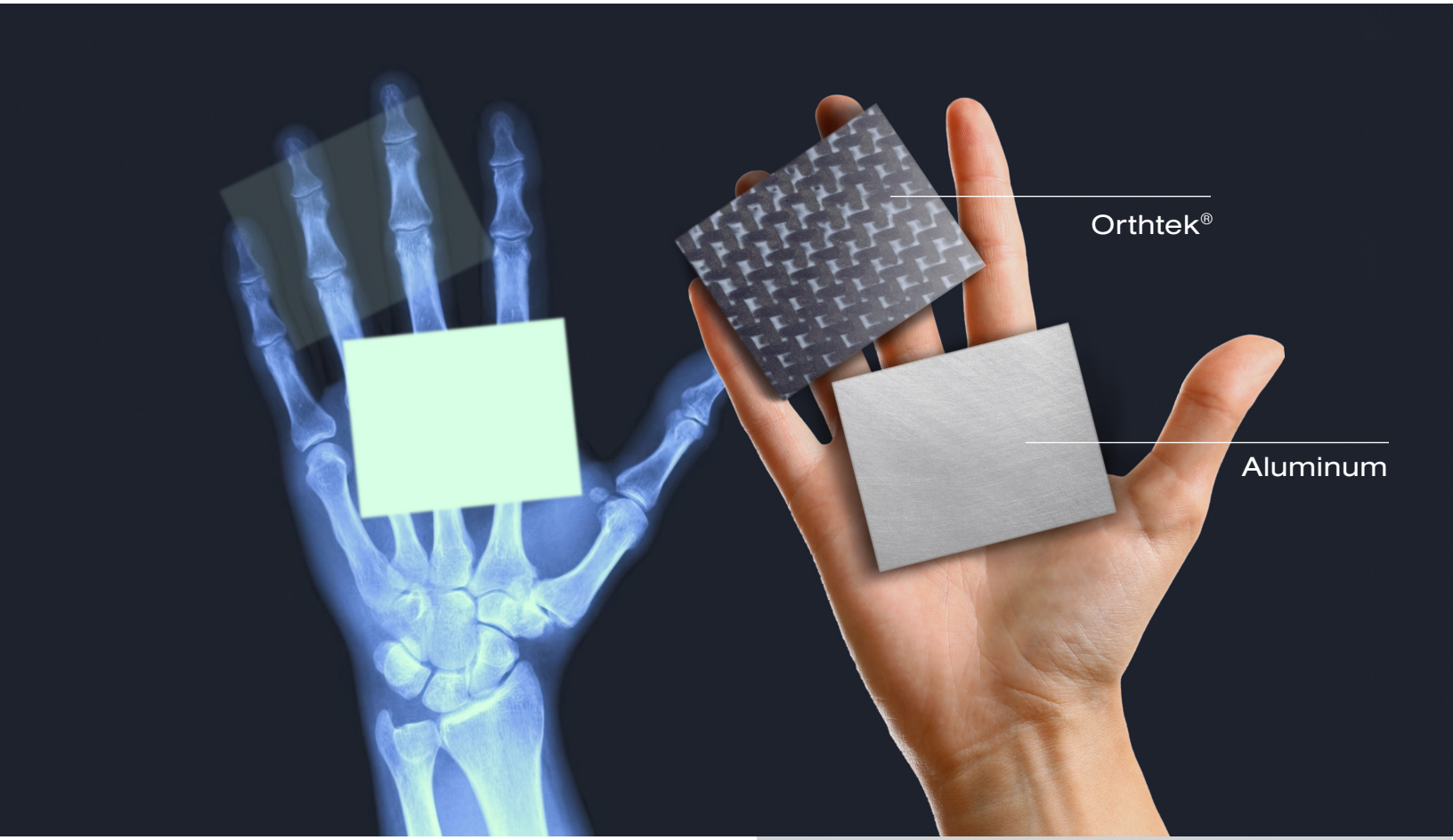
# MEDICAL COMPOSITES

## Lightweight Radiolucent Materials

Precision-molded thermoplastic components made from carbon-fiber-based composite materials for orthopedic applications




## RADIOLUCENT MATERIALS

Greene Tweed offers precision-molded thermoplastic components made from several carbon-fiber-based composite materials for orthopedic applications requiring transparency to x-rays (radiolucency). These materials offer high-strength, precision tolerances and stability after repeated sterilization autoclave cycles, making them ideal for a range of surgical instruments, from nail guides to retractors.

With a superior strength to weight ratio when compared to metals, Orthtek® components are radiolucent, whereas metallics are opaque.

## FEATURES AND BENEFITS

- Radiolucent properties provide transparency to x-rays
- High-strength and stiffness properties ensures instruments perform reliably in surgical environments
- Lightweight components reduce physician fatigue during lengthy surgical procedures
- Resistance to repeated sterilization ensures dimensional stability is maintained after multiple autoclave cycles
- Exceptional corrosion resistance allows components to withstand the harsh chemicals used during the sterilization process
- Low water absorption helps maintain original physical properties of the component

## ORTHTEK® WF

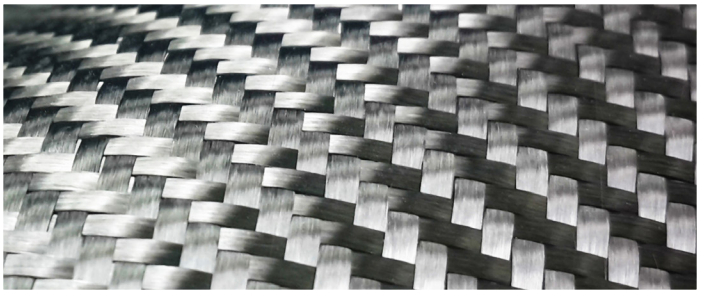
Improved equipment and lower level radiation requirements have increased the use of x-ray technology for surgical procedures and medical treatment. Traditionally, metals such as aluminum, stainless steel, and titanium have been used for structural components in the medical industry.

Many applications require the rigidity of metals and cannot use unreinforced thermoplastics. Orthtek® structures are radiolucent and provide the necessary mechanical performance for structures used in surgical equipment and devices.

These materials provide mechanical properties competitive with metals and are much lighter, resulting in superior strength to weight.

Orthtek® composites are engineered using selective carbon fiber reinforcements and thermoplastic polymers to achieve maximum strength and toughness for applications such as nail guides and x-ray cassettes.

Orthtek components are formed by stacking and molding unidirectional or fabric plies which have been preimpregnated with a thermoplastic polymer matrix. Ply directions are designed to orient reinforcement fibers and achieve desired performance requirements.

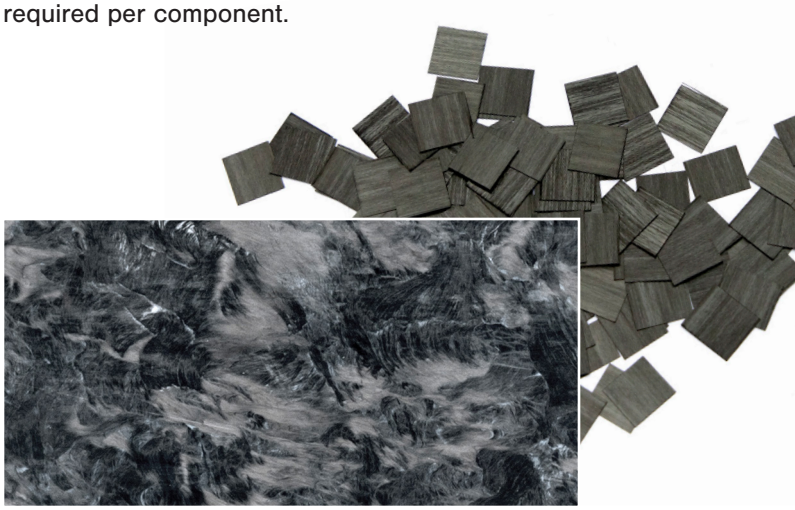


Bi-directional woven carbon fiber

## XYCOMP® DLF

Xycomp® DLF® is a lightweight thermoplastic composite developed to replace complex-shape metal medical tools including nail guides, fixators, retractors and others. With outstanding fatigue, vibration, and impact resistance, it provides up to 60 percent weight savings to help with tool ergonomics and user fatigue while providing exceptional performance.

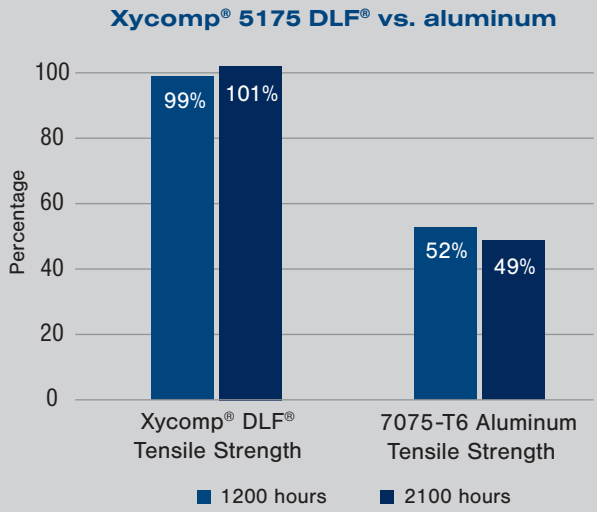
Xycomp® DLF® is produced from aerospace-grade, carbon-fiber-reinforced, unidirectional prepreg tape which is chopped into flakes, resulting in high fiber content (70% by weight), longer fibers (0.5 in./13 mm or greater), and a high degree of material control. Flakes are matched-die compression molded in a proprietary process called ProFusion, enabling the production of 3D shapes with variable wall thickness and molded-in features such as fasteners, inserts, and ribs. The benefits of this molding technique include the consolidation of complex assemblies into fewer parts, and the optimization of raw material required per component.



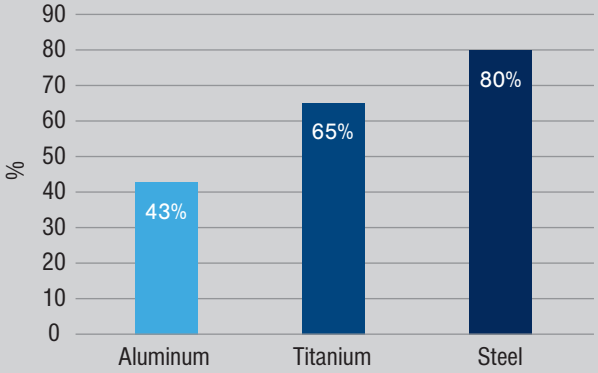
Xycomp® DLF® chopped flakes

### Thermal aging performance vs. aluminum

% Retention of properties after thermal aging at 350°F (177°C)

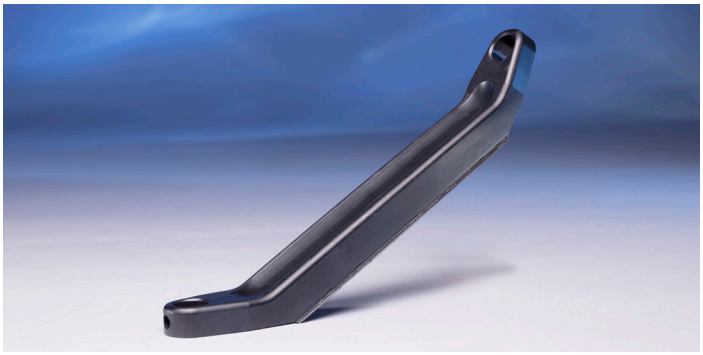



### Density reduction vs. metal for weight savings



## ARLON® 1260

Arlon® 1260 is a carbon-fiber-reinforced version of Arlon® 1000 and has the highest modulus, tensile strength, and shear of all the Arlon® grades. Designers often select Arlon® 1260 when they require a low coefficient of thermal expansion. Arlon® 1260 provides chemical resistance, economic strength to weight ratio, dimensional stability, and injection molding processing approach, allowing for high volume parts.



Universal Screw Guides

## MATERIAL COMPARISON

| Typical Properties | Orthtek® WF | Xycomp® DLF® | Arlon® 1260 |
|---|---|---|---|
| Fiber type | Carbon | Carbon | Carbon |
| Fiber Structure | Continuous woven | Discontinuous chopped | Random short |
| Fiber Orientation | X,Y [2d] | x,y,z [3d] | x,y,z [3d] |
| Fiber Content (By Volume) | 50% | 60% | 30% |
| Tensile Strength (Psi/Mpa) | 91,000/627 | 39,500/272 | 33,400/230 |
| Flexural Modulus (Psi/Gpa) | 7,000,000/48.3 | 5,600,000/38.6 | 2,800,000/19.3 |
| Density (G/Cc) | 1.54 | 1.61 | 1.41 |
| Color | Black | Black | Black |
| **Molding Method*** | **Compression** | **Compression** | **Injection molded** |
| Radiolucency | Yes | Yes | Yes |
| Autoclavable | Yes | Yes | Yes |
| Typical Applications | Nail Guides, External Fixators, Plate Guides, Retractors, and others | Nail Guides, External Fixators, Plate Guides, Retractors, and others | Retractors, external fixators, and medical components |

*Mechanical properties of fiber-reinforced injection molded, and extruded parts are measured in the direction of flow fibers generally tend to align in the direction of flow, resulting in properties significantly higher in this direct to the transverse direction. Fiber in compression-molded parts is more randomly oriented; therefore, mechanical properties are generally the same in all directions.

## CONCLUSION

Greene Tweed has a variety of materials, design resources, and process capabilities to offer a tailored, light-weight, non-metallic solution capable of withstanding the rigorous and demanding environment of operating rooms. Our Medical Composite line of products provides unique benefits, such as molded-in features and radiolucency, while looking like they belong on the next generation Lamborghini.



MEDICAL COMPOSITE PRODUCTS



**Contact Greene Tweed today** to learn more about how our Medical Composites can replace metal components in your application today.

Greene Tweed

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