Special Interest Lecture:
Introduction of cases using TRIZ in corporations

September 6, 2012
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English translation: Kazushi Tsuwako (HGST)
Agenda

- Purpose
- Cases
  - Case 1: Hitachi Global Storage Technologies Ltd.
  - Case 2: Koganei Corporation
  - Case 3: Pioneer Corporation
- Summary of introduction cases
- Case in South Korea
- Reference: Introduction of commendation
Purpose

- The corporate cases reported in the past TRIZ symposiums are introduced with the consideration of the following aspects. It will be helpful for the people who consider to introducing, spreading and deploying TRIZ in their companies.

  - Introduction method
  - Process of problem solution
  - Application to concrete product
Introduction cases

- **Hitachi Global Storage Technologies Ltd.**
  - Introduction of the collaborative activity of KT method & TRIZ to improve Hard Disk Drive’s Quality and Reliability
  - by Kazushi Tsuwako in 2011

- **Koganei Corporation**
  - Case Study of Introducing and Applying TRIZ to Real Projects for Obtaining Results (=Profits)
  - by Asahiko Katagiri in 2008/2009

- **Pioneer Corporation**
  - Introduction of ISW (Idea Search Working)
  - by Fumiko Kikuchi in 2008
The past commendations

The 4th symposium (2008)
http://www.triz-japan.org/happyo_siryo_04.html

The 5th symposium (2009)
http://www.triz-japan.org/happyo_siryo_05.html

The 6th symposium (2010)
http://www.triz-japan.org/happyo_siryo_06.html

The 7th symposium (2011)
http://www.triz-japan.org/happyo_siryo_07.html

The 8th Japanese TRIZ symposium 2012

The past commendations

The 4th symposium (2008)
http://www.triz-japan.org/happyo_siryo_04.html

The 5th symposium (2009)
http://www.triz-japan.org/happyo_siryo_05.html

The 6th symposium (2010)
http://www.triz-japan.org/happyo_siryo_06.html

The 7th symposium (2011)
http://www.triz-japan.org/happyo_siryo_07.html
Outline of previous commendation

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From information on Japanese TRIZ society HP
Case 1: Hitachi GST Ltd.
Introduction of the collaborative activity of KT Method & TRIZ to improve Hard Disk Drive’s Quality and Reliability

Outline

- The promotion activity of TRIZ was started in 2005.
  - Hitachi Ltd. was already started the activity as HiSPEED21 in 1999.
    - http://techon.nikkeibp.co.jp/article/NEWS/20050224/102048/

- The object people are engineers of the R & D and the product development.

- Promotion and spread activity through in-house seminar
  - As for beginners, the seminar is executed centering on the usage of the contradiction matrix.
    - There is a hurdle at the stage where the technological parameter of the product development ties to the parameter of the contradiction matrix.
Point of case

"Clarification of problem by KT method and Idea creation for problem solving by TRIZ"

- On every new 3.5”HDD, the data destruction rate by the scratch is getting higher and higher. The scratch problem was analyzed by the KT method (PA: Problem Analysis) as the first step.
  - It was found that the air spoiler (mechanical parts) caused the particle generation which made scratches.

  KT-PA: Kepner Tregoe Problem Analysis
  KT method: Registered trademark of United States Kepner Tregoe Co. Japanese branch

- The particle injection test with HDD was executed based on assumption of not accumulating contamination easily because Karman vortex did not occur easily by changing shape of the air spoiler.
  - The effect was confirmed.

- To become larger, and to obtain higher reliability, next generation’s air spoiler’s design was worked out by TRIZ.
  - The psychological inertia was broken down by using TRIZ.
### Problem Analysis of OD Scratch

#### State the Problem

Identify the root cause of the data damage occurred on Outside Data Zone (OD) area of new 3.5” HDD

<table>
<thead>
<tr>
<th>Problem</th>
<th>New 3.5” HDD</th>
<th>Old 3.5” HDD</th>
<th>Areal Density Increase</th>
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<tr>
<td>Scratch Increase @OD</td>
<td>2</td>
<td>1</td>
<td>Aluminum Disk, Air Spoiler, Higher RPM</td>
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<tr>
<td>Spiral Scratch @OD</td>
<td>4</td>
<td>3</td>
<td>Higher RPM</td>
</tr>
<tr>
<td>OD &amp; MD area</td>
<td>5</td>
<td>6</td>
<td>Head treads on contamination @OD</td>
</tr>
<tr>
<td>Surface with Air Spoiler</td>
<td>6</td>
<td></td>
<td></td>
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<tr>
<td>Under Air Spoiler</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head Crush @OD</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The KT-PA method is used to analyze the problem.
### Correspondence between HDD’s and TRIZ parameter

<table>
<thead>
<tr>
<th>Key Word of HDD parameter</th>
<th>TRIZ 48 Parameters</th>
</tr>
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<tbody>
<tr>
<td>Bit length on the Disk</td>
<td>Length of stationary object (4)</td>
</tr>
<tr>
<td>Error Rate</td>
<td>Loss of Time (26), Loss of Information (28)</td>
</tr>
<tr>
<td>Seek Time</td>
<td>Duration of Action of Moving Object (12)</td>
</tr>
<tr>
<td>Weight Saving</td>
<td>Weight of Stationary Object (2)</td>
</tr>
<tr>
<td>Sound</td>
<td>Noise (29)</td>
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<tr>
<td>Thermal Stability</td>
<td>Stability (21)</td>
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<tr>
<td>Track Per Inch</td>
<td>Information (11)</td>
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<tr>
<td>Reliability</td>
<td>Reliability (35)</td>
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<tr>
<td>Write Fault Frequency</td>
<td>Loss of Information (28), Loss of Time (26)</td>
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<tr>
<td>Power Consumption</td>
<td>Loss of Energy (27)</td>
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<tr>
<td>Positioning Accuracy</td>
<td>Reliability (35)</td>
</tr>
<tr>
<td>Rotational Waiting Time</td>
<td>Loss of Time (26)</td>
</tr>
<tr>
<td>Cost</td>
<td>Productivity (44)</td>
</tr>
<tr>
<td>Radiation</td>
<td>Temperature (22)</td>
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<tr>
<td>Detectability of media defect</td>
<td>Ability of Detect/Measure (47)</td>
</tr>
<tr>
<td>Test Time</td>
<td>Loss of Time (26), Productivity (44)</td>
</tr>
</tbody>
</table>

*Device made 48 contradiction parameter and HDD’s parameter easy to choose in the correlation table. (Contradiction matrix 2003 was used.*)
Trial “J” Large Air Spoiler

Jumboizing the air spoiler accelerate the data damage at outside area of the media by the media scratch.

Contradiction Matrix from Inventive Principles

<table>
<thead>
<tr>
<th>4 x 28</th>
<th>Length of Stationary Object/Loss of Information</th>
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<tr>
<td>28:</td>
<td>Mechanics Substitution</td>
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<tr>
<td>24:</td>
<td>Intermediary</td>
</tr>
<tr>
<td>3:</td>
<td>Local Quality</td>
</tr>
<tr>
<td>13:</td>
<td>“The Other Way Around”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4 x 35</th>
<th>Length of Stationary Object/Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>35:</td>
<td>Parameter Changes</td>
</tr>
<tr>
<td>31:</td>
<td>Porous Materials</td>
</tr>
<tr>
<td>29:</td>
<td>Pneumatics and Hydraulics</td>
</tr>
<tr>
<td>17:</td>
<td>Another Dimension</td>
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</tbody>
</table>

Introduce electric, magnetic or electromagnetic fields to interact with an object. => Conductive Air Spoiler

Enable each part of a system to function in locally optimised conditions. => With Taper
Case 2: Koganei Corporation
Case Study of Introducing and Applying TRIZ to Real Projects for Obtaining Results (=Profits)

http://www.triz-japan.org/PDF/O_05_01-Katagiri(Koganei)-090825_J.pdf
Outline

• Air pressure equipment comprehensive manufacturer that handles it from development and production to sales
  – 750 employees
  – 300,000 products
  – The engineers should work for not only product development but also acting in cooperation with the marketing, sales, production and the procurement sections.

• Introduction at beginning in October, 2006
  – Promotion and the introduction are aimed at in order of QFD→TRIZ→TM.
    – http://techon.nikkeibp.co.jp/article/FEATURE/20101122/187539/
      QFD: Quality function deployment (Quality Function Deployment)
      TM: Taguchi method/quality engineering (Taguchi Methods/Quality Engineering)

• The seminar schedule and the development schedule are made synchronous.
  – A new product was out as the result (= profit) in three years, and confirmed validity.
  – Two high-speed port valve as a new product was released in July, 2009.
“Introduction of TRIZ that aims at establishment of absolute strong point and the background”

- Decision of introducing TRIZ was based on analysis of problems concerning the introduction to the company and countermeasures against the problems.

- Introduction and use of tool, technique and software that can be worked in conjunction with TRIZ
  - Mind Map, TOC, and the Kano model, etc. was used.

- The process until it achieves the results was requested to one consultant.
  - Customer request and development target setting by QFD
  - Breakthrough of existing technology by TRIZ
  - Optimum design and design verification by TM
Problem analysis using mind map and confrontation cancellation chart before TRIZ introduction.
The seminar and the development schedule are made synchronous.
*QFD–TRIZ–TM was introduced.
Usage-quality development is executed before quality-development of the function.
*Making Contradiction model
*Using Prediction, Principles, Effects and Trimming, the contradiction solution and the reduction in costs plan were created.
⑤TM タグチメソッドへの展開

課題: 新ソレノイドの最適設計

1. テーマの分析
   ■ 機能・属性分析

2. 目的機能の明確化
   ■ 機能・属性分析→特性要因図

3. 理想機能の定義
   ■ \( y = \beta M \)において、\( y \): 仕事量、\( M \): 消費電力として定義

4. 諸特性の定義
   ■ 誤差因子: 尺寸精度・温度上昇
   ■ 制御因子: 設計パラメータ L18 直交表

CAE: 電磁解析ソフトによるシミュレーション

The design is optimized with TM.
Case 3: Pioneer Corporation
Introduction of ISW (Idea Search Working)

Announcement slide URL http://www.triz-japan.org/PDF/P_04_02-kikuchi.pdf
Outline

- The promotion activity was started in 2006.
  - The propeller attended outside seminar related to TRIZ, and the essence was fed back in in-house seminar.

- The object people are engineers in R & D section.
  - The activity of creating ideas for solving the problem in their topics.

- It was promoted such as a half a day workshops and the TRIZ patent excavation meetings.
  - An original tool that explained principle with the case was made, and it can be used in intranet.
  - The activity that specialized in the problem definition and the idea creation.
"Point of TRIZ promotion activity in research"

- Details of promotion activity

- Content of activity of promotion
  - It was introduced by three steps.
  - An original tool can be used in intranet.

- Promotion program
  - ARIZ and USIT were combined and modified for engineers to use.
    Initial of expression of Russian of ARIZ : Algorithm for Inventive Problem Solving
    USIT : Unified Structured Inventive thinking
TRIZ推進の活動内容

・TRIZ半日WS
  半日のアイデア出しをメインとして、3セッションからなる活動
  - TRIZ有効性を確認した
  - 全ての対象部門で行った

・TRIZ特許発掘会
  課題に応じて、アイデア出しのみや、課題探索から解決コンセプト出しまで行う活動
  - TRIZを実践で用いた
  - 進め方の試行錯誤を行い、ISWへのつながる元となった

・アイデアサーチワーキング（ISW）
  活動名からTRIZをはずし、OFDを取り込むことを視野に入れ、研究者の課題に広く柔軟に対応
An original tool is made, and it opens it to the public in Intranet.
The process and the tool of TRIZ and USIT were modified to be suitable for an in-house activity, and it made it to the program.
Summary of introduction cases

- There are propellers in the companies, and they promote TRIZ.
  - They realize the advantage of TRIZ, and they promote to apply TRIZ positively.

- The propeller is supporting the problem analysis, modeling and multipronged approaches.
  - Creating ideas are not only to solve current problems but also to anticipate further problems which will be occurred when the idea is realized.

- The propellers combine TRIZ with other techniques.
  - They improve each technique for engineers to use it easily.
Case of Hyundai–Kia Motors in South Korea:

• Title
  – Concept Development of a Variable Compression Ratio Engine Using TRIZ
    • by Mr. Hong-Wook Lee in 2010
  – Point of case
    • Obtaining the concept of the variable compression ratio engine of the multilink type for patent circumvention
      – The development object was decided by the benchmarking.
      – A lot of tools of TRIZ were applied and the idea was created for patent circumvention.
        » Function Analysis
        » Trimming
        » ARIZ
        » Antidote Strategy
        » IFOS
Case in South Korea

- There is a sign of change in applying TRIZ with leading by consultants.
  - People are learning TRIZ and applying TRIZ by themselves.
  - POSCO established TRIZ university and they are spreading TRIZ systematically.
Reference: Introduction of commendation

Scalable process - Panasonic communications
Practical Use of Scientific Creative Techniques for the development of telecommunication Devices

Selection in the best process corresponding to purpose - Olympus
Promotion of scientific methods including TRIZ
- challenge to the output against time in the development field -

Selection of appropriate technique to various problems - Pioneer
Role of TRIZ in Monodukuri Problem-Solution Tool System

Device by which designer understands TRIZ - Sony
Reverse TRIZ adaptation of industry newspaper articles
Thank you for your attention.