



Curiosity Guide #707

Fluid Power

Accompanies Curious Crew, Season 7, Episode 7 (#707)

Fluid Network

Investigation #6

Description

Find out more about the power of water!

Materials

- 10-milliliter syringe
- 35-milliliter syringe
- 60-milliliter syringe
- T connector
- Plastic tubing
- Scissors
- Ruler
- Water
- Food coloring

Procedure

- 1) Measure and cut three 6-inch lengths of tubing and set aside.
- 2) Fill the 35-milliliter syringe with colored water.
- 3) Turn the syringe upside down to press the air bubbles out of the tip, then connect the syringe to one of the lengths of tubing.
- 4) Connect the other end of the tubing to the T connector.
- 5) Press the 10-milliliter plunger into the syringe, then connect this syringe to a second length of tubing and connect the other end to the T connector.

- 6) Repeat with the 60-milliliter syringe, connecting this syringe to the T connector as well.
- 7) What will happen when you press on the 35-milliliter syringe?
- 8) Try it. What did you observe?

Results

Explanation

The smaller plunger moves a lot. This is because the pressure acting on the 35-milliliter plunger is the same throughout the whole system. Because the volume of the 60-milliliter syringe is larger, the same proportion of liquid enters there as with the 10-milliliter syringe. There is a difference in the force applied to each syringe. Experimenting between the different plungers shows that the smaller the syringe, the easier pushing is, but the less the others rise. Conversely, the larger syringes are harder to push but will rise more. French scientist Pascal in the 1600s realized that fluids (gas and liquids) under pressure in a closed container transmit the force equally throughout the container and on all the surfaces. This is referred to as Pascal's Law.

Increase your knowledge! Hydraulic systems are technologies that use liquid fluid power to move things. We saw how we could apply a force to the syringe to move the water through the system and cause different plungers to move. Liquids don't compress like gases do, but liquids still transmit the power equally in the closed containers. The size of those containers makes a difference. If I applied 10 pounds of force to an area that was one square inch, that force could be multiplied ten times if the second cylinder were ten times the area. Now that's a great advantage!

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