

## Menges Roller Company Presents:



# Carbon Fiber Rollers

- High strength and rigidity means less deflection across the roll face.
- Less deflection = faster web speeds, better web alignment.
- Lower weight = smaller drives, less startup inertia and less wear on bearings
- Faster speeds - because the lower weight results in increased critical speeds
- Supporting technical data on the reverse side of this sheet

*We are proud of the fact that we handle all facets of roller production in our plant in Wauconda, Illinois and we are always looking for new and better ways to serve our customers. I feel the carbon fiber roller, used as an idler or coupled with one of our proven rubber coverings, offers an alternative to steel and aluminum cores that can provide significant advantages in certain applications, particularly when weight and inertia are important considerations.*

*MATT MENGES*

Menges Roller is a full-service roller company serving both end use customers and O.E.M.s. Our machinery department makes cores to 60" in diameter and 30' in length. We manufacture a complete line of idlers and web spacers, and we rubber cover in all elastomers available today. We service the following industries with pride: Converting; Paper; Film; Foil; Packaging; Printing, steel and aluminum; and a variety of other industrial product applications.



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# Physical Advantages of Carbon Fiber Rollers



Carbon Fiber materials, developed for aerospace applications, are gaining increased acceptance in industrial roller applications because of their reduced weight and inertia, and high relative stiffness. Looking at the chart below you can see that for a 3.5 inch diameter roller with a 74 inch face length, quarter inch wall, that the carbon fiber roll weighs about 20% of what a comparably dimensioned steel roll would weigh, and 58% of what an aluminum roll weighs. This reduced mass results in reduce bearing loads, which increases bearing life and therefore reduces maintenance costs. In addition, ease of maintenance is increased as large rolls can be handled by a single man without crane support.

Carbon fibers are manufactured of two types of material: PAN (polyacrylonitrile) fibers and pitch-based fibers. Each type has its own advantages. The PAN carbon fiber has about 50% higher ultimate strength than the pitch-based fiber roll, but the pitch-based fiber roll has a Modulus of Elasticity approaching that of steel, resulting in less roll deflection. The carbon fiber roll can have as little as 35% of the deflection of an aluminum roll.

The reduced weight also results in higher resonant frequencies. By the chart below, the pitch-based carbon fiber roll has a resonant frequency twice as high as a steel roll, resulting in the potential of twice the processing line speed. The reduced weight also results in a reduced mass moment of inertia. By the chart below the carbon fiber roll has about a fifth of the mass inertia of a steel roll. This means it will take one fifth of the torque to accelerate the roll to line speed and one fifth the energy, resulting in reduced operating costs.

## EXAMPLE: IDLER ROLL - 3.5" diameter - .25" wall - 74" face length - internal bearings web width 74" - wrap angle 180° - web tension 1 PLI

Material	Modulus of Elasticity lbs/in <sup>2</sup>	Density lbs/in <sup>3</sup>	Area Moment of Inertia in <sup>4</sup>	Weight lbs	Mass Moment of Inertia lbs x in <sup>2</sup>	Natural Frequency Hz	Critical Speed ft/min	Deflection in
Steel	30,000,000	0.283	3.3901	53.46	142.0389	66.9	3678	0.0038
Aluminum	10,000,000	0.098	3.3901	18.51	49.1866	65.6	3607	0.0115
PAN Carbon Fiber	16,000,000	0.057	3.3901	10.77	28.6085	108.9	5988	0.0072
Pitch Carbon Fiber	28,000,000	0.063	3.3901	11.9	31.62	137	7533	0.0041