



Special Interest Lecture:
Introduction of cases using TRIZ in corporations

September 6, 2012

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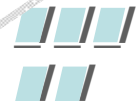


English translation: Kazushi Tsuwako (HGST)



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

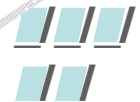
- The corporate cases reported in the past TRIZ symposiums are introduced with the consideration of the following aspects. It will be helpful for the people who consider to introducing, spreading and deploying TRIZ in their companies.
 - Introduction method
 - Process of problem solution
 - Application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

第5回 TRIZシンポジウム 2009

「あなたにとって最も良かった発表」投票結果と発表資料



第5回TRIZシンポジウムでは、昨年に引き続き一般発表の部で発表されたオーラル発表、ポスター発表の中から、参加された皆さまにとって最も良かったと思う発表を選んでいただきました。

この人気投票を企画した趣旨は、TRIZシンポジウムでの発表が、日本におけるTRIZ活動の進展、普及に貢献し、TRIZシンポジウムを開催する度に、発表内容が量、質ともに向上し、TRIZについての相互研鑽の場となることを願ってのことです。

これらの発表者の方々へは、TRIZ活動進展、普及へ貢献されたことに敬意を表し、感謝の意味を込めまして、当協会から賞状を贈呈させていただきます。

この投票に参加された皆さまのご協力ありがとうございました。これらの投票結果を参考にさせていただき、来年のシンポジウムでの発表への挑戦、ご準備をよろしくお願い致します。

【オーラル賞】部門

★結果(=利益)を出すためのTRIZ導入と実務適用事例②

片桐朝彦、土澤聡明、保坂周一(株式会社コガネイ)

[発表スライド資料:日本語\(PDF版\)](#) [発表スライド資料:英語\(PDF版\)](#)

★TRIZ式問題探索によるチャイルドシート改良概念設計

石濱正男、濱田南(神奈川工科大学)

[発表スライド資料:日本語\(PDF版\)](#) [発表スライド資料:英語\(PDF版\)](#)

★通信機器開発における実践的創造技法の活用

庄司隆浩、古賀陽介(ナソニックコミュニケーションズ株式会社)

[発表スライド資料:日本語\(PDF版\)](#) [発表スライド資料:英語\(PDF版\)](#)

【ポスター賞】部門

★特許公報による発明解析事例-その2

日本TRIZ協会 知財創造研究分科会

[発表ポスター資料\(PDF版\)](#)

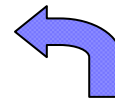
★ものづくり課題解決体系におけるTRIZの役割

熊坂治、菊池史子、福島章雄(イイオニア株式会社)

[発表ポスター資料\(PDF版\)](#)

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)

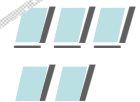
http://www.triz-japan.org/happyo_siryo_07.html



Outline of previous commendation

| 発表者カテゴリ | 2008 | 2009 | 2010 | 2011 | 計 |
|---------|------|------|------|------|----|
| 個人 | 2 | 0 | 1 | 0 | 3 |
| 企業 | 4 | 3 | 1 | 3 | 11 |
| 大学 | 0 | 1 | 0 | 1 | 2 |
| その他 | 1 | 1 | 2 | 1 | 5 |
| | | | | | 21 |
| 全発表数 | 46 | 42 | 40 | 33 | |
| 国内発表 | 32 | 28 | 26 | 25 | |
| 内 企業発表 | 10 | 10 | 6 | 5 | |

From information on Japanese TRIZ society HP

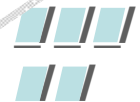




Case 1: Hitachi GST Ltd.

Introduction of the collaborative activity of KT Method & TRIZ
to improve Hard Disk Drive's Quality and Reliability

Announced slide URL: [http://www.triz-japan.org/sympo2011/J09jS-Tsuwako\(Hitachi%20GST\)-110725.pdf](http://www.triz-japan.org/sympo2011/J09jS-Tsuwako(Hitachi%20GST)-110725.pdf)





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/>
HiSpeed21:Hitachi Innovation Program toward Super Process with Excellent Engineering & Digital Technologies for the 21st Century
- 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

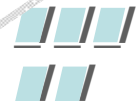
“Clarification of problem by KT method and Idea creation for problem solving by TRIZ”

- 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

The KT-PA method is used to analyze the problem.

| 問題の明確化 / 問題の明確化 | | | | 区別点と変化の確認 |
|--|--|---|--|--|
| State the Problem | | | | Distinction |
| Identify the root cause of the data damage occurred on Outside Data Zone (OD) area of new 3.5" HDD | | | | |
| 問題の明確化 | What is wrong in the way the object looks, sounds, feels, smells | | What is NOT wrong this time, even though it is related, or was wrong, at other times | Peculiarities and differences about the "IS" and "IS NOT" columns |
| | IS | | IS NOT | |
| WHAT(何に) | | | | Areal Density Increase Aluminum Disk, Air Spoiler, Higher RPM Higher RPM Head treads on contamination @OD |
| 対象は? | New 3.5" HDD | 1 | Old 3.5" HDD | |
| | | 2 | New 2.5" HDD | |
| 差異(欠陥)は? | Scratch Increase @OD | 3 | No Scratch @ID | |
| | Spiral Scratch @OD | 4 | Head Crush @OD | |
| WHERE(どこで) | | | | Higher relative speed Crosscurrent on the disk |
| 地理的な場所は? | OD & MD area | 5 | ID area | |
| 対象のどの部分で? | Surface with Air Spoiler | 6 | | |
| | Under Air Spoiler | 7 | Under Actuator | |





Correspondence between HDD's and TRIZ parameter

**Device made 48 contradiction parameter and HDD's parameter easy to choose in the correlation table. (Contradiction matrix 2003 was used.)*

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





Trial “J” Large Air Spoiler

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

Contradiction Matrix from Inventive Principles

- 4 x 28 (Length of Stationary Object/Loss of Information)

28: **Mechanics Substitution**

24: **Intermediary**

3: **Local Quality**

13: **“The Other Way Around”**

Introduce electric, magnetic or electromagnetic fields to interact with an object .

=> **Conductive Air Spoiler**

- 4 x 35 (Length of Stationary Object/Reliability)

35: **Parameter Changes**

31: **Porous Materials**

29: **Pneumatics and Hydraulics**

17: **Another Dimension**

Enable each part of a system to function in locally optimised conditions.

=> **With Taper**

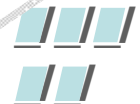
Idea led from invention principle





Case 2: Koganei Corporation
Case Study of Introducing and Applying TRIZ to Real Projects
for Obtaining Results(=Profits)

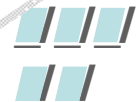
Announcement slide URL http://www.triz-japan.org/PDF/O_04_02-katagiri.pdf
[http://www.triz-japan.org/PDF/O_05_01-Katagiri\(Koganei\)-090825_J.pdf](http://www.triz-japan.org/PDF/O_05_01-Katagiri(Koganei)-090825_J.pdf)





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.





Point of case

“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.

TOC: Constraint theory (Theory of Constraints)

Mind Map is registered trademarks of The Buzan Organisation

- 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

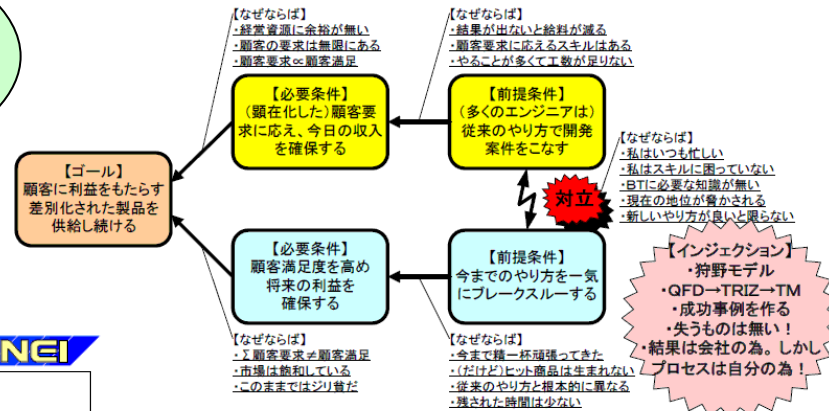




Problem analysis using mind map and confrontation cancellation chart before TRIZ introduction.

③導入、推進を妨げる中核問題

Clean technology materializing user's dreams / KOGANEI



TOC/思考プロセス【対立解消図】

S08

②導入の背景(課題の山)

Clean technology materializing user's dreams / KOGANEI

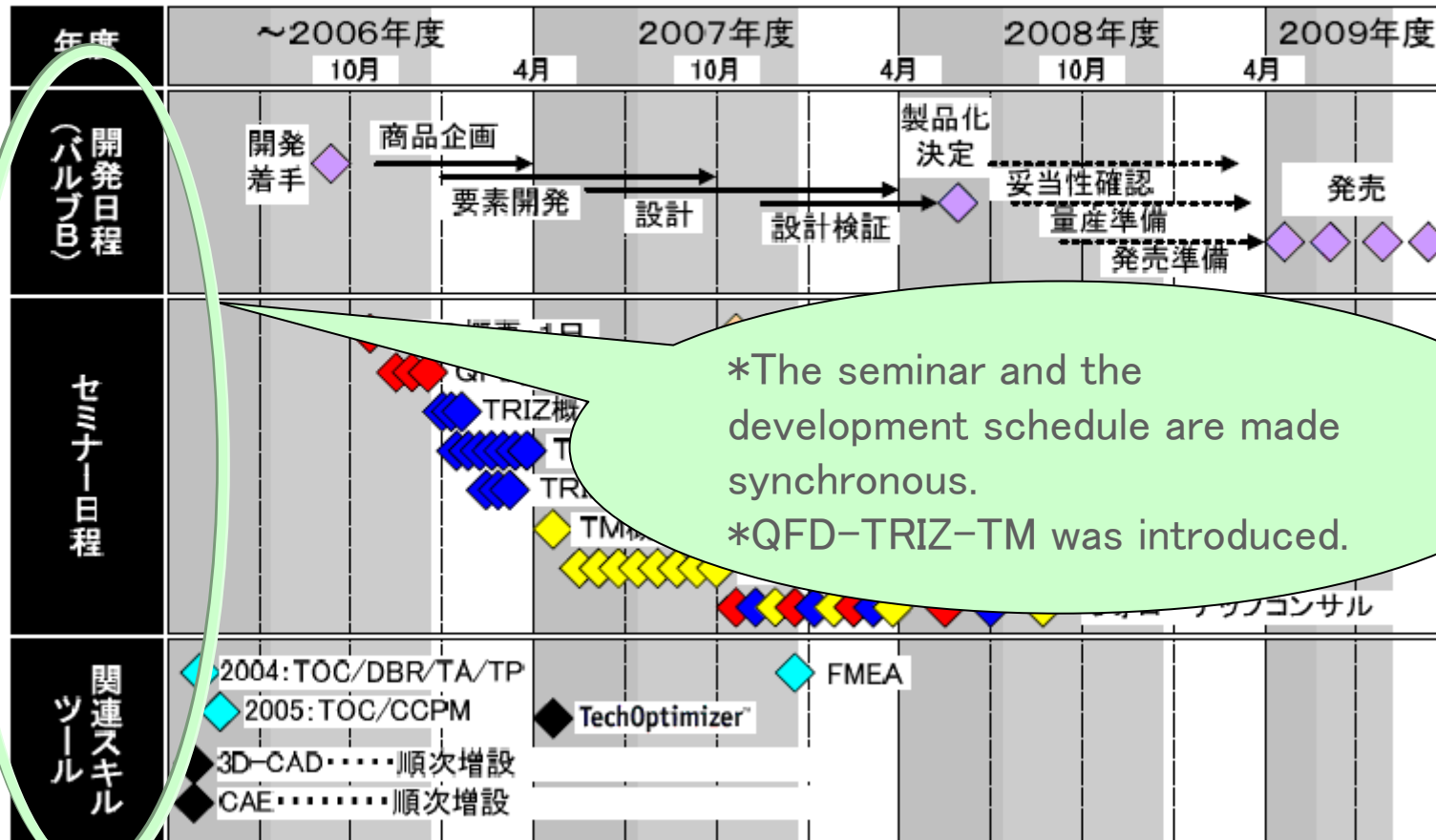


S06

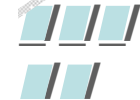




②導入 開発日程との同期化



*The seminar and the development schedule are made synchronous.
*QFD-TRIZ-TM was introduced.





⑤TRIZ プロダクト分析

Clean technology materializing user's dreams / KOGANEI

プロダクト分析→矛盾モデルの作成



⑤TRIZ 原因結果分析

Clean technology materializing user's dreams / KOGANEI

原因結果分析→矛盾モデルの作成

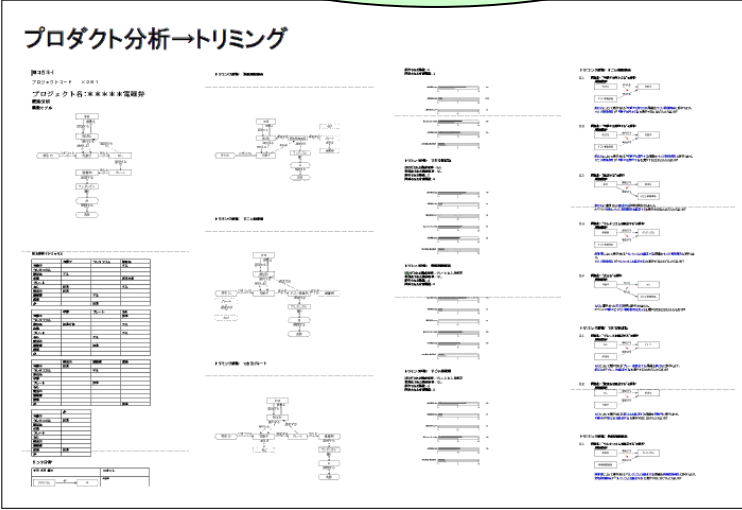
| 原因 | 結果 | 矛盾 |
|------|------|------|
| 原因1 | 結果1 | 矛盾1 |
| 原因2 | 結果2 | 矛盾2 |
| 原因3 | 結果3 | 矛盾3 |
| 原因4 | 結果4 | 矛盾4 |
| 原因5 | 結果5 | 矛盾5 |
| 原因6 | 結果6 | 矛盾6 |
| 原因7 | 結果7 | 矛盾7 |
| 原因8 | 結果8 | 矛盾8 |
| 原因9 | 結果9 | 矛盾9 |
| 原因10 | 結果10 | 矛盾10 |
| 原因11 | 結果11 | 矛盾11 |
| 原因12 | 結果12 | 矛盾12 |
| 原因13 | 結果13 | 矛盾13 |
| 原因14 | 結果14 | 矛盾14 |
| 原因15 | 結果15 | 矛盾15 |
| 原因16 | 結果16 | 矛盾16 |
| 原因17 | 結果17 | 矛盾17 |
| 原因18 | 結果18 | 矛盾18 |
| 原因19 | 結果19 | 矛盾19 |
| 原因20 | 結果20 | 矛盾20 |

*Making Contradiction model
 *Using Prediction, Principles, Effects and Trimming, the contradiction solution and the reduction in costs plan were created.

⑤TRIZ

Clean technology materializing user's dreams / KOGANEI

プロダクト分析→トリミング



S21





⑤TM タグチメソッドへの展開

IMPACTIV

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

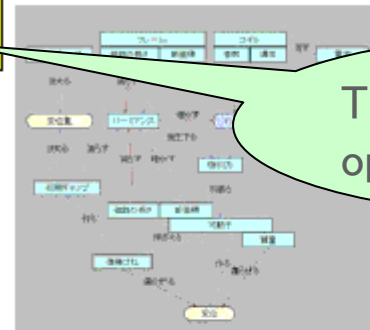
■ $y = \beta M$ において、 y : 仕事量 M : 消費電力として定義

4. 諸特性の定義

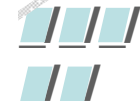
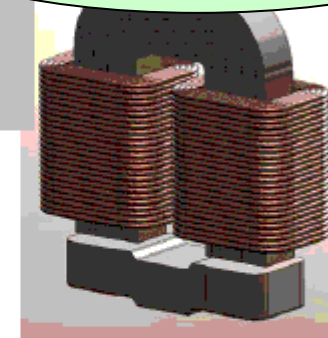
■ 誤差因子: 寸法精度・温度上昇

■ 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



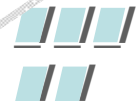
The design is optimized with TM.





Case 3: Pioneer Corporation Introduction of ISW (Idea Search Working)

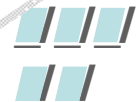
Announcement slide URL http://www.triz-japan.org/PDF/P_04_02-kikuchi.pdf





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.





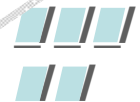
Point of case

“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、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



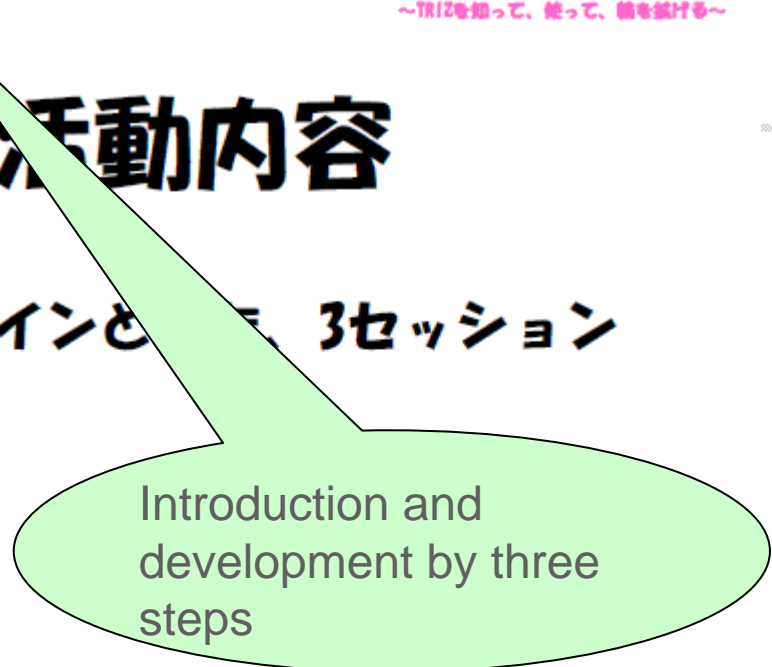
・ TRIZ特許発掘会

- ・ 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、QFD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



Introduction and development by three steps





**Pioneer
idea/invention/innovation
Tool**

An original tool is made, and it opens it to the public in Intranet.





ISW3日間コース

内容

1. 課題に対する共通認識の形成

- 問題定義 (目標の確立)
- 機能-属性分析 (システム構造)
- 原因検討のフレスト (問題の把握)
- 根本矛盾分析 (問題の特定)

2. アイデア出し

- 40の発明原理によるアイデア出し
- 技術進化のパターンによるアイデア出し
- 知識DBによるアイデア出し

3. アイデアまとめ

- KJ法的アイデアの整理分類

4. コンセプト選択

- Pugh's Selectionを使ったコンセプトの選択と結合

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

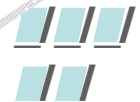
- There are propellers in the companies, and they promote TRIZ.
 - They realize the advantage of TRIZ, and they promote to apply TRIZ positively.
- The propeller is supporting the problem analysis, modeling and multipronged approaches.
 - Creating ideas are not only to solve current problems but also 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





1 **Concept Development of a Variable Compression Ratio Engine Using TRIZ**

2 **Introduction**

3 **Variable Compression Ratio Engine**

4 **Variable Compression Ratio Engine**

5 **Search Matrix**

6 **DMA-1 Patent Discussion**

7 **DMA-1 Troubleshooting**

8 **Idea Generation Using TRIZ**

9 **DMA-2 Analysis Strategy**

10 **Idea Generation Using TRIZ**

11 **DMA-3 Expected Problem of Control Valve**

12 **DMA-3 APZ**

13 **DMA-3 APZ**

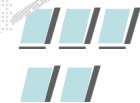
14 **Idea Generation Using TRIZ**

15 **DMA-4 PCZ**

16 **DMA-4 Variable Displacement Engine Using Control Valve**

17 **Idea Generation Using TRIZ**

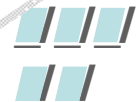
18 **Conclusion**





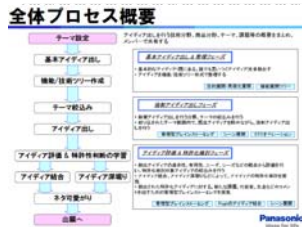
Case in South Korea

- 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

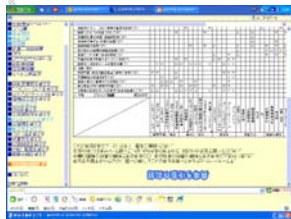
Practical Use of Scientific Creative Techniques for the development of telecommunication Devices



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.

