

Parts Needed for Building a Log / Wood Splitter

The first part is a basic list of parts required to build your splitter whether you choose to go with a dedicated horizontal or a horizontal/vertical splitter. Later on options will be discussed. One of the first items you will have to decide on will be what size/gpm hydraulic pump, cylinder, & engine you will need. There are lots of discussion scattered throughout this forum on what you will need. I have made a couple of charts to help you get started in deciding which combination will best suit your needs. With this said, for myself I am using a single **SHARP** edged wedge, 16 gpm pump, 4 x 24" tie rod cylinder with a 1.75" diameter ram powered by an 11 hp engine I run at half throttle, & a 25 gpm log splitter valve with a 2500 psi pressure relief setting. (15.7 ton) Since sharpening my wedge I have not had any problems with it not splitting anything I want or bogging down the engine.

2 Stage Hydraulic Pump: Gallon per minute (gpm) All 2 stage pumps I have looked at run in a clockwise rotation allowing for direct mount to the engine by way of a "lovejoy connector" . Haldex pumps has a 4:1 gpm ratio between the high & low flow rates. They are set to shift 2nd stage @ 650 psi	High flow - Low pressure	Low flow - High pressure	Minimum size of gas engine required	Min. size of electric motor required for 2,500 psi	Suction Line inner diameter (Hose Barb)	Size of output hose (NPT)	Shaft Dia
	11 gpm	2.8	5 hp	16.0	3/4 or 1"	1/2"	1/2"
	13 gpm	3.3	6 hp	19.0	1"	1/2"	1/2"
	16 gpm	4.0	8 hp	23.3	1"	1/2"	1/2"
	22 gpm	5.5	10 hp	32.1	1 or 1 1/4"	3/4 or 1"	5/8"
	28 gpm	7.0	12 hp	40.8	1 or 1 1/4"	3/4 or 1"	5/8"

Electric Motor HP required: = $\text{gpm} \times \text{psi} / 1714 \times \% \text{ of pump efficiency}$
 (http://www.engineeringtoolbox.com/hydraulic-pumps-horsepower-d_1464.html)



Haldex/Barnes 2 stage pumps



Welded Cylinder with cross tubes



Tie-rod cylinder with clevis ends

Hydraulic Cylinder for Splitting: There is no "perfect" sized cylinder to use. The length depends on the length of the rounds you plan to split. Most of the home owner splitters you will see at tractor supply stores & lumber yards use a 24" length ram/rod. The diameter of the ram/rod will have a slight affect on the return time of the ram and affect the risk of bending the ram. The larger the diameter of the ram/rod, the faster it will return & will decrease the risk of bending the ram. The table below will give you a way to compare the cycle times of different bore cylinders with a 24" ram using a 16 gpm pump with no load. The diameter of the bore & the psi applied will determine the tonnage. If you plan to use a single edged wedge, a 4 - 4.5" bore works well, if you want a multiple edged wedge, you will need a larger bore for more tonnage.

**** NOTE **** The gpm of the pump does NOT affect the tonnage, The psi applied to the cylinder does.

Cylinders come in many configurations as shown above. The important things are: 1- Will it meet your mounting need. 2 – Can it handle the psi you plan to be able to operate up to? And have the tonnage you are looking for. (Cycle time is based on pump staying in high stage only. It is for comparison only.)

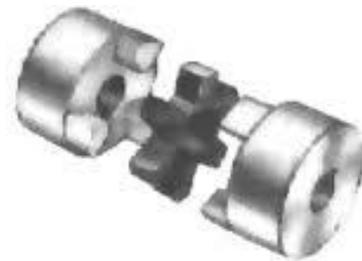
Cylinder bore Diameter	Ram Diameter	Cycle Time using a 16 gpm pump.			2,000 psi	2,500 psi	3,000 psi
		Extend	Retract	Total Time	Tonnage	Tonnage	Tonnage
3"	1.25	2.8	2.3	5.1	7.1	8.8	10.6
	1.5	2.8	2.1	4.9			
	1.75	2.8	1.8	4.6			
3.5"	1.5	3.8	3.1	6.9	9.6	12.0	14.4
	1.75	3.8	2.8	6.6			
	2	3.8	2.5	6.3			
4"	1.5	4.9	4.2	9.1	12.6	15.7	18.8
	1.75	4.9	3.9	8.8			
	2	4.9	3.7	8.6			
4.5"	1.34	6.2	5.2	11.4	15.9	19.9	23.9
	2	6.2	5.0	11.2			
	2.25	6.2	4.6	10.8			
5"	1.75	7.7	6.7	14.4	19.6	24.5	29.4
	2	7.7	6.5	14.2			
	2.25	7.7	6.2	13.9			
	2.5	7.7	5.7	13.4			
5.5"	1.75	9.2	8.3	17.5	23.8	29.7	35.6
	2	9.2	8.0	17.2			
	2.25	9.2	7.7	16.9			
	2.5	9.2	7.3	16.5			
6"	2	10.9	9.6	20.5	28.3	35.3	42.4
	2.25	10.9	9.4	20.3			
	2.5	10.9	9.2	20.1			
	2.75	10.9	8.6	19.5			

This site will allow you to figure tonnage in case your combination is not shown above:
<http://www.pneumaticsonline.com/Calc2.asp>



Mounting bracket:

Connects hydraulic pump body to the engine.



Lovejoy connector:

Connects the shaft of the pump to the engine.

Suction line: Match the size to the hose barb on your pump. Use suction rated hose, but not the wire reinforced type of hose. If the hose is too stiff it will not flex properly related to the motor vibration and can cause the hose barb tube to come loose from the pump. (Many pumps just have it pressed in).

Pressure Line out of the pump: Again match it to your pump. Use a hydraulic pressure line rated at least 3,000 psi. (This is the maximum pressure for most of the hydraulic pumps).

Hydraulic oil reservoir: You can buy or make your own.

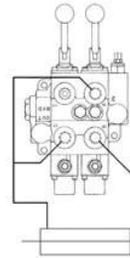
- Size: Rule of thumb -: A gallon of oil per gpm, example: 16 gpm pump, 16 gallon tank. This is to have a sufficient supply of oil allow it time to dissipate heat. (Remember to leave room for the oil to expand as it heats up when filling the tank).
- It will need be vented (Again to allow for the expansion / contraction of the hydraulic oil).
- Need to have an outlet as large as the suction line. (1 – 1 ¼")
- Return port at least ¾" NPT
- Try to mount it higher than your hydraulic pump to help prevent dry startups.



Hydraulic Oil Reservoir



Log Splitter Valve



Auto Cycle Valve

Open Center hydraulic Valve: There are two basic valve systems used on log splitters: They come with different options

- 1- **Log splitter valve** - You have to hold the valve lever on the splitting stroke & on the return stroke, there is a detent to hold the lever until it has fully returned then it will automatically release. This style of valve comes with different gpm flow capacities, settings for the psi pressure release settings, different sized inlet / outlet ports & some have a "Power Beyond" option. Make sure it will handle the gpm & psi you want. (This is the style most commonly found on wood/log splitters.)
- 2 - **Auto Cycle Valve** - This valve is used to automatically cycle a hydraulic cylinder-out, back, stop. When both handles are pulled back the cylinder will extend out. When it reaches full extension, the first spool will go into neutral and begin retracting. When ram makes full retraction, the second spool will kick out and the cycle is complete. To start the next cycle pull both handles back. This valve can also be operated in manual mode. At this time to my knowledge, "Prince" is the only company with an auto cycle valve available. It comes in 2 models:
 - A - Prince Auto cycle valve # RD523MMEE5A4B1 which has the **ability to have "Power Beyond"** by installing an optional conversion plug. (Approximate Price \$295.00)
 - B - Prince Auto cycle valve # RD523MMEE5A1A1 - This valve **does NOT have "Power Beyond"** capability. (Approximate Price \$269.00)

Return hoses from valve to hydraulic oil filter then to reservoir: Most valves will have a 3/4" port on them for the inlet & outlet. Stay with the largest hose it will accommodate normally 3/4". The larger hose will decrease oil restriction/pressure which will generate less heat.

Hydraulic Oil: Check with the pump's manufacture for recommendations. Some commonly fluids: Universal Hydraulic oil, 303 hydraulic oil, & some use transmission fluid. The outside temperature can play a major role in the viscosity you choose.

Hydraulic Oil Filter: They come in different gpm capacities. Choose one which will handle your pump's gpm easily. Place it on the return side between the valves & the reservoir. If you place it on the suction side of the pump and the filter should clog up / collapse you run the risk of cavitation it will likely ruin the pump. To decrease hydraulic fluid loss when changing filters, you can place simple ball cock valves on both sides of the filter housing to cut of oil flow when changing filters or you can mount the filter higher than the oil level in the reservoir & valve.



Hydraulic Oil cooler/radiator: This is optional. I installed one on my splitter as I split some during the summer when the temperature gets up to the low 100 degree F. "Hydraulic fluid temperatures above 180F (82C) damages most seal compounds and accelerate degradation of the oil". (From Brendan Casey - Author of 'Hydraulics Made Easy')

Hope this helps you decide what you will need to have to build or buy your wood/log splitter.

WoodSplitterPlans.Com

