DEPRAG NORTH AMERICA
Screwdriving Technology
OFFERING ASSEMBLY SOLUTIONS
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# Minimizing harmful particles in the clean room

*In miniaturized technology, small particles of contamination can cause a calamity*

During the assembly process while fastening screws, the contamination of tiny particles has become a rising concern. When a circuit board is being assembled, should a microscopic piece of steel, invisible to the naked eye break away, a disaster is inevitable. If the tiny chip accidentally connects two of the conducting tracks, a short-circuit will occur.

As the size of assembly parts become smaller, microscopic particles, measuring a mere 500, 200, or 100?, can cause a malfunction. The technical requirements in the design and building of screw fastening assembly systems are becoming even more precise, which is why "technical cleanliness" is of increasing importance. Jürgen Hierold, Sales Manager at DEPRAG sees this trend as "an opportunity for specialists". He adds, "DEPRAG has taken up this opportunity."

In the early 1980s, DEPRAG SCHULZ GMBH u. CO, the elite in screwdriving systems based in Amberg, Germany had already been tackling this problem with success! The machine tool builders were supplying renowned US manufacturers with screwdriving systems for diskette drive assembly units. "Assembly conditions corresponded more or less, to sterile room requirements", recalled Hierold. He stated, "That was a challenge for us as machine tool makers." The fact that every component DEPRAG manufactures can successfully operate with one another has been to our advantage. Each department sharing a common objective, strongly influenced their customers in the prevention of the slightest abrasion as the fasteners were fed into the screwdriving system, and during the actual fastening process.

While cleanliness during assembly is required, the screwdriving process in its entirety must come under the microscope. Jürgen Hierold said, "Every step from planning, to production and assembly must be carefully examined." The first step is to obtain an accurate definition of the cleanliness requirements for the product in question. Only in cooperation with the design engineers, production, logistics and the quality management department, would it be possible to achieve the highest level of technical cleanliness resulting in proven reliability. In addition, trained staff are as equally important as a clean production environment. The set up of high-cost sterile-room conditions with air conditioning and particle filtering systems have proven to be unnecessary. It is crucial that the clean room be maintained in a constant state of cleanliness. The main objective is to prevent disruptive particles from entering the room via carriers such as people, materials or transport systems.

Contamination of components by particles of dirt can be prevented as early as in the design stage. In their designs, engineers should avoid sharp corners and edges where dirt can accumulate, and which are difficult to clean. Rounded edges are easier to keep free of particles. At the screw location, holes that have been drilled through, as opposed to blind holes are easier to keep clean. Jürgen Hierold said, "Equally, appropriate cleaning processes are the foundation of preparing the clean-room, such as using specially treated fasteners." For example, with its Cleancon® service, Arnold, the well-known manufacturer of threaded fasteners, offers fasteners in their manufacturing process, cleaning and packaging which are designed specifically to meet the demands of technical cleanliness in the screwdriving process.

Investigations have confirmed that the screwdriving assembly process itself can also produce hazardous particles caused by friction. Alternative materials and processes can counteract this. Jürgen Hierold explained, "If I use uncoated aluminum or untreated steel for the assembly unit, I

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am simply opening the door to particle contamination caused by friction or corrosion. Choosing alternative materials such as polished stainless steel and eloxated aluminum will reduce the number of such particles, and each component of the assembly system will be much easier to clean."


If a pneumatic screwdriver is required in the production plant design, that too must meet the cleanliness criteria. DEPRAG's standard range contains pneumatic screwdrivers suitable for sterile rooms with polished stainless steel housings and controlled exhaust air extraction, which we recommend for assembling screws inside a clean room. Jürgen Hierold emphasized, "Such high-quality industrial screwdrivers are easily adaptable to the high standards and requirements of cleanliness, and have proven themselves many times."

Likewise, the number of particles can also be greatly reduced as the fasteners are separated from one another, by choosing the right technology. Standard vibration feeder/conveyor move the screws by creating a throwing motion inside the conveyor hopper. As the screws rub against one another, harmful particles are caused by this abrasive action. Jürgen Hierold states, "If technical cleanliness is paramount, we recommend that parts should be fed gently using a feed system that employs an oscillating rail segment (Sword Feeder)."

If the screw is fed to a position directly above the screw hole in the component, particle contamination cannot necessarily be prevented. "It is better to look for alternatives", stressed the expert. The feeder system works cleanly and reliably by having the screwdriver travel to a specified position above a vacuum source. A blast of air shoots the required screw into position for the next screwdriving operation. If particle contamination should threaten the process, the vacuum will remove them immediately. Only then does the screwdriver travel back to the "screwing position" and the screw is fitted. "Vacuum sources at every relevant position increase cleanliness, and are recommended at every point where abrasion or friction can occur", states DEPRAG Sales Manager Hierold.

Mr. Hierold has his sights on even more assembly processes. If the screwdriver bit does not fit accurately into the screw drive, the abrasion will cause unwanted particles. The DEPRAG MINIMAT-EC-SERVO range of screwdrivers reduces their speed as they engage with the screw. The integral sensor system assists with recognizing the precise position of the screwdriver and ensures that the bit engages properly into the screw drive head. Once the bit is correctly engaged into the head does the speed increase to carry out the fastening action. This prevents bit slippage and particle contamination.

Using cover stencils and screw templates during the production process reduces the possibility for hazardous particles to make their way to the assembly part and also assist with ESD protection. Electrostatic discharge generated on assembly components during the process is conducted away and hazardous contamination particles are captured by the template cover. Jürgen Hierold said, "By bundling this complete package of different counter measures, we minimize the build-up of particles.

Hierold also recommends that when plant engineers need to create clean room production facilities, they should choose a machine tool builder that offers every key aspect of screwdriving systems from their own range of manufactured tools. "It's the best way of ensuring that each

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component and each process, such as feeding, positioning, and screwdriving properly work with one another. This entire process must be examined, evaluated and enhanced with technical cleanliness in view."

Miniaturization in technology is emerging at a steady pace. Technical cleanliness is undoubtedly a hot topic, and has become a quality characteristic in the production process. In the automotive and computer sectors, what is considered standard for the more sensitive parts of the product now concerns suppliers and other industries too. If you are willing to comply with the high standards and requirements of cleanliness, you will have a good advantage in the market. Said Jürgen Hierold, "The specialists at DEPRAG are ready for the future. We can produce the solution."

DEPRAG SCHULZ GMBH u. CO. is represented around the world by more than 600 employees. This one-stop-shop SME is a serious specialist in screwdriving technology and plant engineering. DEPRAG has a great deal of experience of technical cleanliness from its involvement in the automotive and electronics industries.

As with the growing importance of a cleanroom, DEPRAG offers several dedicated products that are directly geared towards the Medical, Dental, Electronics and Pharmaceutical industries. One of these products is the DEPRAG "Cleanroom Balancer" Model No. SBC-15. The balancer has a specially sealed aluminum case, which provides a Class 10 protection rating. For more technical specifications as well as dimensions, please use the following **LINK** to view a product specification sheet. In addition to our standard Screwdrivers, we also offer **ESD-safe** Screwdrivers and **Cleanroom** Class-100 Screwdrivers. Please use the links to view a sketch, download a catalog or to read a specification sheet.

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