

10th IYNT 2022; Tskneti, Georgia

Problem 10. *Rubber bands heat engine*

Opponent: David Brătucu
Team Romania - Limitless 3.0

21-28 August 2022

Problem statement:

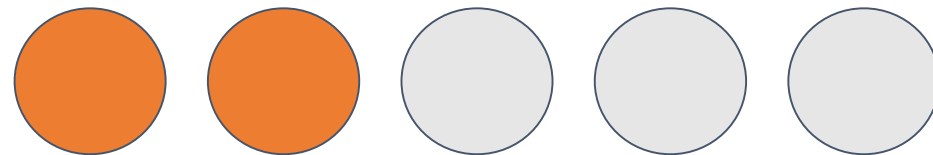
All the ***spokes*** in a **bicycle wheel** are replaced by **rubber bands**. If the rubber bands on **one side** of the wheel are ***heated***, the wheel starts to **rotate**. ***Investigate this effect.***

Theoretical Part

Strong points	Weak points
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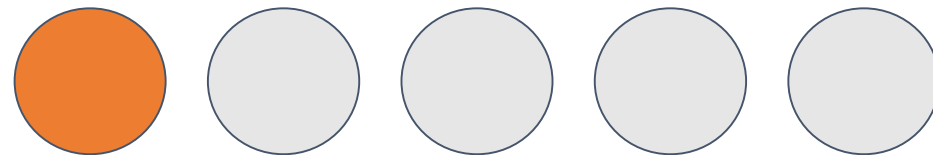
1. Talked about the Gough-Joule effect and tested it experimentally.
2. Understood the phenomenon
3. Great visuals

1. Did not give a theoretical explanation as to why rubber bands contract when heated
2. Did not explain the formulas he wrote
3. Did not explain why efficiency η is relevant for the problem.
4. Did not vary the rubber bands
5. Did not give a closed form for the theoretical angular velocity (starting from energy variation relation)
6. Hard to follow presentation



Experimental Part

Strong points	Weak points
<ol style="list-style-type: none">1. Showed the experimental setup2. Inserted videos	<ol style="list-style-type: none">1. No hypothesis2. Did not explain why the color of the rubber band is relevant3. Did not show any experimental videos or procedures/steps for measuring.4. No variation in the experiment5. Crowded graphs, didn't show any trend lines or drew any monotonous intervals



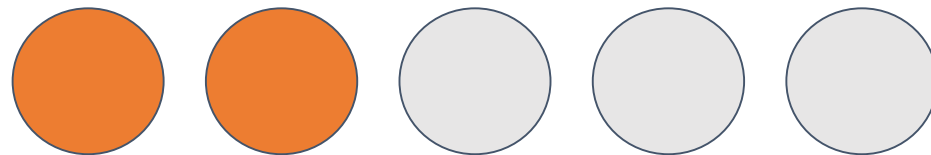
Conclusion

Strong points

1. Correlated the theory and the experiment
2. Did correlate theoretical formulae with experimental conclusions

Weak points

1. Did not explain why efficiency was needed to arrive at a comparison between
2. Not enough variation in the experiment
3. Did not come with any conclusion to the hypothesis
4. Didn't measure accuracy or errors w.r.t. theory



Discussion topics

1. Did you perform the experiment multiple times(i.e. are your results over an average)?
2. Do you think repeating the experiment 2 times is enough? Why?
3. When did you consider the starting time for the wheel?
4. Is the wheel in a continuous non-stop motion if it is unbalanced?
5. How did you use the physics tracker?
6. What type of motion was that?(accelerated/constant)
7. Suppose that the wheel stays still. If you were to move it by hand, what would happen?
(disequilibrium, decentralization)
8. How did you ensure that the elastic coefficient of the rubber band is the same?
9. I believe that an uneven distribution of hooks or rubber bands may introduce errors too big to control the results. Did you try to solve this issue?

Discussion