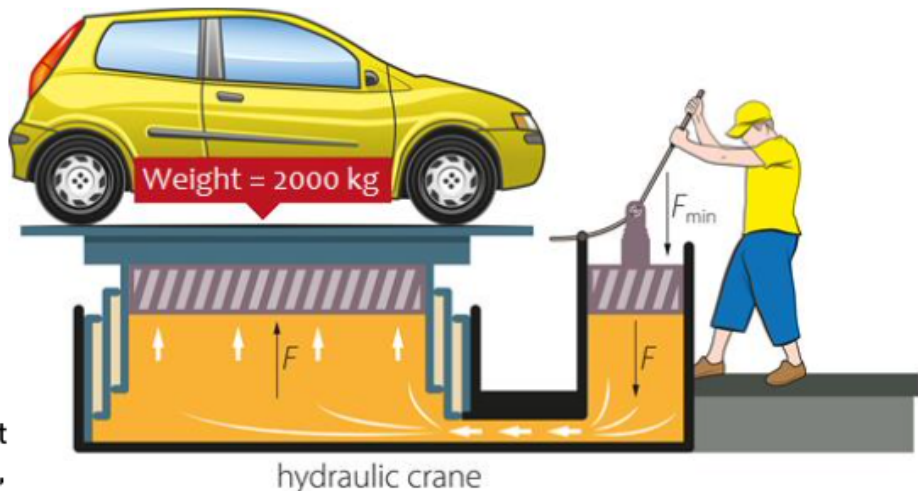


Pascal's Law - Hydraulics

What is Pascal's Law?

Pascal's Law states that a pressure change at any point in a confined incompressible fluid is transmitted throughout the fluid and acts on the walls of the container equally.

Pascal's law helps explain why hydraulic systems work. When we apply pressure to one part of an incompressible fluid, the fluid acts on every part of the enclosed container. If the pressure is strong enough, it will move container walls, like the slave piston in a hydraulic system.



The multiplication factor allows more work to be done. Pascal's principle states that if the slave piston has an area 5 times greater than that of the first piston (master), the force will be 5 times greater on the slave piston.

In the diagram, the worker mechanic needs to lift the 2000 kg car. This would be impossible without a mechanical advantage. Let's assume the multiplication factor is 10, guessing that the area of the slave piston is 10 times larger than the master piston. In this case, we can use the following equation to determine the force needed:

$$\text{Force} = \frac{\text{weight}}{\text{multiplication factor}}, \text{ therefore, Force} = \frac{2000 \text{ kg}}{10} = 200 \text{ kg}$$

Use of Hydraulic Systems

Hydraulic systems are used in heavy equipment, like forklifts, backhoes, and excavators.

Advantages

- Simple and safe due to using less parts than mechanical systems
- Great control as push buttons can make it easy to start, stop, accelerate or decelerate
- The most powerful option for creating force

Disadvantages

- Hydraulic fluids can be messy and can leak if a valve or pipe is damaged
- Hydraulic fluids can be corrosive and are flammable
- The fluids in a hydraulic system can freeze. Most hydraulic fluids have a freezing point of -12 degrees Celsius, so using these systems in the winter can be problematic