



## Piledriving Investment Equipment

www.PiledrivingIE.com/Shoptalk

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**Q:** “How do I properly match a power unit to a vibro? How do I know if my power unit is too big or small to run a certain sized vibro? How is it calculated?”

**A:** You will need to know three things:

- 1.) How much rated horse power does your engine have in the power unit?
- 2.) What size pumps are in the power unit that is used to generate flow to the vibro?
- 3.) What size vibro are you using? Specifically, what size motors is the vibro using if not standard.

**1.** To know the rated horse power you can look at the tag on the Engine, it will be either on the top or the side of the engine. If the unit is so old the tag is gone then you will either need to make educated guess based on the power unit name, use ET (Electronic Technician), or do some research on it.

**HP RATING:** \_\_\_\_\_ **hp (we will use this number later)**

**2.** What size pumps are you using in the power unit? For APE/Antaeus/ICE they will mostly be gear pumps, for newer units will be fixed displacement or variable piston pumps. Some units will use more expensive pressure compensated variable displacement piston pumps. Regardless of pump size you are looking to find a “per revolution displacement” flow amount. Meaning: How much oil does the pump push for each revolution that it spins? (**See the Gear pump measure chart on next page then come back here**):

**Flow per Rev:** \_\_\_\_\_ **in<sup>3</sup> per Rev X 16.387 = \_\_\_\_\_ cc's** **Example:** 10.8 CID x 16.387 = 176.9cc



1 Cubic Inch



1 Cubic Centimeter

**Note:** CID = Cubic Inch Displacement or cubic inches / in<sup>3</sup>

For Antaeus: Take your cc number and X 1.38 \_\_\_\_\_ **Example:** 176.9cc X 1.38 = 244.23cc

For APE: Take your cc number as is since it's a 1 : 1 ratio on pump drive.

**Where does 1.38 come from?** APE's pump drive is 1 : 1, so each time the engine spins once the pumps spin once, Antaeus pump drive is 1 : 1.38, so each time the engine spins once the pump drive spins all the pumps 1.38 times. Antaeus units will spin the pumps 1.38 times faster.

Take your cc number and x max RPM \_\_\_\_\_ **Example:** 244.23 X 1800rpm = 439,617cc

**Final number=** \_\_\_\_\_ **Example** 439,627cc

**3.** What size vibro do you have? Specifically, what size motors are in the vibro? Hydraulic vibratory hammers typically are using a bent-axis hydraulic motor of some CC size. Example: 125cc or 160cc. The “cc” is Cubic Centimeters, not to be confused with cubic inches. This is how much oil it takes to make the motor spin one time. Example a 160cc motor will take 160cc's of oil to spin the motor one revolution.

\_\_\_\_\_ cc X 2 motors = \_\_\_\_\_ cc **Example:** 160cc x 2 = 320cc

Antaeus -2, -4, -6 = 1.42 | APE 200 = 1.28 | APE 150 = 1.28 (for other ratios e-mail me)

Take your total motor cc \_\_\_\_\_ and multiple by the gear ratio \_\_\_\_\_

**Example for APE 200:** 320cc X 1.28 = 409.6cc

**Example for Antaeus** 325-6 = 320cc X 1.42 = 454.4cc

**Final number** \_\_\_\_\_ cc per rev or (1VPM): **Example for 325-6:** 454.4cc

**Now go to last page and put it all together ---->**



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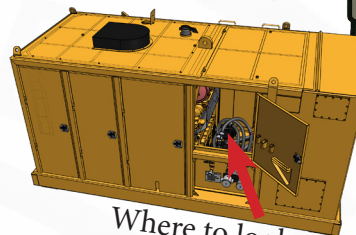
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### How to measure a gear pump:

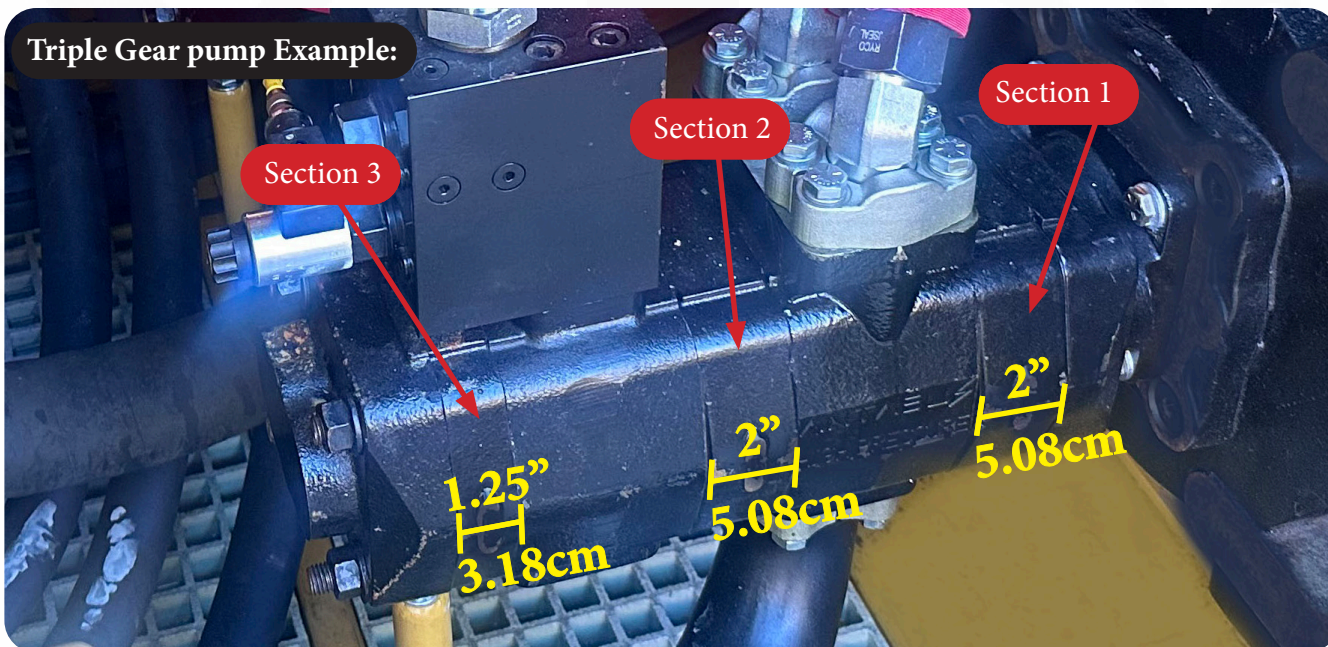
Gear pumps come in all different sizes and sections. The size refers to the size of the gear, which effectively is the size of the pump for that section. [See below in Yellow]

Gear pumps can have multiple sections, below is an example of an Antaeus triple pump with three sections. Most gear pumps have two sections or one but never four on pile driving equipment.



Where to look

### Triple Gear pump Example:



### Example Flow Calculation:

**Number of Sections:** 3 (measured from engine side first)

**Measured (External Sandwich) Section Sizes:** 2" x 2" x 1.25" X = by (like in lumber)

**Flow:** (use below chart): 2 x 2 x 1.25 (sandwiches) = 5.4 + 5.4 + 2.7 = 13.5 in<sup>3</sup> per Rev

Gear Width (External) (Sandwich Width)		Gear Width (Internal)		Displacement (Flow per Rev) CID CC		Dash Size	Purpose
3 inch	7.62cm	2.5 inch	6.35cm	10.8 in <sup>3</sup>	176cc	-30	Cooling
2.5 inch	6.35cm	2 inch	5.08cm	9.0 in <sup>3</sup>	147.5cc	-25	Cooling
2 inch	5.08cm	1.5 inch	3.81cm	5.4 in <sup>3</sup>	88.5cc	-15	Main
1.75 inch	4.45cm	1.25 inch	3.18cm	4.5 in <sup>3</sup>	73.7cc	-12	Main
1.5 inch	3.81cm	1 inch	2.54cm	3.6 in <sup>3</sup>	59cc	-10	Main
1.25 inch	3.18cm	.75 inch	1.9cm	2.7 in <sup>3</sup>	44.2cc	-7	Main

\*CID = Cubic Inch Displacement



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### Final Calculations:

Calculate for MAX VPM:

**Vibro:** \_\_\_\_\_ cc per rev      **From 325-6 example: 454.4cc**

\*This is how much oil you need to push into the motors (assuming you have two of them), and make the eccentrics spin one full revolution. For the 325-6 example, assuming you had 160cc motors on it (which normally they are 180cc) it would take 454.4cc's of oil to spin the vibro one time.

**Pumps:** \_\_\_\_\_ max flow in cc's      **Example: 439,627cc**

\*This is how much TOTAL oil will flow OUT of the pumps based on your max rpm, or total flow in cc's.

You now have the information to tell you what VPM is possible for max:

<b>Final Answer:</b>	<b>Calculation:</b> max pump flow (in cc's) / vibro cc per rev = max vpm <b>Example:</b> 439,627cc / 454.4cc = 967 VPM
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Therefore, in my example, it should be clear that either my motors are too big or my pumps are too small to run my example vibro. **Ideally max VPM should be 1650 VPM for the US.**

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**Now, how do I know I have enough horse power to accomplish the task? Can I run my example vibro on 20hp or do I need 1000hp?**

The standard calculation (without a mega deep dive) is as follows:

**(Max PSI of the system X total max GPM) / (1714 \* .092) = \_\_\_\_\_hp needed**

**You will need to convert your max flow to GPM (currently it's in CC) so take your CC number divide by 16.387 = Cubic Inches then divide by 231 to get gallons per minute**

**Example:** 439,627cc / 16.387 = 26,827 CID / 231 = 116.1 GPM

**Example:** 4,800 PSI X 116.1 GPM = 557,280

1714 x .92 = 1576.8

557,280 / 1576.8 = 353hp.

**This means in my example scenario, to spin my vibro at 4,800 PSI at max 967 VPM you would need 353hp.**

I am using 92% efficiency in this example, but you can reduce this number to .85 or 85% to be safer.