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Latest inspection technology for flawless production of fiber composites

100% in-line inspection of composite materials for the highest process reliability and resource efficiency

Composite materials are playing an increasingly important role in numerous industries, and they are often used in safety-relevant areas such as aviation, the automotive industry, and in the construction of wind power plants. Thus the inspection of fiber-reinforced plastics is of crucial importance for manufacturers. State-of-the-art tools now enable a completely new level of quality assurance: In addition to the monitoring of raw materials (fabrics, roving) and epoxy resin coatings (pre-pregs), they ensure that the individual rovings/tapes are measured and inspected, while also determining the height of topological material defects in three dimensions. This significantly increases the range of applications and improves production monitoring considerably.

Increasing competitive pressure to ever higher quality standards means that the requirements are becoming ever greater for manufacturers of fiber-reinforced plastics and other composite materials, especially given that most of the products are used in applications with very high safety standards. End customers, such as in the aviation and automotive industries, require their suppliers to have all materials certified, which is why the quality produced must be fully recorded and documented. Camera-based, all-in-one inspection solutions ensure that composite materials are reliably inspected at high resolutions. The new systems can be deployed and integrated in a

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targeted fashion, even in highly specialized manufacturing processes, while covering all customer-specific requirements.

Complete inspection and quality documentation in roving/tape production

In the manufacturing of rovings/tapes, where a large amount of windings are produced right next to each other simultaneously, the inspection system monitors the individual rovings/tapes with extremely high accuracy. All relevant defects are detected and classified in real time. This enables the machine operator to take corrective action and eliminate defects, thus significantly increasing the share of usable product. In the production of rovings/tapes, the system is able to measure and evaluate each roving's/tape's width, as well as detect split or protruding filaments. The system creates a defects log for each individual spool, thus ensuring 100% inspection and quality documentation. Comprehensive tools for statistical evaluations enable additional conclusions to be made regarding the manufacturing process, helping to optimize production lines – saving time, costs and resources.

3D height measurement and synthetic resin inspection for flawless production

One of the new and unique methods for surface inspection of fiber-reinforced plastics and composite materials is the 3D height measurement of loosely attached fibers, defects and foreign particles in material lines in topological expression. The defect height serves as an important criterion for the exact classification of material defects. Damaged areas are fully measured in three dimensions via the 3D sensor (z sensor) to ensure that height-relevant defects can be precisely distinguished from other defects, such as holes, weaving

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defects, or contamination. This is particularly important for detecting “fuzz balls” (fiber bundles) located on the surface of the materials. Another remarkable feature is the inspection of synthetic resin on pre-preg (pre-impregnated) materials. During the inspection of synthetic resins, cameras are used to inspect the uniform and complete epoxy resin coating of the material. By doing so, the system also inspects the functional properties of the material.

100% in-line inspection for all process stages

Unwanted metal particles can also be reliably detected by integrating metal detectors into the inspection systems. The latest inspection technology has also been upgraded with several other tools. For example, offline recipe optimization now makes it possible to improve the inspection recipe based on recorded video, independent of ongoing operations. This allows for worldwide compliance of the highest quality standards with minimum reject rates, particularly for production on different lines and for frequently changing production orders and quality settings.

With these new features, the inspection systems will become an indispensable tool for achieving the highest level of production efficiency and transparency, ensuring top quality for end customers. The highly sophisticated imaging analysis algorithms provide users with comprehensive evaluation options in real time. This is made possible by the state-of-the-art camera and lighting systems, which detect even the smallest and lowest-contrast defects in all process stages.

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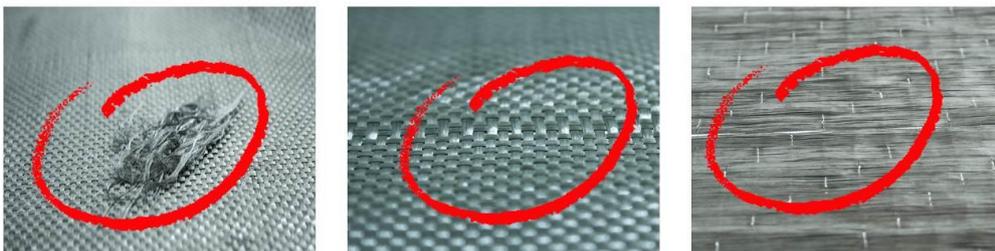
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Efficient use of resources thanks to customized data reports

All data, such as the classification of defects, is archived for evaluation and subsequent analyses, including fault images. Customized reports support users in avoiding defects, reducing reject rates, and minimizing costs – a decisive factor in the efficient use of resources. In addition to data analysis, the system is equipped with an interface for the higher-level software architecture ^EPROMI (Enterprise PROduction Management Intelligence). Thanks to the vertical and horizontal data integration, ^EPROMI enables data from various lines or even different plants to be displayed and analyzed across the company in a comparable fashion.

Images



680_1:

For the highest production efficiency: Reliable detection of loosely attached fibers (fuzz balls) in fiber-reinforced plastics and additional 3D height measurement in topological expression.

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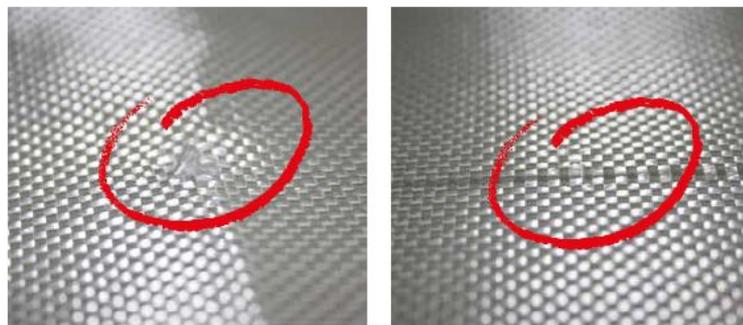
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680_2: ISRA's high-performance cameras for 100% inspection and monitoring of epoxy resin coatings.



Images 680_3a: Typical defects on fiber composites are detected, classified and visualized for the user in real time.

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