U-SIT And Think News Letter - 23

Updates and Commentary

Unified **S**tructured **I**nventive **T**hinking is a problem-solving methodology for creating unconventional perspectives of a problem, and discovering innovative solution concepts, when conventional methodology has waned.

Dear Readers:

- In Mini-Lecture 22 a drinking vessel was selected as a prototype of an existing manufactured product to be improved through invention. The USIT process of invention was launched and will be continued here.

1. USIT – How to Invent: the USIT textbook.	$44.50
2. USIT – an Overview	FREE

3. Mini USIT Lecture – 23

"USIT – an Alternative Method for Solving Engineering-Design Problems"

Continuation of **How to Invent** …

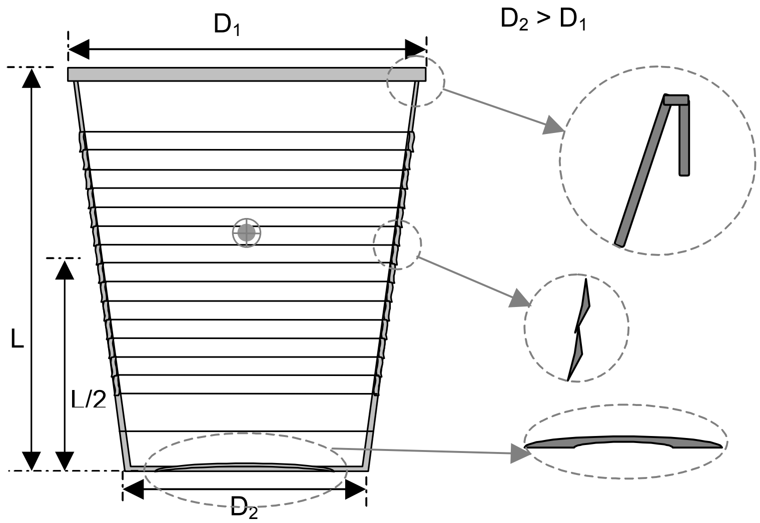
Recap of Mini USIT Lecture 22.
We set out to invent a new artifact based on an existing prototype not of our own design.

- Our goal is to discover multiple new functions from which one or more may lead to an invention – a new product.
- Our strategy is to induce new ideas by analyzing old ideas (albeit inferred plausibilities from existing characteristics of a man-made object).
- Our process is to propose plausible functions for obvious features of the selected artifact. Plausible functions are substituted for originally designed functions since this is (presumably) unavailable information. I believe that plausible functions are more innovative, or thought provoking toward innovation, than original functions. The reason is obvious – imagined plausibility is itself innovative thinking.
- Our basic assumption is that all artifacts were created for one or more purposes – characteristics of artifacts imply functions

The last bulleted statement might be more accurate if worded as, "– characteristics of artifacts imply functions from desired attributes or unwanted effects from inadvertent attributes".

Continuation …
In the last mini-lecture, I began constructing a list of obvious characteristics of the selected artifact, a

drinking vessel. The approach was serial beginning with object (its sketch), continuing to attributes, and ending with functions (and unwanted effects). I noted that a parallel method might be more natural in that it allows jumping about between attributes and functions (whichever come to mind first). My attempt at this exercise is shown below.



#	Characteristics	Attributes	Functions (and associated unwanted effects, •/▪)
1	shape	circular cross-section in plan view (D_1 to D_2)	• to minimize depth of liquid at sides of mouth preventing dribble while drinking, • to simplify blow-molding tools minimizing cost.
2		trapezoidal cross-section in elevation view (shown above; $D_1 > D_2$)	• to ease removal from molding tools reducing defective parts, • to aid stacking, thus, minimizing storage space, • to reduce slippage when grasping (imagine grasping an inverted trapezoidal-shape container ($D_1 < D_2$).
3		thin wall	• to reduce material cost ▪ if too thin (tooling design and quality control issues) it causes non-uniformity of polymer thickness during blow molding and subsequent weak regions for later failure.
4		equally spaced parallel bands in mid section	• to roughen surface increasing resistance to slippage from grasp, • to strengthen shape against distortion while handling, • to produce an attractive pattern (information) improving an uninteresting appearance, ▪ too narrow bands may allow interlocking of nested containers interfering with single-container removal.
5		rolled-down lip	• to increase surface-to-lip contact area lessening dribble, • to prevent sharp-edge contact with lips eliminating contact discomfort.
6		center of gravity above half-height	▪ characteristic of trapezoidal design that increases probability of tipping and spillage when grasping/releasing
7		"oil-can" bottom (concave shape)	• to eliminate convex bottom that could increase probability of tipping and spillage when resting on a flat surface.
8		edges of bands have raised ridges	• (see #4), • to produce reflections making thin, transparent, empty container more visible reducing accidental tipping, • to improve attractiveness of design (creating information)

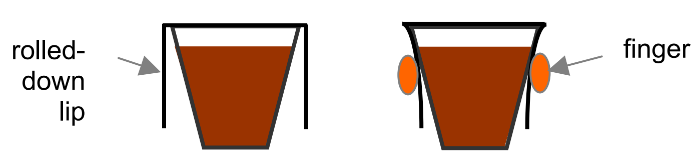
9		embossed lettering on bottom	• to create information
10	material	polymer	• to improve strength-to-cost ratio, • to reduce manufacturing cost by using blow molding
11		transparent	• to make contents visible and identifiable eliminating uncertainty, • to make quantity of contents visible eliminating uncertainty.
12		flexible	▪ consequence of thin wall (#3) that produces distractive buckling noise when an empty container is handled roughly
13		large elastic range	• to reduce manufacturing damage during extraction from a mold
14		brittle (no plasticity)	▪ a room-temperature property of the polymer. It has no obvious benefit and is another source of distracting noise during rough handling that causes sudden brittle fracture, ▪ shards have sharp edges producing some risk of injury in accidental contact (e.g., during clean up).
15		light weight (relative to other vessels of comparable volume)	• (see #3), ▪ increases probability of being knocked over or off of a table.
16		smooth surface	• to ease removal from molding tool reducing defective parts, ▪ causes tendency to slip from grasp when cold contents induce condensation of moisture reducing friction.
17		imperviousness	• to contain liquid without loss through seepage
18		thermally conductive	▪ causes instant discomfort on grasping when containing hot liquid
19	technology	blow molded	• to reduce manufacturing cost
20			

Nineteen characteristics should produce some useful information.

Innovative concepts should have come to your mind as you did this exercise yourself. I got several ideas. However, some of my ideas turned out to be simple recall and modification of concepts I already knew. They came to mind in my initial list of known solutions and as I drew the original sketch of the drinking vessel. My list of known concepts included the following.

Known drinking vessel concepts (known to me):

- a lid with a sipping hole to eliminate dribble,
- fold-out handles (paper cups) to grasp and prevent contact with a hot cup,
- molded handles (plastic cups) for heat protection,
- a collapsible, telescoping cup for small storage space (the parallel bars on the prototype drinking vessel brought this idea to mind),
- a thin rolled-down lip that extends along the outside almost to the bottom of the vessel. When grasped between the fingers the rolled down part bends inwards and makes contact with the inner surface of the vessel providing a double thickness of polymer between the hot liquid and a finger for improved heat protection. I saw this on a plane between Europe and the U.S.A., (see sketch).

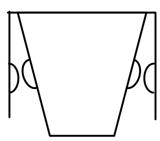


- plastic cups with bottoms extended radially forming an attached saucer to prevent tipping,
- inverted trapezoidal cups ($D_1 < D_2$) with molded handles to prevent tipping when resting in moving vehicles.

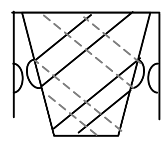
Our experience in the Sicilian classroom was that drinking hot coffee from these thin polymer vessels was a bit painful and required using double vessels or sitting the vessel down between uses. Hence, thermal conductivity was the cause of the worst unwanted effect, namely, lack of protection of fingers when grasping the hot container. So as I worked on my list of known solutions this unwanted effect was in my mind. As I thought of the turned-down lip concept it came to mind to put additional material between the turned down lip and the vessel's outer wall to increase the path for heat and reduce the amount of heat transferred to one's fingers.

I thought of inserting polymer spheres in the space between the turned down lip and the vessel wall but wondered how to blow mold spheres. This led to [solution concept, SC01] blow molding dimples in both surfaces so that the dimples would come into contact when the vessel was grasped. The diameter of the dimples could be smaller than one's finger making the path for heat transfer even longer. Then I wondered if dimple-to-dimple alignment during grasping would be a problem requiring more precise blow-mold tooling. Another idea came to mind. Instead of circular dimples [SC02] use spiral dimples, then they always make contact when grasped. See sketches.

SC01



SC02



Where would you go from here?

****** To Be Continued in the next USIT Newsletter ******

5. Problem-Solving Tricks and Related Miscellany

6. Feedback Suggestions / corrections / etc.

7. Q&A Questions you would like to have discussed are welcome.

8. Other Interests

- Regarding inquiries about ordering the book, "Unified Structured Inventive Thinking – How to Invent", details may be found at the Ntelleck website: www.u-sit.net. The cost of the book is US$44.50 plus shipping and handling. See the website for S/H charges. Send a check made out to **Ntelleck, LLC** for the proper amount, drawn on a US bank, to

Ntelleck, LLC, P.O. Box 193, Grosse Ile, MI 48138 USA

Please send your feedback and suggestions to Ntelleck@u-sit.net

To be creative, U-SIT and think.