

## 4.22 Continuous Fiber Composite for Use in Gears

**Statement:** Lightweight material brings strength and durability to complex shapes.

**Problem:** Conventional methods of using discontinuous fiber composites for forming complex shapes can produce defects, including a tendency toward weakness and fatigue at the cut ends of the fibers.

**Solution:** Novel technology uses multiple layers of formable continuous fiber composite material, eliminating the cut ends that form a potential site for failure, as well as filler materials between plies.

**Technology description:** The novel method uses three approaches. The first approach is applicable to gears that are planar in shape and have a single hub and a single rim. The thickness variation is accomplished using multiple layers of continuous fiber composite material formed to specific shapes and separated by filler materials. The second approach is using multiple layers of continuous fiber composite material in the shape of a solid of revolution. The third approach is a power transfer assembly made by combining approaches one and two.

**Benefits:**

- Lightweight -- Approximately 20 percent lighter than steel.
- Durable -- Offers high cycle fatigue resistance.
- High power density -- Features lower material density combined with high specific strength as compared to steel.
- Customizable -- Can be used to fabricate structures of complex shapes, and strength and stiffness can be selected and controlled.
- Quiet -- Can be designed to reduce vibration in gears and other moving components.

**Areas of application:** The technology can be used where weight and noise reduction is required, and manufacturing costs should be lowered.

- Drive systems in land vehicles.
- Construction machinery.
- Wind turbines.