



## DESIGN FOR AUTOMATION

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### Terms

Design for Automation (DfA) describes the way a product is designed with the aim of making it suitable for automated assembly. Due to their universality, humans can also bring together parts that are difficult to assemble. Unfortunately, this is rarely the case with automation processes. DfA is all about making it possible to assemble a product automatically with little or no human intervention.

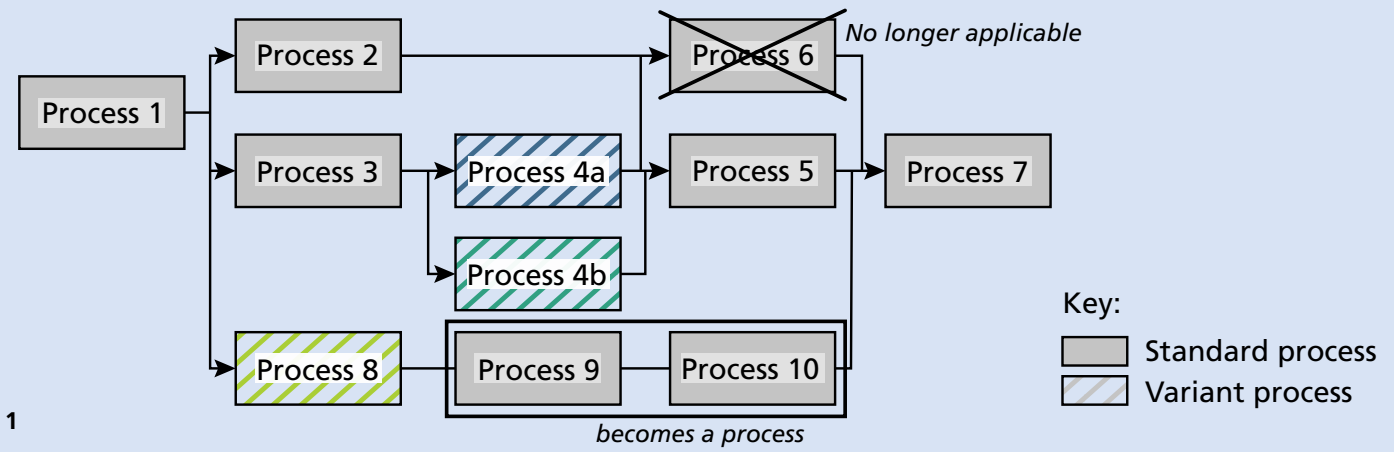
Design for Automation thus goes one step further than Design for Assembly, which considers product design suitable for assembly in general. The rules of an assembly-oriented design are also found in the Design for Automation, but additionally supplemented by the aspect of automation. If something is easy to automate, then it is also easy to assemble manually.

### Current situation

The incentive to automate assembly processes is high and is growing constantly. Besides economic aspects, ergonomic or quality factors often play a major role in the decision to automate.

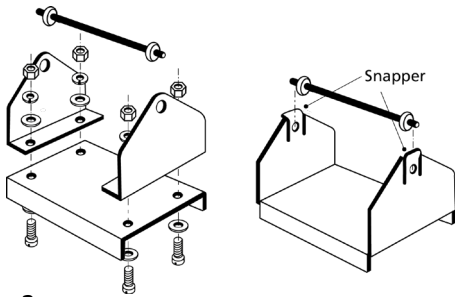
However, previously manual assembly processes cannot be automated without taking a methodical approach. First of all, a concept for an automation solution has to be designed. A good product design is essential to a successful automation concept. Using today's approaches, the automation solution will not be cost-effective or can only be realized with great difficulty if a product is not designed for automation. Accordingly, the product must be designed so that it is easy to assemble (automatically).

But what distinguishes a product that is easy to assemble from one that is difficult to assemble automatically?



1

Factors making a product difficult to automate include complexity due to the number of different components involved, poor accessibility or certain joining technologies.



2

Examples of results include the use of assembly-compatible joining methods or technologies, a reduction in the number of parts to be joined, etc. Solutions have to consider not only technical feasibility but also the economic benefit. Both aspects are compared and evaluated. Identifying potential is ultimately not confined to cutting product and direct manufacturing costs but also includes logistics and general costs.

### Integrating assembly priority graphs to show changes in the assembly structure

Depending on the general matter at hand, an assembly priority graph can be considered from an integrative point of view. This can be used to demonstrate effects of the design on the assembly structure.

If, during the product design stage, several separate parts are combined to form a single part, for example, new dependencies and degrees of freedom in the product structure and assembly structure can be exploited (e.g. a workstation eliminated). To take this into account, either an existing priority graph is used or a new priority graph developed jointly. The product design and changes in the assembly structure are then worked on in parallel.

### Our approach

#### Workshop

When it comes to (re)designing a product suitable for automated assembly, various departments of a company are involved – from design, through work preparation and production right up to controlling. We bring the people concerned together in a joint workshop, which is led and designed by Fraunhofer IPA with experts from automation and production management.

During the workshop, we analyze a defined product range (e.g. a new product) and derive design potential. Based on the eleven “Golden Rules” for designing a product suitable for automation, we work with you to optimize your product step by step.

### Result & advantage

By the end of the DfA workshop, you have a catalog of measures in your hand for optimizing the product design. When integrating the priority graph, effects on the assembly structure are also identified. Furthermore, preliminary concepts for the automation solution can already be developed in the course of the workshop.

In addition, you gain an understanding of how this knowledge can be transferred to other products and projects, enabling you to improve your automation potential in the long term.

### Our services

DfA workshops (several days) to increase your automation potential.

- 1 Example of a priority graph with process changes through DfA.
- 2 DfA has reduced the number of components from 24 to 2 and the assembly time from 84 to 4 seconds (savings: 95%).