



Proper Ergonomics Integral to Design of Power Tools

By Bill Schultz

Amperage. Revolutions per minute. Horsepower. Stock capacity. The list of power tool performance categories goes on and on.

But perhaps the most important tool characteristic to consider when purchasing a new power tool has to do with ergonomic design, or more simply put, comfort as it relates to performance of the tool.

Strictly defined, ergonomics is an applied science concerned with adapting jobs to workers. Ergonomically designed tools optimize the interaction between the worker and the job, and reduce stress on the user. It's important to understand the ramifications of these stresses and reduce them whenever possible. Such stresses can lead to carpal tunnel syndrome, tendinitis and Raynaud's syndrome, commonly called white finger disease.

Tradesmen should consider the power tool as an extension of their hands. An ergonomically designed power tool will provide comfort and control, allowing the project to be completed with better results and less fatigue.

To find the best power tool, a professional needs to look for the tools that offer the desired performance features along with a comfortable ergonomic design. There are several elements to consider when shopping for an ergonomically designed power tool:

■ **Handle Locations.** Handles should be positioned to provide the best balance while allowing for ease, accuracy and maximum control when in use.

For example, the handle of a drill must feel comfortable and yet provide support, control and balance for accurate drilling and to prevent breakage of drill bits.

Drills are available with many styles of handles: T-style, D-style, spade, pistol grip and combinations of each. The T- and D-style and spade handle drills traditionally are used for drills of larger and heavier design and should be operated with two hands. Pressure is applied with both hands resulting in a supply of force 'in line' with the drill bit.

The more compact pistol grip design allows for drilling "in line" using just one hand. However, it is strongly recommended to operate the drill with two hands as bit sizes increase and as the material being drilled requires.

■ **Handle Design.** As important as the location of the handle is the form, thickness and texture of the handle.

The challenge for manufacturers is to design power tools that can be used comfortably by hands of all shapes and sizes and in types of environments. Early on, it was thought that by squeezing a clay mold, the ideal handle form would be created. Aside from the fact that this form would fit limited hand sizes, it also constrains the user to a single fixed position resulting in poor circulation and numbness.

Two power tools may look entirely different, each may provide the ultimate in ergonomic design. Because each power tool operates at different speeds, with varying weights and torques, the ideal design for each tool varies.

An ergonomically designed power tool may feature a handle that is long or short, and curved, straight or contoured, depending on the power, weight and friction of the tool. The tool avoids creating concentrated pressure points on the hand and accommodates the user in a variety of work

positions, such as overhead drilling, crouching, etc. The tool fits various sizes of hands, is free of pinch points and helps reduce user fatigue.

Another design element is handle texture. Texture on the grip portion of the handle provides the operator an anti-slip condition with or without gloves. This textured surface also provides for cooling of the skin allowing air to circulate between the hand and the tool. However, extreme textured surfaces may cause skin irritation or skin damage and should be avoided.

■ **Performance Features and User Posture.** A primary objective of an ergonomically designed power tool is to allow the user to complete an application while maintaining a natural, comfortable posture. It is the job of the manufacturer to design power tools that locate the functional controls of the tool so an appropriate posture can be maintained.

For example, strategic positioning of a power cord on a worm drive circular saw allows the user to continue a cut without interruptions to clear the power cord from the cutting path. Also., by providing on-tool storage on other tools for a collet wrench or additional drill bits, the manufacturer keeps the user from having to search for these items, thus interrupting a comfortable work posture.

The design and positioning of a tool's handle has direct impact on user fatigue. Ergonomically designed power tools provide handles that will allow the user to apply the required amount of pressure in many different hand positions for reduced fatigue.

While a manufacturer can claim that its power tools employ ergonomic design, the final judgment rests in the hands of the user. Before purchasing a tool based on its performance features, pick up the tool. If the tool doesn't feel comfortable in the store, it's not going to get any better when being used. □

About the Author

Bill Schultz is Manager of Industrial Design, S-B Power Tool Company.