WE EQUIP SUPER SOLDERING CELLS WITH SUPER ROBOTS.

Our modern 6-axis robots solve even the most complicated tasks very rapidly.

Eutect, the electronic soldering module manufacturer, relies increasingly on Mitsubishi Electric's 6-axis robots. This type of robot not only handles more complicated tasks than standard 3-axis kinematic modules – it does so more rapidly and takes up less floor space.
Eutect's customers benefit from better process integration, greater flexibility, shorter setup and cycle times as well as savings in space and investment costs. The use of robots provides a measure of future-proofing; this is hard to quantify, but is more important than ever.

Eutect's solution integrates three processes (flux application, preheating and soldering) to just 4 m^2
[Source: Eutect GmbH]

Part of a family-owned business: our robots

Eutect GmbH is a family-run business in the greater Stuttgart area, one of the most vibrant high-tech regions in Europe, and specializes in modular automation solutions for soldering processes. These include applications in the areas of mini-wave soldering, laser soldering, induction soldering, piston soldering, thermode soldering and lift/dip soldering for circuit boards.

Eutect was founded in 1996 by senior manager Manfred Fehrenbach in order to engineer special-purpose machines, but focused from the start on providing solutions and services rather than on constructing machinery.

In most cases, designers and engineers help their customers to accelerate and optimize their processes instead of just construction a machine according to specifications. This is comparable to Mitsubishi Electric's business model; our goal is not just to provide components, but to create solutions together, as well developing and promoting technology partnerships.

In 2008, Matthias Fehrenbach, son of the company founder and Assistant Managing Director, decided to invest in a used 6-axis industrial robot from Mitsubishi Electric Factory Automation (MELFA). This new idea was tested by mounting a robot upside down on the ceiling of one of the company's small automation cells, gaining space below the robot for other processes. The possibilities of this configuration were tested extensively at Eutect's technical center, where they were able to limit the floor space taken up by the machine to just 2 m. x 2 m. This was achieved by combining the robot with Eutect's intelligent gripper and magazine design, and by integrating additional process modules.

Since the first client project in 2009, Eutect has developed and delivered many highly specialized robot cells for German

automobile subcontractors and electronic component manufacturers. Some of these Eutect cells are used in production sites in other parts of Europe and as far away as South Korea.

Perfect customer solutions based on our technology

Although the company would be regarded as small with only 32 employees, Eutect is known throughout the industry and mainly supports large manufacturing companies in Germany. These companies are increasingly faced with requirements from clients to increase their range of products and the ability to customize them, without raising their prices. Manufacturers must be able to meet these challenges in order to survive in the market.

Eutect works closely with its customers throughout the development process in order to create a satisfactory solution. This starts with consultation and the construction of a prototype in our own technical center, and continues in the form of offline simulation and visualization as well as programming with Mitsubishi Electric's software tools MELFA WORKS and RT ToolBox2.

Eutect has used a modular approach for more than ten years and provides a corresponding "toolkit", from which the client can select the individual machine components that he needs. Eutect's module kit provides almost endless combination options for production cells, kinematic modules and processing modules.

The 'kinematics' menu of the module kit provides everything your robot needs. This solution will soon supersede previous linear and rotary positioning systems by simplifying complex electronic soldering jobs and making automation economically feasible for smaller quantities. According to Eutect's Managing Director Matthias Fehrenbach, about 40% of machines ordered at present are equipped with a robot. "With robotics, we can have the advantages of automation – even with small batches and very complex handling applications."

Our innovations for Faulhaber

Eutect is currently developing a robot cell with an articulated robot from Mitsubishi Electric's RV 4FLM series (see Fig. 1) for Faulhaber, the micromotor specialists. The company is also located near Stuttgart and has more than 1,700 employees at international development and production locations. Faulhaber is also one of Eutect's suppliers, and makes the miniature drives for their advanced gripping and handling technologies.

The cell currently being constructed for Faulhaber is equipped with an upright RV-4FLM robot from Mitsubishi Electric and will, after completion, solder the winding contacts of tiny electrical motors using the high-temperature enameled-copper soldering procedure. Unlike the products of some other companies, Mitsubishi Electric's robots can be mounted without modification to the floor, overhead to the ceiling or to the wall, so that the configuration can be optimized for optimal use of space for the task at hand without any compromises.

Mitsubishi Electric's RV-4FLM is a 6-axis articulated robot with a carrying capacity of up to 4 kg and an operational radius of up to 649 mm. This ensures absolute mobility and flexibility for any task. In addition, processes can be carried out consistently with a precision or repeatability of ± 0.02 mm. Cables and compressed air lines for electric or

pneumatic gripping modules are located inside the robot's arms, where they provide negligible resistance to the arm's movement. The ability of the robot to compress itself completely into a flat packet also contributes to this, so that its six degrees of freedom can be fully utilized.

Like all robots in Mitsubishi Electric's RV-F series, which can even be ordered in a clean room version if needed, Eutect's new robot also has IP67 protection classification for harsh environments. This protects the robot against the tiny particles of solder that are scattered through the air if the liquid solder in the machine reaches temperatures of up to 500°C. Moreover, it also readily endures the damp spray cleaning process that is necessary from time to time for this process.

Another innovation for the "little Faulhaber", as the new machine is referred to at Eutect, is the compact footprint of just 1 x 1.2 m and a weight of only about one tonne. This makes the whole automation cell completely mobile, since it can be easily maneuvered with a pallet truck and will fit into any transport vehicle. It can be sent at short notice to any location in Europe, wherever additional soldering capacity is required. So it is appropriate that Mitsubishi Electric's robot controller is regarded as one of the most compact in the industry, and with its two rack units (RUs) in a 19" rack it is hardly noticeable in the cell.

We optimize and perfect our products with simulation software

Of course, there is also a "big Faulhaber", which was also developed in close cooperation between Eutect and Mitsubishi Electric. It is an integral component of a production line and is equipped with two MELFA robots in a single cell. This was also the first Eutect project on which the MELFA WORKS 3D robot simulation software was used.

MELFA WORKS is a plug-in for the updated 3D CAD program SolidWorks, and supports the entire MELFA robot program. It includes a comprehensive library with grippers, sensors and other components for the simulation of all processes within the work cell and analysis of collision contours. With the help of this simulation software, alternative robot programs can be tested and perfected until they have achieved maximum efficiency and performance. "One day of simulation and modeling work saves 21 days of attempts and errors with the real machine", notes Matthias Fehrenbach. "And even better: I can show already show customers beforehand how their soldering cells will look. We can even calculate realistic cycle times. This is reliable data for the customer who wants to determine profitability beforehand and be sure that they're making a good investment decision."

Our automation for the automobile industry

Another superlative project that Eutect carried out in cooperation with Mitsubishi Electric was a work cell for a well-known manufacturer of automobile parts. The customer brought his own design suggestion to Eutect for a soldering application to be used with door handle sensors in automobiles, which required 12 m² of floor space.

With a MELFA 6-axis robot (type RV-7FM-D1-S15) and thorough virtual testing and optimization, Eutect reduced the floor space to a minimum while retaining the

same functionality. Combining Eutect's unique solutions for workpiece handling and transportation with Mitsubishi Electric's robots and software resulted in a quantum leap in integration: three processes, i.e. flux injection and application, infrared preheating and soldering were combined with overlapping cycles and housed on a surface area of only 4 m² – a third of the space originally planned by the customer. This reduced the cycle time for the four door handle sensors (required for one car) to a record-breaking 18 seconds. This saves production space and provides a clear investment cost benefit (see Fig. 3). "In view of the fact that our work cells function around the clock in a three-shift operation, this is an enormous increase in efficiency – and a convincing sales feature", says Matthias Fehrenbach.

The general contractor for the entire production line was the automation specialist Engmatec GmbHfrom Radolfszell. The company ensured seamless integration of the standard Eutect machine equipped with a MELFA robot. MELFA robots are also used before and after soldering on the production line of the automobile subcontractor, for example while handling, conveying and installing the circuit boards. The cycle time for soldering each circuit board is 4.5 seconds, including post-production testing with Mitsubishi Electric's SCARA robots.

Our successful partnership

After this successful project work, Eutect and Mitsubishi Electric met at trade shows, technology events and technology partner meetings, and developed a relationship in this way as well as via mutual industry contacts. Eutect found a like-minded partner in Mitsubishi Electric: a company that specializes in manufacturing as well as providing complete solutions for its customers – just like Eutect itself.

Mitsubishi Electric's robot division also specializes in small, light and nimble precision robots that seem to be created to meet Eutect's requirements. Matthias Fehrenbach has this to say: "We have worked with Mitsubishi Electric's engineers for nearly ten years now. We appreciate the quality of their components, controllers and software, and particularly their personal approach and first-class support."
"Programming of the latest Eutect robot cells was taken on by Mitsubishi Electric's software partner Adiro, a member of the Automation Network (a pool of experts founded by Mitsubishi Electric over 20 years ago)", according to Wolfram Zielke, Key Account Manager of Mitsubishi Electric's robotics division in Southern Germany. "Mitsubishi Electric has purposely developed relationships with companies that have various core skills and diverse process expertise in areas such as soldering, welding, coating, deburring and software." "We refer to the pool of experts and their know-how as needed, in order to avoid any unnecessary development costs for our clients", according to Zielke.

Eutect also made an attempt with another provider, but found integration of the robots much more difficult: the power cables for the handling technology and tooling were in the way, and the clumsiness of the controller and other components cancelled out some of the benefits expected from the robots. Eutect particularly missed the additional benefits that Mitsubishi Electric offered, including the simulation software (MELFA WORKS) and support of HMI development, as well

as the industry expertise, know-how and committed customer support of its partner.

Mitsubishi Electric's robot programming software is also distinguished by its excellent user-friendliness. It is intuitive and easy to learn – another reason for customers to decide on a Eutect solution with components from Mitsubishi Electric, since this makes reprogramming the robot and adapting the cell for future tasks straightforward without any external assistance.
Conversely, Mitsubishi Electric also benefits from the close partnership with Eutect, since this provides a way for the company's robotics products, as part of the specialized Eutect solutions, to find their way into the production facilities of major manufacturers. This also gives Mitsubishi Electric an opportunity to demonstrate the abilities of its robots at various trade fairs such as Lasys (international trade fair for laser-based material processing), SMT Hybrid Packaging (system integration in microelectronics) and Productronica (leading international trade fair for the development and production of electronics). The robots show off their obvious benefits here for similar applications and other production areas such as dispensing, laser welding and material testing.

"We have worked with our partners at Mitsubishi Electric for a long time, and also with our current project, we simply told them what we want for our customers. All our requirements were met – including offline testing in the design phase and a very convenient programming environment for the user", according to Matthias Fehrenbach.

Wolfram Zielke adds: "The Eutect company is a very esteemed client and partner, and we look forward to continued cooperation on other projects in the near future. We value clients like Eutect, because they enrich our pool of experts with specialized process knowledge that we can refer to when carrying out projects for other clients. Eutect also introduces us to new market segments: a clear win-win situation for both companies."

Summary

All parties involved agree that small, light articulated robots like those from Mitsubishi Electric not only increase the efficiency and flexibility of production machines, they also reduce development costs and can be used to optimize required floor space. MELFA controllers are already equipped with a generous interface for Industry 4.0 applications and the Internet of Things (IoT), which turns systems into sustainable and future-proof investments.

There are already 4 to 5 robot cells in the pipeline for 2017, and an even larger number is planned for 2018. Every third automation project at Eutect is now a robot cell, which also means that a robot from Mitsubishi Electric is being used.