



NCCA

An Chomhairle Náisiúnta
Curaclaim agus Measúnachta
National Council for
Curriculum and Assessment

Junior Cycle Engineering Classroom-Based Assessment 2: Example of Student Work 01

January 2024

CBA 2 ENGINEERING STEERING SYSTEM

ANALYSIS

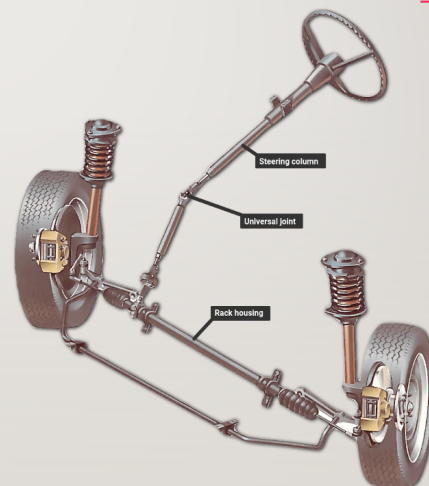
- What are steering systems?
- Vehicles that use steering systems ?
- Why do we need steering system?
- Different types of steering systems?
- How does steering system work?
- What are parts of steering system ?
- What are the signs of steering system problems?
- When was steering system created ?

General knowledge about steering system

- A steering system typically consists of various components such as a steering wheel, linkage, and in some cases, power assistance, which collectively enable the driver to change the vehicle's direction by turning the front wheels or rudder.

WHAT ARE THE STEERING SYSTEMS PARTS OF A CAR?


- The system involves a circular gear (the steering pinion) which locks teeth on a bar (the rack). It also transforms big rotations of the steering wheel into small, accurate turns of the wheels, giving a solid and direct feel to the steering. It consists of a steering wheel, steering column, universal coupling, linkages, and rack and pinion



VEHICLES THAT USE STEERING SYSTEMS


Linkage and hook steering system

Sr 18




Rack and pinion steering system

Sr 17




Sr 16




Fork steering system

Sr 19




Rack and pinion steering system

Sr 12




Split / Differential steering system

Sr 13




Sr 14



Sr 15

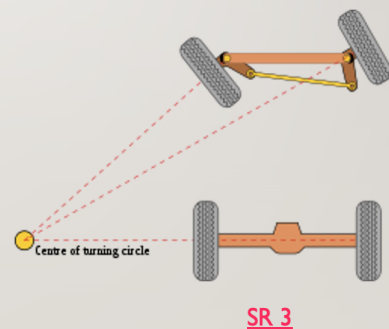
Rudder steering system

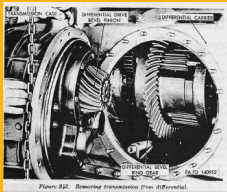
Sr 15



VARIOUS STEERING SYSTEMS

- Vehicles can use various steering systems, such as rack and pinion, recirculating ball, hydraulic power, electric power, rear-wheel, hydraulic fluid, manual, and four-wheel steering, depending on their size and purpose.

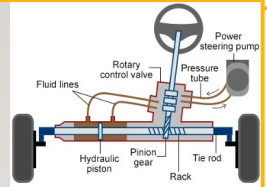




SR 6

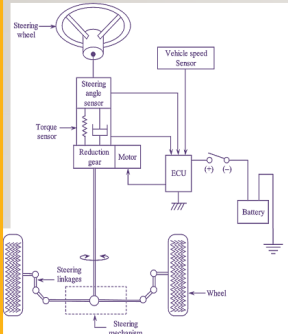
DIFFERENT TYPES OF STEERING SYSTEMS

SR 4

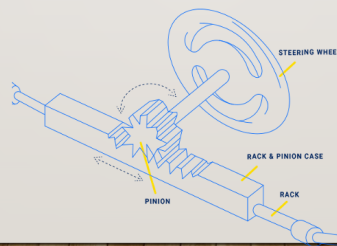


- There are three basic types of power steering systems found in vehicles: the hydraulic power steering (HPS), the rack and pinion steering, the electric power hydraulic steering (EPHS), the differential steering, and the fully electric power steering (EPS). Electric and electronic power steering both refer to the same system.

SR 8



SR 5

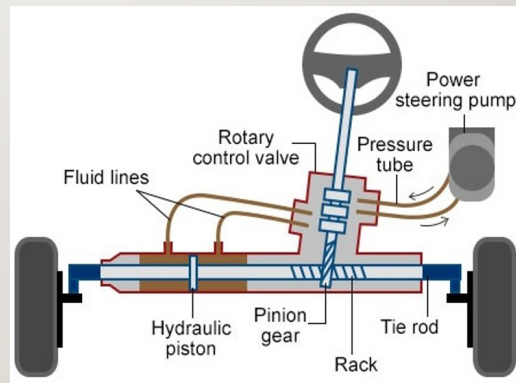


SR 7



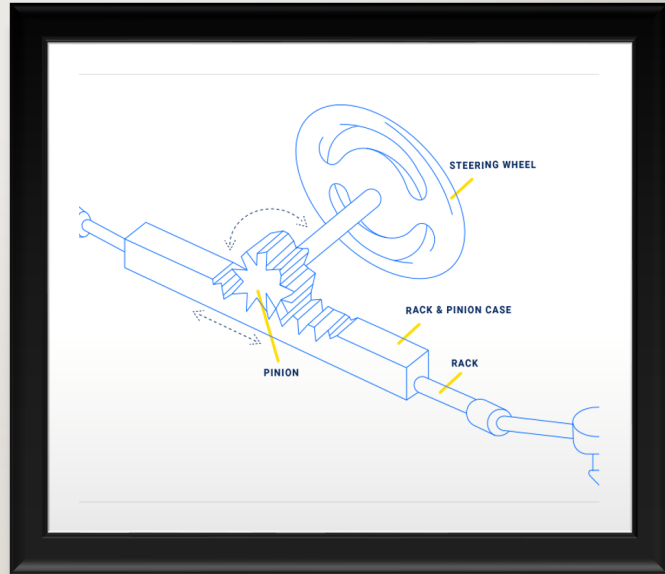
HOW DOES THE HYDRAULIC POWER STEERING (HPS) WORK

- Hydraulic power steering (HPS) is a steering system that uses hydraulic pressure to assist the driver in turning the wheels, providing smoother and more effortless steering control in vehicles.



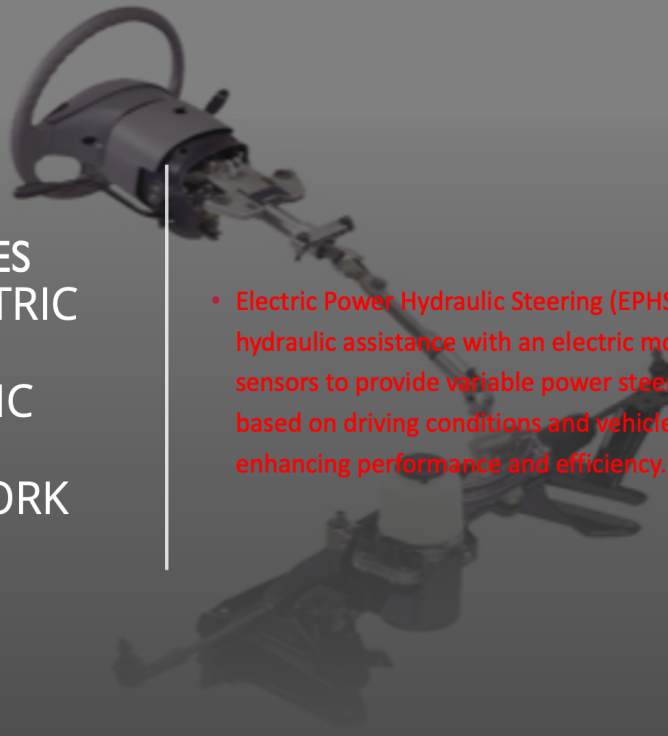
HOW DOES RACK AND PINION STEERING SYSTEM WORK

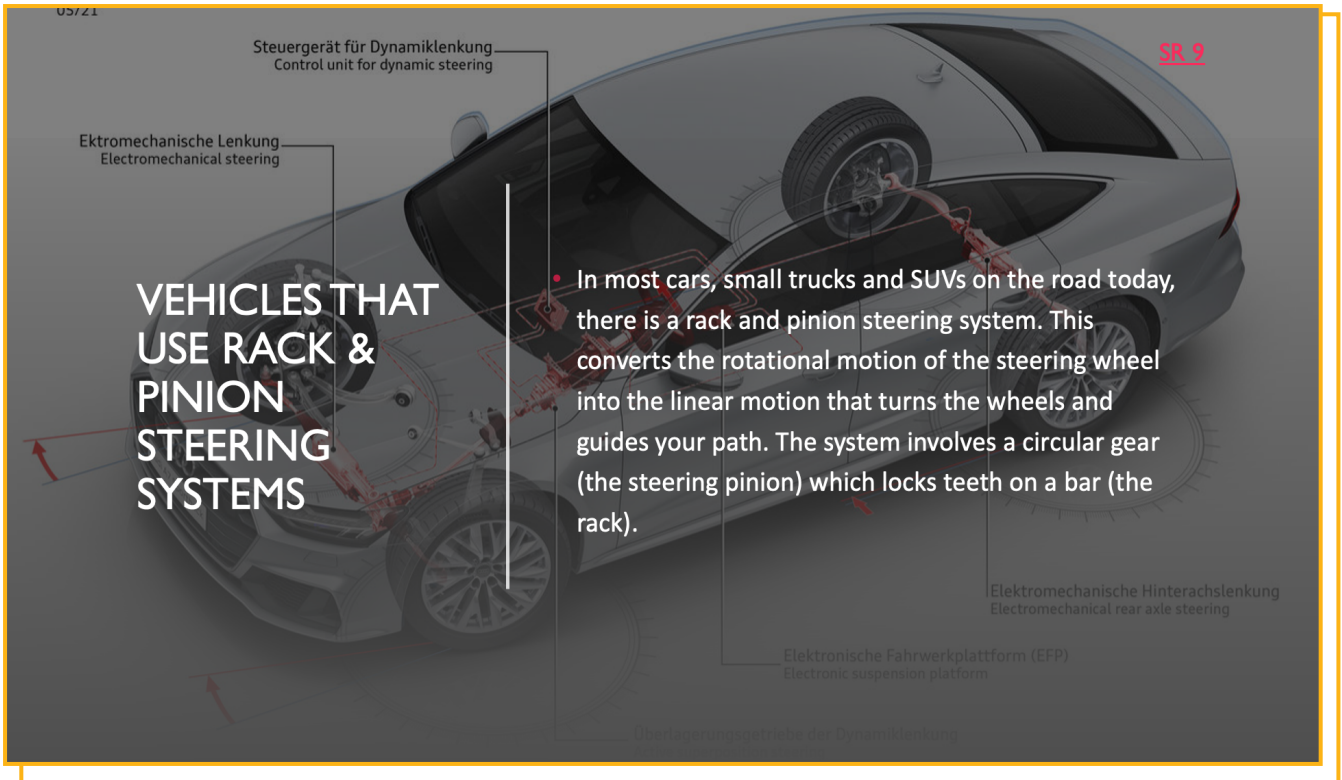
- The system involves a circular gear (the steering pinion) which locks teeth on a bar (the rack). It also transforms big rotations of the steering wheel into small, accurate turns of the wheels, giving a solid and direct feel to the steering



HOW DOES THE ELECTRIC POWER HYDRAULIC STEERING (EPHS) WORK

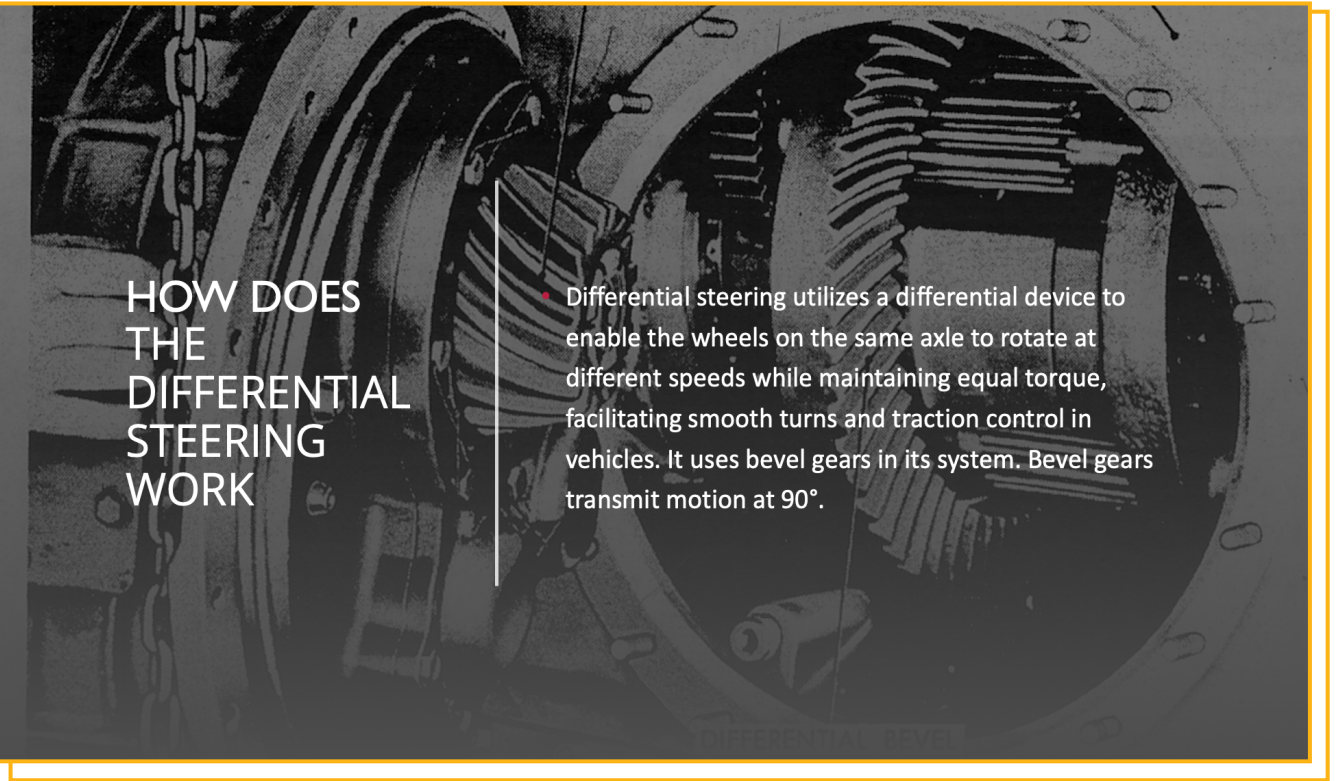
- Electric Power Hydraulic Steering (EPHS) combines hydraulic assistance with an electric motor and sensors to provide variable power steering assistance based on driving conditions and vehicle speed, enhancing performance and efficiency.





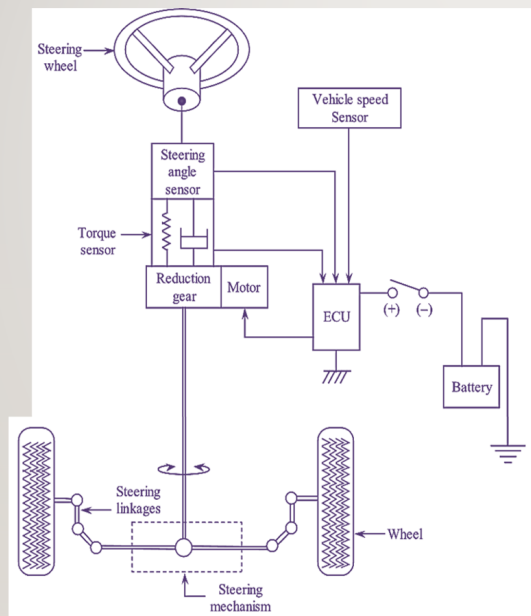
VEHICLES THAT USE RACK & PINION STEERING SYSTEMS

- In most cars, small trucks and SUVs on the road today, there is a rack and pinion steering system. This converts the rotational motion of the steering wheel into the linear motion that turns the wheels and guides your path. The system involves a circular gear (the steering pinion) which locks teeth on a bar (the rack).



HOW DOES THE DIFFERENTIAL STEERING WORK

- Differential steering utilizes a differential device to enable the wheels on the same axle to rotate at different speeds while maintaining equal torque, facilitating smooth turns and traction control in vehicles. It uses bevel gears in its system. Bevel gears transmit motion at 90°.

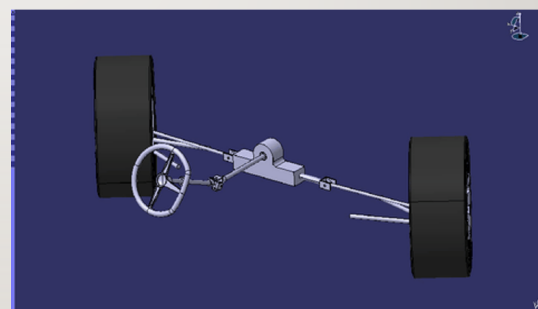


HOW DOES THE FULLY ELECTRIC POWER STEERING (EPS) WORK

- Fully Electric Power Steering (EPS) operates by using an electric motor to assist in steering without hydraulic components, allowing for precise control, energy efficiency, and adaptive steering assistance based on driving conditions.

WHY DO WE NEED STEERING SYSTEM

- The main functions of the steering system is to provide vehicle turning per will of the driver, directional stability, it converts the rotary movement of the steering wheel into an angular turn of front wheels, and absorbs road shock from being transmitted to a driver's hands.



EVALUATION

- I enjoyed doing the project on steering systems, I developed lots of new skills e.g. creating a Power Point presentation, adding links to my sources of information, I also learned how to record videos on my iPad and use that video on the PowerPoint presentation. I learned a lot of new information about steering systems. The topic had a lot of information when I researched it and it was difficult to decide how much information to put in.

Sr 11



VIDEOS TO SHOW UNDERSTANDING OF A SPLIT STEERING OR DIFFERENTIAL STEERING SYSTEM

English description

Ukrainian description

Pr



[Click here](#) to view the English description video above

[Click here](#) to view the Ukrainian description video above

SOURCES OF INFORMATION (SECONDARY RESEARCH)

- | | |
|------------------------------------|---|
| 1. SR 1: page 3 | 11. Sr 11: page 15 |
| 2. SR 2: page 4 | 12. Sr 12: page 5 |
| 3. SR 3: page 6 | 13. Sr 13: page 5 |
| 4. Sr 4: page 7 | 14. Sr 14: page 5 |
| 5. Sr 5: page 7 | 15. Sr 15: page 5 |
| 6. Sr 6: page 7 | 16. Sr 16: page 5 |
| 7. Sr 7: page 7 | 17. Sr 17: page 5 |
| 8. Sr 8: page 7 | 18. Sr 18: page 5 |
| 9. Sr 9: page 11 | 19. Sr 19: page 5 |
| 10. Sr 10: page 14 | 20. Sr 20: text in presentation |

Pr = primary research
Sr = secondary research

Note and Disclaimer: All links provided in this submission were checked and confirmed to be active at the time of submission by the student.



Teacher annotations using the Features of Quality

The annotations capture observations by the teacher, using the features of quality, with a view to establishing the level of achievement this work reflects. The annotations and judgments were confirmed by a Quality Assurance group, consisting of practising teachers and representatives of the NCCA, the Inspectorate, the State Examinations Commission and the Oide support service.

Teacher annotations

Research and analysis:

The research method chosen demonstrated a comparison of a range of sources which led to the production of a comprehensive and detailed analysis of the data/findings. The use of a primary video source was highly effective and complimented the research conducted through secondary sources.

Exploring concepts:

The response demonstrated a comprehensive understanding of a range of concepts in relation to the theme.

Communicating their work:

A number of slides contained a significant amount of text. Acknowledging this, the presentation of the findings is of an excellent standard, using highly effective media including a PowerPoint presentation and relevant imagery with embedded links to secondary sources of information. This, together with the bilingual primary videos provided by the student, allowed for a critical consideration of what information best communicated their response.

Overall judgement:  Exceptional



Exceptional



Above expectations



In line with expectations



Yet to meet expectations