Guide To

Specifying Hydraulic Hose Assemblies

A practical guide to designing, specifying and sourcing hydraulic hose assemblies for safe and efficient performance

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Table of Contents

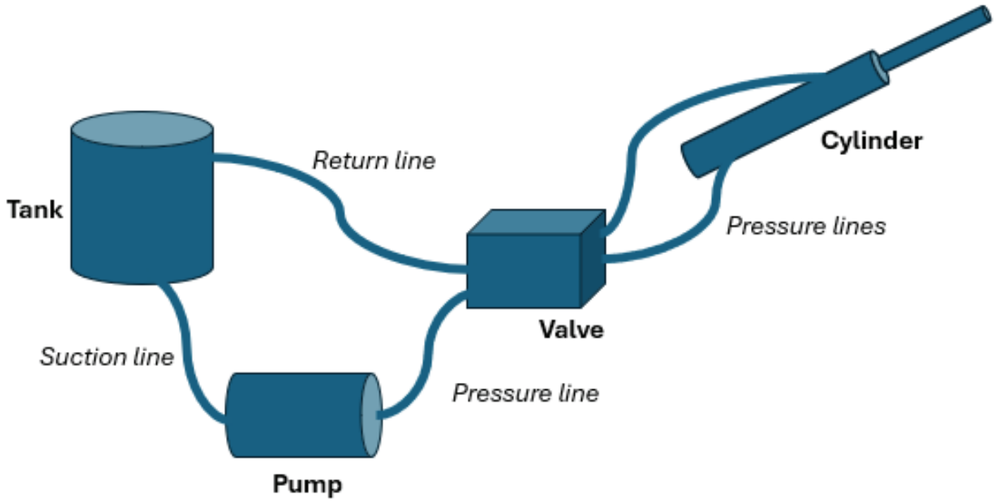
Don’t Crack Under Pressure

Master your hydraulic hose setup like a pro.

One of the biggest challenges for you as a designer or builder of powered machinery is just how many sectors of engineering you need to be knowledgeable about. If you are in a sector such as agriculture, construction, commercial vehicles, or any other industry producing and using mobile heavy-duty equipment, then the power source is likely to be hydraulic. This is a subset of engineering with its own specific requirements and “rules of thumb”.

In this guide we provide an overview of the key stages that you can go through to correctly size and specify hose assemblies both to provide effective in-use operation and to facilitate your sourcing process.

A Basic Hydraulic System



In the most basic hydraulic system, there will be a cylinder, or sometimes a hydraulic motor, that is providing motion. The power to drive this comes from the hydraulic pump, which is electrically powered.

The reason that an electric motor or linear actuator is not used directly in many applications is because a hydraulic solution can provide higher torque and power and can work across a much broader range of force and speed.

The pump draws hydraulic oil from a tank, through a suction line, and feeds a valve, through a pressure line. The valve controls the pressure fed to each side of the cylinder to allow position control and force applied by the cylinder ram.

Finally, there is a return (or tank) line from the valve back to the tank. There may also be a case or drain line from the pump (not shown).

In open-centre systems, hydraulic oil circulates continuously through the pump, valve, and tank when the pump is running.

Determining Required Pressure

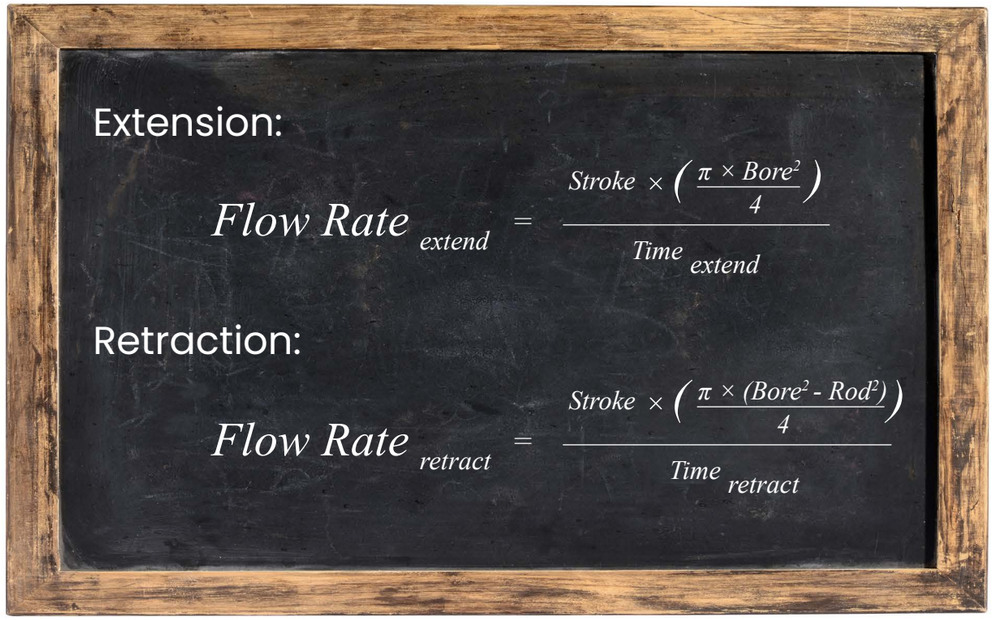
Designing a hydraulic system is somewhat of an iterative process, but a good starting point is to consider what pressure you need or can get.

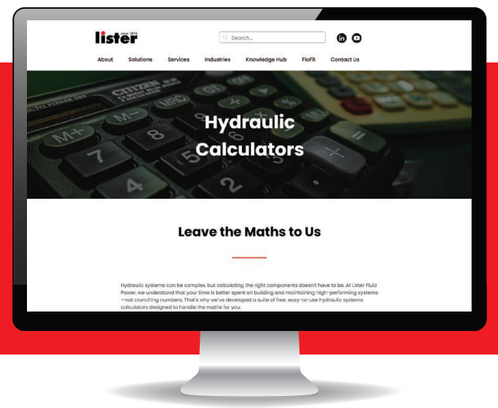
If you know the force that you will require then it is, of course, a simple matter to select a cylinder capable of providing that. Since pressure is force divided by area, you can calculate the pressure once you choose your cylinder diameter. For example, if you are designing a tipper lorry you might want to select the largest diameter, and stroke, cylinder that you can physically fit into the space you have available.

Another place to start is to choose your power pack or power-take-off unit, again by choosing what will fit with the dimensions of your finished equipment, and then identifying what will be the maximum pressure that you can attain from it.

Calculating the Right Flow Rate

Let us assume that on our big tipper lorry we want the bed to raise in 40 seconds. We know that we need to fill the full volume of the hydraulic cylinder in that time, so now we can calculate the flow rate.





To simplify this process, you can use our free online Hydraulic Flow Rate Calculator at:

www.listerfluidpower.com/hydraulic-calculator

Choosing the Correct Hose Size

We know the flow rate at which our system is going to be operating. If we select a fluid velocity, then we have enough information to be able to calculate the hose bore size. There are some guidelines to follow.

Hydraulic Line	Suggested Velocity Range
Pressure Line	4.5 – 7.5 m/s
Suction Line	1.1 – 1.5 m/s
Tank/Return or Case/Drain Line	2.5 – 3.0 m/s

If we operate outside of these parameters, then various inefficiencies can occur. For example, if the pressure line velocity is lower than 4.5 m/s it can create a back pressure situation. Above 7.5 m/s is inefficient, trying to fill a bigger void than needed.

Jump to our free online Bore Size calculator at https://www.listerfluidpower.com/hydraulic-calculator

Input the details there and the calculator will do all the magic and provide the hose bore size. For example, far a pressure line with a flow rate of 260 litres/minute, and a velocity of 7.5 metres per second, the bore needs to be 27.12 mm. We would round this up to the nearest standard hose size – in this case, 32mm (1¼")

Selecting the Right Hose Type

When selecting the type of hydraulic hose, consider the following common constructions:

One-wire Braid

Suitable for lower-pressure applications

Two-wire Braid

Offers higher pressure capacity and better durability

Spiral-wound (e.g., 4- or 6-wire)

Required for very high-pressure systems

Compact hoses

Provide flexibility in tight spaces while maintaining high-pressure ratings.

Your choice should be based on the maximum operating pressure, flexibility requirements, and routing constraints of your system. Always consult manufacturer specifications for exact performance ratings.

Picking Suitable Hose Ends

The selection of hose ends is determined by pressure and by preference.

It is important to bear in mind that you will probably also need adaptors so you should choose your hose ends with that in mind. For example, suppose you have a 1" spiral hose that is 420 bar rated. If you choose a low-cost BSP fitting that can immediately cause a complication, as the adaptor is only rated to 210 bar!

For BSP (British Standard Pipe) or BSPT (BSP taper) threads follow certain dimensional standards, however pressure ratings may vary by manufacturer.

Metric fittings, on the other hand, typically conform to **ISO 8434-1** (formerly DIN 2353), which standardises both dimensions and pressure ratings.

How to Choose Correctly

- Select a hose rated at or above the maximum system pressure.
- Ensure the hose material is compatible with your hydraulic fluid.
- Consider both the fluid and ambient temperatures.
- Use flexible hoses where tight bends are required and ensure proper support.
- Match hose fittings to port types (BSP, JIC, Metric, NPT, etc.) and confirm pressure ratings for both fittings and adaptors.

Final Checklist

Check off these points to ensure that you have specified and receive a reliable custom hose assembly

- Correct hose bore size calculated for flow rate and velocity
- Hose type selected based on pressure, flexibility and durability
- Fittings matched for compatibility and pressure rating
- Assembly checked for routing, abrasion protection and clamping
- Hose assemblies manufactured by a reputable supplier

A well-designed hydraulic hose system ensures safe, efficient, and long-lasting equipment performance.

This guide was written by Dr. Peter Davies and Craig Thomas for Lister Fluid Power, as part of our commitment to sharing practical knowledge and promoting safe, effective hydraulic practices across the industry. Get free access to similar guides on our website www.listerfluidpower.com.

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