

Press Release

On the lookout for new trends - Focus on the latest in screw assembly

FROM AIR-OPERATED SCREWDRIVERS TO EC-SERVO SCREWDRIVERS - RELIABLE AND PRECISE

High-tech manufacturer provides optimal screwdriving technology for any application

To discover the latest trends in screwdriving technology, a visit to the AUTOMATICA trade fair; the leading platform for automation innovations turned out to be illuminating. In Hall A6, Stand 310 at the DEPRAG stand, three slogans caught my eye: "Technical – Clean – Screwdriving – DEPRAG", "Intelligent – Manual – Assembly – DEPRAG", "Sheet Metal – Direct – Screw Assembly – DEPRAG". This seemed to be the right place to get all my questions answered. At the exhibition stand I met Jürgen Hierold, VP Sales at DEPRAG SCHULZ GMBH u. CO. and asked about the newest trends in screw-driving.

To be able to appreciate the current trends in screw assembly one needs also to have an understanding of past innovations and developments. DEPRAG has been specializing in screwdriving technology and automation since over 80-years and so can look back on years of experience. One must also take into consideration, the differences in the development of screwdriving technology on an international level and for example, how in Asia there are different requirements to those in the USA. And in the same way, how the market in the USA was already displaying many trends in the eighties which only later reached Europe and vice versa.

For quite some time, there was an increased demand for fully-automated assembly processes. In order to provide for the increase in quality consciousness, these fully automatic assembly systems were seen as the best option for efficient and reliable manufacturing. Expressed simply, people sometimes make mistakes and their work is not repeatedly accurate (without additional measures been taken). The possibility of using, for example, a robot to minimize errors and increase processing reliability is of course attractive. However despite the advantages of

fully-automated processes for processing reliability and **Intelligent Workstation** efficient production we have learned that a fullyautomated system cannot react so flexibly as semiautomatic or manual processes when it comes to shortterm changes in factors such as changing numbers of parts.



Of course fully-automated systems are still used. But in the last few years DEPRAG has seen a trend towards intelligent manual work stations which combine flexibility from the human aspect with processing accuracy. In comparison with today, back in the past it was only possible to guarantee processing reliability and precision with high additional costs. Today the situation is different: standardized, intelligent modules guarantee processing reliability, which is why, depending upon the specific requirements, it is profitable to select flexible manual work stations as an automation concept.

One example of an intelligent component is the positioning control in combination with a part fixture and integrated sensors. The processing sequence is thereby predetermined, visually displayed and the correct working sequence can be controlled. Positioning control concepts from DEPRAG are based on diverse solutions, for example position control stands or portals in varying designs for all kinds of applications. Optimal processing reliability is guaranteed with the MINIMAT® EC screwdriver. The torque, angle, speed, waiting time and rotational direction can be freely programmed within the performance range of each spindle and thereby adapted to each individual screwdriving task. The integrated torque and angle measurement ensures precise control of screw tightening as well as documentation of important processing parameters. Together the position control stand and EC screwdriver are an effective method of coordinating processing. The screwdriver will only start if the selected sequence is adhered to.



EC- and EC-Servo Screwdrivers
with corresponding
Controllers

However, the move towards intelligent manual work stations the not the only noticeable trend. For many years there have been developments towards electronic screwdriving tools. They are used ever more frequently for assembly work. The screwdriving system selected ultimately depends on

a variety of factors. EC systems are programmable and adjustable and capable of the kind of documentation required in the assembly of high quality products, such as for the automotive industry. The DEPRAG sensor-controlled EC servo screwdrivers are therefore used in the assembly of airbags. Screw joints in the auto industry are divided into the risk categories A, B and C in accordance with the VDI directive 2862.

Category A covers those safety-critical screw connections whose failure could result in loss of life or limb. For these the highest processing reliability and dependability is required. Torque and angle measurement and control via transducer are compulsory in order to fulfill the minimum requirements of category A.

An EC screwdriver which is classified in category B can have torque and angle measurement and control via motor current analysis. For category C however a screwdriving system with mechanical shut-off suffices. The reliable pneumatic screwdrivers of the MICROMAT® and MINIMAT® series are used today internationally in their tens of thousands for the most varied of assembly tasks such as assembly of mobile phones. They feature an extremely precise mechanical shut-off clutch. As soon as the preset torque is reached the clutch disconnects from the drive. The standard deviation is ± 3 percent, which is an outstanding value.

The move towards electronic screwdriving tools is without question a legitimate one. However, it is also a fact that pneumatic screwdriving systems are still used a lot. Alone, the production volume of the DEPRAG pneumatic screwdrivers speaks for itself. Looking at the difference between the two major drives, it is common knowledge that both electricity and compressed-air are workable drive mediums. A system is selected depending on the individual features and criteria required. One such factor is flexibility, if the torque, angle, speed, rotational direction or screw depth parameters must be altered during the application task, then an electric system makes sense. EC screwdriving systems can be freely programmed to take these parameters into consideration and can easily make changes to the assembly process. If there is no requirement to alter any parameters, then a pneumatically driven shut-off screwdriver is usually sufficient. An additional factor is the processing reliability, which has a decisive influence on the scope and costs of the screwdriving system to be chosen. The requirements for processing reliability must be clearly defined ahead of time. For some applications the transfer of signals will suffice, for others all assembly steps must be precisely documented. In this case the intelligent EC screwdriving system is predominantly used.



Additional criteria include torque precision, recording of operating data and guidance for any statistical processing. To incorporate these features a screwdriving system is required, which can communicate with a superior processing data storage device and fulfill documentation

requirements. The EC- or EC-servo technology is again best suitable in this case. Both systems allow recording of torque and angle values. The EC- and EC-servo technology can therefore be seen as the more attractive solution, although the higher investment requirement must be considered as well.

As a general rule, a screwdriving system controlled by motor current is about five times as expensive as a pneumatic system. Transducer-controlled screwdriving systems can even be up to ten times as expensive. The price gap between the different technologies is therefore relatively wide and selection should be considered carefully.

Another item to consider, especially for pneumatic systems, is the operating cost. It is a fact that compressed air is expensive, but this alone should not be the deciding factor for the selection of a system. The operating costs cannot only be judged on the drive medium, but also the incurred costs over the complete life cycle must be taken into account. Generally during screw assembly the effective power-on time of the motor is often very short, the actual required energy is a lot less than assumed in the nominal performance data. Within the operating costs one should not only consider the comparison of energy prices but also the maintenance costs. Pneumatic screwdrivers can be simply and inexpensively repaired and maintained by on-site maintenance staff. EC-screwdrivers usually will need expert service personnel and specific measurement equipment. One must not forget that the EC- and EC-servo screwdrivers are not only assembly tools but also measurement instruments. If they fall under EN ISO 9001/2000, they must be regularly inspected and calibrated. Pneumatic screwdrivers are heavy duty tools for continuous industrial use and are insensitive to external influences. DEPRAG often receives pneumatic screwdrivers back for maintenance, which were last returned thirty years previously and have in the meantime carried out several million screw assemblies.

For the future, screw assembly continues to be challenging. The project "Industry 4.0" in the German market and the computerization of the entire industrial process is one such challenge, which we are involved with. The scope is not yet determined but its goal is the creation and promotion of intelligent networks in classic industry e.g. production technology. Logistics, stock and purchasing, overall communication between all internal as well as external areas and processes so that customers or business partners are all interlinked. Modern factories will therefore be intelligent, efficient, flexible and sustainable. In order for this computerization of industry to function Manufacturing Execution Systems (MES) are needed for transparent production. The basis for this is consistent documentation of machine data logging and product data acquisition. If all goes to plan then "Industry 4.0" will be the fourth industrial revolution. We

are on the edge of our seats!

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