

HW 1d

Vended Cola Problem:

When purchasing a canned cola product from a vending machine, one should leave the can unopened for a short period of time before opening the can. Failing to do so can lead to a very messy “spewing” of the contents.

In order to “scientifically” approach this problem, the following “thought experiment” is conducted:

Three identical refrigerated cans of cola (labeled A, B, and C) are obtained. They are subjected to the following treatments.

- Cans A and C are simultaneously vigorously shaken for 30 seconds. Can B is not shaken and is allowed to sit on a desktop.
- Can A is opened immediately following shaking and (as expected) spews.
- Can B is opened at the same time as Can A and (as expected) does not spew.
- Can C is allowed to sit on a desktop for 2 minutes and is then opened and does not spew.

Putting the pieces together...

We have now collected data about weight loss, gas space, and looked at several web sources indicating carbonation pressures. We have also performed calculations of surface area, bubble number, and terminal velocity and clearance fraction as a function of bubble diameter.

We are now ready to prepare a final report to answer the original question... what is responsible for the “spewing” of vended cola products if not allowed sufficient time to “rest”?

We have not collected data of a sufficient type to pin down the exact mechanism (increased number of sites, increased surface area, decreased diffusion pathlengths, etc) but we have seen that all of these are strong functions of the presence of bubbles, especially when small.

Using all the data available, provide an explanation of the percent of the can’s contents that would spew for the “Can A” situation and relate that to the vended product. In considering the “Can A” situation, assume that the spewing occurs during the first 0.5 seconds the can is opened and that shaking the can caused the rate of CO₂ leaving solution to be increased by a factor of 100 and a factor of 10,000.

Your report should be written as a technical memo. See the following web link for specifications for the memo, citations, equations, tables, and figures.

<http://eng.auburn.edu/programs/chen/programs/undergraduate/other-information/technical-writing.html>

The section on figures is still under construction, so you will have to “deal” with a document in a state of flux (sorry!).

All available data is listed on the course schedule page (see top left sidebar).