from the mother spool. Mikrosam's machines provide proven

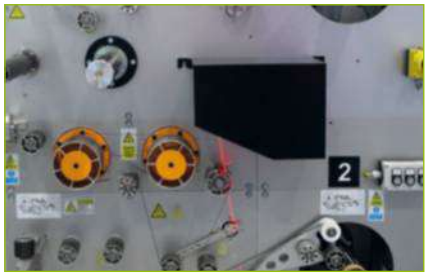

Fig. 3: Quality Control System with In-Process Layup Inspection System (IPLIS)

capability to precisely slit wide prepreg rolls to narrow rolls (i.e. to 300 mm or 150 mm wide) for more accurate slitting. The final step in the slitting process could be an AFP-ready spool slit down to 1/4"or 1/8" width with accuracy of +/-0.125 mm. To detect errors on slit tapes before they are rewound on spools, Mikrosam's slitting machines features a software solution: Quality Control System (QCS) with an integrated inspection system: In-Process Layup Inspection System (IPLIS) (Figure 3). IPLIS is used to detect a variety of errors, such as fuzz balls, twists, foreign objects, etc. The software monitors and records all production parameters and provides a historical overview and analysis of the slitting process giving the customer full traceability of each slit tape.

Material compatibility

Different types of prepreg materials have various characteristics, for example the kinds of fibres, resins or release foil. It is important to pick a slitting and rewinding machine that works well with the specific material you want to use. Check if the machine can handle the specific characteristics of your intended prepreg without damaging it. Mikrosam provides an in-house slitting service that is often used by customers to verify the process and review the slitting machine end-product. For instance, if you are planning on supplying material for an AFP machine, you will require a slitting and rewinding machine for UD prepreg slit tapes which has thickness ranges of 0.10 mm to 0.30 mm. The width of the mother roll and the end-use format will dictate the configuration and specification of the slitting system. Typically rolls of up to 320 mm wide can be precisely slit down to 1/8", 1/4", 1/2", 1", 2", for use with many AFP machines. These slit tapes can be wound directly onto AFP-ready spools with a parallel winding pattern, or onto cassettes as an intermediary step. Wider mother rolls that can be up to 1 m or 1.2 m wide require a pre-slitting unit that creates 2 or more child spools from 1 mother roll. The child spools are then fed into the precise slitting machine for narrow slitting. Mikrosam offers a variety of slitting solutions from wide to narrow (1,200 mm down to 1/4"), with a range of features to support specific materials.

Automation and efficiency

There are other important aspects to bear in mind: what operations are automated and easy for the operator; what configurations create capital efficiency. Ergonomics and ease of use play a key role in quickly reaching efficiency from an in-house slitting process. That includes how easy it is to load/unload material; how quickly you can splice material and maintain quality; how flexible the machine is for configuration; how long slitting cycles can last before cleaning and maintenance; how quickly you can replace consumable parts or adapt them for different widths, etc. For example, if material quantity needs are high, choose the One-Step Slitting Process machine. This means the child spool of up to 320 mm of material is slit and directly wound onto an AFP-ready spool. In such case, 12, 24 or 48 spools can be created in a single run with process speeds of 100 m/min. Mikrosam's machines have a fast spool fix system for quick replacement and fast exchangeable slitting modules. For smaller quantities, including R&D purposes, you should consider Mikrosam's Two-Step Slitting Process machines. In this case, the slitting and rewinding are separated into 2 units. One creates pre-slit cassettes which can be used or stored; another rewinds one or more cassettes onto the AFP-ready spool on demand. This means a lower upfront capital expenditures (CAPEX) for the buyer, and fast response to material demands without sacrificing quality. Furthermore, it allows the in-house process to scale-up production of slit-ready tapes with the addition of rewinder units.

Fig. 4: Spool (left); thermoset spool (right)

Operator training and support

How operators are trained and support provided by the manufacturer are also key factors. Make sure operators receive thorough training on how to use and maintain machines, follow safety rules and troubleshoot any issues. Mikrosam provides initial, additional and full training on operation and maintenance, conducted by its engineering and operator teams.

Total cost of ownership (TCO)

When buying a machine, it's not just about the initial cost, but also about all ongoing expenses, operators, maintenance, shifts, spare parts and how dependable it is in the long run. Looking at the TCO gives buyers a clear picture of what it will cost to own and use such machines.

Additionally, when bringing such an operation in-house, one must compare the TCO against costs of purchasing commercially available slit prepregs. The alternative to in-house slitting is usually to rely on third party slitting services. While this may provide consistent quality it may be inflexible on the quantity of material and the lead-times to obtain the material needed. In summary, bringing prepreg slitting operation in-house is not an easy decision but one with a definitive ROI for future composite business. Consider all the factors outlined here and how it may affect company growth. Mikrosam are always available to assist in case studies and share more information to make the decision easier. □

More information:
https://mikrosam.com/