TECH TALK:

by John Allison
EnviroSpec - www.envirospec.com

FIGURING HORSEPOWER REQUIREMENTS

The first thing you need to know is how to determine how much horsepower you will need to drive your pump.

How to figure horsepower requirements: Let's say you buy a pump that is rated for 4,000 PSI and 5.5 GPM and you want to know how much horsepower you will need to obtain those numbers. Here is how you determine what engine you will need.

If you have a gas engine...
PSI X GPM ÷ 1100 = THE HP YOU WILL NEED.
Example: 4,000 PSI X 5.5 GPM ÷ 1100 = **20 HP**

If you have a diesel engine...
PSI X GPM ÷ 1250 = THE HP YOU WILL NEED.
Example: 4,000 PSI X 5.5 GPM ÷ 1250 = **17.6 HP**

If you have an electric motor...
PSI X GPM ÷ 1450 = THE HP YOU WILL NEED.
Example: 4,000 PSI X 5.5 GPM ÷ 1450 = **15.17 HP**

Considerations:
If you have a belt drive system with the correct pulley set-up you could assume that if you have an engine that is rated for 20 HP @ 3,600 RPM (normal engine speed) that you have enough engine to produce the 4,000 PSI @ 5.5 GPM pump - example above.

But what if you are gear driving the pump? If you have bought a 1450 RPM Pump that is capable of handling 4,000 PSI @ 5.5 GPM that same engine (20 HP) is to small and here is why. Gear boxes have a ratio of 2.2 to 1 which means that 1450 X 2.2 = 3190 RPM. That means you will need to run the engine at approximately 3200 RPM so you do not 'red-line' the pump. If you run the engine at it's full 3,600 RPM you will be turning the pump that is rated for 1450 RPM at 1636 RPM. (3600 ÷ 2.2 = 1636). So now how much horsepower will you need for this 1450 RPM pump when you gear drive it.

IF 3600 = 20 HP
20 HP ÷ 3600 =.0055555 x 3190 =
17.72 HP at 3190 engine RPM.

So now your 20 HP is only producing 17.72 HP because you are having to run it 'slower.' If you are ordering an engine simply order a larger engine. How much larger?

Use this formula:
PSI X GPM ÷ 1100 x 1.12 =
'will be the required horsepower rating'
that you will need for a 1450 RPM Pump
that you will be gear driving

BUT WAIT!

You already have 20 horsepower and are not ready to buy another engine - *and* you need ALL of the 4,000 PSI @ 5.5 GPM!

Simply buy a 1750 RPM Pump that will give you the pressure and a little more VOLUME.

Why more volume and how much more?

'Why more volume?' We have already determined that you need ALL of the 20 HP that your engine will produce at 3600 RPM (wide open.) And we have determined that with a 1450 RPM pump we can not run the engine at 3600 RPM. So, if we do the math using a 1750 RPM Pump and the gear box ratio is 2.2 to 1 you will see that 2.2 to 1 is 3850 RPM engine speed which is to fast for the engine. We are trying to get the GPM to 5.5 when running the engine at 3600 RPM - right?

So here is what we are going to do.

Find a pump with a 24MM (std) shaft that you can run at 1750 RPM and use this formula.

Take the desired GPM - 5.5 in this case - and multiply it by 1.07.

5.5 X 1.07 = 5.885 GPM

You probably won't find a pump with that exact specification but you will find a 6 GPM pump. Now - use this calculation to determine the actual GPM of that 6.0 GPM pump when you are running the engine at 3600 RPM.

6 ÷ 3850 X 3600 = 5.61 GPM
Close enough?