Challenges for the assembly of vehicles

Major changes are on their way for automotive manufacturers and their suppliers. The developers have to deal with a variety of challenges:

– Hybrid drives, electric vehicles
– Customization
– Demographic change
– Recycling requirements
– Production in emerging countries
– Energy efficiency requirements

These challenges can only be met by taking an integrated approach.

Assembly and logistics planning

– Assembly strategies and systems built on scalable automation and meeting the requirements of demography
– Material flow simulation
– Human resources tools for factory operation and planning
– Prototype factories as an instrument to test readiness for series production
– Work structuring and job evaluation on the assembly shop floor

Assembly simulation in vehicle development

Robotics and assembly simulation:

– Simulation of large deformations of flexible cables and pipes (quasi-static and dynamic)
– Assembly simulation of flexible structures (cable harnesses, pipes, headlining, floor mats, door panels etc.)
– Automated path planning
– Simulation of spray painting

Software tool:

– IPS Path Planning and Cable Simulation

Our services

The institutes collaborating in the business unit vehicle assembly of the Fraunhofer Automobile Production Alliance offer a variety of services, including global solutions for the following key subjects:
Fixtures and lightweight design
– Development of the necessary technology modules
– Control strategies to check for collisions and to avoid them
– Benchmarking and cost-effectiveness analysis

Energy efficiency analysis of assembly strategies
– Analysis of energy consumption profiles (energy mining)
– Identification and monitoring of efficiency indicators
– Energy-related process models for assembly operations
– Energy-efficient control and process control strategies
– Decision support (simulation, forecasting)

Collaboration systems (human-robot)
– Design of collaborative workplaces
– Control functions (force and impedance control)
– Design of control modules and safety concepts
– Intuitive programming
– Construction of a demonstrator

Use of IT, RFID, and sensor systems in assembly and logistics processes
– End-to-end tracking of car bodies
– RFID/radio tracking of vendor parts and automated confirmation of installation in car body
– Traceability at the touch of a button
– Actuation of assembly, formation of assembly sequence
– Role-based process visualization, staff information
– Control of rework processes
– Horizontal integration of production-related IT-systems on the assembly shop floor
– Plug-and-work solutions, ongoing comparison of reality to digital model
– Inline quality assurance of surfaces
– People tracking, body language and gesture recognition

Intelligent tools
– Process analyses
– Development and optimization of joining methods
– Tool development and prototyping
– Integration of process control systems
– Feasibility studies and process validation
– Assistance with technical implementation

Adhesive technology
– Selection and modification of adhesives
– Design, qualification and testing of manufacturing processes
– Quality assurance and failure analysis
– Staff training

Design of workplaces
– Ergonomic improvements (e.g. mounting position, gripping and walking movements, lifting and carrying equipment)
– Design of fixtures
– Reduced time to access parts
– Design of assembly jigs
– Ergonomic arrangement of tools

– Visual assistance (color-coded containers, electronic work instructions etc.)

1 Development, implementation and testing of robot systems and their component parts (in collaboration with 3M).
2 Painting technology and paint shops.
3 Development of advanced driver assistance systems.
4 Metal matrix composites for lightweight applications.
5 Processing technologies for lightweight materials.