A new process to forge high-power-density hollow shaft for power transmission will be presented. This process is based on a differential heating concept where the flow stress of a tubular billet is altered along the tube length. With the aid of FE simulations the feasibility of this process was assessed for an axle shaft and a pinion gear shaft. The assessment via FE was focused on material flow characteristics, forming loads and dimensional accuracy of the product, which was then followed by scaled down laboratory experiments for an axle shaft. Results of preliminary field trials on forging of hollow axle shaft carried out at Mid-West Forge will also be presented.