HOW TO SELECT THE RIGHT PUMP AND CYLINDER

How to Select a New Pump for Existing Cylinders

First you must find the displacement of the cylinder or volume of oil required to extend the cylinder. On Graph No. 2 draw a straight line connecting the cylinder diameter in the center column with the cylinder stroke in the right-hand column. For example: The dotted line shows that a 3-1/2 inch cylinder with a 10 inch stroke needs 95 cubic inches of oil to fully extend it as shown in the left-hand column. Multiply this by two if you have two cylinders operating at once.

Next you must find how large a pump is required to extend this cylinder in a given time. For example: You wish to extend your 3-1/2 x 10 inch cylinder in 3 seconds. On Graph No. 3 draw a straight line connecting 95 cubic inches in the left-hand column with 3 seconds in the middle column. The dotted line shows you need a pump that will deliver 8-1/2 gallons per minute as shown in the right-hand column.

Look at the page showing Gresen Vane pumps and assume the crankshaft speed of your tractor is 1200 RPM. You will find a TB-9 Vane pump will deliver 9.6 gallons at 1200 RPM.

You can also use Graph No. 1 to find the pump size required if you know the cylinder diameter and the speed of operation required in inches per minute. For example: If you desire to extend an 8 inch cylinder at 10 inches per minute, draw a straight line connecting 8 inches in the left-hand column with 10 inches per minute in the right-hand column. The dotted line on Graph No. 1 shows this will require a pump that will deliver 2-1/4 gallons per minute as shown in the middle column.

How Much Horsepower is Required to Drive a Pump

To find the horsepower required to drive you pump use Graph No. 4. If you have a pump with 20 gallons per minute output operating up to 1,500 pounds pressure, draw a straight line connecting 20 gallons per minute in the left-hand column and 1,500 pounds in the right-hand column. The dotted line shows this pump will require up to 18 horsepower to drive it as shown in the middle column.

How to Select the Correct Cylinder Diameter for an Existing Pump

For example: You have a pump that delivers 8-1/2 gallons per minute and you want a 10 inch stroke cylinder to extend in 3 seconds. On Graph No. 3 draw a straight line connecting 3 seconds in the middle column and 8-1/2 gallons per minute in the right-hand column. The dotted line shows this will extend a cylinder with 95 cubic inch displacement as shown in the left-hand column.

Next you must find a 10 inch stroke cylinder with the required 95 cubic inch displacement. On Graph No. 2 draw a straight line connecting 95 cubic inch displacement. in the left-hand column with 10 inch stroke in the right-hand column. The dotted line shows that this will require a 3-1/2 inch diameter cylinder as shown in the middle column.

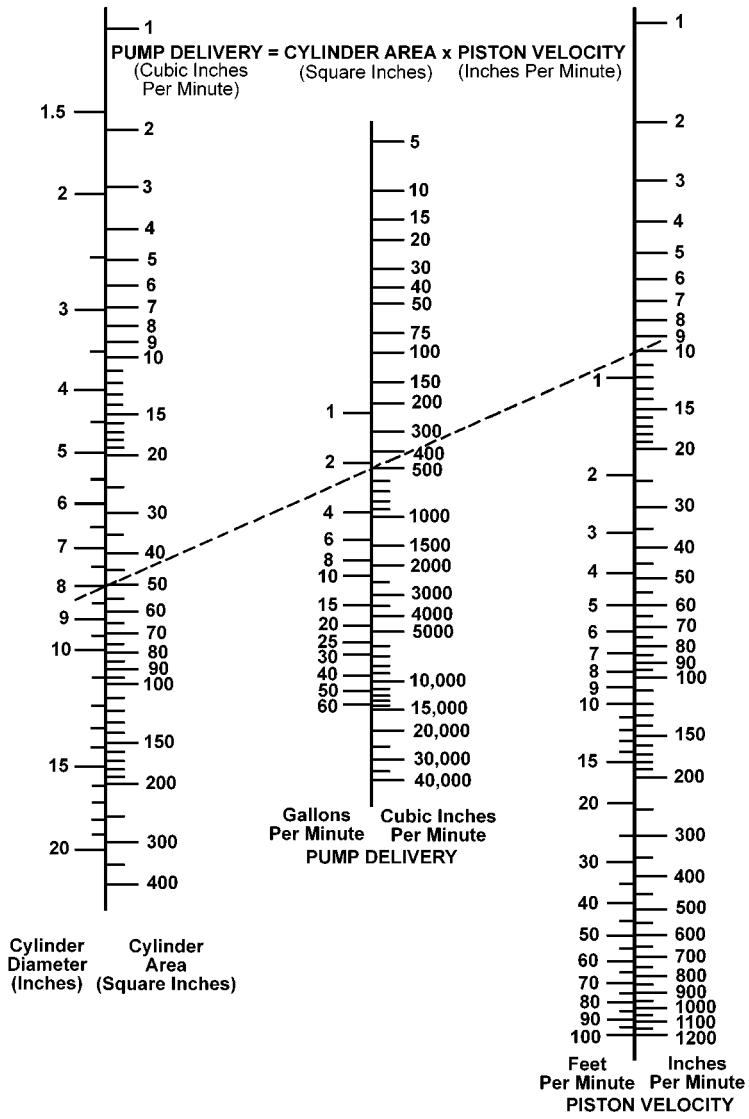
To Find How Large a Cylinder is Required to Produce a Particular Force

For example: You require a 5,000 pound or 2-1/2 ton force and you have a 500 pound per square inch system. On Graph No. 5 draw a straight line connecting 5,000 pounds in the left-hand column with 500 pounds pressure in the right-hand column. The dotted line shows that a 3-1/2 inch diameter cylinder will produce this force as shown in the middle column.

To Find How Much Force a Particular Cylinder Will Produce

For example: You have a 3-1/2 inch diameter cylinder and a 500 pound pressure system. On Graph No. 5 draw a straight line connecting 3-1/2 inches in the middle column with 500 pounds pressure in the right-hand column. The dotted line shows that this will produce 5,000 pounds pushing force as shown in the left-hand column.

Use the edge of a piece of clear plastic sheet as a straight edge to read these graphs for best results. This allows you to see the entire graph when you are using it, including the part of the graph covered by the piece of plastic.

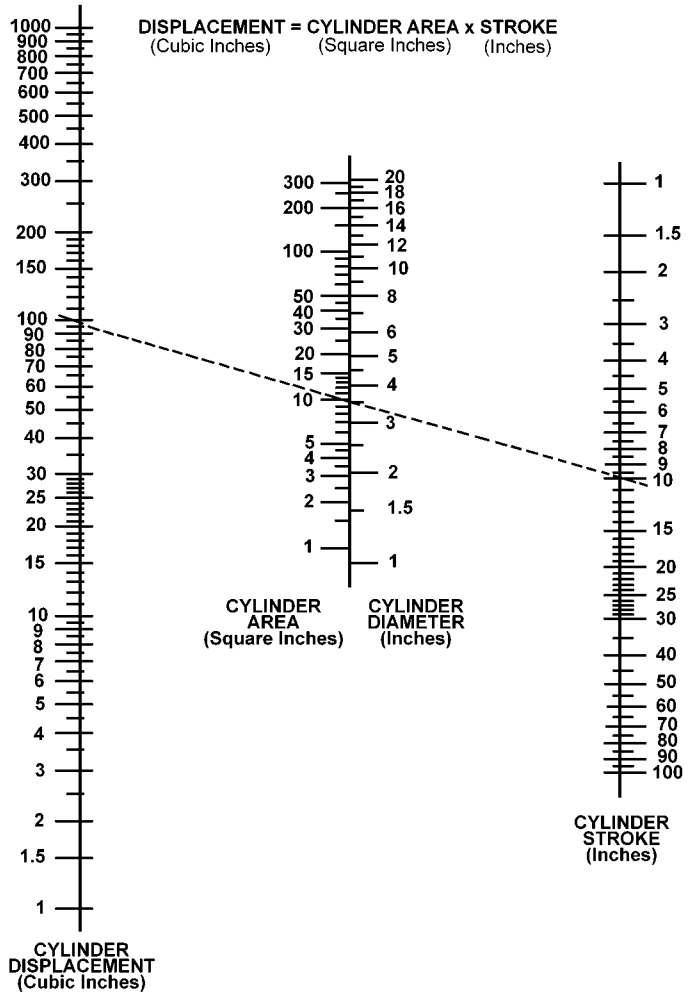


GRAPH NO. 1 PUMP SIZE (PUMP DELIVERY)

This graph will determine what size pump is required to operate a particular cylinder.

To determine the size of pump (GPM) needed to operate a particular cylinder, find the piston velocity desired in the right-hand column and the cylinder diameter in the left-hand column. Draw a straight line through these two points. The point this line touches on the center column is the pump delivery in gallons per minute (GPM) needed to operate the cylinder.

For example: The dotted line shows that to extend a 8 inch cylinder at a rate of 10 inches per minute (piston velocity) a pump with a delivery of not less than 2-1/4 gallons per minute (GPM) is needed.

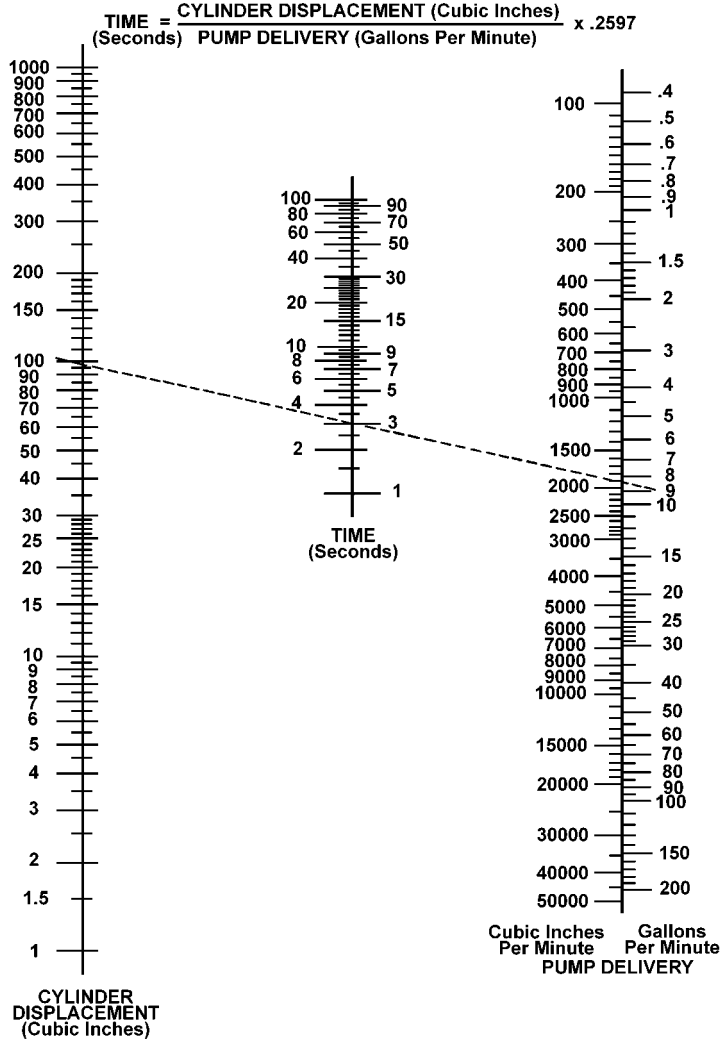


GRAPH NO. 2 VOLUME PER STROKE (DISPLACEMENT)

This graph determines the volume of oil needed to fully extend a cylinder.

To determine the volume of oil needed to fully extend a cylinder, fine the length of the cylinder stroke in the right hand column and the cylinder diameter in the center column. Draw a straight line through these two points and extend to the left-hand column. The point this line touches on the left-hand column is the volume of oil in cubic inches needed to fully extend the cylinder.

For example: The dotted line shows that a 3-1/2 inch cylinder with a 10 inch stroke needs 95 cubic inches of oil to fully extend it.

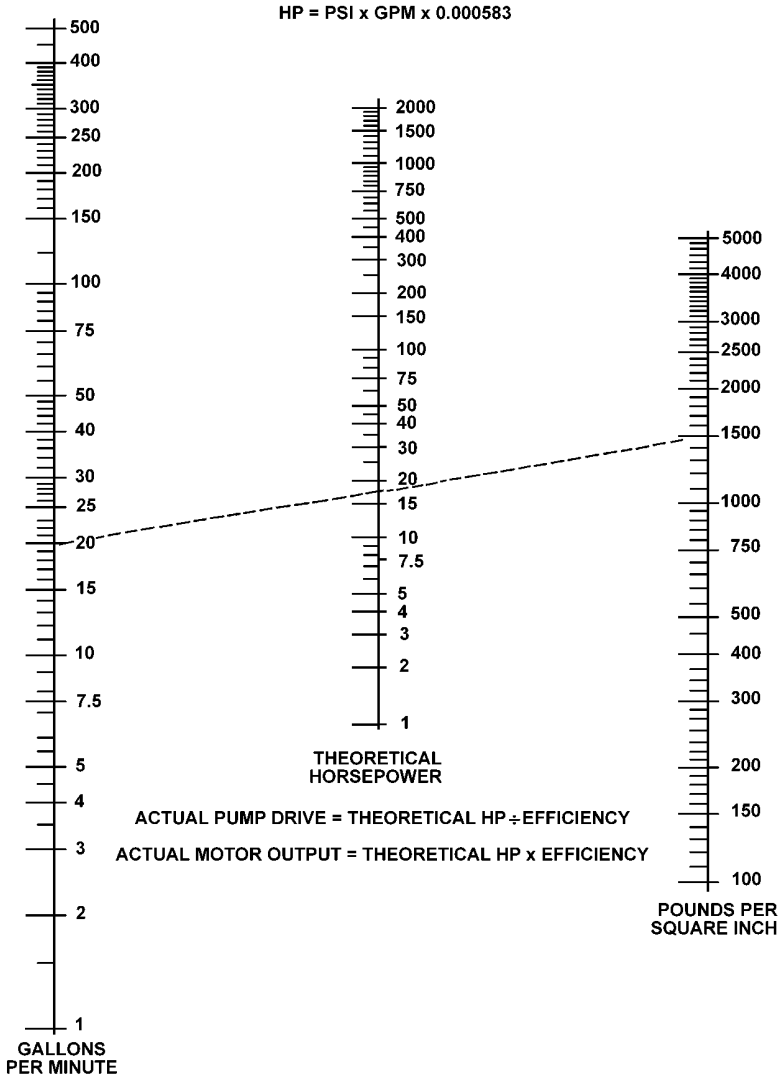


GRAPH NO. 3 CYLINDER SPEED (TIME)

This graph determines how fast a cylinder will act with a particular oil volume (GPM) from a pump.

To determine the time it will take to fully extend a cylinder, find the volume of oil the pump will deliver (GPM) in the right column and the volume (displacements) of the cylinder in the left-hand column. Draw a straight line through these two points. The point this line touches on the center column is the time needed to fully extend the cylinder.

For example: The dotted line shows that a pump delivering 8-1/2 gallons per minute (GPM) will fully extend a cylinder with a 97 cubic inch volume (displacement) in 3 seconds.

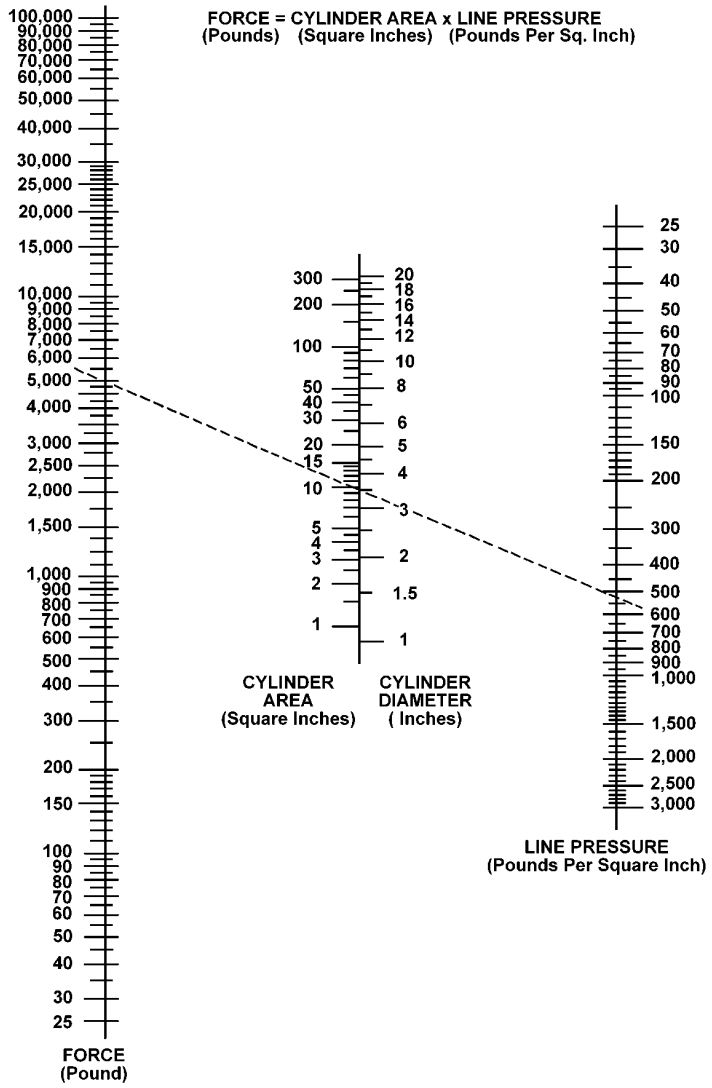


GRAPH NO. 4 PUMP HORSEPOWER

This graph determines what horsepower is required to operate a particular size of pump at a particular hydraulic pressure.

To determine the horsepower needed to operate a particular pump, find the hydraulic pressure to be used in the right-hand column and the maximum gallons per minute the pump will deliver in the left-hand column. Draw a straight line through these two points. The point this line touches in the center column is approximately the horsepower required to operate the pump.

For example: The dotted line shows that a pump that will deliver 20 gallons per minute (GPM) operating at 1,500 PSI pressure requires approximately 18 horsepower to operate the pump.



GRAPH NO. 5 LOAD CAPACITY (FORCE)

This graph determines the load or force a cylinder will lift or push at a known pressure.

To determine the force that a cylinder will produce, find the hydraulic pressure in the right-hand column and the cylinder diameter in the center column. Draw a straight line through these two points and extend to the left-hand column. The point this line touches on the left-hand column is the force the cylinder will produce.

For example: The dotted line shows that a 3-1/2 inch cylinder operated at 500 lb. pressure will lift or push a 5,000 lb. load.

NOTE: For pulling force in double-acting cylinders, the rod area must be subtracted from the cylinder area, and the difference between these used (net cylinder area).