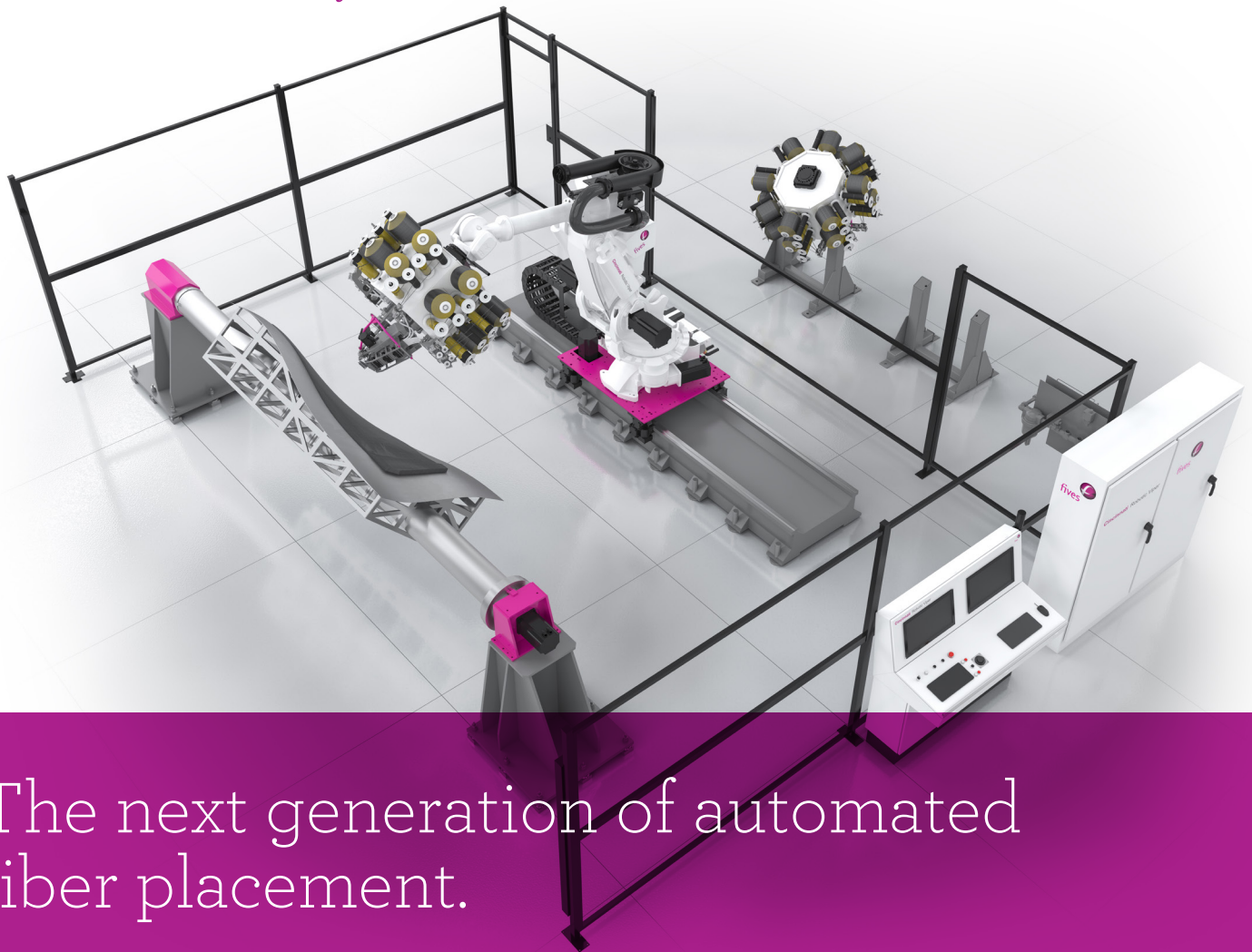


Cincinnati Robotic Viper

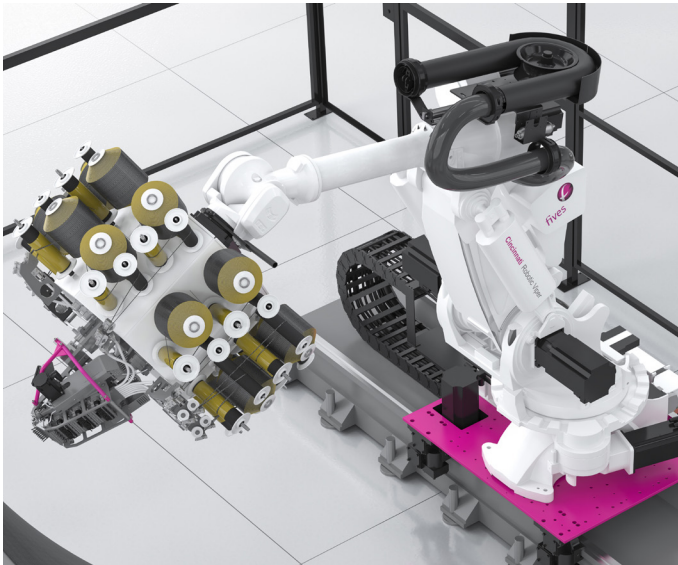
Fiber Placement Systems



The next generation of automated fiber placement.

- High Reliability Cut/Add Mechanisms
- Accuracy at High Laydown Rates
- Modular Design
- Designed to be backward compatible to previous generation Viper AFP Systems
- In-Process Inspection System

Lower price point without sacrificing the quality, accuracy and reliability of renowned Fives composite equipment.



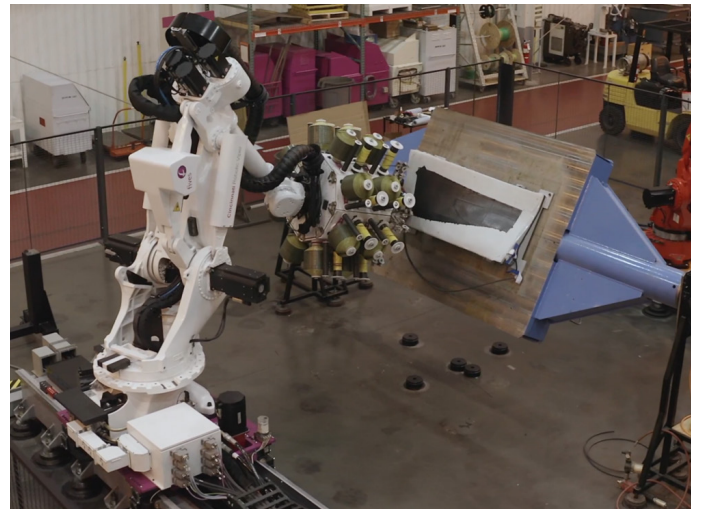
MACHINE PLATFORMS

- Vertical Gantries, Moving Column, Robotic Arm
 - Fixed and Docking Creel designs
 - Fixed Tool, Rotating Mandrel
 - Modular Head Design
 - Multiple Material Widths
 - 1/8", 1/4", 1/2"
 - Multiple Material Types
 - UD Carbon, Glass & Kevlar Epoxies, BMI, Out of Auto Clave, Dry Fiber

TESTING AND PROVE-OUT PLATFORM

- New Feature Capabilities Fully Validated on Test Vehicle at Fives Cincinnati Facility
- Latest Head Technologies to be delivered for all Future AFP Systems
- Head Designed to be backward compatible to previous generation Viper AFP Systems

Functions	Sub-functions	Specifications	
Overall Capability	Material size	Width	3.2mm, 6.4mm, 12.7mm (1/8", 1/4", 1/2")
		Number of Tows	4-16 (increments of 4)
	Mail Types	Prepeg (tow/slit tape)	Yes
Application	Creel	Dry fiber	Yes
		Head docking	Yes
		Material size	75mm (3") core ID x 335mm (8.5") OD x 300mm (12") long
Tow Feed/CCR	Add/Restart	Spool weight	2.7 - 7.0kg (6-15.4lbs)
		On the fly speed	1.0 m/sec
	Cut	On the fly speed	1.0 m/sec
		Minimum tow length	95mm
Performance	Clamp	On the fly speed	1.0 m/sec
	Accuracy	End of tow	+/- 2.0mm throughout velocity range
	Laying	Feedrate	up to 1.0 m/sec
CAM Software		Program and Simulation Software	ACES
Miscellaneous	Part Probing	Contact or not contact	Yes
	Ultrasonic trimming	Docking Unit/separate from AFP head	Yes - Optional Equipment
	Process vision	Video	Yes
	Inspection	Fives in Process Inspection (IPI) System	Yes - Optional Equipment
		Integrated OLT Inspection System	Yes - Optional Equipment



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