



CLECO POWER TOOLS WHITE PAPER

Re-engineer Your Assembly Lines for Zero-Defect Production

No consumer wants a defective product, least of all when that product costs a significant amount of money. At best, a loose fastener in a washing machine or automobile can lead a consumer to question the overall quality of the product and the company that made it. At worst, it could lead to a costly recall or even a failure during use.

Fortunately, by focusing on four key aspects of their fastening process—durability, ergonomics, scalability and traceability—manufacturers can re-engineer their assembly lines to ensure zero-defect production.

Built to Last

Durability is a critical attribute of fastening tools. Think about it: If a vehicle contains 1,000 threaded fasteners and an assembly line is turning out 250,000 vehicles annually, that's more than 250 million run-downs.

There are two consequences when your front-line fastening tools go down, and both of them are bad. Either you're not assembling product, or assemblers are forced to use alternative methods of tightening fasteners. In the latter case, those alternatives may not be as accurate as your original tools, or they may not have all the error-proofing or data collection features you want. That opens a window for potentially defective assemblies to be produced.



Cleco's new NeoTek corded electric nutrunner is 21 percent lighter than the previous model and can run 1 million cycles maintenance-free.



For zero-defect production, you want assembly tools that are both accurate and repeatable. For example, the NeoTek tool's capability, as measured by Cm and Cmk indexes, is 2.0, ± 7 percent.

When equipping your assembly line, look for fastening tools with proven durability. For example, Cleco's new NeoTek corded electric assembly tools can run 1 million cycles maintenance-free—two or three times the industry standard. The right-angle head of the nutrunner is a machined component rather than a casting, and the drive system consists of spiral-cut bevel gears. The tool's handle has a configurable, two-position, start switch rated for 4 million cycles.

The cable connecting an electric tool to a controller is another wear item that you should think about. With the NeoTek tool, the use of digital communication from tool to controller reduces the number of conductors in the electrical cable from 28 to eight, significantly decreasing the cable's diameter and reducing its weight by 50 percent. Having fewer conductors also means the cord has a better bend radius for accessing hard-to-reach locations. An orange stripe running the length of the cable facilitates correct installation during festooning and helps maintenance technicians easily identify twisted cables. The cable also features a quarter-turn twist-lock connector, an industry first. This design provides a connection as secure as traditional screw-on connectors, but without the fine threads, which can easily be damaged over time.

Of course, even the best-made tools eventually need maintenance, so you should also look for tools that will give you a heads-up if something needs attention. For example, some electric tools can monitor how much current is drawn by the motor during run-downs. If the motor begins pulling more current or less current than expected, that could be an early indication that the tool needs maintenance. When the tool's controller detects such fluctuations, it can send an alert to a technician to service the tool before a catastrophic failure can occur or defective assemblies can be produced.

Ergonomics and Fastening

Ergonomics is just as important to producing zero defects as it is to improving worker health and safety. When tools are easy to use and interact with, assemblers are much less likely to produce defective joints.

For example, the handle of the NeoTek tool provides visual, audible and tactile feedback on the fastening operation. Four LED light rings—red, yellow, green and blue—are configurable and easily visible. The lights and other signals inform the operator of the status of the rundown, so he doesn't have to look at the controller constantly and, instead, can keep his eyes on the task at hand. In many cases, as when the operator is working in an engine compartment or vehicle interior, the controller may not even be visible.

The placement of controls is also critical. Using a tool should be second nature for an assembler. Made of an impact-resistant polymer, the handle of the NeoTek tool has configurable, multifunction buttons that can be used to trigger various operations, such as scrolling through menus on the controller or operating a bar code scanner. The operator can activate the tool's two-stage start switch with just his index finger. The first stage could, for example, turn on a light or initiate a slow start of the motor to ensure the tool is properly placed on the fastener. The second stage can trigger the actual run-down.

Of course, the weight and feel of the tool is also important for ergonomics. A lightweight, balanced tool makes all the difference when you're using that tool to perform hundreds of run-downs on an eight-hour shift. Assemblers that are happy with their tools are more likely to pay attention to their work and build quality product.

Ergonomics—particularly tool weight—was a key design parameter for the NeoTek tool, which is 21 percent lighter than Cleco's previous model. Two right-angle tools—the 30 and 50 series—are the first products to be introduced as part of a complete NeoTek portfolio that is set to launch over the next year.

Four models are available in the 30 series, which is designed for low-torque applications. The smallest has a torque range of 1.3 to 6 newton-meters; the largest has a torque range of 5.7 to 28 newton-meters. All the tools in the 30 series weigh less than 3 pounds.

Seven models are available in the 50 series, which is intended for medium-torque applications. The smallest has a torque range of 6 to 30 newton-meters; the largest has a torque range of 41 to 205 newton-meters. Tool weight ranges from 3.5 to 8.7 pounds.

Scaling Up

In manufacturing, as in life, the only constant is change. When choosing fastening tools for your assembly line, you should consider both your current and future needs. You may not want certain features, functions and accessories now, but you may need them down the road. You don't want to re-equip your line every time there's a change in production. It's much wiser to invest in future-proof tools.

Let's say you've invented a new widget. At first, assembly is straightforward, and you don't need a lot of mistake-proofing technology. Later, however, as the product matures, model variations are introduced. Now, instead of assembling the same product one after the other, your line might build three units of Model X, two units of Model Y and four units of Model Z. Each model has its own fastening requirements.

Adding a bar code scanner at each station would ensure that the right fasteners are installed in the right products in the right way. When an assembly arrives at a station, the operator can scan the item's bar code, and the controller will automatically configure the tool with the correct torque and angle specifications for the fasteners at hand. A monitor can show the operator where to install the fasteners and in what sequence.

Will your tool controller be able to interface with a bar code scanner? Or will you need a new controller and perhaps even an entirely new set of tools. This is why scalability is so important to zero-defect production. You want to the ability to add mistake-proofing accessories as the demands of your assembly line increase.


And, a host of accessories are available to help error-proof the fastening and assembly process. For example:

An on-board gyroscope allows the tool to compensate for operator influence in angle measurement and control. This increases accuracy and eliminates the need for stationary tool fixturing.

A smart socket tray can guide operators during assembly. Containing various bits and sockets, the tray is linked to the tool controller. Let's say the operator must install two 14-millimeter bolts and two 17-millimeter bolts, in that order. When the assembly arrives at his station, a blinking light on the tray tells the operator to pick up the 14-millimeter socket. If he pulls the wrong socket, the tool will not operate. When he retrieves the correct socket, the controller automatically updates the tool's parameters to install the 14-millimeter bolts.

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The image shows the Cleco mPro400GC-Hybrid Controller, a black and orange industrial control unit with a large touchscreen displaying a software interface. A long, black and orange tool is connected to the controller via a cable. The controller has the Cleco logo at the top and a circular dial at the bottom. The tool has a red and black handle and a black shaft with a red tip.

The centerpiece of the NeoTek system is the Cleco mPro400GC-Hybrid Controller, which features a large touchscreen with an easy-to-use software interface.

Location systems can recognize where a tool is in relationship to the product being assembled. Such systems can enable the tool if it's being used in the right spot on the right product and disable the tool if it's not.

The tool controller plays a key role in future-proofing your fastening process. For example, the centerpiece of the NeoTek system is the Cleco mPro400GC-Hybrid Controller, which features a large touchscreen with an easy-to-use software interface. Programming can be done directly from the unit or remotely from a PC using license-free software. The dual-analog and digital controller supports legacy models of Cleco corded electric tools (17, 47, 67, 18 and 48 Series), as well as the company's LiveWire cordless tools. One controller can accommodate up to 16 corded or cordless tools.

The controller supports industry-standard protocols and fieldbus communication, such as DeviceNet or Profibus, which allows for easy integration into any manufacturing environment. That means the controller can communicate with PLCs and other line control systems, so if a defect does occur, the product can be held at that station until the problem is resolved. It also means the controller can work with error-proofing accessories such as smart socket trays and stack lights.

Accuracy and Traceability

Error-proofing devices like smart socket trays are great, but they will ultimately be useless if the tool itself isn't accurate. For zero-defect production, you want assembly tools that are both accurate and repeatable. For example, the NeoTek tool's capability, as measured by Cm and Cmk indexes, is 2.0, ± 7 percent.

It's also important for tools to be capable of detecting problems during run-downs, such as cross-threading, stripped threads, missing parts (such as gaskets), reused bolts (some fasteners can only be used once), or "re-hitting" a fastener that has already been tightened. A high-quality DC electric tool can recognize such problems by detecting deviations in the expected torque vs. angle curve.

Traceability goes hand in hand with accuracy. Whether they're making automobiles, appliances or medical devices, manufacturers must be able to document that their products were assembled to specifications. When equipping your assembly line, look for a tool controller that can interface with your manufacturing execution system so fastening data and other information can be collected and tied to specific serial numbers. You also want to be able to look at your fastening data collectively to spot potential problems with fasteners, parts or tools early—before a batch of defective product gets made.

Conclusion

Because of their accuracy and their ability to perform advanced run-down strategies, DC electric tools were once considered as best reserved for safety-critical joints. Less expensive, less accurate tools were fine for everything else—or so went the conventional wisdom. Today, however, manufacturers cannot afford to take any fastened joint lightly. Whether it's a warranty issue or a joint turns off a consumer because "it just doesn't look right," the cost of defects is simply too high.

And yet, defect-free production is not easy. Work on the assembly line is demanding. Imagine having to tighten, say, six bolts every 45 seconds over the course of an eight-hour shift without ever making a mistake. That's tough! You're going to get tired. Your attention is going to wander. Ergonomic, smart, accurate and scalable fastening technology—tools that work with assemblers and not against them—will go a long way toward achieving zero-defect production.

For more information on DC electric assembly tools, call 800-845-5629 or visit www.clecotools.com.