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A4_6 Freddy Fazbear's Power Plant

N. Savic, H. Birch, L. Tzabach

Department of Physics and Astronomy, University of Leicester, Leicester, LE1 7RH

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Abstract

In this paper, we investigate how much energy is required to keep the animatronics at Freddy Fazbear's Pizzeria constantly running since the closure of the restaurant. To do this, we calculate the average energy used by an industrial robot working constantly for roughly 7 years. We find that, to keep the animatronics constantly running for this amount of time, a total of 6.6×10^{11} J are required for each of them, or 6.1×10^{7} AA batteries.

Introduction

Five Nights at Freddy's (FNAF) is a well-known children's gaming franchise about a security guard working at a closed restaurant, Freddy Fazbear's Pizzeria, where the haunted animatronics roam free. A film was recently released on the concept of this franchise, which this paper is based on. Assuming the animatronics are constantly in operation, how much total power is required to keep them running without maintenance since the restaurant's closure?

Power Usage of Animatronics

Freddy Fazbear's Pizzeria is said to have closed in 1993 [1], while the film was set in 2000 [2]. The primary assumption we have made in this paper is that the animatronics have been left to run constantly for the 7 years (or 2.2×10^{8} s) between these two events.

To calculate the total energy required to power them for this period of time, we use the equation:

$$E = Pt \tag{1}$$

where E is the total energy required for one animatronic, P is the power used, and t is the time period.

We have made the assumption here that the animatronics are average industrial robots with a typical power usage of 3 kW [3].

Therefore, when substituting the values for time and power into Equation 1, we get an energy of 660 GJ. Hence, this is the energy required to power one of the animatronics over a 7 year period.

We have assumed that the only animatronics being constantly powered over this period of time are the four which appear in both the film and the first FNAF game. These are Freddy, Chica, Bonnie, and Foxy. With them appearing to be similar sizes in the film, we have also assumed that they all require the same amount of energy.

The total energy, E_{tot}, required to power all 4 of these animatronics is 2.64×10^{12} J.

Now that we have this value, we are able to calculate the number of average batteries are required to power all 4 animatronics.

Batteries Required over 30 Years

AA batteries are some of the most commonly used batteries [4], therefore we will assume that

the animatronics are being powered by them.

The average AA battery has a total power output of $2-4$ Wh [5], so we will use a value of 3 Wh (or $10,800$ J). The total number of AA batteries required to power one of the animatronics is:

$$n = \frac{6.6 \times 10^{11}}{10,800} = 6.1 \times 10^{7}$$

This means that a total of 2.4×10^{8} batteries are required to power all 4 animatronics.

With there being a predicted global production of 4 billion AA batteries annually [6], it is entirely possible to produce all the batteries required to power the animatronics in under a year.

Discussion

To power all 4 of the animatronics for 7 years, we require roughly 2.4×10^{8} AA batteries. We have also assumed that the batteries are instantaneously replaced after they die. Taking into account the fact that far too many AA batteries would need to be used and hence replaced, this is likely not the most efficient method of powering the animatronics.

An alternative method for powering the animatronics could be through the mains power supply. This could be achieved through having inductive coils running under the floor which generate a magnetic field, hence wirelessly powering the animatronics. Since the pizzeria closed down in 1993, the wireless technology required would have most likely not been wide-spread enough for it to be plausible to use in a restaurant. Using inductive coils would make the efficiency so low that a much larger energy would be required than the one calculated.

Overall, using batteries to power the animatronics could be a reasonable method, especially given their global annual production.

Conclusion

Overall, we have found that, to power the 4 animatronics constantly for 7 years, 2.64×10^{12} J of energy are required, or approximately 2.4×10^{8} AA batteries. With the average global production of AA batteries being roughly 4 billion, it would take under a year to produce the batteries required, which is a reasonable timeframe.

References

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