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Too Hot To Handle

Coffee Cup Contradictions

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We want our coffee to be hot to be enjoyed to the fullest while the outside of the cup to be at normal temperature for us to hold it comfortably. Can we relate to this day to day contradiction?

Plastic cup is an option as it is a bad conductor of heat, but it's disposal post-usage pose an environmental challenge. Paper cup is a good option but they are a bad insulator of heat so it may burn user's hand while holding the coffee cup and the coffee that is inside will get cold in no time as a result of rapid heat transfer. Paper cup is also frail and can buckle under the load of a drink it holds.

Now customers have invented the workarounds by nesting one paper cup inside the other or by use of a sleeve as an intermediary. But that means lot of wastage in terms of additional cups / sleeves, it also increases the inventory that the retailer has to hold of these two items.

Here we have a contradiction to solve and we will take help of contradiction & inventive principles one of the TRIZ tools. There are two types of contradictions 'technical' and 'physical' contradiction.

Technical contradiction means innovator wants to improve one technical parameter for achieving ideal technical goal but in the process some other technical parameter stops her from improving it or gets worsened as a result.

Physical contradiction on the other hand is when we need opposite parameters from the same object. Now the case in discussion here is a perfect example of a physical contradiction where we want two opposite attributes from the same object. So for coffee cup, here is how we define the physical contradiction.

"we want cup to be hotter from inside so coffee stays hot for a longer time(+) and cooler & stronger from outside which makes it easy for us to hold (-)"

The inventive principles that are used to solve such type of physical contradictions are as under
#IP 1 Segmentation, #IP 2 Taking out, #IP 3 Local Quality #IP 17. Another Dimension,
#IP 13. Other Way Around, #IP 14 Curvature, #IP 7 Nested Doll, #IP 30. Flexible Shells/Thin Films, #IP 4 Asymmetry IP#24. Intermediary IP#26 Copying

When TRIZ, an innovation science suggests these inventive principles what it is communicating to us is '*someone somewhere has solved a contradiction that you are trying to solve right now',* inventive principles represent DNA of an idea that has solved similar contradiction that we are trying to solve, rules & analogues examples inspire us to ideate on the problem at hand. Refer details of these principles, rules & analogues examples by accessing the enclosed link TRIZ Inventive Principles

(Note : IP means – Inventive Principles, # represents the principle number)

Rippled Cups : Solving Above Physical Contradiction (Refer Figure 1 below to see application of few of the above inventive principles in action)

1) Corrugated cardboard has segmented surface by way of peak & valleys (Inventive Principle #IP 1: Segmentation). It also acts as intermediary between user's hand and the paper cup that holds the coffee (Inventive Principle #IP 24 : Intermediary)

2) Corrugated surface has raised land (ripple surface) which traps the air in the gap between inside cup surface and land protrusion of corrugated sheet wrapped around it (Inventive principle IP #17 : Another Dimension)

3) Ripple wall takeaway cups consist of a standard paper cup with an outer layer made from rolled up corrugated cardboard. This cardboard is glued to paper cup from the outside during its manufacture (Inventive Principle IP #30 Flexible Shells & Thin Films)

4) Ripple wall cups are essentially a cup within a cup (Inventive Principle IP #7 Nested Doll)

Figure 1 : Corrugated Cup Design and Applicability of Inventive Principles

How does a ripple cup works (Refer Figure 2 on the next page)

In normal paper cups heat passes from the liquid to the surface of the cup and from there to the atmosphere. Heat is rapidly lost in this manner, in rippled cup, heat instead passes into the trapped air in the gap between the inside cup and raised land of the corrugated sheet (protrusion). The heat from inside of cup is lost to this trapped air, heating it up creating a thermal equilibrium and minimising the further heat loss. Thus this layer of warm trapped air acts as a thermal insulator, so now we can enjoy our coffee with rippled cup. When the customer holds the cup her fingers only come into contact with raised land of the ripple surface, this has the least contact with the hot contents of the cup.

This prevents heat to be transferred to the holder's hand. The raised land also provides the necessary stiffness (strength) to the frail paper cup.

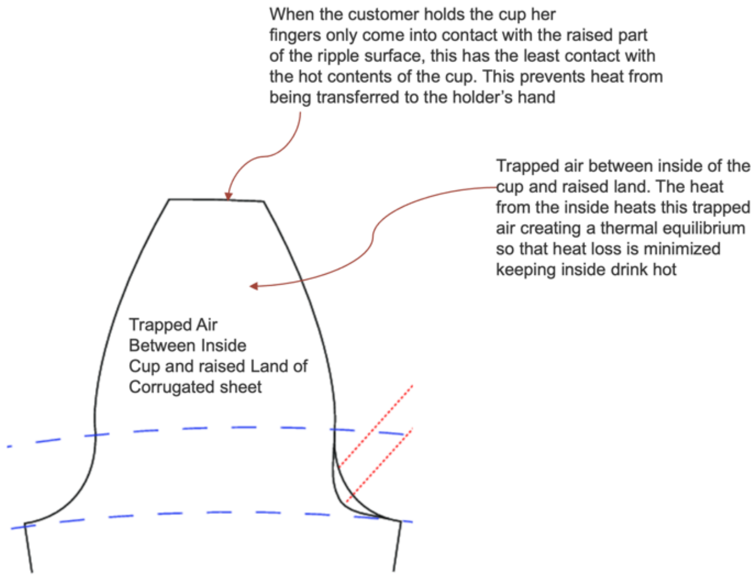

Figure 2 : How Trapped Air Due To Corrugated Surface Create a Barrier To Prevent Heat Loss (Exploded View)

Problems Solved By Ripple Cups

1. Preserves coffee temperature
2. Decrease chance of accidents due to burn injuries
3. Better for planet
4. Reduces coffee waste (some users throw the coffee because it got cold)
5. The seller doesn't have to keep inventory of sleeves or extra cups so this reduces inventory cost

Call for Action

The idea behind this article is to demonstrate one of the TRIZ tools contradiction & inventive principles in action. Working with TRIZ tools reduces design iterations, cut down idea to implementation time, helps innovation team generate ideas on evolution of technical systems and business systems and most importantly helps innovation teams solve the contradictions that come in the way of idea to implementation journey

TRIZ can help innovation team deal with technical & business transformations and strengthen organisation's existing initiatives like Lean, Six Sigma, TOC etc. It has a great potential to give breakthrough benefits in all the business endeavours

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