

Simplifying Conversion and Enhancing Outgoing Product Quality on the ICOS Vision System with TRIZ

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Background

ICOS vision system

- ICOS is an inspection tool used for screening cosmetic defects like co-planarity, ball deformation, ball height and etc

Problem Statement

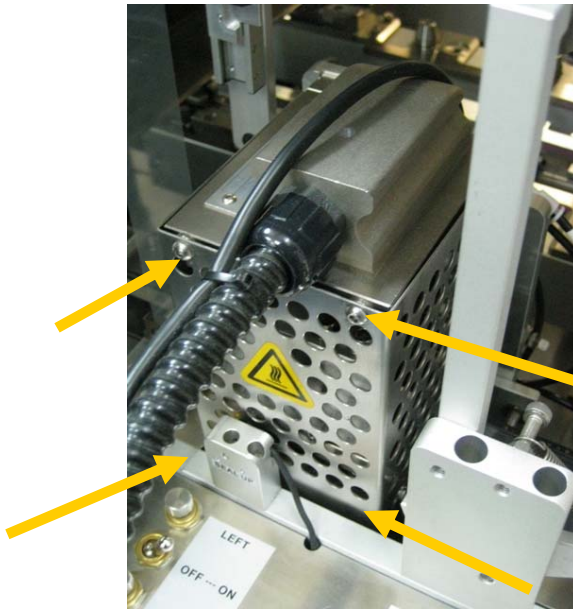
Incomplete Seal & Open Seal of the Tape & Reel

- ❖ Robustness of the outgoing material packaging

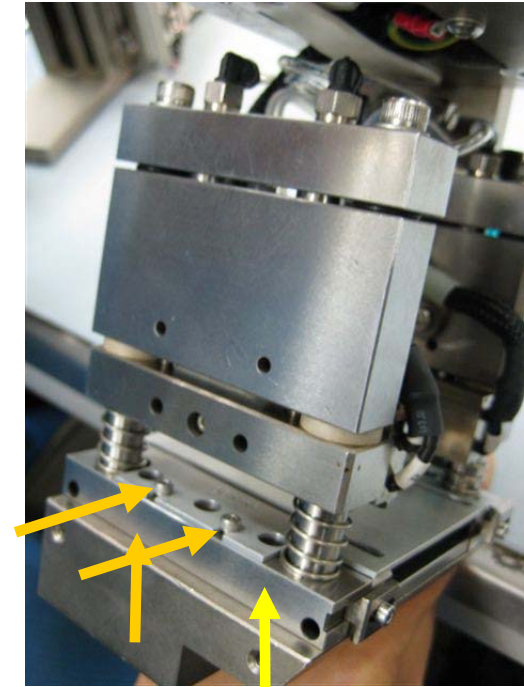
ICOS Seal Head complexity

- ❖ A conversion takes up quite a significant amount of time due to the complexity of the Seal Head
- ❖ Hard to reach areas in the Seal Head
 - ❑ Only a small opening available to screw and unscrew parts

Example of hard to reach parts/areas



Seal Head Cover with washers and screws



The part that takes the longest during the conversion (2X)

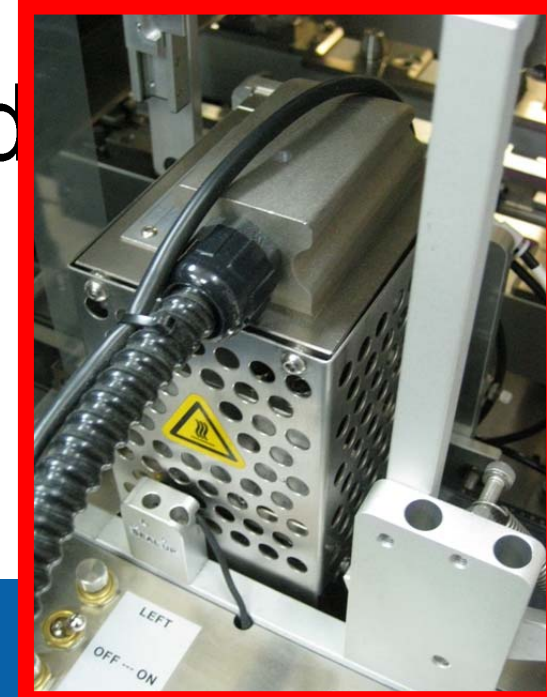
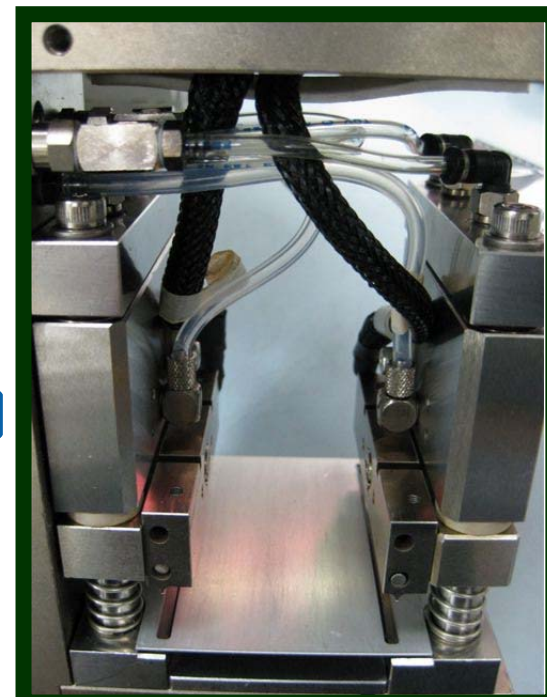
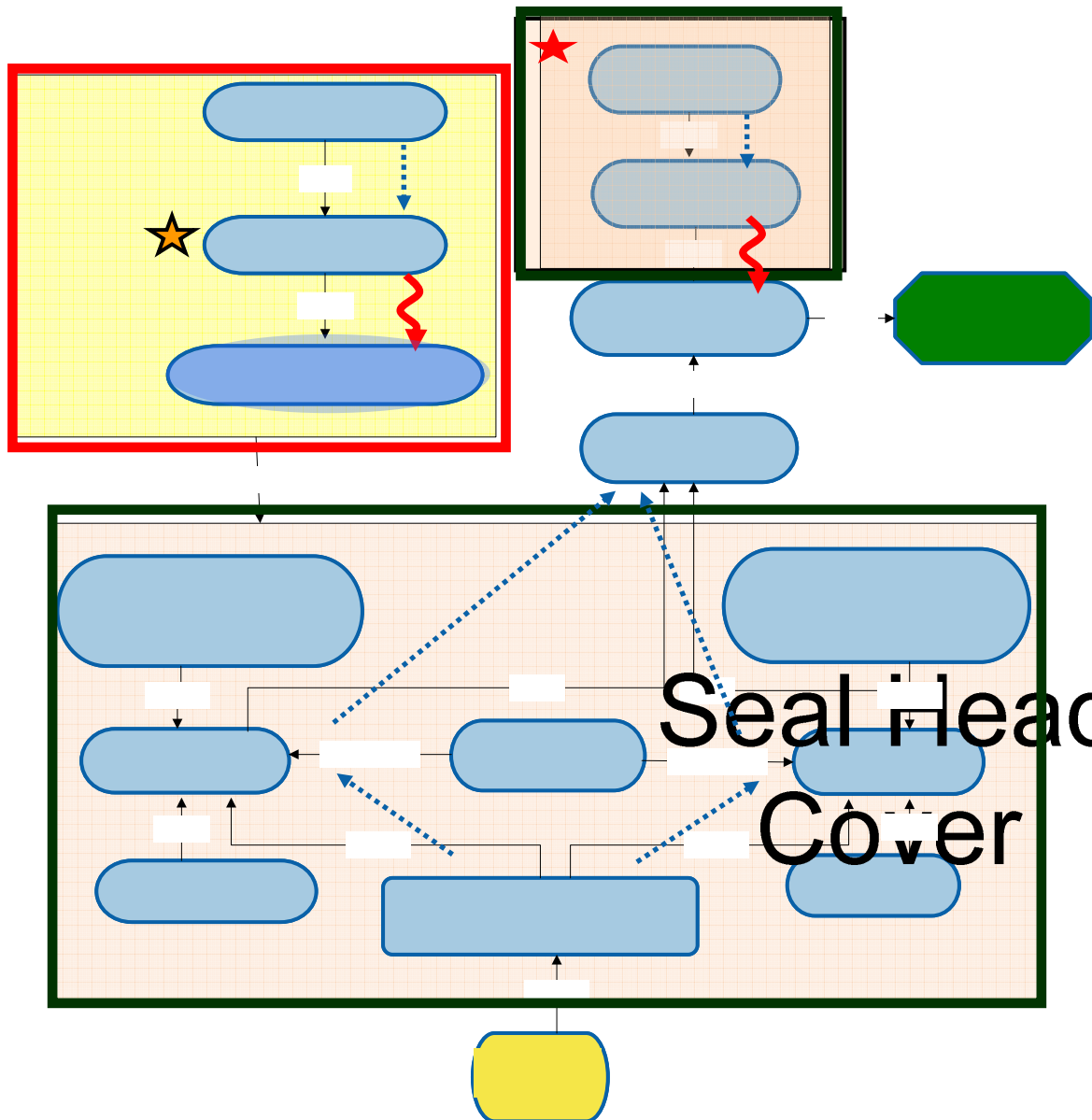
Space is extremely limited in the ICOS for conventional tools

From Problem to Solution...

Applied *Theory of Inventive Problem Solving (TRIZ)*
to problem for the solution

- ❖ **Build Function Model**
- ❖ **Use the 40 Inventive principles**
- ❖ **Perform Trimming**
- ❖ **Make changes based upon recommendation**
- ❖ **Results and Impact**

Function Model

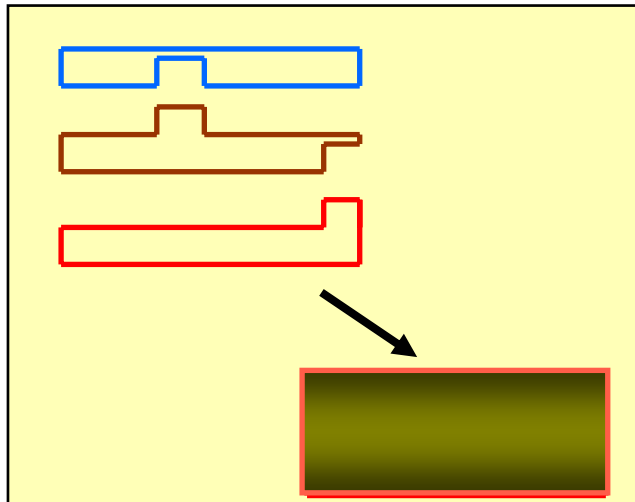


- ★ Time consuming
- ★ Important part
- ⤴ Harmful
- ⋯ Insufficient

TRIZ Inventive Principles

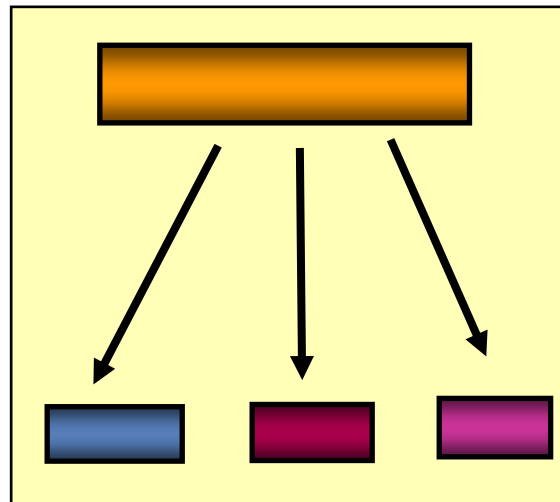
Contradiction

If the washers and seal head cover is fixed properly, Reliability of the seal head is optimized but time spent to fix all items back or remove is longer



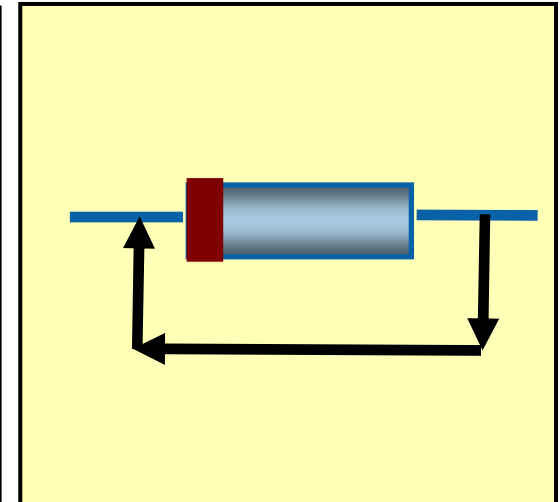
Merging

If top plate screws can be easily accessed, time spent to remove parts reduces but top plate shape will have to change



Segmentation

If sealing quality is monitored, reliability improves but a new process will have to be introduced



Feedback

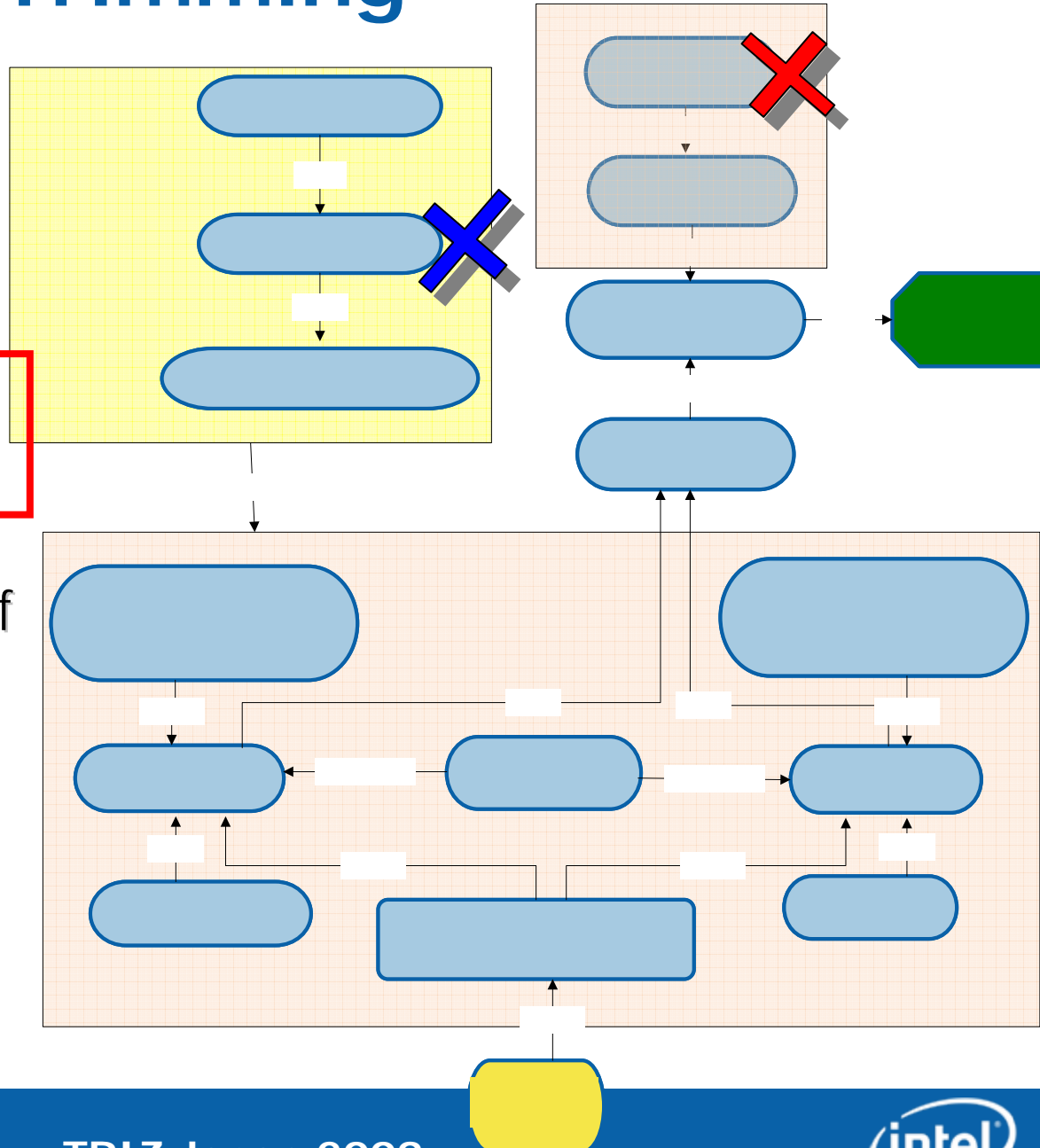
Trimming

Trimming rules

Rule A: You don't need the function anymore

Rule B: The object performs the function itself

Rule C: Some other component does the function

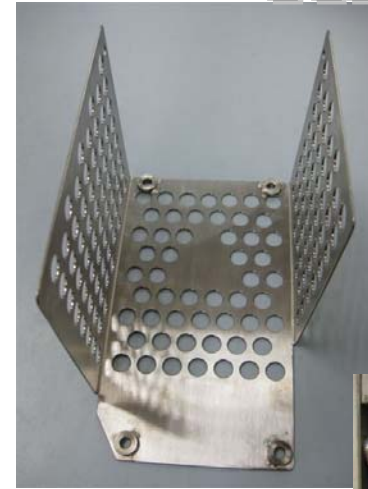


Before

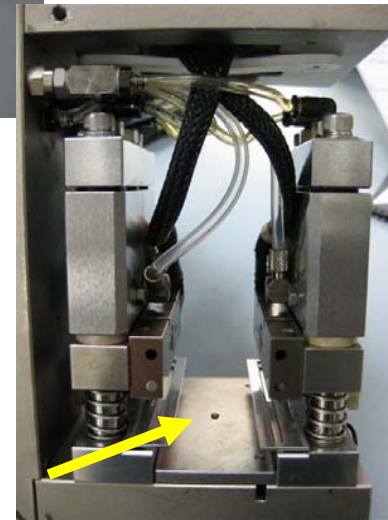
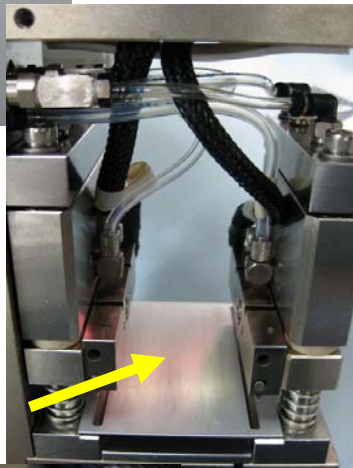
Changes Made

After

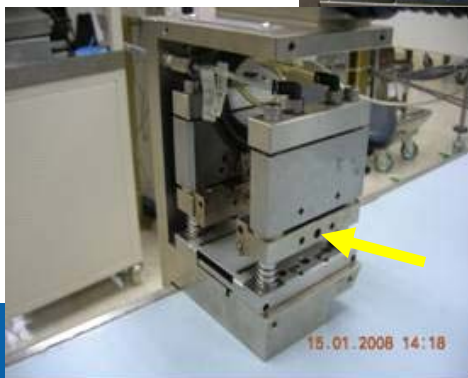
Merging of parts to minimize loosening and tightening and of missing out parts



Segment the 1 piece top plate into 3 pieces and eliminate the large centre piece. Weld the top plate to the slider body and eliminated the 4 screws. No need to remove or reinstall the top plate moving forward



Add a new down stroke sensor that serves as a feedback mechanism. This provides detection for sealing line quality



Results & Impact

- ➔ **35%** reduction in time used for a conversion
- ➔ Total reduction of almost **50%** of downtime, related to Sealing defect
- ➔ Machine **productivity** improves with the simplification of the conversion process which reduces the scheduled downtime
- ➔ Overall **sealing quality** improves as there is a new feedback system to monitor the quality of sealing

Key Learning / Summary

Problem duration: A few years now

What was done previously: Technician will have to manually fine tune of the Seal head by checking the sealing line from time to time.

With TRIZ:

1. The complexity of the Seal Head is simplified
2. Time taken to reach the solution ~ 3 months (from idea to implementation)
3. The individual constraints were eliminated as it allows you to look at each problem differently with the use of the contradiction matrix
4. Stability of the Seal Head is better
5. Time used during conversion reduced

Acknowledgement

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Thank you!