Marcos' Law: Energy can be created.

Abstract

The First Law of Thermodynamics is a fundamental principle that explains the conservation of energy in physical systems. It states that energy cannot be created or destroyed but can only be converted from one form to another. This law is crucial for understanding the behavior of closed systems in both natural and engineered settings. To maximize movement, energy must be efficiently converted into work and minimize energy losses. However, in practical systems, energy conversions are rarely 100% efficient. By considering both the potential and limitations of this law, scientists and engineers can better design processes that respect energy conservation principles. In a closed system, driven by falling water to move a wheel, the positioning of a component that captures the water can bring the water back to the highest container, this highest container stores the falling water to make the wheel turn. Consequently, the water returns to the initial container, creating the force to turn the wheel a little more. This mechanical phenomenon produces more energy than the initial energy. The process was done experimentally by creating the object according to the figure, proving the effect and recording it on video.

Breaking the first law of thermodynamics: it is possible to create energy.

Creation is the action or process of bringing something into existence. In this text, I will demonstrate how it is possible to create energy. It is possible, within a closed system, to create energy using the initial energy.

The First Law of Thermodynamics: Foundation and Implications for Closed Systems

The First Law of Thermodynamics is a fundamental principle that underlies the study of energy in physical systems. Formally stated, it posits that energy cannot be created or destroyed; it can only be converted from one form to another. This law, which reflects the conservation of energy, serves as a cornerstone for understanding the behavior of closed systems in both natural and engineered settings (Cengel & Boles, 2019).

Defining a Closed System

A closed system is one that can exchange energy with its surroundings but not matter. This distinction is critical for applying the First Law, as it confines the energy transformations to heat and work interactions. The change in internal energy accounts for all energy exchanges within the closed system.

Practical Implications

The First Law's implications extend across various disciplines. In engineering, understanding energy balance is essential for designing systems like engines, turbines, and refrigerators, where heat and work are meticulously managed to achieve efficiency (Smith et al., 2020). For example, in a steam turbine, energy added as heat is partially converted into work, with some residual energy contributing to internal energy and exhaust heat.

In environmental science, the First Law helps in assessing energy flow in ecosystems, treated as closed systems for modeling purposes. Energy transformations such as photosynthesis and respiration obey conservation laws, reinforcing the interconnectedness of natural processes (Odum & Barrett, 2005).

While the First Law ensures energy conservation, it does not indicate how efficiently energy can be converted into work. This aspect is governed by the Second Law of Thermodynamics, which introduces the concept of entropy and irreversibility in energy transformations (Fermi, 1956). The combination of these laws highlights that while total energy remains constant, usable energy may decrease over time.

Maximizing Movement: Theoretical Considerations

To maximize movement, energy must be efficiently converted into work, and the system must minimize energy losses. According to the first law of thermodynamics, all the energy added to the system as heat should ideally be converted into work in a perfect system.
However, in practical systems, energy conversions are rarely 100% efficient.

In mechanical systems, energy losses typically occur due to factors such as **friction**, **heat dissipation**, and **irreversibility** in the conversion process. For example, in an internal combustion engine, not all the thermal energy generated from burning fuel is converted into useful mechanical work; much of it is lost as heat to the exhaust and engine components (Cengel & Boles, 2007).

In biological systems, the efficiency of energy conversion into movement is similarly affected by biochemical processes and metabolic efficiency. For instance, muscle contraction, which enables movement in humans and animals, involves the conversion of chemical energy stored in ATP (adenosine triphosphate) into mechanical work. However, a significant portion of the energy is lost as heat due to inefficiencies in muscle fiber dynamics and metabolic pathways (López-Sánchez et al., 2015).

Thus, while the first law of thermodynamics does not impose a limit on the amount of energy available for movement in a closed system, practical inefficiencies mean that maximizing movement requires optimizing energy conversion processes and minimizing losses.

The Limits of Maximizing Movement: Real-World Applications

In real-world applications, **perfect energy conversion**—where all the energy added to the system is converted into movement—is unattainable due to the inefficiencies introduced by friction, heat, and irreversible processes. For example, even the most efficient heat engines, such as those used in spacecraft propulsion, face limitations due to the second law of thermodynamics. No matter how optimized the system is, some energy will inevitably be lost to entropy.

In biological organisms, maximizing movement becomes even more complex. The human body, for example, can increase its energy efficiency through training, but the process still

needs to be improved by metabolic and biochemical inefficiencies that lead to heat generation, which cannot be fully recovered for mechanical work. This explains why humans experience fatigue after prolonged physical exertion—biochemical pathways and energy conversions are not infinitely efficient.

How to Produce More Movement by Optimizing Energy Efficiency in Physics

In physics, the concept of movement is inherently linked to the transformation and transfer of energy. Whether it is the movement of a mechanical system, the motion of particles in thermodynamics, or the locomotion in biological systems, optimizing energy efficiency is crucial for maximizing the amount of useful movement. Energy efficiency refers to how effectively energy is converted from one form to another without significant losses. In the context of movement, it involves optimizing the conversion of energy into kinetic work, minimizing dissipation, and ensuring that the energy provided to a system is as effectively utilized as possible. This article explores how optimizing energy efficiency can increase movement and explores the relevant physical principles that govern such optimizations.

Strategies for Improving Energy Efficiency and Movement

To optimize energy efficiency and produce more movement in both mechanical and biological systems, several strategies can be employed:

- **Friction Reduction**: Using low-friction materials, lubricants, and advanced bearing systems (e.g., magnetic bearings) can reduce energy losses in mechanical systems (Lugt, 2017).
- **Aerodynamic Design**: Streamlining objects and reducing their drag coefficient minimizes energy lost to air resistance, increasing the speed and efficiency of movement (Barlow et al., 2017).
- **Energy Recovery Systems**: In systems like electric vehicles and hybrid cars, regenerative braking recovers kinetic energy during deceleration and converts it back into electrical energy for later use (Lloyd & Bräunl, 2016).
- **Biological Optimization**: In humans, improving muscle efficiency through exercise, optimizing posture, and refining motor control can reduce the metabolic cost of movement, allowing for more efficient energy conversion (Fitts, 2018).

Techniques for Recycling Energy: Work Recovery and Heat Recovery

In practical systems, efficient energy recycling focuses on recovering as much of the energy lost in the form of heat or mechanical work as possible. There are several key strategies to achieve this:

Regenerative Braking and Work Recovery

One of the most common methods for recycling energy in mechanical systems is **regenerative braking**, a process used in electric vehicles (EVs) and certain industrial machines. In this system, instead of using traditional friction brakes that dissipate energy as heat, the kinetic energy of the moving object is converted back into electrical energy through the motor. This electrical energy is then stored in a battery or capacitor for later use.

Regenerative braking is governed by the principle of **conservation of mechanical energy**:

$$\text{Kinetic Energy} = \frac{1}{2}mv^2$$

During braking, the vehicle's kinetic energy is converted into electrical energy through the motor acting as a generator. This energy is then reused when needed, reducing the need to replenish energy from external sources.

Marcos' law

In a closed system, driven by falling water to move a wheel, the positioning of a component that captures the water can bring the water back to the highest container, this highest container stores the falling water to make the wheel turn. Consequently, the water returns to the initial container, creating the force to turn the wheel a little more.

This mechanical phenomenon produces more energy than the initial energy. The process was done experimentally by creating the object according to the figure, proving the effect and recording it on video(Dos Santos, 2024), as you can see in figure 1:

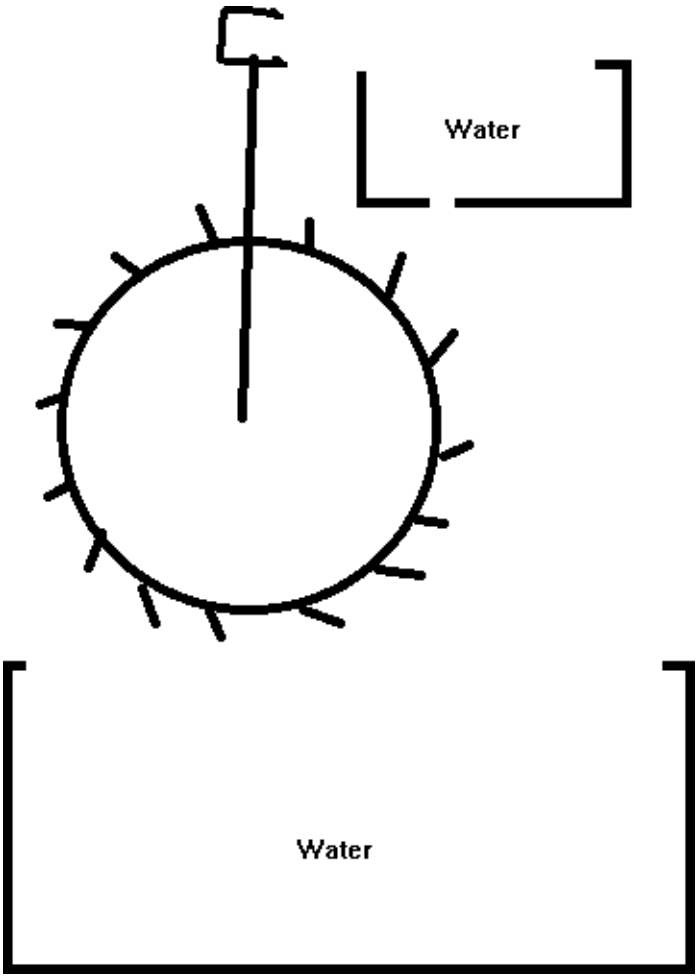

Fig.1 Cylindrical model driven by falling water, used to exemplify the use of initial force to produce extra force.

Conclusion

The First Law of Thermodynamics provides a foundational understanding of energy conservation in closed systems. Its applications range from mechanical engineering to ecological modeling, emphasizing the importance of energy management and transformation. By considering both the potential and limitations of this law, scientists and engineers can better design processes that respect energy conservation principles.

Maximizing movement through optimized energy efficiency involves a combination of reducing energy losses, maximizing power output, and understanding the fundamental thermodynamic constraints that limit efficiency. Whether in mechanical systems, biological systems, or technological innovations, the goal is to minimize friction, drag, and heat dissipation while improving the rate of energy transfer and work production. While perfect efficiency is unattainable due to the second law of thermodynamics, modern engineering, and biological adaptations can significantly improve energy efficiency, producing more movement for the same energy input.

Creation is the action or process of bringing something into existence. In this text, I demonstrated how it is possible to create energy. It is possible, within a closed system, to create energy using the initial energy.

References:

- Barlow, J., Rae, W., & Johnson, S. (2017). Fundamentals of Fluid Mechanics (7th ed.). Pearson Education.
- Cengel, Y. A., & Boles, M. A. (2007). Thermodynamics: An Engineering Approach (7th ed.). McGraw-Hill.
- Cengel, Y. A., & Boles, M. A. (2019). Thermodynamics: An Engineering Approach (9th ed.). McGraw-Hill Education.
- Dos Santos, Marcos Francisco . (2024, August 12). Energy spin water [Video]. YouTube. https://www.youtube.com/watch?v=gaRlNevVets
- Fermi, E. (1956). Thermodynamics. Dover Publications.
- Fitts, R. H. (2018). Cellular Mechanisms of Muscle Fatigue in Physiology of Sport and Exercise (6th ed.), Human Kinetics.
- Lloyd, D. & Bräunl, T. (2016). Electric Vehicle Dynamics and Energy Efficiency. Springer.
- Lugt, P. M. (2017). Lubrication and Maintenance of Industrial Machinery: Best Practices and Reliability. CRC Press.
- López-Sánchez, J. P., et al. (2015). Energy efficiency of muscle contraction and its implications for exercise performance. Frontiers in Physiology, 6, 250. doi: 10.3389/fphys.2015.00250.
- Odum, E. P., & Barrett, G. W. (2005). Fundamentals of Ecology (5th ed.). Cengage Learning.
- Smith, J. M., Van Ness, H. C., & Abbott, M. M. (2020). Introduction to Chemical Engineering Thermodynamics (8th ed.). McGraw-Hill Education.