Task 7.1 Answer

10/9/2023

1 Will the motor in the question work?

First off, a brushed DC motor such as the one given in the question would work given that it could reach suitable speeds. Another bonus would be the brushed motor's simple wiring and its reliability too and some of the vacuum cleaners available today do actually use brushed DC motors.

2 Are there more suitable options?

Brushless motors would probably be the better choice.

- **Durability:** Given that this vacuum cleaner is intended to clean on a planetary scale it would be wise to assume that durability is one of the most important factors we need to consider given that said suction motor must also be rotating at high speeds. This pro makes the brushless motor the most suitable option as it does not have brushes that can be worn down.
- **Efficiency:** Another thing to consider would be the fact that brushless motors are more efficient as they have less friction between their internal components compared to brushed motors, and in a scenario where we are in a post-apocalyptic wasteland, energy is scarce so efficiency is an important trait to consider.
- **Speed:** Another thing to consider would be the brushless motor's RPM which can reach 100,000 and typically vacuum cleaners need about 30,000 - 35,000. Given that vacuum cleaners generally do not use gearboxes or power transmission systems, this would leave the brushless motor as a prime candidate.

3 Are popular motors like servos and steppers viable?

It would be wise to disqualify both servo and stepper motors completely given that:

- No distance needs to be measured here
- Steppers have a much lower RPM than needed as steppers can only reach about 1,000RPM while we would need at least more than 25,000RPM
- Servos cannot rotate more than 360°