Annex to: [Theorem no. 201: Jensen's Inequality](#) at [theoremoftheday.org](#)

math prof @mathematicsprof · 25 nov. 2018

In calc when teaching the 'min surface area of a can with given vol, of which soln is diameter = ht, I wrote a cat foot company telling them how much they'd save by making their cans taller. Got a letter from the marketing dept telling me a million reasons for the can's design.

26 212 707

David Feldman @DavidFeldman · 26 nov. 2018

As others have said, if you still have it, please share the letter. I'd love to use it the next time I teach Calc I.

4 3 68

math prof
@mathematicsprof

Carnation

Corporate Offices

5045 Wilshire Boulevard
Los Angeles, California 90036
Telephone (213) 932 6000

April 13, 1987

[redacted]
Professor of Mathematics
Dept. of Mathematics
[redacted]

Dear Professor [redacted]

We appreciate the interest you expressed in examining the height-to-diameter relationship of containers used in our food products. A 1:1 ratio of height versus diameter is the most efficient use of material, if only the surface area of material is considered. However, there are many other factors which must be considered when designing a can for a particular product. Listed below are some of these other factors:

1) Thermal Processing — There is an inverse relationship between the most efficient design for cans relative to surface area and the amount of processing time required to sterilize the product contained within. In other words, a tall thin can or short wide can will require considerably less processing time and energy to achieve commercial sterility than a can which is nearly equal in height and diameter.

2) Strength Requirements — During thermal processing, considerable internal pressure develops. This pressure can cause the ends of the can to become permanently distorted. Because of this, ends on most cans are made of metal which is substantially thicker than that used in the can cylinder. Therefore, there is not a simple cost-to-surface area relationship relative to metal. As this can becomes taller and the end becomes smaller, thinner metal can be used in both the cylinder and the ends.

3) Can Manufacturing Line Changeover Time — Virtually all can lines run a variety of can sizes. The time required to change over from one can size to another is considerably less if only can height is changed, rather than height and diameter. In addition, since the same ends can be used if only the height is changed, the machinery used to manufacture ends does not have to be changed over to a different diameter. Reduced changeover time translates into reduced downtime and increased line efficiency.

4) Scrap Loss — Generally, more metal scrap is generated as the diameter is increased.

5) Warehouse and Shipping Efficiency — Smaller diameter cans make more efficient use of packaging and shipping space.

As you can see, cost and efficiency of a container are related to factors other than just the amount of material used. These are just a few of the factors which must be taken into consideration when designing a can. We hope that you now better understand that container design is not quite as simple as minimizing surface area.

Once again, thank you for your genuine interest.

Sincerely,

[redacted]
Assistant Product Manager
Friskies Buffet