Scorpio Technology NEWSLETTER

INSIDE **THIS** ISSUE

Page 1

Primary - **STEM – Hydraulics**
Teacher Conferences & Workshops

Page 2

Secondary – **WHAT'S NEW? Arduino Compatible**
This Month's Q&A Technology Tips: **Gears**

Page 3 - 4

Secondary – **PHYSICS & TECHNOLOGY - Hydraulics**
Feature Article: **Every time I drive my car…it's Pascal!**

TEACHER CONFERENCES & WORKSHOPS

Scorpio is attending or supports these Design & Technology teacher activities:

SCITECH 2020- 12-9-2020 *Conference for Science & Technology Teachers,* Daramalan College, Canberra
DATTA AUSTRALIA – 12 to 18-10-2020, Design & Technologies Week *Developing creative problem solvers*.
ITE (NSW) - 25 to 27-11-2020, Sydney Masonic Centre, Sydney
DATTA VIC – 3 & 4-12-2020 *Design Disruption*, Harvester Technical College Sunshine

WELCOME

This month we present the topic of Hydraulics and Blaise Pascal who formulated the concept. Hydraulics are found throughout many industries especially those using heavy lifting equipment. Without it, many applications would be extremely difficult to complete.

As always, we are here to help, so if you have any issues or questions, don't hesitate to contact us at (03) 9802 9913 or sales@scorpiotechnology.com.au

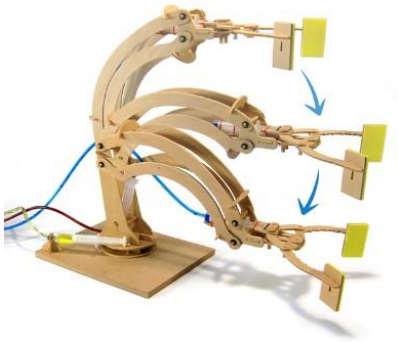
PRIMARY: STEM - HYDRAULICS

MIDDLE & UPPER PRIMARY: Investigate the fascinating world of hydraulics with these working models.

HYDRAULIC GEARBOT
(Code: WM6723)

This catapult is operated by hydraulics & gears. It can be used to launch small objects. It is a relatively easy to assemble kit. Includes instruction manual.

Investigate – hydraulics, gears, measure distance
"2016 Toy of the Year Award" for building kits (Creative Child Magiazine). Ages 8+



HYDRAULIC ROBOTIC ARM
(Code: WM6710)

Large scale industries use Robotic articulated arms to perform repetitive tasks such as spot welding. Use the model to observe the independent hydraulic circuits provide control over the arm pincers ... grip, lift, twist, lower and release. Provided as an unassembled kit.
Ages: 8+

These two kits also use hydraulics:

HYDRAPULT (Code: WM6720)
HYDRAULIC MINI EXCAVATOR (Code: WM6716)

LEARN TO MAKE, MAKE TO LEARN

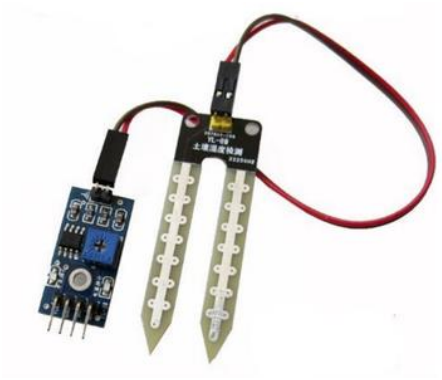
If you think you can do a thing,
or think you can't do a thing; you're right.
Henry Ford

SCORPIO TECHNOLOGY Vic Pty Ltd,
1/31 Dalgety St. Oakleigh Vic 3166
www.scorpiotechnology.com.au

SECONDARY: WHAT'S NEW?

ARDUINO COMPATIBLE

The Arduino Uno R3 is a microcontroller board based on a removable, ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analogue inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. These kits and components are Arduino compatible products.



SOIL / MOISTURE SENSOR for Arduino Uno R3 (Code: SENSMOIST)

This is a simple water sensor, can be used to detect soil moisture. Module Output is high level when the soil moisture deficit or output is low. Can be used in a module plant waterer device. The plants in your garden no longer need you to manage the watering. Operating voltage: 3.3V~5V.

This Month's Q&A Technology Tips: Gears

We stock a large range of Pinion gears, Spur gears, Worm gears & Gear racks. Gears available with hole sizes 1.9, 2.4, 2.6 & 2.9mm.

Q: How do I read the gear specification?

- Pinion gear gives number of teeth and hole size.
- Spur gears consist of two gears in one. For clarity all spur gears have the number of teeth listed for both larger and smaller gears, e.g. 22Tx10Tx2.4 This means outside gear has 22 teeth, pinion gear 10 teeth and 2.4mm hole size.

Q. What does "Module" mean when talking about gears?

A. "Module" is the unit of size that indicates how big or small a gear is. It is the ratio of the reference diameter of the gear divided by the number of teeth. Thus: ***m = d/z*** **(Module = Reference diameter ÷ Number of teeth)**.
Scorpio's gears are 0.5 module. Module 1 translates to "number of teeth on a gear = mm diameter" e.g. 1 Module 60T gear is 60mm diameter. Scorpio's 60T being 0.5M is 30mm diameter.

The Wind up Torch has 0.6 Module gears for increased strength, and are not interchangeable with the 0.5M.

Q. Why do the gears have so many different holes sizes?

A. The hole size depends on the usage. Gears with a:

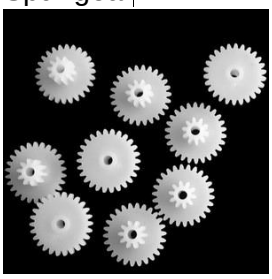
- 1.9mm hole are press fit onto a 2.0mm motor shaft
- 2.4mm hole are press fit onto a 2.5mm shaft
- 2.6mm hole are free spinning on a 2.5mm shaft
- 2.9mm hole are press fit onto a 3.0mm shaft

Q. Why are brass pinion gears used on a Faulhaber motor?

A. These motors are industrial grade and more likely to be damaged with press-fit plastic gears. The brass pinions are designed and manufactured for this motor. The brass pinion gears are attached to the motor's shaft by the use of a small grub screw.

Pinion gears

Spur gear



Worm gears 1.9mm hole suits Motor Shaft

Gear rack

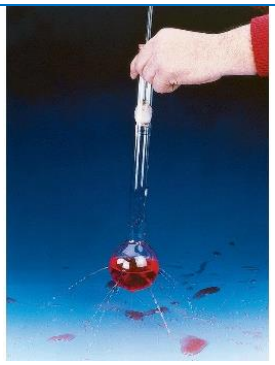
Brass pinion gears for use with Faulhaber motor in Solar Challenge competitions.

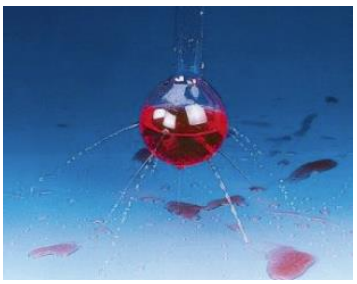
.

HYDRAULICS - Investigate the properties of fluids and hydraulics

Pascal's law (also known as **Pascal's principle**) is the statement that in a fluid at rest in a closed container, a pressure change in one part is transmitted without loss to every portion of the fluid and to the walls of the container. The **law** was first stated by French scientist and religious philosopher Blaise **Pascal**.

You might also be interested in teaching tools to demonstrate Pascal's principle to your students:





PASCAL'S PRINCIPLE DEMONSTRATOR (Code: AR1020340)

This apparatus is used to demonstrate that the liquid transmits equal pressure in all directions.

On pushing the plunger inside with the apparatus filled with water, water is ejected with equal force from all the holes.

PASCAL'S BALL (PASCAL'S LAW SYRINGE, METAL (Code: AR1020360)

Similar to Pascal's Principle Demonstrator, but of metal construction to provide more rigidity, sturdiness and durability.

PASCAL'S LAW APPARATUS (Code: AR1020370)

Comprises a spherical glass bulb (with holes) with its neck supported horizontally and is connected to a vertically mounted 50ml plastic syringe through a flexible rubber tubing. The complete apparatus is mounted on a plastic base.

Every time I drive my car...it's Pascal!

Article written by Alex Kapoyanis

Chances are the title above has got most of you curious. That's good, so keep reading!

Have you ever wondered from where the computer programming language got its name back in the 1960s? What about Pascal, the SI system unit for pressure? What about Pascal's Triangle?

It's all thanks to **Blaise Pascal**, a 17th Century French mathematician, physicist, inventor and theologian, who experimented with Mercury Barometers and atmospheric pressure, conic sections, and projective geometry, to name just a few. So what's he got to do with driving my car?

Pascal's principle is the basis of hydraulic systems such as a car's braking system and hydraulic power steering systems. So, what are Hydraulics? Generally speaking, hydraulics (a branch of fluid mechanics / dynamics) is the study of fluids under flow and pressure. Hydraulics also deals with fluids as they flow through pipes, rivers, and stored in dams, tanks, etc.

When applying Pascal's principle (or law) to a hydraulic system "a change in pressure at any point in an enclosed fluid at rest is transmitted undiminished to all points in the fluid and to the walls of the container". An example of this is when you press the pedal to apply the car brakes. Once force is applied onto the brake pedal, this produces pressure on the fluid which is then transmitted to the cylinders in the brake callipers to engage the brake pads onto the brake disc, thus slowing the vehicle.

All around us there are hydraulic systems in use: landing gears of aircraft, heavy construction vehicles such as excavators and cranes, hydraulic lifts and the list goes on. Let's not forget the toy water pistol!

"Imagination decides everything".

Blaise Pascal

French mathematician, physicist, inventor, writer and Catholic theologian.

(1623-1662)

If you want to provide a fun (and a little bit messy) demonstration of Pascal's principle to your students, Pascal's Principle Demonstrator (aka Equality of Pressure in Liquids) will do the trick. It's a simple device comprising of a glass tube with a plunge piston, attached to a glass bulb with holes. Just fill the bulb with water from a beaker, press down the plunger and demonstrate to your students that the liquid will squirt out of the holes with equal force in all directions.

Pascal's Principle Demonstrator
(Code: ***AR1020340***)

REFERENCES

- https://kids.britannica.com/students/article/Pascals-law/
- Arco – Arihant Industries, Equality of Pressure in Liquids Glass 1020340, Instruction Manual, 16/6/20
- Arbor Scientific, Pascal's Demonstrator P1-2190, 2013
- Department of Physics, Simon Fraser University, Pressure Syringe Demonstration, Sited 2/6/20
- Enrique Zeleny"Pascal's Syringe" http://demonstrations.wolfram.com/PascalsSyringe/ Wolfram Demonstrations Project
- Bodhaguru, Physics - Application of Pascal's Law in Hydraulics -English; https://www.youtube.com/watch?v=hV5IEooHqIw , Published October 5, 2017
- Professor Julius Sumner Miller, Lesson 14 – Pascal's Principle – The Properties of Liquids – Demonstration in Physics (1969), https://www.youtube.com/watch?v=8ma4kW3xVT0, Published: February 3, 2014
- United States Navy Department, Application of Pascal's Law, Part 1 (1943), https://www.youtube.com/watch?v=qiGhiMloBcE ; Published: February 2, 2016
- Marshall Ellenstein, "Hewitt-Drew-It! Physics 64. Pascal's Principle"; https://www.youtube.com/watch?v=5rTVo_eb10o ; Published: February 6, 2016
- Biography.com Editors, Blaise Pascal Biography, https://www.biography.com/scholar/blaise-pascal The Biography.com website, Updated: April 16, 2019, Original: SEP 12, 2014
- J J O'Connor and E F Robertson, Blaise Pascal Biography, https://mathshistory.st-andrews.ac.uk/Biographies/Pascal/ , MT Mac Tutor, University of Saint Andrews, Scotland; Last Updated December 1996
- https://www.pngwing.com/en/free-png-ngbgn/download?width=1000