Improving Productivity & Reducing Operating Costs - TRIZ Application

Client

India Design & Engineering Services Centre of $ 8 BN diversified global manufacturer that delivers innovative equipment and components, consumable supplies, aftermarket parts, software and digital solutions and support services. **The India Centre is responsible for providing design & engineering solutions.**

Problem/ Challenge

Improving productivity & convenience of Garbage Collecting Companies, who are customers of the Client. These companies were facing challenges in garbage collection – increased manual handling, reduced productivity and increased garbage collection costs.

The main problem was the design of a grabber caliper which could not hold all sizes of the dustbins leading to increased manual handling of smaller size bins.

Result achieved

Two design concepts which have been implemented leading to significant customer benefit – improved productivity and lower garbage collection costs.

Background

The client is the India Design & Engineering Services Centre of a diversified global manufacturer and solutions provider with annual revenue of over $8 billion. The organization delivers innovative equipment and components, consumable supplies, aftermarket parts, software and digital solutions, and support services through five operating segments. **A group company** is a premier manufacturer of ultra-durable, high-productivity, custom-configured garbage trucks, and Connected Collections® technology that help customers achieve the lowest Total Cost of Collection (TCC).

The garbage trucks manufactured by this organization has a pickup assembly which has two calipers which are operated with hydraulic mechanism for gripping the dustbins and emptying them into a large collector bin mounted on the garbage collection truck. The gripping and unloading of the dustbins in the bigger bin is controlled by the vehicle operator without getting out of the cabin. **These garbage trucks are sold to "Garbage Collection Companies".**

Problem/ Challenge

During garbage collection, the vehicle driver had to get down from the vehicle to pick up smaller bins which could not be gripped by the gripper and had to manually empty them in bigger container mounted on the vehicle. This reduced the productivity of garbage pick up and increased cost of operations by way of putting up an extra man and / or offering overtime which was a significant cost.

Technical Problem: The garbage caliper could not move beyond a certain point to grip smaller dustbins. This was because current design constraints

Key Business Constraints: The design modification cost must be nil or minimum possible. The time to introduce improved design must be minimum.

Approach & Solution

BMGI worked with the project team to solve this problem. This was done through workouts with the team. The workout first imparted knowledge on the TRIZ methodology and associated techniques followed by the application of the TRIZ methodology on the specific problem.

The key steps were as follows:

1. Defining broader and narrower problem to arrive at specific contradictions
2. Systematic application of TRIZ tools to define both technical & physical contradictions. The idea behind using both type of contradictions is to arrive at common inventive principles for different sets of contradictions. In BMGI's experience, such an approach gives quick clues to possible implementable ideas.
3. Use technical contradiction matrix and physical contradiction solution strategies to identify inventive principles that can lead to possible solutions
4. Appropriate TRIZ tools were used to finalize several design options (some of them presented here)
5. The design modifications were done for several parts using other TRIZ tools like Trends of Evolution, Contradictions, Inventive Principles
6. Some new product ideas were also generated around the same problem using Ideal Final Result Questionnaire and Trends of Evolution which will open new line of business for the organization.
7. There were many design options that were suggested and some of them under consideration were totally different than current design
8. Prioritizing & selection of best design option for a pilot
9. The pilot testing was done, and solutions finalized for introduction in the market

Steps & Outputs

1 . Defining Broader & Narrower Problems

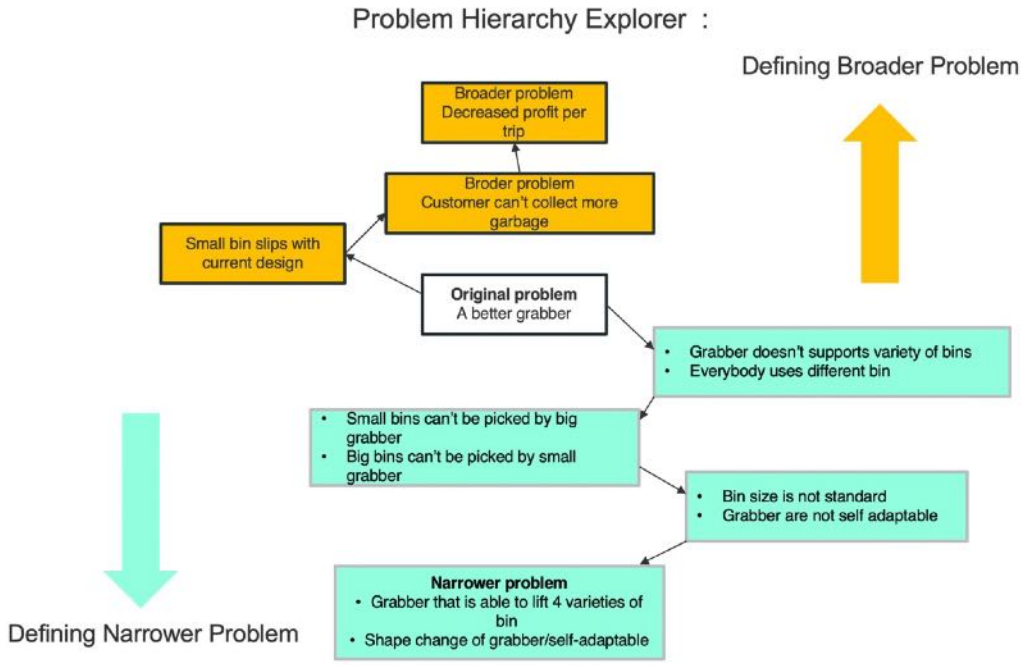


Fig 1 : Problem Hierarchy Tool defining Broader & Narrower Problem

2. Defining Physical Contradictions

❑ Separation in Space

Where we want the grabber to be big? Around a Big Dustbin
Where we want the grabber to be small? Around a Small Dustbin

❑ Separation in Time

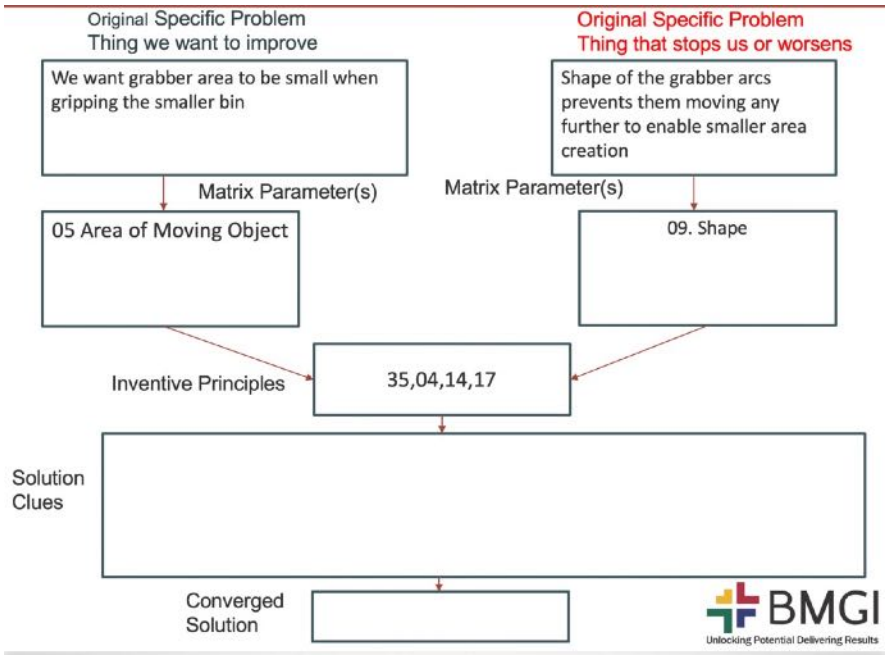
When we want the grabber to be big? When picking up big dustbin
When we want the grabber to be small? When picking up small dustbin

❑ Separation on Condition

We want the grabber to be big if? We are picking big dustbin
We want the grabber to be small if? We are picking small dustbin

Fig 2 : Physical Contradiction Questionnaire To Identify Physical Contradictions Around The Problem

2. Defining Technical Contradictions & Associated Inventive Principles



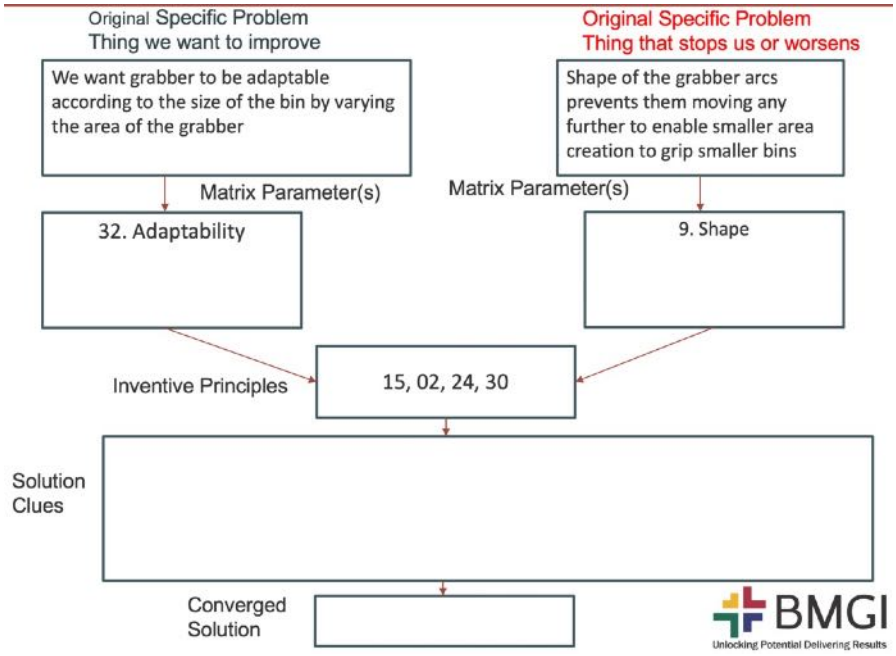


Fig 3 : Defining Technical Contradiction

3. Defining Physical Contradictions & Associated Inventive Principles

- Separation in Space
  - Where we want the grabber to be big? Around a Big Dustbin
  - Where we want the grabber to be small? Around a Small Dustbin

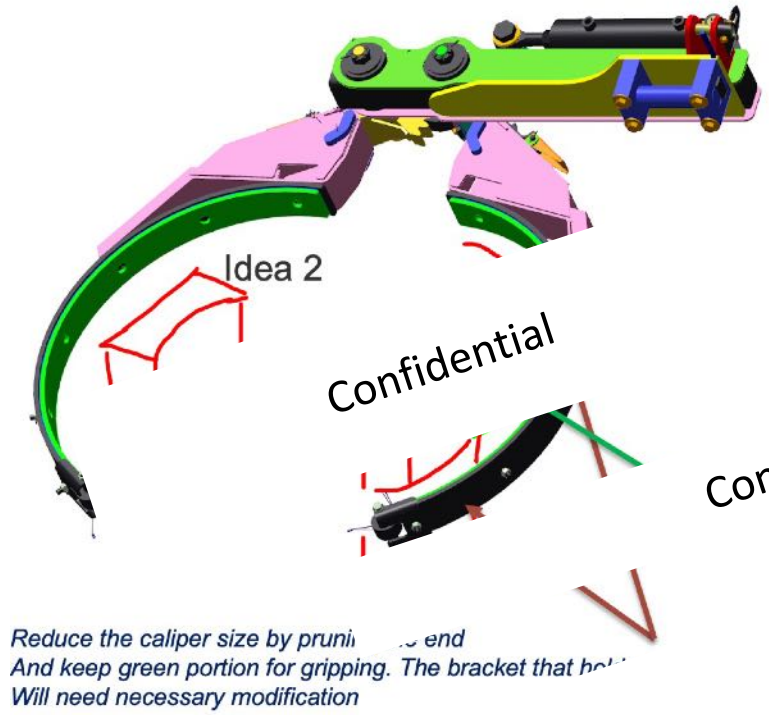
Inventive Principles To Be Used To Solve Such Contradiction :
Segmentation (1), Taking Out (2), Local Quality (3), Another Dimension (17), The Other Way Round (13), Curvature (14), Nested Doll (7), Flexible Shells / Thin Films (30), Asymmetry (4), Intermediary (24), Copying

- Separation in Time
  - When we want the grabber to be big? When picking up big dustbin
  - When we want the grabber to be small? When picking up small dustbin

Inventive Principles To Be Used To Solve Such Contradiction :
Dynamics (15), Preliminary / Prior Action (10), Periodic Action (19), Beforehand Cushioning (11), Partial or Excessive Action (16), Skipping (21), Copying (26), Mechanical Vibration (18), Thermal Expansion (37), Discarding & Recovering (34), Preliminary Anti-Action (09), Continuity of Useful Action (20)

Fig 4 : Inventive Principles Associated with Space & Time Physical Contradictions

4. Probable Solution Ideas Taking Clues From Inventive Principles



Principle 2 : (Taking Out)
Principle 4 : Asymmetry

Rule : Extract the disturbing part or property from an object / Extract the only necessary part (Principle 2)
Change the shape or properties of an object from symmetrical to asymmetrical (Principle 4)

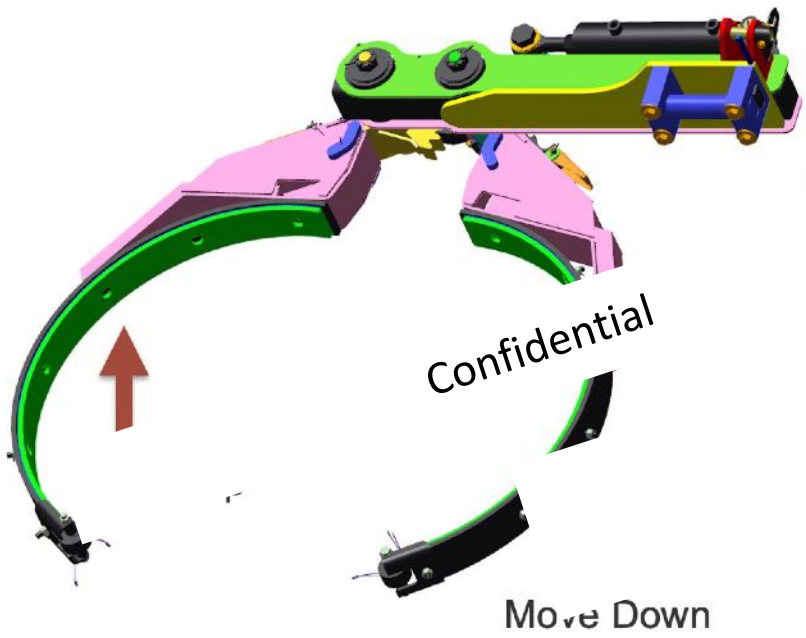
Idea Trigger Word : Extract / Remove, Break Symmetry

Idea :

1) Removing the interfering gripper caliper (Left or Right) as there is no smaller part of the caliper inside the other. The caliper given some surface rough the frictional force, thus

2) The arc short in vertical plane. This is

Reduce the caliper size by pruning end
And keep green portion for gripping. The bracket that hold
Will need necessary modification



Principle 17 : (Taking Out)

Rule : Move into an additional dimension

Idea Trigger Word : Move Outside The Plane

one of the grip in the vertical plane. This wo caliper end r & cr cket gripper ing caliper.

Confidential

Fig 5 : Probable Solution Options

About BMGI

Breakthrough Management Group International (BMGI), a global consulting firm with a strong focus on **delivering results** and has **delivered cumulative benefits to its clients worth several billion dollars** with an **engagement ROI of 5:1 to 20:1.** BMGI specialises in enabling organisations drive profitable growth and innovate. Solutions include building innovation opportunities portfolio for driving growth, breaking optimization barriers to multiply profits and transform customer experience. We have developed several methodology & framework-based assets to enable client success.

BMGI's clients include leading Fortune 1000 Global companies and other Indian companies from diverse industries such as financial services, IT/ITES, airlines, chemicals, FMCG, discrete manufacturing, telecommunications, petrochemical, textiles, healthcare & energy.

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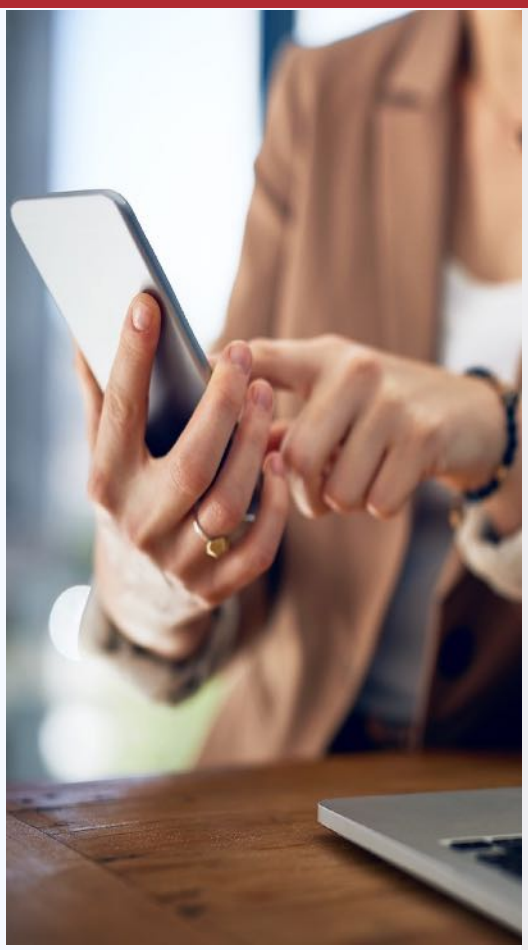

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