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1. This can opener must have at least 25 percent pinion to gear torque ratio. The gears must be in an involute profile. The gear ratio must match the diameter ratio. The contact ratio should be at least 1.3 in order to prevent excessive backlash. It must fit into the allowed space. It must connect to the input and output of the opener. Must be resistant to jam, especially due to reversing of the gear train (links with the contact ratio).
2. To make the torque output of the gear train to 50 percent of pinion, we did the following. In order to maintain high gear ratio while still limiting how small the gear can be, we used multiple spur gears in mesh. As we have used spur gears instead of helical gear with higher contact ratio, backlash or vibration may occur which decreases the motion quality. Also, due to high pressure angle, gear teeth may be subject to stronger contact, making the motion less smooth. However, the strength in spur gears is the price, since manufacturing and machining does not require high of a tolerance compared with ,say, helical gears.

Gear Ratio:

$$\left(\frac{\text{Driver}}{\text{Driven}}\right) \left(\frac{60}{12}\right) \left(\frac{60}{12}\right) \left(\frac{50}{60}\right) \left(\frac{70}{20}\right) = 72.9$$

Old ratio:

$$\left(\frac{78}{11}\right) \left(\frac{72}{10}\right) = 51.05$$

$$51.05 \text{ T} \rightarrow 72.9 \text{ T}$$

(~42.8% increase)

3. We should still use the plastics in this design since plastic was proven to be durable enough for wear during the usage, according to the original design. Also, since the gears that mesh together directly do not have big discrepancies in size, we do not need undercut in our gears, which increases the mechanical performance of the gear train. This also reduces jamming since jamming occurs when the gap in the involute profile is too large, which is common in gear profile with large gear ratio.
4. We have a spline shaft fit in this mechanism. Since the shaft is directly in mesh with the gear, we classified this type of fit as spline in the lecture. We still use the attachment type since the torque transmission is comparatively big and the sliding property can generate large combinations of gear ratio with other gear profiles.