

Carbon Fiber Composite Technology

Praxair Surface Technologies' ultra-light laser engraved ceramic anilox rolls represent the latest technology in high-performance press components for the printing industry. Intended as a direct replacement for OEM anilox rolls, these high-performance rolls are designed to equal or better the original equipment specifications of rolls from the press manufacturer. In fact, there is no visible difference between these carbon-fiber composite rolls, and a steel laser engraved ceramic anilox roll. However, the similarities stop there.

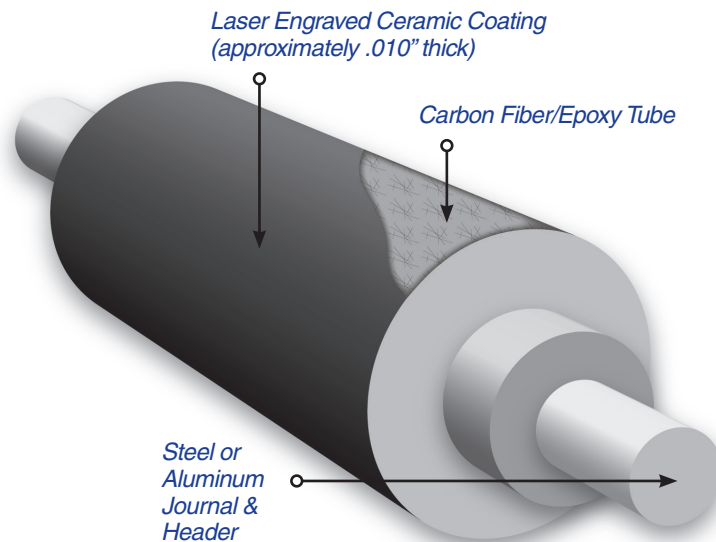
Constructed of advanced carbon-fiber composite material, these anilox rolls are 40 to 90% lighter than are their steel counterparts, but are stiffer and more stable. Yet, even with these advantages, they are coated with the same durable ceramic coating, and laser engraved to the same wide range of screen angles and densities the industry has embraced for steel laser engraved ceramic anilox rolls.

Construction of composite rolls begins by fabricating a strong lightweight tube. High strength carbon fiber strands coated with molten high-performance resin are wound around a mandrel to form the tube. The strength of the fiber strand material itself, the angles used for winding, and the tube's wall thickness, are custom designed to minimize deflection over the length of the completed tube. After winding, the resin and fiber are cured in a high-temperature chamber to produce a rigid, lightweight, composite tube.

The journals are next mated to the composite tube. These are available in a variety of material choices. Carbon steel may be utilized, as well as stainless steel or aluminum. Journals may be matched to OEM specifications, or custom designed to further minimize weight. The selected journals are bonded to the ends of the carbon-fiber composite tube with a high bond strength epoxy formulated for joining composite structures. The method of attaching the journals completely encloses the ends of the composite tube wall to protect the edges that may otherwise become vulnerable to damage during handling.

same coating used on Praxair Surface Technologies' steel rolls. Bond strengths of the coating to the composite surface are in excess of 3,000 PSI. The coating is then laser engraved to the screen angle and density required for a specific application.

The result is a rigid, lightweight roll that exhibits less deflection over the span between its journals than an equivalently sized steel roll. The weight savings eases handling and reduces vibration at high web speeds. The improved stiffness has the potential to provide more uniform contact between



Praxair Surface Technologies has developed the technology that next allows the application of chromium oxide ceramic wear-resistant coating to the composite roll assembly. This is the

the anilox roll and the plate over the entire length of the roll - a characteristic that maintains a more consistent print density across the web.

Carbon-fiber composite laser engraved ceramic rolls for narrow web applications are so light they can frequently be handled by one person. In wide web sizes, these lightweight rolls make roll changes safer and easier. In both narrow web and wide web applications, the reduced mass of these rolls means faster press startup and shut down, allows increased web speed, and promises longer life for bearings, bushings, and journals.

In the end, these Praxair Surface Technologies' high-performance composite anilox rolls remain completely compatible with their steel counterparts. The journal material and engraved ceramic surface that are exposed to the operating environment are the same as steel rolls; only the roll's weight and stiffness have been changed for the better.

Comparison of Key Characteristics of Steel vs. Composite 5.8" x 49.5" rolls (65.6" overall Length including Journals)

Characteristic	Carbon Fiber Composite Roll	Steel Roll
Weight	48 lbs.	268 lbs.
Deflection (no load)	Less than 0.0001"	0.00025"
Deflection (2 lbs./linear in. load)	0.0003"	0.0004"
Static Inertia (I) (in4)	25.3	43.4
Dynamic Inertia (lb-in4)	147	1244

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