

eM-Workplace – eMPower for manufacturing process management

Digital manufacturing environment for robotic workcells

fact sheet

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► Summary

eM-Workplace enables the design, simulation, optimization, analysis and off-line programming of multidevice robotic and automated manufacturing processes in the context of product and production resource information. It provides a concurrent engineering platform to optimize processes and calculate cycle times. With eM-Workplace, you can design life-like, full-action mock-ups of complete manufacturing cells and systems on 3D graphics computer workstations.

Features:

Interoperability with major MCAD systems – i.e., no data translation needed

Robots, machines, tools, equipment libraries

Modeling of components

Modeling of complex kinematics of robots and other mechanisms

3D layout definition of workcells

3D path definition with reachability check, collisions detection and optimized cycle time

Motion simulation and synchronization of several robots and mechanisms

Modeling and optimization of the whole manufacturing process, SOP (sequence of operations)

OLP (off-line programming)

- Optimized programs downloaded to robots on the shop floor

- Up-loading existing production programs for optimization

As a scalable, standalone solution, eM-Workplace (formerly Robcad) fully integrates core technologies with a powerful set of process-specific applications for a wide range of processes, including spot welding, arc welding, laser- and water-jet cutting, drilling and riveting and human operations.

eM-Workplace is an industry de facto standard, with over 4,000 seats in production

engineering helping users improve manufacturing processes – cutting costs, increasing quality and accelerating time-to-market.

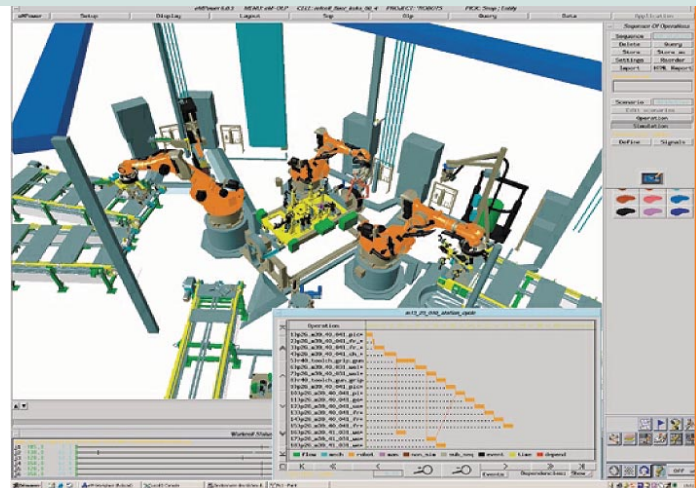
eM-Workplace serves manufacturing process design teams, including contractors and their supply chain, as well as service companies (system integrators and design houses) within automotive, aerospace, utilities and heavy industries.

eM-Workplace base

eM-Workplace facilitates better and more reliable decisions upfront, significantly reducing capital investment, planning and assembly times. It allows process design engineers to graphically study and manipulate workcells that can then be analyzed, optimized and verified before users invest in costly production machines or equipment.

eM-Workplace simultaneously models all physical characteristics of robots and other automated devices, enabling users to verify the accessibility limits (reach target, define path, avoid collisions and calculate cycle times) while developing a planning concept.

Preliminary set-ups of automated production can therefore be designed before launching the manufacturing process.



Benefits:

Increase manufacturing quality, accuracy and profitability
 Reduce labor hours and process engineering lead time
 Greatly improve program accuracy and process quality
 Optimize development and capital investment
 Better use production equipment (OLP)
 Reduce product costs
 Accelerate time-to-market

Core technologies

eM-Workplace includes core components required for robotic simulation. In addition to its 3D graphical visualization capability, eM-Workplace adds a time dimension to the cell model.

Integration with product design

eM-Workplace fully integrates with most industry MCAD systems, including native data from Catia, NX, Pro/Engineer, I-deas® NX Series, CADDSS, direct CAD interfaces or neutral formats such as IGES, DXF, VDAFS, SET, STL and STEP.

Robface, a Tecnomatix™-neutral data exchange format, enables the implementation of any kind of dedicated MCAD interface.

Interoperability with MCAD data models enables the verification of the product together with the manufacturing process.

eM-Workplace can handle very large volumes of data, enabling the simultaneous modeling and coordination of many automation tasks.

Workcell layout design and modeling

In addition to the most comprehensive library of robots available, eM-Workplace allows the easy modeling of additional robots and mechanisms.

eM-Workplace layout features enable the design and construction of 3D environments. Once a process has been designed with eM-Workplace, its robotics capabilities enable robot reachability checks.

Motion simulation for robots and mechanisms

eM-Workplace generates configurable motion planning based on the controller features. It allows calculation of cycle times, analysis of real-time performance and saved testing time.

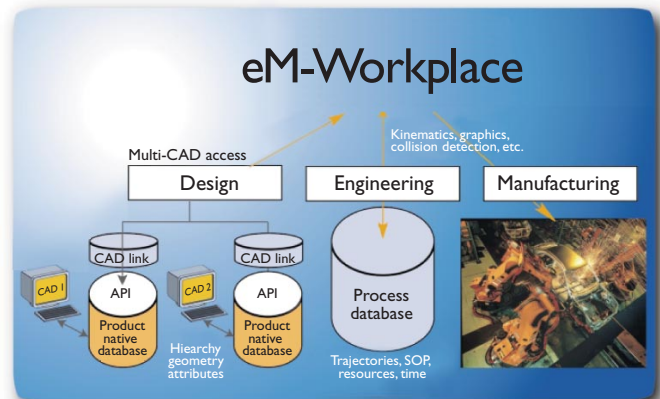
The RRS (realistic robot simulation), which is based on using the real controller motion planning software, offers extremely accurate cycle time calculation.

Collision detection

eM-Workplace can dynamically detect collisions during robot simulation and motion, preventing costly damages to equipment.

SOP (sequence of operations)

eM-Workplace enables the description and sequencing of all operations and tasks performed with production resources (e.g., robots, mechanisms, humans). This capability enables the visualization and optimization of the entire work cell cycle.



OLP (off-line programming)

eM-OLP enables accurate simulations of robot motion sequences and the delivery of machine programs to the shop floor. eM-Workplace interfaces to most robots (50+ standard interfaces representing over 200 controller configurations), adjusting the program to all specifications of the controllers. Controller-specific information, including motion and process attributes, can be added to the generated robot paths. eM-OLP then generates the controller program, which is then downloaded to the real controller.

Programs can also be uploaded for re-use and optimization.

Standard and customized eM-Workplace interfaces enable minimum touch-ups and more efficient off-line programming.

eM-Workplace can generate the most suitable combination of equipment to meet specific manufacturing requests, allowing faster product introduction and early evaluation of manufacturing times, costs and project investments. Equipment can then be used exclusively for production and not wasted on program development.

Robot calibration improves positioning accuracy

eM-Workplace provides calibration functionalities to accurately align digital cell models with actual layouts. After downloading the program, the robot will accurately move to defined locations in the cell without need for touch-ups.

eM-Workplace also interfaces with other calibration tools, including those from Dynalog (www.dynalog-us.com) and Krypton (www.krypton.be).

Open system environment for customized program functions

The eM-ROSE API offers an open system environment for developing customized features and applications. It enables easy, fast and efficient programming and provides high-level access to all eM-Workplace proprietary core technologies and algorithms, including geometry, kinematics, motion planning and graphics.

The MacROSE module offers an interactive mode to develop macros or prototype applications.

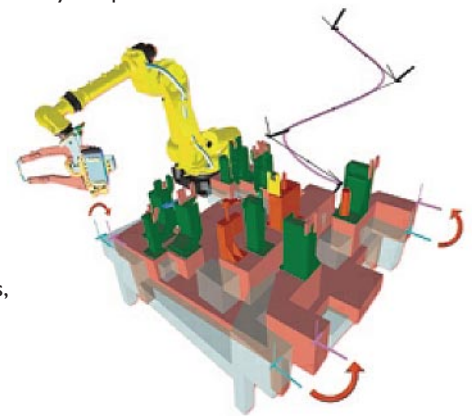
Automatic path planning

eM-Workplace generates collision-free robot and part assembly paths by using automatic path planning technology.

In a populated environment, the trajectories can be found easily and automatically, helping to increase user productivity.



Off-line programming



Robot calibration: aligning digital and real worlds

Reporting

Editable HTML reports about cells, BOMs and SOPs are available. Contents include images and data extracted from the work cells, with sub-reports for robots, guns, devices, non-kinematics components, human models, paths, weld-points, jpeg graphical views and VRML2 animations.

eM-Workplace can also generate drawings of cell layout and animated movies.

Integration with virtual reality tools

Virtual technology enables users to create intuitive simulations. Users can navigate graphically within the eM-Workplace digital workcell's environment by using virtual reality technologies to export graphics, simulation and collision detection.

eM-Workplace supports a variety of virtual reality equipment such as VD2 (VRCom) and Invision (Intro).

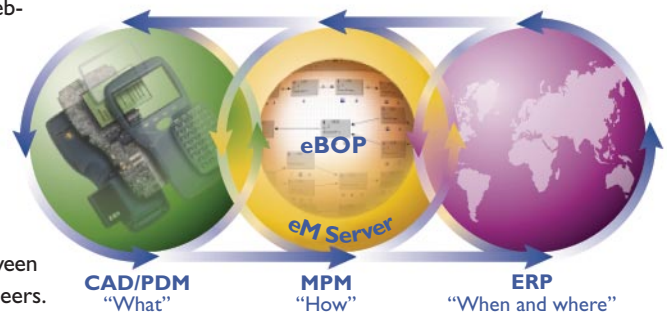


VR integration

A key component in manufacturing process management (MPM)

MPM comprises all the technologies and methodologies for collaborative development and management of manufacturing process information – much as traditional methodologies help manage product information. MPM provides links between upstream PLM (product lifecycle management) software, such as computer-aided design (CAD) and product data management (PDM), and downstream applications, such as enterprise resource planning (ERP).

eM-Workplace integrates with the web-based Tecnomatix eMServer, allowing users to exchange layout (resources and parts) and process information from the workcells with eM-Planner, the eMPower platform's enterprise solution backbone. This integration increases and optimizes the level of collaboration and synchronization between Process Planners and Simulation Engineers.



Hardware requirements

eM-Workplace supports various hardware platforms:

- Windows 2000 and XP PCs
- SGI Unix workstations
- HP Unix workstations
- Sun Unix workstations

Process applications

The eM-Workplace suite of applications is based on leading-edge technologies that encapsulate work methodologies while addressing the specific needs of each process with dedicated functions and increasing productivity.

Spot welding

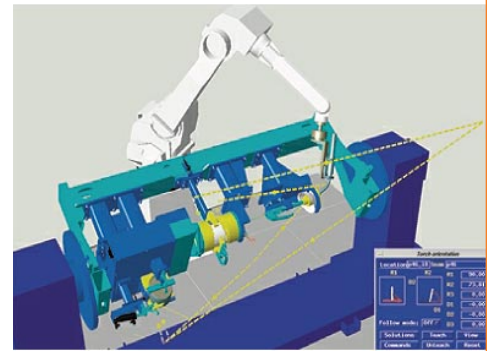
eM-Spot addresses the entire spot-welding design process, taking into account such critical factors as space constrictions, geometric limitations and welding cycle times. Powerful features such as gun search, automatic robot placement, path cycle-time optimizers and weld-point management tools enable users to create virtual cells, simulations and programs that accurately reflect the physical cell and robot behavior. eM-Spot also enables efficient off-line programming of robots, shortened production ramp-up time and optimized introduction of new products or variants without having to stop the welding line and lose production time.



Spot welding

Arc welding

eM-Arc enables the design, simulation, analysis and of off-line programming of arc-welding processes. It enables creation of workcell layouts based on definitions of robot motions, seams, gantries and welding equipment. Seams are created based on the part geometry and qualified welding procedures. Tooling can be verified according to torch access. Torch orientation, gantry and positioner settings can be optimized to ensure collision-free access, robot reach and optimized welding conditions. The welding sequence can be defined and optimized to limit part deformations and minimize cycle time. Complete, fully proved programs can be downloaded to equipment on the shop floor, minimizing production downtime. The same welding paths can be easily adjusted and transferred to various equipment available in the factory.

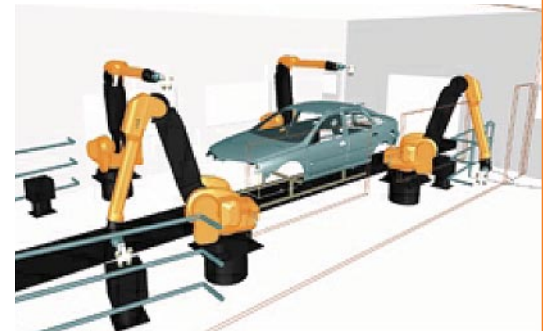


Arc welding

Painting, sealing, gluing, sand blasting, shot peening, flaming and thermal spraying

eM-Paint provides software tools that address the entire spraying process: designing the robot path, verifying access to all areas, determining coverage parameters and thickness, creating and adjusting process triggers, simulating and downloading the optimized program to the shop floor.

For the painting process, eM-Paint supports robots or painting machines using conventional or electrostatic spraying. Its comprehensive functionality, combined with the opened and configurable thickness calculation function, enable its implementation for such other spraying processes as sealing, underbody sealing, gluing, sand blasting, thermal plasma spraying, shot peening and flaming.



Painting

Drilling and riveting

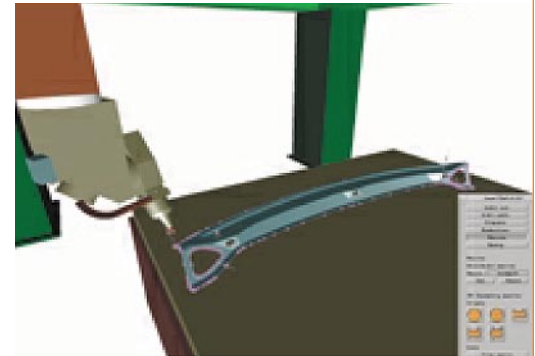
eM-Drill enables the programming of drilling and riveting machines for aerospace industry applications. With eM-Drill, users can define a large amount of drilling and riveting points for fixing the fuselage envelope on the plane structures.

An optimized path connects these points to minimize the robot or machine motion. The entire environment is simulated, including the drilling and riveting effectors and anvils. The anvil can be reoriented in order to ensure collision-free access. An optimized and fully proved program can then be downloaded to the machine, avoiding time-consuming on-site verifications.

Laser, water-jet and plasma cutting

eM-Laser provides software tools that enable automatic creation of complete contours by simply clicking a single curve or single surface. Geometric flaws such as gaps can be accommodated. The contour is converted into linear, circular and spline motions, with the orientation always kept normal to the surface; the tool compensation feature allows tool diameter to be taken into consideration.

Orientation can be easily manipulated with advanced tools to handle singularities (sharp corners), to manage wrist configuration and optimize motion (offset wrist with 5-axis machines, 6-axis robots) and to automatically avoid collisions with the part. After sequencing the paths, an optimized and fully proved program can be downloaded to the machine or the robot.



Laser cutting

Polishing, grinding and deburring

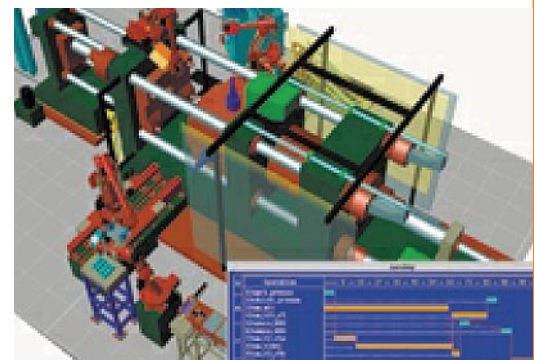
eM-Workplace enables the creation of finishing paths based on the part geometry. Paths can also be imported from a CAM system, enabling visualization and simulation of the entire environment, including tool changers and positioners, robots or NC machines. Path orientations can be modified to ensure easy, smooth and collision-free access with reduced wrist motion. Positioner angles can be defined and optimized to improve the process. Tool penetration can be visualized (polishing) while the robot follows its path. A complete, optimized and fully proved program can be downloaded to the machine.

Handling, machine servicing

eM-Workplace enables accurate design of the entire cell layout: all elements are positioned according to the available space, while ensuring robot reachability.

Grippers can be designed and mounted on the robot, and human tasks can be designed with the eM-Human module.

Using the SOP function, the entire sequence can be modeled, simulated and optimized. Cycle time can be accurately calculated.



Handling

Monitoring and remote tele-operation

The eM-Martel application focuses on the specific needs of remote maintenance operations. This tool is fully compatible with all eM-Workplace products and major MCAD interfaces.

Human simulation

eM-Human is a 3D-simulation software tool for designing, analyzing and optimizing manual workplaces and operations. It simulates human tasks using human models of appropriate gender and body size. It also optimizes the workplace by using various ergonomics analysis methods, including posture, energy expenditure and lifting force, as well as manual cycle times by using MTM-methods. The human operations can be simulated together with robotic and mechanical tasks once inserted in the same SOP chart.

Global professional services help you maximize eM-Workplace benefits

Our worldwide network of technical experts can assist eM-Workplace users with the following operations, allowing operators to remain focused on their own tasks:

- Customize OLP modules
- Develop ROSE applications
- Set-up, program, calibrate and create work cells

Service professionals can check and adjust fluid off-line programming according to specific requirements, having integrated the controller-customized specifications to minimize retouching. And the UGS services can develop specific functionalities to increase productivity and support specific workflows.

But UGS offers customers much more than depth of expertise. We take great pride in our ability to deliver the highest level of global professional services so that you can achieve maximum benefits from UGS technology within the shortest possible time.

Whether you are facing a challenge at home or in a remote part of the world, UGS has the flexibility and the professionals in place to respond. Our experts share vast experience and business knowledge in project implementation, project design and project methodology.

The UGS team can help your organization achieve quick, maximum impact on your business processes through comprehensive consulting, development, implementation support and engineering service programs that fit your environment and objectives.

eMPower solutions for MPM

The Tecnomatix eMPower suite makes up an end-to-end collaborative solution that enables the planning, design, analysis, optimization and operation of manufacturing processes – letting users create and share manufacturing information across the enterprise and throughout the supply chain.

eMPower solutions help manufacturers implement effective MPM strategies – from sharing product and process designs, to joint process planning and engineering by teams in distributed locations – helping planners to make decisions such as where, how and with what resources to manufacture products.

Leading manufacturers around the world are adopting UGS Tecnomatix solutions to expand revenue potential by reducing costs, accelerating product introductions, shortening time to volume and optimizing production execution.

For more information about UGS Tecnomatix solutions, visit www.ugs.com.

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