



CALIFORNIA STATE SCIENCE FAIR 2004 PROJECT SUMMARY

Name(s) Drew K. Spence	Project Number J0827
Project Title Do Low-Flow Toilets Actually Conserve Water?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The 1995 National Energy Policy Act required that low-flow toilets be installed in all new housing to reduce water usage. Consumers report however, that these toilets require multiple flushings and question the effectiveness of their water savings. I tested high-flow and low-flow toilets to see which one is more effective in conserving water and in meeting consumer acceptance.</p> <p>Methods/Materials A low-flow "Mansfield" 1.6 gallon (6.8 liter) toilet and a Standard 1975 3.8 gallon (16.1) toilet were used. A toilet paper usage survey was conducted and it revealed that on average 7 sheets of 2-ply toilet paper were used for liquid waste and 18 sheets of 2-ply toilet paper for solid waste. The experiment consisted of 10 flushes each of solid matter and liquid matter in each type of toilet. The average stool weight in western urbanized society is under 150 gm per day (Goodhart, Shills 1980). Volume of the stool was also taken into consideration and so two Hostess Ho-Ho-Ho#s weighing 56.7 gm and having a volume of 106 cubic cm were used to represent the solid matter. One drop of green food coloring was used to represent the liquid waste. Sheets of toilet paper were added as determined from the toilet paper survey. If a toilet became plugged it was plunged and cleared before the experiment resumed.</p> <p>Results Results of my experiment revealed that the low-flow toilet required the same number of flushings with "Liquid Matter" and twice the number of flushings on average with "Solid Matter". The toilet plugged with "Solid Matter" 40% of the time and required plunging. Converting number of flushings to volume of water used revealed that on average high-flow toilets used 9.3 liters more water with "Liquid Matter" and 3.13 liters more water with "Solid Matter" than the low-flow.</p> <p>Conclusions/Discussion Despite the multiple flushings required, the low-flow toilet used 58% less water with "Liquid Matter" and 16% less water with "Solid Matter" than the high-flow toilet. Consumer complaints that the low-flow toilet offers less water savings than it#s name implies may stem from the perception that more water is being used because more flushings are required. The increased incidence of toilet "pluggings" with low-flow toilets was supported by this project. For many consumers, avoiding a plugged toilet may be more important than saving water.</p>	
Summary Statement This project compares the number of flushings required with low-flow and high-flow toilets to determine if low-flow toilets acutally conserve water.	
Help Received My mother purchased the items on my materials list. I used the low-flow toilet in my family's home and the "high-flow" toilet in my grandmother's home. My father took the photographs of me conducting the experiment and helped me to make certain the toilet was clear when it became plugged.	