Scorpio Technology NEWSLETTER

INSIDE THIS ISSUE

TEACHER CONFERENCES & WORKSHOPS

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

DATTA ACT – Sat 10/09/2022, TECHnow Conference, Daramalan College, Cowper St, Dickson

DATTA VIC - **Rescheduled** to Friday 9/12/2022 "Designing the Future", Banyule Nillumbik Tech School, Greensborough

WELCOME

Gear up for some more great ideas!

Remember, we're here to support you, however we can. Contact us at (03) 9802 9913 or email us at sales@scorpiotechnology.com.au

PRIMARY STEM: ENGINEERING

Bringing **engineering** into your primary classroom provides opportunities to learn problem-solving skills, work together, to think critically and creatively whilst also communicating clearly and concisely.

Stem vector created by brgfx - www.freepik.com

Check out Scorpio's 2022 PRIMARY STEM CATALOGUE for many great ideas suited to your classroom needs.
Click on link:

https://www.scorpiotechnology.com.au/catalogues

Solar Powered Rovers (Code: SN550030)

Explore solar energy by building your own solar-powered vehicles and devices. Construct three types of solar cars, a solar fan, and a solar robot. Perform science experiments with each model to learn about gear ratios, solar cells, and more.
Suitable ages: 8+.

LEARN TO MAKE, MAKE TO LEARN

" Every challenge we encounter in life also gears us up for more difficult tasks further up the road".

Hermann J Steinherr

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

Aero Dancer (Code: SN550035)

Build a fun inflateable tube dancer that uses the physics of flowing air to perform its eye-catching moves. Learn about gears and circuits as you assemble your tube dancer's fan--complete with battery, motor, and switch. Conduct physics experiments with air pressure, air flow, aerodynamics, and fluid dynamics. Includes fun, hands-on activities and challenges. 9V battery required (*not supplied*).

An eight-panel, full-colour manual guides model building with step-by-step illustrated instructions.
Suitable ages: 8+.

LET'S GET READY FOR THE 2022 MSVC

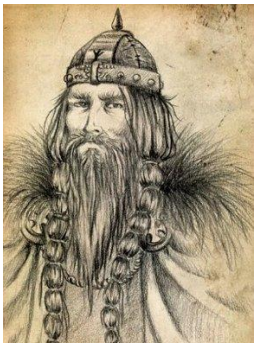
As you know, we are only getting closer to this year's challenge. We thought it wise to touch base with you to go over all the pertinent points of the challenge so that you can get the most out of it.

You can learn more about this year's event and ask any questions you may have on the Model Solar Vehicle Challenge facebook page: https://www.facebook.com/ModelSolarVehicleChallenge/ .

Clint Steele VMSVC Chair
csteele@modelsolar.org.au

What's the difference between a steampunk bike and a regular bike?
On a steampunk bike the gears don't do anything.

Did you hear about the wooden car with wooden tyres, wooden gears and a wooden steering wheel?
It wooden go.



DID YOU KNOW?

The Bluetooth logo is the merging of "H" and "B," the initials of Harald "Bluetooth" Gormsson, written in the ancient letters used by Vikings called runes. Merging the runes creates a new "bind-rune". The logo was designed by engineers Sven Mattisson and Jim Kardach who were working on wireless technology in the 1990s and required a distinctive logo.

King Harald **"**Bluetooth**"** was a 10th century Scandinavian king who united Denmark and Norway in 958. His nickname was "Bluetooth" probably due to a dead tooth.

- A History of Bluetooth & The Story Behind The Bluetooth Logo
  https://fabrikbrands.com › bluetooth-history-and-the-bluet...
- Origin of the Name | Bluetooth® Technology Website
  https://www.bluetooth.com › About Us
- The Bluetooth logo has an awesome secret message - Creative Blog
  https://www.creativeblog.com › news › bluetooth-logo-se..
- https://skjalden.com/why-is-bluetooth-called-bluetooth/

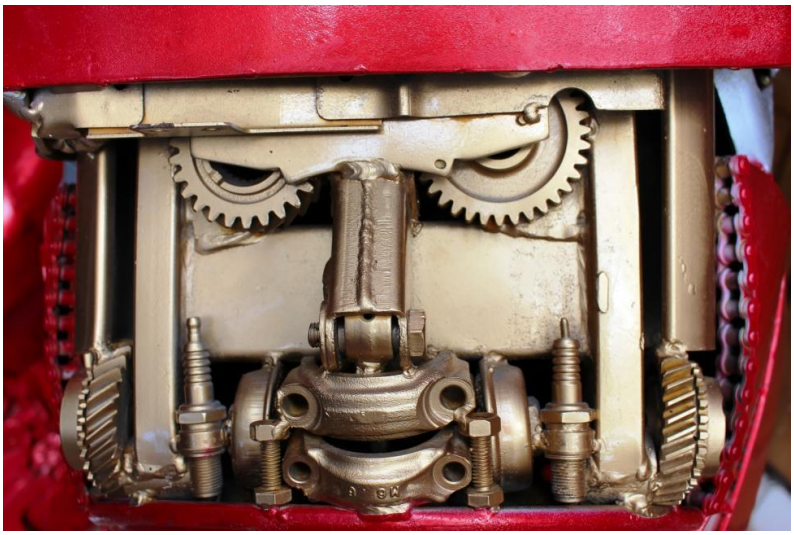
PRICE INCREASES

The impacts of COVID-19 has affected our lives and will continue to do so for some time. It continues to be a tough time for everyone. We have all experienced price increases in everyday costs. Small businesses such as ours, are not exempt from rising costs. We have incurred a 10% devaluation in the exchange rate, product costs and a huge surge in shipping costs.

We regret that keeping prices at the current rate is unsustainable. We will be increasing some prices but as usual we will continue to bring you great products that provide value without breaking your budget.

GEARS

Gears have been in use since ancient times. Their main purpose is to absorb the gap in torque or rotating speed between the prime movers such as motors and engines and the driven mechanisms. It's easy to forget that most of our gadgets and machinery contain gears.



Gears have projections or "teeth". When gears or other toothed parts fit together or mesh they transmit force and motion from one gear to another. The gear transmitting the force or motion is called the **drive gear** and the gear connected to the drive gear is called the **driven gear**.

THE FUNDAMENTALS

Q. What materials are used to make gears?

A. Gears are made from a wide variety of materials. The three factors that determine gear material are strength, durability, and cost of material and of manufacturing.

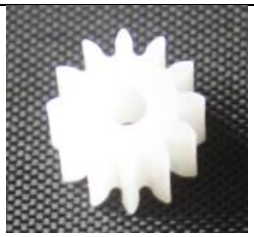
Non-metal gears are made from acetal (a plastic polymer), ceramic, compressed and synthetic resins like nylon, polycarbonate and wood. Plastic gears are made by injection moulding which allows for manufacture of large quantities.

Metal gears are made from aluminium, brass, bronze & phosphor bronze, cast iron, ductile iron, powdered metals, stainless steel and steel - carbon steel or alloy steel.

Metalic gears are made by cutting, rolling, casting and forging. Metal spur gears not requiring high accuracy and hardness are usually made using round rod material. The blanks are turned on a lathe. The teeth are cut using a hobbing machine. They are then deburred.

Q. What types of gears does Scorpio stock?

A. Scorpio kits contain 4 main types of gears: These are available with different hole sizes and number of teeth.

			
Spur Gear	*Pinion Gear*	*Worm Gears*	*Gear Rack*

Q. Where are spur gears used?

A. The most common type of gear is the spur gear. They are used in a wide range of applications from domestic to industrial such as:

- Washing machines
- Clothes dryers
- Blenders
- Mechanical clocks and watches
- Engines
- Construction equipment
- Fuel pumps
- Power plants

Each time a gear tooth on a Spur gear engages a tooth on the other gear, the teeth collide, and this impact makes a noise. This is why they are not commonly used in cars.

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

A. "Module" is the Metric unit of size that indicates how big or small a gear is. As the gear teeth get larger, the module value goes up. Thus:

$$\mathbf{m = d/z} \text{ refers to: } \quad \text{Module} = \frac{\text{Reference diameter}}{\text{Number of teeth}}$$

For example:

- a 1.0 Module 50 Tooth gear will have a diameter of 50mm
- a 0.5 Module 50 Tooth gear will have a diameter of 25mm

Q. Where are gear racks used?

A. A gear rack is a linear gear. The gear rack meshes with round gears. Two or more racks can be interlocked to make a longer rack. Gears move sideways instead of rotating.

Gear racks are frequently used in large gantry systems for material handling, machining, welding and assembly, especially in the automotive, machine tool, and packaging industries. In some of our kits they are used for steering.

REFERENCES:

- https://science.howstuffworks.com/transport/engines-equipment/gear2.htm
- https://www.motioncontroltips.com/spur-gears-what-are-they-and-where-are-they-used/
- https://sciencing.com/materials-used-spur-gears-7194660.html
- https://khkgears.net/new/spur_gears.html

Simple Safety Reminder!

Your safety gears are between your ears.
(Unknown)

THEORY – GEARS AND GEAR RATIOS

Extract from the Lo-Rider Teaching unit (Code: LORIDER)

Gears transfer rotary motion from one gear to another by contact between their teeth.

There are 3 reasons why gears are used:

1. To change the speed of rotation (this can be either an increase or decrease in speed). This is called the **V**elocity **R**atio (VR).
2. To change the applied force (this can be either an increase or decrease in the applied force). This is called the **M**echanical **A**dvantage (MA).
3. To change the direction of rotation (meshing gears always turn in opposite directions).

DRIVER AND DRIVEN GEARS

When gears mesh, one gears makes the other gear turn. The gear that causes the turning is called the DRIVER Gear. The gear that is turned is called the **DRIVEN Gear**.

The gear connected to the end of a motor shaft is called the **DRIVER Gear**.

The first picture shows two gears meshing. The 10 Tooth gear turns the 50 Tooth gear.

The 10 Tooth gear is the DRIVER Gear.

The 50 Tooth gear is the DRIVEN Gear.

If you imagine that the 10 Tooth gear is connected to the end of a motor shaft then the force supplied by the motor will be through the 10 Tooth gear. When the 10 Tooth gear turns once, its 10 teeth will mesh with 10 teeth on the 50 Tooth gear. The 10 Tooth Driver gear will have to make 5 completed revolutions to mesh with the 50 teeth on Driven gear, causing it to turn once.

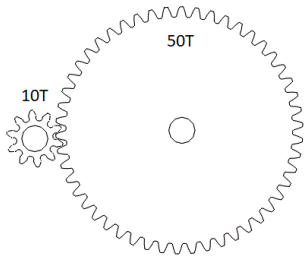
The number of times each gears turns is called the **V**ELOCITY **R**ATIO

If the number of teeth on both gears are known then their Velocity Ratio can be calculated.

$$\text{Velocity Ratio} = \frac{\text{Number of Teeth on Driven Gear}}{\text{Number of Teeth on Driven Gear}}$$

$$= \frac{50}{10}$$

$$= 5$$



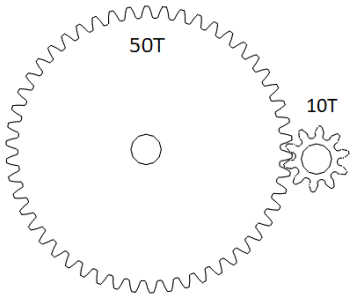
The Velocity Ratio is 5. The driver gear must turn 5 times to make the driven gear turn once.

The Mechanical Advantage will also be 5. The force applied by the driver gear will give the driven 5 times the force (turning power).

Velocity Ratio = Number of Teeth on Driven Gear

Number of Teeth on Driven Gear

= 10
50
= 0.2



The Velocity Ratio is 0.2. The driver gear turns once causing the driven gear to turn 5 times. The Mechanical Advantage will also be 0.2. The force applied by the driver gear will give the driven gear 0.2 times (one fifth) of the force (turning power).

If you decrease speed using gears you will increase the turning force.

If you increase speed using gears you will decrease the turning force.

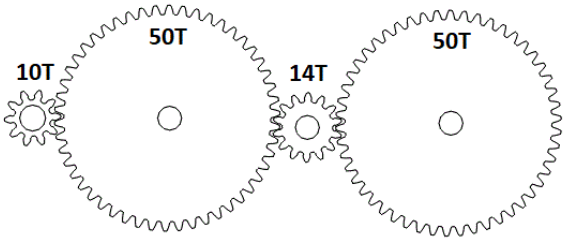
GEAR TRAINS

A gear train is a combination of two or more gears that transmit turning force from the input gear to the output gear.

The two pictures shown are the same gear train just shown differently.

In both cases the driver gear is 10 Tooth gear on the left.

This shows the 4 gears meshing. The 10 Tooth gear is a driver gear. The 50 Tooth gear meshing with it is the driven gear. The 14 Tooth gear is a second driver gear and the 50 tooth gear meshing with is a second driven gear.



This is set of gears works identically to the one shown above. This type of gear train is called a Compound Gear Train. In this case the 14 Tooth gear is attached to the 50 tooth gear. Its advantage is that many gears can be mounted together in a much smaller space.

The method of calculating the Velocity Ratio (VR) and Mechanical Advantage (MA) are identical.

Velocity Ratio = Product of the number of teeth on the Driven Gears

Product of the number of teeth on the Driver Gears

(in this case the Driver Gears are both 50 teeth)

= 50 x 50
10 x 14
= 2500
140
= 17.86 or 18