Project „Flexible Assembly Processes for the Car of the Third Millennium (MyCar)"

Methodology Description (High Level)

Intelligent Tool for Adaptable Assembly Line Design and Operation

Methodology Description (High Level)

Given the vast number of different assembly equipment and joining processes that are available...

... How can we efficiently design automated assembly lines ensuring that multiple criteria can be met at the same time?
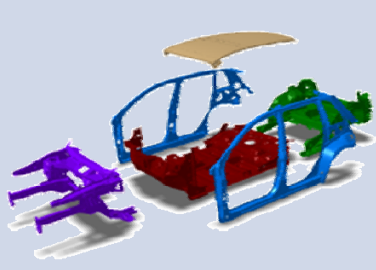
Available results

Tool for the intelligent and fast generation of efficient assembly **line designs in terms of**:

1. Investment Cost

2. Equipment Carryover

3. Technical Availability

4. Production Rate

5. Flexibility

Topics Addressed

In the early design stages the following data are available

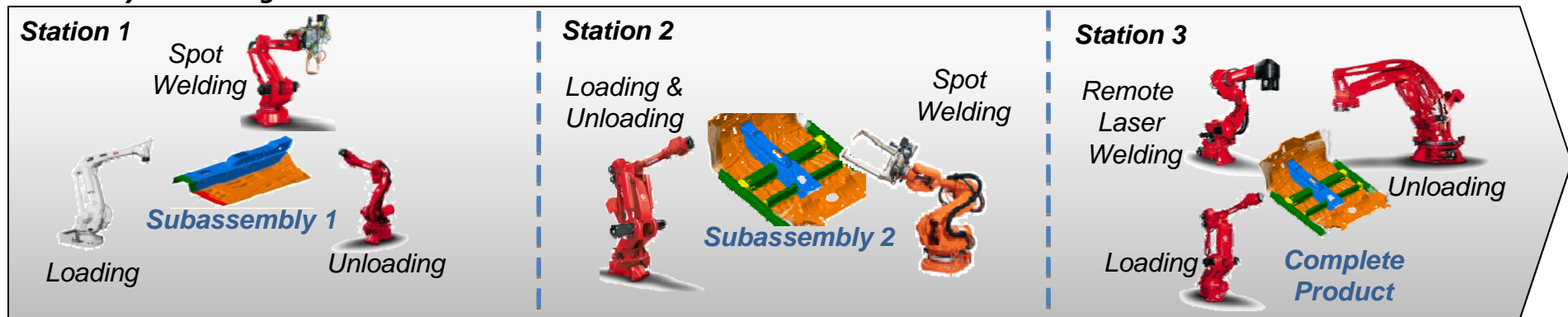| Product Specifications And Assembly Sequence	Required Assembly Process specifications	Available (owned & market) resources specifications	User defined performance indicators
		•Inv. Cost •MTBF •MTTR •Owned quantity •Compatible tools	- Total Inv. Cost - Line Availability - Equip. Reutilization - Flexibility - Annual production rate - Other user defined…

The challenge is to:

"Derive an assembly line design / configuration (alternative) that can produce the specified product and satisfy the user defined criteria"
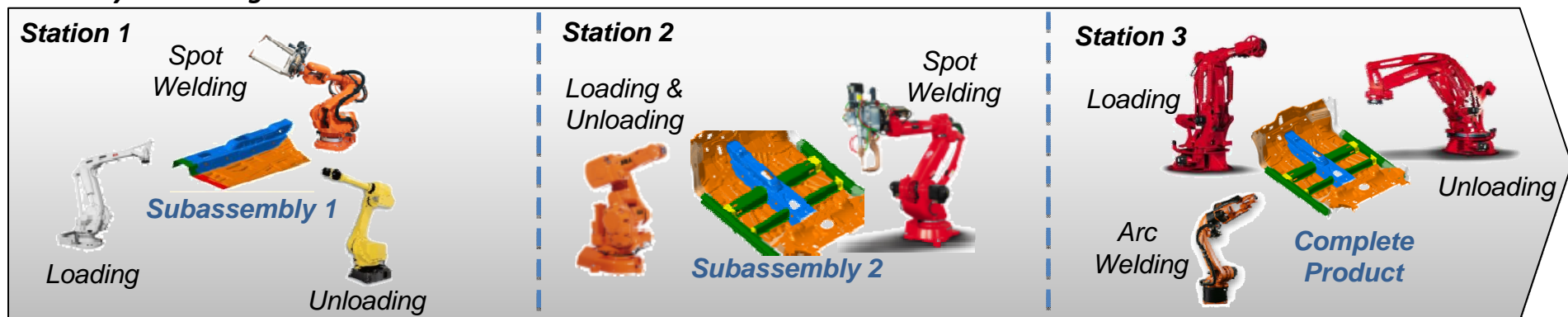
3

Assembly Line Design Alternatives

"A combination of resources carrying out operations required to produce subassemblies"

Assembly Line Design Alternative 1

Assembly Line Design Alternative 2

Approach

To formulate the problems as search problems that can be attacked more efficiently

Modeling of human decision making process

➤Modeling of automated assembly line design decisions

Automated generation of assembly line designs

➤ Model development for the systematic generation of assembly line designs
➤ Development of search algorithm for the efficient exploration of the design solution space
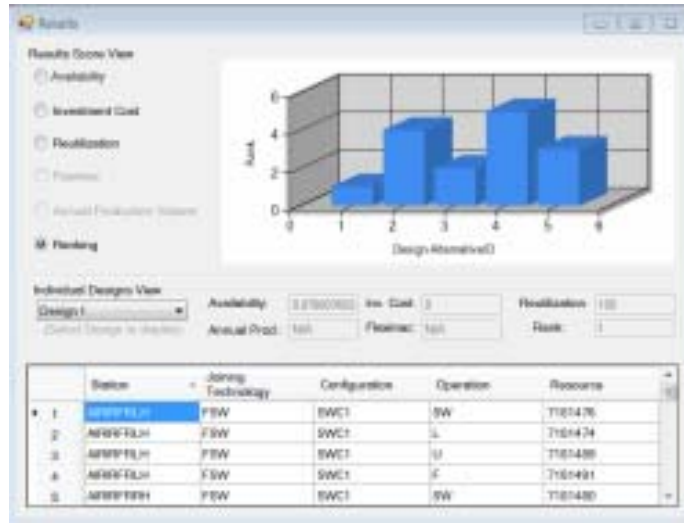
Definition of criteria and evaluation of alternatives

➤KPI definition for Automated & Human Based Assembly Lines
➤Multiple criteria evaluation

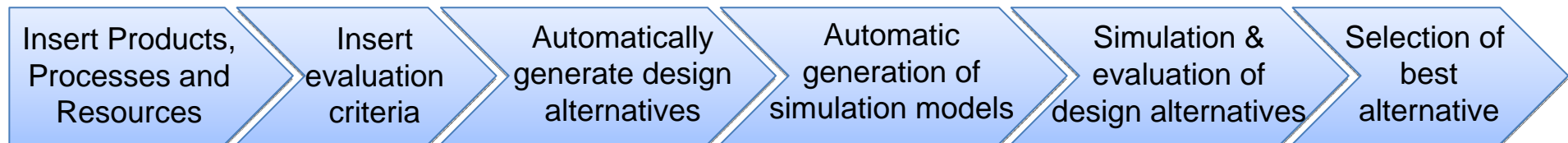Integration into decision making support software **tools**

Intelligent Assembly line Design Tool

- Standalone Windows Application

- Designer may quickly:

  - ✓ Insert product structure and available resources

  - ✓ Select different demand scenarios to be used in the simulation

  - ✓ Select the importance of performance criteria

  - ✓ Obtain design alternatives of high quality and compare them

- The tool uses the following steps :

Insert Products, Processes and Resources → Insert evaluation criteria → Automatically generate design alternatives → Automatic generation of simulation models → Simulation & evaluation of design alternatives → Selection of best alternative

Benefits of the approach

• Automatic generation and evaluation of design alternatives - fast search within a vast number of complex design alternatives

• Automatic building of simulation model enhances the design evaluation capabilities

• Can help reduce investment cost and enhance equipment reutilization.

• Ensure high technical availability and validate line capacity - fast line ramp up