

## Pressurization Correlations in Canned Beverages

### Introduction

The intent of this experiment is to determine the pressure within 3 cans of different dimensions and contents: Coke, Mountain Dew energy drink, and Arnold Palmer. Another function of this exercise is to determine any possible correlations between the can dimensions or contents and their internal pressures. External measurements indicating internal pressure differences is very important not only in food storage, but storage of any volatile substance, airlocks, fluid-filled tires, or transferal of material through pipes.

### Materials and Methods

Three strain gauges oriented at  $45^\circ$  angles from each other on each can measured the effect of releasing the pressure in three axes. We opened each can to measure the difference in strain as the internal pressure dissipated, then the height, diameter, and can wall thickness was recorded for analysis. Using known relationships between the magnitude of principle strain and pressure, the maximum and minimum strain and known material constants each derived a value of pressure within the can. The difference in these pressures is due to uncertainty in the calculations, presented in table 1.

### Results

Table one shows values of each can's dimensions, next to its respective calculated internal pressure.

Can contents	Height(mm)	Width(mm)	Wall Thickness (mm)	Internal Pressure(kPa)
8oz. Coke	104	57.23	0.113	$433.7 \pm 24.2$
16 oz. Energy Drink	156	66.05	0.118	$331.8 \pm 19.3$
23oz Arnold Palmer	191	74.3	0.128	$356.5 \pm 13.4$

Table 1: Can Information

### Discussion

The contents of the cans did not obviously correlate to the pressures within. Whereas the Arnold Palmer can was the only one containing fluid that is not carbonated, its pressure closely matched that of the carbonated energy drink. The least voluminous can did contain the most pressure, but that also did not appear to be a trend for the remaining cans. logically, a canned beverage without carbonation needs pressurization to withstand being stacked and packed. Seeing as the carbonated energy drink contained the same or less pressure, a carbonated beverage does not need more pressurization than a flat beverage. Coke must be an out-lier with more pressure than needed.