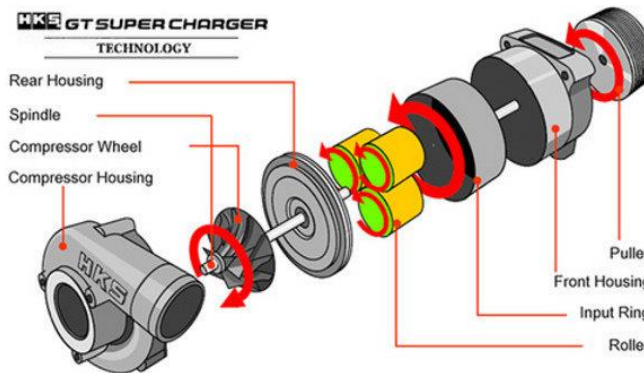


# WORK-ENERGY-POWER

Unit 10 & 11 Dr. John P. Cise

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& New York Times , January 29, 2016 by Tom Voelk

## Video Review: The New XF, a Jaguar Light on Its Feet



The **supercharger**, unlike the turbo, is driven by a belt, just like your alternator, which means **((it snaps some power from the engine in order to generate boost)))**. This is accepted as a small price to pay for the ultimate overall HP gain. Because of this fact, **superchargers are better suited to bigger engines (6 cylinder upwards)**. A big plus of a supercharger system is that it is not exposed to the heat issues of the turbo, and does not require the use of an intercooler. A **(( same size turbo will make more peak HP than the supercharger due to the power lost to actually turn the supercharger over.)))**

With a lighter, aluminum-based frame, the XF packs plenty of pep and torque, and with its 8-speed transmission, achieves reasonable fuel economy. BEFORE 2008, Jaguars with more than two doors had distinct designs as British as Highclere Castle. Then the XF arrived. Crisp and contemporary, it quickly became Jaguar's best-selling car. Now, for its second generation, it has taken the approach that less is more. On average, it is 200 pounds lighter. The old Ford-sourced steel platform is out, replaced by a **bonded and riveted aluminum platform under the body** drawn up by the designer Ian Callum. It's a lot of drama, offering a hint to the fun ahead. The R model tested surges with deep rich torque **from rest to 60 miles an hour in just six seconds**

**(jaguarusa.com says 0 – 60 in 5.7 s.)**with its **340-horsepower**, three-liter **((supercharged V6.))** If that disheartens, move up to the S model for 380 horses.

**INTRODUCTION:** The goal here is to use the power concept ( $P = W/t$ ) to confirm Jaguarusa.com stated weight of new 2016 Jaguar XF as 3891 lb. As is stated above this Jaguar XF has a HP of 340 HP and gets to 60 mph in 5.7 s (from Jaguar site). As is stated in the article this XF uses a supercharger (~ 37% efficient) to attain more power compared to a standard gasoline engine (~ 15 – 20 % efficient). Turbo charged engines are a bit more efficient (~ 40 % or more) for reasons stated above.  $X = \text{efficiency}$ ,  $X P = W/t = [1/2 m v^2]/t$  eq. 1, work(W) of engine goes into Kinetic energy ( $K = 1/2 m v^2$ ).

**HINTS:** 550 ft. lb./s = 1 HP, 60 mph = 88 ft./s.,  $wt = m g$ ,  $g = 32 \text{ ft./s}^2$

**QUESTIONS:** (a) Convert 340 HP to ft. lb./s.?, (b) Find mass of this car. At Jaguarusa.com the weight of this car is 3800 lb. (c) Supercharged cars are very efficient. Find efficiency X of car using power concept eq. 1 ?

**ANSWERS:** (a) 187,000 ft. lb./s., (b) ~ 118.75 slugs, (c) ~ 43.14 % Note: > 40% efficiency is expected for super charger engines.