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THINK LENS FOGGING'S NO BIG DEAL?

Think Again: Safety, Productivity and Your Bottom Line Are At Risk



Rely on Advanced Anti-fog Lens Coating for the Hazard You Can't Afford to Overlook

Fogging is the number one problem faced by safety eyewear users. It occurs widely across industries – from construction, manufacturing, chemical, and utilities, to oil and gas – and across applications. Fogging on untreated lenses is nearly impossible to avoid no matter where work is conducted, and it might seem like no big deal.

But maintaining a clear, fog-free view is vital to the wellbeing of workers and employers alike. When tasks are conducted with fog-obscured vision, workers risk not only eye injury but also bodily harm. It takes seconds – or less – for a potentially catastrophic event to occur: a slip or fall; getting struck by equipment or caught in machinery; or coming into contact with harmful chemicals or electrical current. Productivity and compliance are at serious risk, too.

With so much at stake, it's easy to see why employers seek effective anti-fog solutions, and why eyewear manufacturers strive to develop longer-lasting anti-fog coatings. But not all AF-coated lenses deliver the same level of protection or consistency, and until now lenses with anti-fog coating didn't necessarily stand up to the demands of the workplace. Recent innovations in anti-fog lens coating have dramatically improved performance. This paper examines the dangers and costs of fogging and the differences among anti-fog lens coatings, to help guide safety managers in selecting those that deliver the consistent, long-lasting results required to keep workers safe and productive, and to support employers' bottom lines.

Factors that cause fogging

Lenses fog due to several factors, all of which are related to temperature and humidity.

Environmental heat and humidity

The most obvious reason for fogging is a hot and/or humid environment. Whether workers are outdoors in sticky summer conditions or inside a steamy boiler room or food manufacturing plant, moisture in the air causes tiny droplets of water to collect on lenses, primarily the outside surface.

Worker exertion

Lenses fog when workers exert themselves. As an individual's body temperature rises, the heat and sweat produced around the eyes, face and head need to dissipate into the atmosphere. Since spectacles, goggles and sealed eyewear restrict ventilation, moisture condenses and forms fog on the inside surface of the lens.

Transitions between warm and cool environments

Whether workers move from warm to cool environments, such as a hot loading dock to a refrigerated storage unit, or from cool to warm settings, such as a wintry outdoor site to a heated vehicle, transitions between warm and cool environments cause fogging, primarily on the outside of the lens.

Lens washing

A lesser known factor behind fogging is washing. Each time lenses are cleaned with soap and water they are exposed to moisture – the very element they are designed to manage. With each washing, most lenses' anti-fog properties erode, making them less capable of managing water from the environment. Given the variety and prevalence of factors that contribute to fogging, it is easy to see how fog impacts the majority of workers across a majority of environments.

Impact on Safety

Whatever the cause, workers whose vision is obscured by fog cannot clearly see the hazards around them, and are therefore left vulnerable to an array of injuries, from minor bumps to life-threatening harm. Alternatively, workers who remove their eyewear to avoid the hassle and distraction of fog are vulnerable to eye injury from falling objects, airborne particulate matter, and splashing chemicals.

In addition to the obvious physical hazards, safety eyewear also protects the eyes from harmful visible and invisible light. The effects of overexposure to optical radiation range from eye fatigue, dryness and irritation, to short-term and permanent vision loss. In fact, long-term exposure to the sun's invisible ultraviolet rays is a leading cause of cataracts and blindness in the U.S.1 Therefore, when workers remove their safety eyewear – and keep it off – due to fogging, they face greater risk from physical and optical radiation hazards alike.

Impact on Productivity

Foggy lenses negatively impact productivity, too. When safety eyewear fogs, workers have little choice but to remove it and wipe it clear – which can lead to repeated interruptions throughout the shift. When eyewear is removed, even briefly, in the work zone, work is interrupted and individuals are unprotected. When workers leave the site to dry their lenses away from hazards, productivity takes an even greater hit. The cumulative cost of fog-related interruptions can add up to a big reduction in productivity.

The Cost of Noncompliance

Foggy lenses directly impact compliance. It is not uncommon for workers to take off fogging eyewear – and leave it off – rather than deal with the ongoing hassle and distraction of fog. But when workers leave eyewear off altogether, not only are they risking eye injury, they are also in noncompliance with safety regulations, which can incur hefty penalties. Since safety eyewear is a highly visible form of PPE, violations are easy for inspectors to spot. While regulatory fines for noncompliance may seem sizable, consider the cost of noncompliance resulting in an eye injury:

- The cost of lost vision to an individual is immeasurable, spanning medical expenses, diminished quality of life, and the reduced ability to earn a living.[1]
- Workplace eye injuries cost U.S. employers an estimated $467 million per year in direct costs.[2]
- With indirect costs included, such as legal fees, judgments and training new workers, the estimated total exceeds $934 million per year.[3]

Despite national and corporate safety programs, approximately 2,000 occupational eye injuries occur in the U.S. every day – more than 700,000 annually – taking a massive toll on workforce health and overall productivity.[4] Yet, most safety professionals agree: nearly all occupational eye injuries could be prevented through the proper use of the appropriate eyewear.[5]

Anti-fog Solutions Differ Widely

While anti-fog solutions include wipes and sprays, the best defense against fogging is a high-performance anti-fog lens coating. Be aware that different manufacturers' coating technologies work in different ways, though, with varying levels of success and longevity. Furthermore, the methods used for applying coatings vary widely, resulting in a spectrum of consistency and performance. When the reservoir of anti-fog agents is shallow, for instance, those agents are easily wiped or washed away completely after the first few uses. Likewise, a coating whose application isn't closely monitored is likely to deliver inconsistent anti-fog performance and even distorted lens optics. Many anti-fog products look good out of the box, but when coating formulations or application methods lack effectiveness or durability, safety eyewear becomes just another piece of disposable PPE that requires frequent replacement.

Advances in Anti-fog Technology and Application

Today's advanced lens coating technologies actively manipulate moisture through surface acting agents, chemicals designed to move to the lens surface as needed to prevent fogging. The most reliable coatings employ dual-action properties:

- hydrophilic properties that absorb moisture into the lens, and
- hydrophobic properties that spread excess condensation in a clear film over the lens surface and ultimately shed moisture off the lens.

Applying dual-action anti-fog coating so it goes on and stays on permanently – even after repeated washings and wiping – is key to the coating's durability. Look for manufacturers that bond anti-fog agents permanently to the lens, and those that rely on controlled application methods and vigorous product monitoring that ensure anti-fog coatings absorb, then spread and shed, the greatest amount of moisture consistently over the longest possible time. A long-lasting, consistently fog-free safety lens is one your workers can wear shift after shift with the clear, fog-free view vital to performing their tasks.

1 *Prevent Blindness America*
2 *U.S. Bureau of Labor Statistics*
3 *National Institute for Occupational Safety and Health*
4 *Anti-fog performance based on independent lab test results*
5 *Comparative lens life test performed using a Bayer Abrasion Test method and may vary between environment and applications.*

Five Tips for Selecting Effective Anti-fog Eyewear

1. Look for anti-fog coating that employ dynamic, dual-action properties: hydrophilic and hydrophobic.
2. Be sure the manufacturer's batch creation and application processes are rigorously monitored and tested to ensure the highest standard of anti-fog consistency and longevity.
3. Be sure the lens coating application process delivers smooth, consistent results on every pair of eyewear to support exceptional, distortion-free optics.
4. Look for manufacturers using an intense curing process to permanently adhere the coating to the lens. Only permanent coating will deliver consistent fog-free performance, even after frequent wear, wiping, and washings.
5. Look for anti-fog coating on a wide range of safety eyewear types, from goggles and sealed eyewear to spectacles, as well as lens tints, to provide anti-fog protection to workers across a wide variety of applications.

Conclusion

The need for effective anti-fog performance on safety lenses is clear. Look for proven technologies that deliver the longest-lasting fog-free vision and durable staying power that stands up in the harshest, wettest conditions. By selecting effective anti-fog coatings on the styles and lens tints best suited for the application, workers benefit from uninterrupted vision and continuous protection from their safety eyewear. Employers benefit from a safe, productive and compliant workforce – which supports a healthy bottom line.

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