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Evaluating auto-darkening welding helmets
While the radical graphics on many auto-darkening welding helmets may have surface appeal, there’s no guarantee that they will offer adequate performance. To go beyond the aesthetics and purchase a premium top-tier helmet that actually performs up to standards, there are a few features and functions to consider. These include comfort and balance and auto-darkening filter (ADF) technology as well as sizes, shades and modes, controls, sensors, batteries and shell designs.

**COMFORT AND BALANCE**

According to ESAB customer research, welding operators value comfort and balance more than any other attribute. Therefore, headgear is just as important to a welding helmet as a tire is to a racecar: The point of contact is what makes the difference.

For a typical welding helmet, there are three points of contact that make up the headgear.

The first is the headband, which provides primary contact points on the forehead and the back of the head, with a ratchet mechanism to adjust the band diameter. The second is padding for the forehead and the back of the head, which may or may not be provided. To keep the helmet from slipping down, the third is a band that goes over the top of the head. Combining all possible options for adjustability, a typical helmet has about 100,000 possible combinations.

Next-generation helmets have headgear that provides five contact points, such as the Halo headgear on the new ESAB Sentinel A50 helmet. Distributing the weight over more contact points reduces the perceived weight on the helmet. It also provides greater adjustability – more than 500,000 possible combinations in total.

Think of headgear adjustments like the gears on a mountain bike: The
Flat lens covers trap spatter, but convex lens covers shed spatter, which especially helps when overhead welding. Note the external grind mode button so operators do not need to remove the helmet to shift modes.

For anyone who needs to wear reading glasses, note the brackets on either side of the lens. They hold a “cheater lens” – basically a magnifying lens available in different powers – which can be essential for obtaining a good view of the weld puddle.

A top-tier helmet typically comes with a protective bag, extra lens covers, instructions and maybe a do-rag or welding beanie. Batteries should be included.

more options you have, the more comfortable the ride. Operators with smaller or larger than average heads will appreciate this flexibility.

To further reduce perceived weight distribution, look for helmets with a lower pivot point. When the helmet is in the up position, not only is a lower position more comfortable, it also reduces the chance of the operator catching the helmet on obstructions when working in tight areas.

ADF TECHNOLOGY
Perceived weight distribution is directly related to the size of the ADF, which comprises the majority of a helmet’s weight. A larger viewing area requires more glass and weighs more (and incidentally costs more; the ADF typically accounts for 60 to 70 percent...
For process flexibility that includes low-amp welding and plasma or oxyfuel cutting, look for a welding helmet that offers both low (5 to 9) and high (9 to 13) shade ranges.

Welder Tyler Hawker tries out the new ESAB Sentinel helmet at Fabtech 2016. Notice how low the helmet rides in the up position, which helps reduce fatigue and the chance of catching the helmet on an obstacle.

Ten years ago, switching speed of the lens (which is actually an LCD screen) was an issue on low-end helmets. Today, many of the top-tier lenses switch from a light to dark state at speeds of 1/25,000th of a second. To put this in perspective, the human eye takes 3/10th to 4/10th of a second to blink. Further, the lens has a permanent passive filter to protect against UV and IR light. So even if the ADF fails to darken, the UV and IR filter helps protect the eye.

As ADF technology has advanced, there’s more differentiation between low- and high-end helmets. Operators now need to learn how to evaluate of helmet cost). While oversize viewing areas have been popular, many operators say that a viewing area in the neighborhood of 4 in. by 2.5 in. works just fine for seeing the joint while helping reduce weight and keeping the helmet more affordable.

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Optical clarity. The European Norm (EN) 379 Standard is recognized worldwide to provide welders with a rating system by which they can evaluate ADFs. The standard sets performance requirements for optical quality and evaluates them on a scale of 1 to 3, with class 1 being the highest. The four factors that determine quality are:

- Optical quality 1, 2 or 3: Indicates optical quality of the ocular.
- Light diffusion class (switchable filters only): Indicates light diffusion by the ocular.
- Variation in luminous transmittance (switchable filters only): Indicates shade variability in the dark state of the ocular.
- Angle of dependence of luminous transmittance (optional): If applicable, it is marked before the standard number.

The EN 379 Standard states that the highest optical classification is 1/1/1/1. The Sentinel A50, with a 1/1/1/2 optical class rating, offers a sharp, clear and consistent view of the weld puddle without the extra cost to
of course, ADF shade affects view the most. Not too long ago, top-tier helmets offered a shade range of 9 to 13. Newer top-tier helmets offer a range of 5 to 13. The lower ranges help when TIG welding at low amperage when using small diameter electrodes at lower amperages, and when plasma or oxyfuel cutting (cutting goggles and glasses often come in shade 5). To prevent operators from accidentally using a low shade number in high-amperage applications, some helmets require the operator to manually toggle between low (5 to 9) and high (9 to 13) ranges.

In addition to shade ranges for welding and cutting, top-tier helmets also offer a “grind mode” of shade 3.5 or, most commonly, shade 4. Activating the grind mode, such as by pressing a button on the outside of the helmet, fixes the shade of lens so that operators can grind without the grinding sparks causing the lens to darken to a welding state. Helmets with modes for welding, cutting and grinding replace the clutter of different equipment for these tasks.

obtain the angle dependency 1 rating, a difference that most operators find difficult to perceive. What operators can easily perceive, however, is the color tint of the lens.

TINTED WINDOWS
Until 2008, most ADFs created a greenish cast that muddled the varying shades of red in the weld puddle and heat-affected zone (HAZ). Newer ADFs offer more of a true color perception, transmitting a blue tint from the weld and actually emitting more light than from a green tint transmission. Recognizing true color helps operators better read the weld puddle and the HAZ, critical factors for puddle control and bead placement.

To further help operators, the Sentinel A50 helmet offers front lens covers in clear and amber. Just like tinted shooting glasses provide marksmen with greater contrast between the target and its background, an amber tint can improve contrast between the weld puddle and the rest of the joint as well as enhance the light in low-light conditions.

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Regardless of price, all welding helmets must meet the ANSI Z87.1 (and/or CAN/CSA Z94.3) standard, which covers impact resistance, flame resistance and light leakage.

and eliminate downtime when switching between applications.

For those who TIG weld at extremely low amperages: welding at 2 to 5 amps AC or DC can cause some ADFs to flicker in and out of the darkened state. Some top-tier helmets are rated for low-amp TIG welding, but others are not. Before choosing a helmet for low-amp TIG, be sure to read the fine print in its technical specifications.

CONTROL FUNCTIONS
Other helmet control functions include “sensitivity,” which adjusts how much light it takes the ADF to darken. This function particularly helps when welding outdoors where sunlight can cause the ADF to darken before the operator strikes and arc. The “delay control” function enables the operator to adjust how long it takes the lens to react after the operator breaks arc, such as from 0.1 to 1 sec. increments. This function helps in high-amperage applications (notably flux-cored welding with large-diameter wires), as it keeps the lens dark a fraction of a second longer to give the weld puddle a chance to cool and lose some of its “cherry red” intensity.

Some ADFs also provide memory functions to store pre-selected settings for shade, sensitivity and delay. For operators who frequently switch between applications (such as from low-amp TIG to high-amp TIG to stick to MIG to flux-cored), the memory function eliminates fiddling around with settings before welding. And, being honest, it lets operators weld with the optimum settings instead of just making do with a less-than-acceptable setting.

As for the controls themselves, most helmets have mechanical switches and knobs located inside or outside the helmet. One shortcoming is that settings can be hard to read in low-light conditions. To address this issue, some helmets are using color touchscreen LED technology similar to that of a smart phone, which clearly displays numbers in any light.

SENSORS AND BATTERIES
Typically, ADFs have two or four sensors located in the corners of the helmet, regardless of price.
the cartridge. Professional welders prefer helmets with four sensors, especially if they weld out of position, because having more sensors reduces the likelihood of blocked sensors. Some top-tier helmets, such as the ESAB Aristo Tech HD, also use electromagnetic arc sensors that automatically react to the magnetic field of the arc. This eliminates interference from sunlight or other electrical/electronic equipment and also ensures that the helmet darkens when the sensors are blocked.

To change from a light to dark state, ADFs use a variety of technologies, including solar power, lithium batteries (typically CR2450) or a combination of lithium batteries and...
solar power. There is a widespread misconception that the solar power recharges the batteries; that’s not true.

Rather, after the battery provides the power for the ADF to darken, the solar power provides a supplemental power stream to keep the ADF darkened. This allows the helmet’s control circuitry to rely predominantly on solar power, minimize the battery drain and extend battery life.

**SHELLS AND LENS COVERS**

Regardless of price, all welding helmets must meet the ANSI Z87.1 (and/or CAN/CSA Z94.3) standard, which covers impact resistance, flame resistance and light leakage. That said, some helmets are more durable than others depending on construction. Those that use a nylon-reinforced polymer provide exceptional durability.

Welding helmets use a plastic lens to protect the ADF’s glass from spatter, smoke, scratches and impact. Some lens cover designs permit change in a matter of seconds while others require removing the entire ADF, which can be time consuming and annoying. If an operator is welding in situations that create a lot of spatter and smoke, this is a significant consideration.

Purchasing a top-tier helmet can cost $250 to $350. But, by following the suggestions provided, users can be guided toward an informed decision. Speaking from a corporate perspective, note that choosing a good helmet doesn’t just improve operator productivity and comfort, it goes a long way toward enhancing operator satisfaction – and happy operators are always more productive.

Of course, there’s no substitute for getting under the hood and seeing what the weld puddle looks like through the ADF. Trade shows, distributor open houses and events where welding suppliers will be present (especially car and farm shows and races) all provide a good opportunity to find the best fit for your head.