

DEPRAG demonstrates ECU assembly at MOTEK 2013

## There is no magic to developing good automation equipment

*Appropriate components from a single supplier lead to success*

There's no magic to building automation equipment. If systems integrators choose appropriate components, they will build an efficient and well-functioning assembly system right from the start.

Kurt Meier knows this too. He is a mechanical engineer and works as a system and machinery designer in the automation department of a well-known manufacturer of small electronic devices. He designs, plans and refines the equipment right up to the point that the first work pieces start to emerge from the finished plant. He enjoys his job and says the work constantly fascinates him. Today he is on his way to the 32nd Motek show in Stuttgart, the well-known trade fair for production and assembly automation. His mission is clear - he needs to design a screwdriving unit for an ECU (electronic control unit). He has set himself a goal for his visit to the trade fair. He wants to establish which components he will use for the assembly system he has planned, obtain information from as many suppliers as possible, and perhaps already make a decision about the supplier.

Engineer Kurt Meier has a busy day ahead of him. He has already specified each one of the individual processes that make up his assembly task. All procedures, for example feeding, handling, screwdriving, assembly, inspection, testing, evaluating, analysis and documentation have to be incorporated and harmonized to one another. The components he selects should not exceed his existing budget, yet they must still comply with the strict requirements for processing reliability in the assembly of an ECU. More importantly, the components he selects must be compatible with one another. "An assembly system", he believes, "is like a Rubik's cube, because it is complete only when all the parts are properly aligned".



*Components for Torque Measurement*

And there is yet another problem to add to the mix. To start with, the new product to be assembled on this system will be produced only in small quantities. However, the intention is to rapidly increase production rates. Kurt Meier is pondering: "When production starts would I be better off setting up some less expensive manual workstations? But then how do I achieve maximum processing reliability in the face of the "human element of uncertainty"? Or should I choose a highly automated solution straight away, and in that case how do I design the machinery? Can I reuse the components from the "small solution" later on, and where can I find everything?" If that were not challenge enough, the assembly process for his ECU has to take place inside a technical clean room.

Kurt Meier has already picked out his choice from his show guide. He intends to start off by visiting the stand of DEPRAG SCHULZ GMBH u. CO. In Hall 1, on stand 1610, this well-respected screwdriving specialist is demonstrating an assembly system for an ECU, similar to one that might be used to control the engine in a car. He immediately sees parallels with his own application.

For many years Meier has known the famous MINIMAT screwdrivers from the range offered by machine engineering company DEPRAG in south-west Germany, and he is very happy to use them in his systems. He likes the technical sophistication and reliability of the EC Servo screwdriver and the pneumatic screwdriver, which has proven itself thousands of times throughout the world.



*Feeder for manual Workstations*

He looks over the machinery on DEPRAG's stand with great interest. To assemble the ECU mentioned above, the DEPRAG specialists have built a linear transfer system, in square formation with return stroke, on which the most important assembly steps and the system components required are demonstrated. Soon Kurt Meier is deep in intense discussions with Martin Wagner, engineer and technical consultant with DEPRAG.

In this assembly system, specially designed for the exhibition, the upper and lower halves of the component arrive at a manual workstation on a work piece carrier. The operator manually fastens

four screws onto the pre-mounted PCB. Where a high level of processing reliability is required, as is the case

in the automotive industry, a MINIMAT-EC manual screwdriver is recommended, guided by a position control stand. A fully automated screw feeder accurately feeds the screws. DEPRAG's technical consultant Martin Wagner explains: "All the relevant components for this manual workstation come from our own in-house design and manufacturing facilities. It means that we are competent partners for the automation tasks undertaken by system integrators. All the components have been tested thousands of times, and are reliable and efficient. And we guarantee that the modules fit with one another and are harmonized to be compatible."

A position control stand assists the operator at the manual workstation in DEPRAG's exhibition set-up. Screws for placement on a work piece often have to be fed through in a specific order. This intelligent stand controls the sequence so that no mistake is made. A standard screw feeder from the DEPRAG range automatically



*Components for manual Workstations*

dispatches the four fasteners for the screwdriving task to the operator at the manual workstation. Kurt Meier takes note. "The position control stand provides process reliability - even on the manual workstation."

He also needs an automated feeder for his particular screwdriving task. The fact that his control units need to be assembled inside a technical clean room makes his job even harder. Kurt Meier fears unavoidable contamination caused by abrasion from a vibratory feeder. Martin Wagner has the ideal solution, specially developed to meet the demands of technical cleanliness. It is a feeder system that enables the screws to be supplied to the separation process via a lifted segment. "The solution lies not just in removing contaminating particles, but in preventing them from occurring in the first place," explained Wagner. And

to ensure the removal of other foreign bodies that may get into the feeder supply along with the bulked screws, he refers to a special device known as the DEPRAG particle killer. The particle killer uses a vacuum connection to suck out contaminating particles from the air used to shoot the screw into the screwdriver spindle. More vacuum connections are provided however abrasion might still occur, for example as the bit engages into the screw head.

A DEPRAG PROCESS UNIT controls the manual workstation - in this instance it is a DPU100. On the screen it guides the operator through the screwdriving process. Martin Wagner spoke of DEPRAG's experience of planning and creating assembly systems along with the necessary control and measurement technology to

ensure processing reliability. "Design engineers benefit from our systems engineering expertise in this area too. Our engineers know all the problems that systems operators and workers face as they carry out their assembly tasks."

If the DPU100 gives the OK to the sample part, the operator sends the workpiece holder containing the part to the next workstation. In a compact assembly cell - the DCAM's (DEPRAG COMPACT ASSEMBLY MODULE) fully-automated bush press-fit operation is carried out. Kurt Meier takes note of the workpiece handling system: he can possibly make use of that. It would be ideal not to have to hunt around any longer, and also have the assurance that the workpiece handling works hand-in-hand with the other DEPRAG components.

In the DCAM assembly cell on the exhibition stand four bushings are now press-fitted onto the top half of electronic control unit. For this task the vacuum spindle on the press-fit tool travels towards the bushing feeder which uses a pick-and-place process to ready the bushing. The spindle "fetches" the bushing and passes through a visual inspection station where the geometry of the bushing is measured. The result of this test is displayed on the touch screen. If the measurement is correct - i.e. a bushing has been correctly picked up - it is press-fitted. Processing reliability for this step of the process is assured by means of a force-stroke monitoring system. The linear robot now places the upper half of the ECU onto the lower half four times in succession, and the workpiece carrier moves it on to the next station, another DCAM assembly cell.



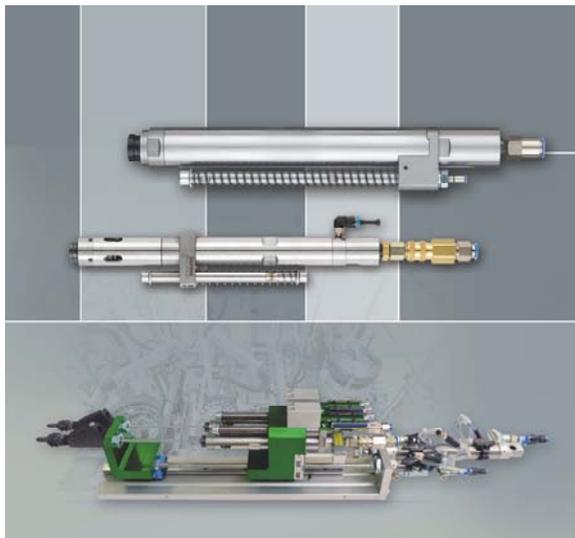
*Process Control Components*

Here, the top part is screwed onto the bottom section, a fully automated work step with maximum processing reliability. Process planner Meier knows the benefits of DEPRAG screwdrivers. The screwdriving function modules with EC stationary screwdrivers, recommended for high-spec screwdriving processes, are known throughout the world and are designed to ensure optimum processing reliability. Torques, arcs, speeds, waiting times and direction of rotation can all be programmed as required within the performance spectrum of the screwdriver spindle concerned and adapted to the particular screwdriving task in hand. This is exactly

the right screwdriving tool for Kurt Meier's planned assembly unit. Brushless EC motors guarantee low-maintenance operation. A DEPRAG AST10 automatic sequence controller with integral web server is used in combination with the MINIMAT-EC screwdriver. This means that any screw-driving program can be set up and configured using the Linux operating system.

After the screwdriving operation (in this case the screws are fed through a hose feeder) a second step at this second assembly platform checks the function of the printed circuit board which was assembled at the manual workstation. For this task, the workpiece carrier is raised and fixed in position, so that a test adaptor can touch the printed circuit board. If this functional test is positive, the DPU200, which is controlling the processes on both the DCAMs, indicates on the screen that the fitted component is "OK". Like all DEPRAG PROCESS UNIT modules, it is also equipped with DCOS software, available in various standard packages. It includes all modern data recording functions as well as statistical quality and process analysis functions. All the principles of an optimum Human Machine Interface (HMI) have been assimilated into the specially developed software. For example, the uncluttered color touch-screen can be operated by touch with a finger

or stylus, and can be easily seen, even from a distance.



*Components for automatic Screwdriving*

Kurt Meier can now see on the DEPRAG stand how a second manual workstation on the square formation dismantles the assembled component so that the demonstration process can start over again for trade show visitors. In his application such a workstation could be used as a repairs workstation. The fitted component is either removed, or the necessary corrective work carried out as indicated by the control unit. Only once the assembled component has been classified as OK is it released for further processing or packing.

As he looks through his notes, and after his deep discussions on the stand Kurt Meier, he is astonished to realize that he has already found all the components he has been seeking for his assembly unit here on the DEPRAG stand. The partner for the widest variety of assembly tasks has provided solutions in each of the four areas: screwdriver technology, feeder technology, control and measurement technology. And the financial aspect fits too - all the components are based on standard solutions that have been proven over many years in use throughout the world. And the comprehensive advice he received has convinced him of their dedication to customers and the skill and experience of DEPRAG's technical staff. But even more decisive for him as a systems integrator is the fact that all the components in the system are from a single source: DEPRAG, his automation partner, stands for functionality and component interaction in the complete installation. He has immediately eliminated the need for time-consuming arrangements and interface specifications which would automatically be necessary had he chosen components from different manufacturers. Manufacturer and supplier - a single point of contact!

Kurt Meier is very happy. He will be sending DEPRAG the drawings and sample parts as soon as he can, so that the automation experts can draw up a design. As he holds this year's gift for visitors to the DEPRAG stand - a Rubik's cube - he has to smile. "With the right partner by your side, harmonizing the components for feeding and handling systems, the screwdrivers, the assembly units, the inspection and testing systems, and the evaluation, analysis and documentation systems is no magic process."

And that is also the message given out by plant engineers DEPRAG SCHULZ GMBH u. CO. from Amberg, Germany, at the 32nd Motek, the international trade fair for Production and Assembly automation between 7th and 10th October 2013, in Stuttgart. With DEPRAG as your supplier work, cost and risk are minimized and plant engineers gain a reliable partner who, based on its expertise, is prepared to take on responsibility for component function.



*Components for stationary Feeding*

DEPRAG SCHULZ GMBH u. CO, based in Amberg has more than 600 employees in more than 50 countries. For several decades DEPRAG engineers have been producing innovative automation concepts for a wide variety of industrial sectors. The plant engineers are a respected supplier for system integrators, and also has a high level of expertise as a "one-stop shop" for individual complex automation solutions.

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