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**Falco eMotors Pvt Ltd**  
***Learning Center of HVLS fans***  
***Power consumption and Efficiency***

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# Power Consumption and Efficiency

Many of the HVLS fan manufacturers provide with their motor and/or drive ratings. It becomes difficult for a customer to decide whether which one is best for them. So they go by numbers. But few companies might provide manipulated data; or data which is ideal only for their in-house company testing conditions. Customer might get misled with such data. Here is the easiest and most conventional way to evaluate and verify the power consumption of any motor. Let us assume that ratings of below two products are given.

# Power Consumption and Efficiency

Many of the HVLS fan manufacturers provide with their motor and/or drive ratings. It becomes

<b>Parameter</b>	<b>XYZ product</b>	<b>Epoch Product</b>
Power (Pin)	0.75 kW	1.1 kW
Torque (T)	340 Nm	110
Speed (N)	60 rpm	55 rpm

**Table. 1 Rated electrical parameters of any two random products**

# Power Consumption and Efficiency

$$P_{out} = T * \omega$$

Where, T = Torque (in Nm)

$\omega$  = Speed (in rad/sec)

Convert speed in rpm into rad/sec using,

$$\omega = \frac{2 * \pi * N}{60} \quad ; \text{ here } \pi = 3.14$$

# Power Consumption and Efficiency

According to the law of conservation of Energy/Power, output power can never be more than input power.

$$\text{Hence, } P_{\text{out}} < P_{\text{in}}. \quad \text{----- (1)}$$

Let us compare the power analysis for both products:

## 1. For XYZ Product:

$$\omega = \frac{2 * \pi * N}{60} = \frac{2 * 3.14 * 60}{60} = 6.28 \text{ rad/sec}$$

So, Power Output ( $P_{\text{out}}$ ) is given by,

$$P_{\text{out}} = T * \omega = 340 * 6.28 = 2135.2 \text{ W} = 2.135 \text{ kW} \quad \text{----- (2)}$$

$$\text{Given, } P_{\text{in}} = 0.75 \text{ kW} \quad \text{----- (3)}$$

Here,  $P_{\text{out}} > P_{\text{in}}$ , which cannot be true. Hence data provided by XYZ product is **FALSE**.

# Power Consumption and Efficiency

## 2. For Epoch Product:

$$\omega = \frac{2 * \pi * N}{60} = \frac{2 * 3.14 * 55}{60} = 5.756 \text{ rad/sec}$$

So, Power Output ( $P_{out}$ ) is given by,

$$P_{out} = T * \omega = 110 * 5.756 = 633.16 \text{ W} = 0.633 \text{ kW} \quad \text{----- (4)}$$

$$\text{Given, } P_{in} = 1.1 \text{ kW} \quad \text{----- (5)}$$

Here,  $P_{out} < P_{in}$ , which is true. Hence data provided by Epoch product is **TRUE** and acceptable.

# Power Consumption and Efficiency

There are some losses present in the system which cannot be eliminated, but can be reduced. In HVLS fan application, these losses can be Controller losses (switching & conduction losses etc), Motor losses (Core loss, Cu loss, Eddy current loss), Fan losses (Bearing & Frictional losses) and other environmental factors which contributes in loss. Due to this reason  $P_{out} \neq P_{in}$ .