

Process Improvement by Using TRIZ Methodology

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Abstract: This paper presents process improvement by using TRIZ methodology, TRIZ is a Russian technique for solving engineering related problems using its 40 principles and brain storming technique to give us a generic solution to problem. A small scale beverage plant was surveyed and some of the most repetitive problems were analyzed and using TRIZ methodology a solution was provided. The aim is to minimize the repetitive problem and provide better solution and to promote use of TRIZ methodology for solving engineering based problems.

Keywords: TRIZ, 40 Principles, Generic Solution, Brain Storming.

1. Introduction

With increase in competition in market it necessary to outstand from the crowd to make product better and use better technologies and techniques to fulfill the increasing demands of the product. All the industries are trying to bring new technologies so that their products are more reliable and the contradiction faced should be minimize. These techniques are not just used to make difference in the market but also are cost and time effective. The lesser time your product takes to reach the market the more chances of growth and profit. Triz is one of the Russian problem solving techniques which is used to solve engineering related problems in any plant and reduce the consumption of time and increase the chances of success for the plant. Triz uses contradiction matrix to eliminate the problems that are generally faced in any manufacturing plant. There are two factors a problem can be solved on improving factor and

worsening factor. For example, bullet proof vests should be strong, but not heavy here we have to identify improving factor and worsening factor and then refer to contradictory matrix to eliminate the contradiction faced triz uses this relation and helps in eliminating a contradiction. some renowned companies like xerox, general motors, rocco and will and johnson have applied triz technique and have achieved the better outcome. the objective of this study is to implement the triz in a small scale beverage plant to eliminate the major contradiction faced and to optimize the outcomes.

2. Problem statement

To improve the process and solve existing problems in a small scale soft drink plant using TRIZ Methodology.

3. Proposed system

In the following study some repetitive problems were noted as the small scale plant was surveyed the main problems were related to the engineering applying the triz methodology and optimizing the plant's output and solving the problems faced are the main focus of the survey the problems faced were,

- Overflow during bottle filling due to excessive foam
- Failure in PLC circuit due to unstable power supply
- Cooling problems in moulding machine

Using the 40 principles of triz the solutions for the above mentioned problems were found and were proposed to apply in the plant for optimization and better output.

Table 1
Literature survey

No	Author	Title	Conclusion
1.	Prabhdeep Singh Bajwa, Dalgobind Mahto	TRIZ based Methodical Invention Function Model. [1]	By stealth! This "stealth" approach has been practiced by a few Value Methodology facilitators over the past several years, who have reported (subjective) improvements in brainstorming results.
2.	Sunil N. Adhikary, Rajesh B. Buktar	A Case Study in Increasing Productivity by DOE in Manufacturing Sector. [2]	Looking at adaptive, scientific approaches in manufacturing plants to experimentation provides better and efficient solutions to the system. The TRIZ tools outperforms the traditional ways that were used for completing the projects
3.	Leonid Chechurin	TRIZ in Science, Reviewing indexed publications. [3]	However, they have to point out that the unique and unbeatable ability of TRIZ to assist new idea generation makes it a tool to be integrated with other known methods rather than to be influenced or combined with.
4.	Xiangdong Li, Qinghai Li, Zhonghang Bai, and Lixiao Geng	Research on TRIZ and CAIs Application Problems for Technology Innovation. [4]	It includes two aspects: technical and nontechnical factors. Proceed from the angle of applying TRIZ and CAIS in the manufacturing enterprises, points out the technology innovation mode choice, the establishment of realization of innovative process based on TRIZ and CIAS to be the key of the success of the manufacturing enterprises is technological innovation.

4. Foundation of TRIZ

- a) *Technical systems*: Everything that performs a function is a technical system. Examples of technical systems include car, pens, and books and knives. The hierarchy of technical systems spans from the least complex, with only two elements, to the most complex with many inter-acting elements.
- b) *Levels of innovation*: The levels of innovation were divide into different levels according to innovative technology used for solving the problem.
- c) *Ideality*: The Law of Ideality any technical system used throughout its lifetime has tendency to become more reliable simple and easy to use. Every time we improve a technical system, we push that system closer to Ideality.
- d) *Contradiction*: Contradiction stands when we try to improve the parameters of one system but detoriate another one.
- e) *Evolution of technical systems*: The pattern of dynamization suggests that any technical system that has underwent any evolutionary process makes a transition from a rigid to a flexible structure.

5. Applying TRIZ to the problems reported

Problem 1:

Overflow during bottle filling due to excessive foam

Excessive Foam Was Generated While Filling the Bottle from the 9 HEAD filler which Resulted in Wastage of the Product and More Consumption of Time.

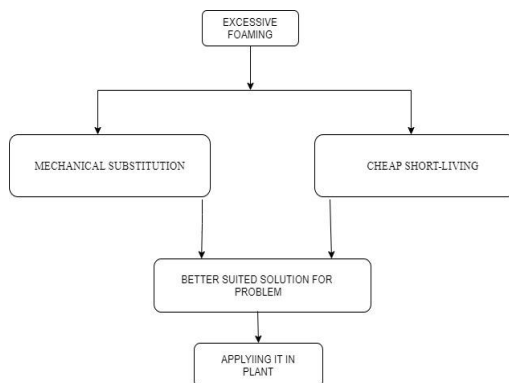
Improving factor identified was Loss of Substance as we have to reduce the loss of product

Worsening factor identified was Energy spent by stationary object i.e. 9 Head Filler

Using 39x39 contradictions Matrix we came up with two principles that would be the Generic solution of the Contradiction.

- Mechanical substitution
- Cheap short-living

As the possible solutions of the problems being faced.



Cheap short-living suggested that the filling should be outsourced and should be given to any other plant which has specialization but howsoever being a small scale plant this was

not a proper solution.

Mechanical substitution was to have a small adjustment in the space between Filler and the Bottle and Decrease the space. Decreasing the space, it was noted that there was reduction in formation of Foam which solved the Problem.

Problem 2:

Failure in PLC circuit due to unstable power supply

As the plant is located in small town there was issue load shedding due to sudden power cut there was drop in current which would result in failure of plc circuit again and again.

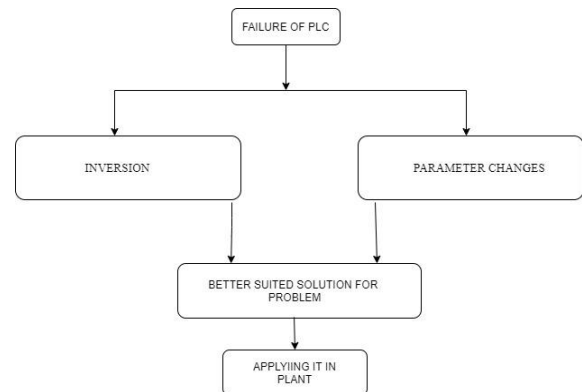
Improving factor is reliability of the systems we required making the system more reliable.

Worsening factor is complexity of the system if system gets a little complex but more reliable it is always a great choice.

- Inversion
- Parameter changes

Inversion was not a feasible solution because we as it suggested inverting the problems and increasing the difficulty to access

Parameter changes providing a stabilizer to the machinery would help in reducing the sudden change in current and would avoid the failure of PLC and it is termed as better substitute.



6. Result

The solutions are provided to the management and some changes are suggested after the PDCA (Plan, Do, Check, Act) the provided solutions will be considered for implementation

7. Conclusion

The solution provided for the problems were based on the theoretical research and contradiction matrix using triz methodology. The solution was useful and improved the process in the pant however it was observed that some amount of capital was required for the implementation but it can be considered as one-time investment and to avoid future failures in plant. Triz helped to find the solution which were readily available just needed a little brain storming process to be followed there can be more changes in future. Triz should be promoted as an optimization technique and implementation should be made.

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