

An aerial photograph of a white wind turbine standing in a field. The field is characterized by numerous concentric, circular furrows in the soil, creating a ripple-like pattern. The turbine is positioned in the lower right quadrant of the frame. The overall color palette is warm, dominated by golden-brown and tan tones from the soil and the turbine's body.

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# RENEWABLE ENERGY:

FORGING CRITICAL COMPONENTS  
TO FIGHT CLIMATE CHANGE

As the global community seeks to use more alternative energy, increasing volumes of highly reliable and durable forged components will be required. (Courtesy: Shutterstock)

*The availability of a wide range of forged components is helping to keep renewable energy projects on track and production reliable for the long-term.*

By DEL WILLIAMS

**T**he accelerated adoption of renewable energy plays a vital role in tackling climate change. In this endeavor, numerous clean, sustainable energy sources rely on essential forged components in turbines to reduce the emissions from fossil-fuel combustion contributing to global warming.

Whether wind, hydro, tidal, wave, current, geothermal, or biomass power, the process of converting energy often requires using turbines. The turbines, in turn, rely on components such as shafts, gears, and seamless rolled rings to capture, transmit, and amplify the mechanical motion necessary for power generation, according to Jeff Klein, director of sales for All Metals & Forge Group (AM&FG), an ISO 9001:2015 and AS9100D manufacturer of custom and standard open die forged parts and seamless rolled rings.

“Each of these forged components plays a critical role in the overall efficiency and reliability of the energy conversion process,” Klein said.

Open die forged parts and seamless rolled rings are used because they have superior properties and can endure the harsh environment and stresses present in these settings. Other factors can include exposure to high temperatures, salt water, and any abrasives in the air or water such as sand, dust, or dirt particles.

As the global community seeks to use more alternative energy, increasing volumes of highly reliable and durable forged components will be required. Until recently, acquiring many of these critical forged components could take a year or more due to shortages and bottlenecks in the supply chain, which could threaten the viability of a renewable energy project.

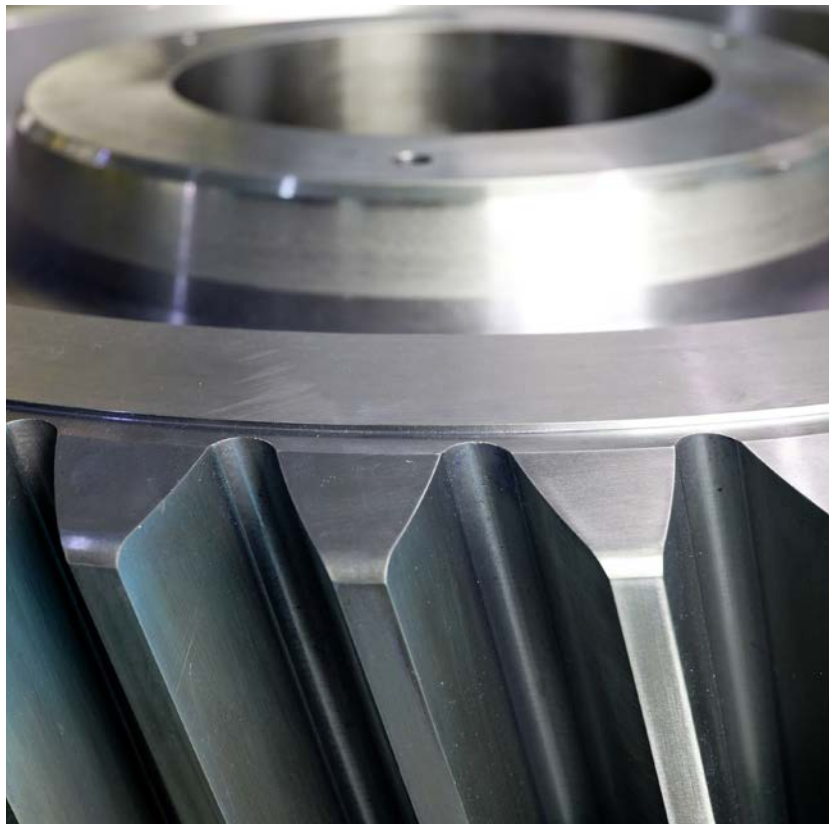
Now, leading forged part manufacturers have streamlined the process to less than two months for a wide range of durable custom-forged components, which helps to expedite project completion and lowers overall costs. The company produces a range of forged products that includes rings, discs, hubs, blocks, shafts (including step shafts or with flanges), sleeves, gear blanks, cylinders, flats, hexes, rounds, plates, and custom shapes. Carbon steel, alloy steel, stainless steel, nickel, titanium, and aluminum are among the materials used for forging. These

forgings meet rigorous industry specifications such as ASTM, AMS, AISI, ASME, SAE, GE, DIN, ASME B 16.5, ASME B16.47, and API 6A.

## ESSENTIAL FORGED COMPONENTS FOR RENEWABLE POWER

The conversion of energy into electricity often involves a similar grouping of forged parts. Turbines typically consist of several key components, including blades or paddles to capture energy from the moving wind or water, a forged rotor shaft to transmit the rotational motion, and forged gears to increase the rotational speed as necessary. Other custom forged shapes may also be required such as drive shafts, step shafts, flanges, and flanged shafts for turbine parts, as well as structural components.

To withstand the harsh environments in which they are used, open die forgings and seamless rolled rings are known for their strength and durability, and are less likely to crack or warp, which is ideal for critical components that require high tensile strength.



Top custom forgers have now reduced the production time for renewable energy components from over a year to less than two months. (Courtesy: All Metals & Forge, LLC)



Renewable energy conversion relies heavily on precision-forged components such as shafts, gears, and seamless rolled rings. (Courtesy: Shutterstock)

“Depending on the metal and alloy, the forged parts and rings are also resistant to thermal and chemical damage, which further extends longevity while reducing the need for maintenance, repair, and replacement,” Klein said.

Open die forging is ideal for providing large, custom parts. As an example, AM&FG can produce seamless rolled rings or contoured rolled rings up to 200 inches in outside diameter, and custom forgings up to 40 feet long or 80,000 pounds. The company, which has been manufacturing and selling open die forgings and seamless rolled rings for more than 50 years, can also produce forgings for drive and tending ends and large cylinders in diameters that cover the sizes

needed in the power-generation industry.

While open die forging is typically associated with larger, simpler-shaped parts such as bars or blanks, the process enables the creation of “custom-designed” metal components.

Open-die forging facilitates the production of seamless rolled rings and other components to exact specifications with optimized mechanical properties and structural integrity. The rings can be produced in a variety of alloys, sizes, and shapes specific to the requirements.

#### **RAMPING UP RENEWABLE ENERGY PRODUCTION**

As demand for renewable energy accelerates globally, there

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is a growing need for new power generation turbines built from forged components such as rings, shafts, and gears as well as replacement parts for turbines already in use.


While the procurement of required components often takes a considerable amount of time, from 20 weeks to as much as a year, AM&FG has its own production facilities with strategic expandable capacity to expedite the process. This enables the company to deliver many custom forgings in a timeframe of eight to 10 weeks. To minimize any potential project delays or production downtime for the industry, the company also strives to provide quotes within 48 hours.

Furthermore, to optimize efficiency and reduce costs, the company frequently provides near-net-shaped forged parts with more refined surface finishes. Surfaces are within 2mm of finished machined dimensions, with a 250 RMS surface finish. However, it can provide 125 RMS or finer drill holes, and do contour forgings as needed. The company can also finish machine parts to within  $\pm 0.001$  inch of drawing dimensions. Some forge shops only offer raw unmachined parts (RMS 500 or “as forged”). In contrast, for example, AM&FG produces a better surface finish, saving machine shop time and equipment wear and tear.

In addition, the company conducts ultrasonic testing at zero expense to the customer to guarantee the absence of internal cracks, pits, or voids. This instills the utmost confidence in the quality of the parts, according to Klein.

“In many cases, All Metals & Forge Group can offer ultrasonically tested parts that are more affordable than raw forged rings or components,” he said.

As the world grapples with the challenges of global warming and the expanding renewable energy sector, the demand for forged components is expected to increase significantly.

To meet demand, industry professionals that work with experienced forging operations will have ready access to the reliable, durable components they need to keep their renewable energy projects and production on track — and keep climate change in check. 

#### ABOUT THE AUTHOR

Del Williams is a technical writer based in Torrance, California. For more information, contact All Metals & Forge, LLC at 973-276-5000; Canada, 416-363-2244; toll-free, 800-600-9290; or go to [www.steelforge.com](http://www.steelforge.com).