7. Generating Solutions

Example Application of TRIZ: A New Structural Material for Bullet Proof Garment

Statement: Bullet proof vests should be strong, but not heavy.

Step 1 - Identify the contradiction(s)

Strength (improves) versus Weight (worsens)

Step 2 - Look at the list of features and identify those important to your contradiction.

Strength - #14
Weight - #2

Step 3 - Identify which are improving features and which are worsening features

Strength (#14) improves and Weight (#2) worsens

Step 4 - Refer to the TRIZ Contradiction Matrix to learn which of Altshuller's Principles may be useful for this problem.

Row 14 (Strength) and Column 2 (Weight) of the Contradiction Matrix indicate the following Principles may be useful: 40, 26, 27, and 1. We now look at the Principles list to learn that these numbers correspond to

40. Composite materials
26. Copying
27. Cheap short living
1. Segmentation

Next we brainstorm how we could use these four Principles to solve our problem.

40. Composite materials

The explanation of this Principle from the TRIZ website is:

- Change from uniform to composite (multiple) materials such as reinforced polymers.

For lighter-weight, stronger, vests, the use of composites is an active area of research. Polymers (Kevlar) reinforced with carbon nanofibers are currently being investigated

as a strong lightweight alternative to steel for structural materials.

26. Copying

The explanation of this Principle from the TRIZ website is:

- Instead of an unavailable, expensive, fragile object, use simpler and inexpensive copies.
- Replace an object, or process with optical copies.
- If visible optical copies are already used, move to infrared or ultraviolet copies.

We could copy the design of abbreviated scuba diving wet suits for use as a bullet proof garment.

27. Cheap short-living objects

The explanation of this Principle from the TRIZ website is:

- Replace an inexpensive object with a multiple of inexpensive objects, comprising certain qualities (such as service life, for instance).

This Principle does not appear to be readily applicable to this problem. This is not necessarily unusual, because these Principles are only general suggestions to help focus our thinking in areas that have proven fruitful in previous problems.

1. Segmentation

The explanation of this Principle from the TRIZ website is:

- Divide an object into independent parts.
- Make an object easy to disassemble (Replace worn or damaged parts).
- Increase the degree of fragmentation or segmentation.

Perhaps we could consider several different coverings for different parts of the body (pants, vest, etc.) rather than a one-piece suit. Maybe different materials to cover the critical areas such as chest and head, each taking advantage of specific properties that

would be customized for their differing applications.

So, by identifying problem contradictions, the elements of TRIZ can be used to help reach a solution. Using the TRIZ method, we were able to generate two additional ideas.

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ISBN 0-13-008279-1