
POWER-TO-SAFETY

Norman Richter

As the hydrogen economy accelerates worldwide, safety and process reliability are becoming paramount. This applies not only to hydrogen itself, but increasingly to oxygen – a highly reactive by-product of electrolysis. Sealing technology specialist IDT has developed a solution that addresses both challenges: LE-Safe, a gasket engineered to safely handle hydrogen and oxygen in demanding applications across international markets.

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Industrial hydrogen production via electrolysis is a technological frontier – one that comes with elevated safety demands. Water splitting generates not only hydrogen, but also oxygen, a reactive element requiring strict safety protocols. Plant operators face new challenges when advancing hydrogen processes while also controlling the risks of oxygen.

Effective environmental and safety protection starts with acknowledging the inherent complexity of power-to-gas technologies: they offer significant opportunities but also carry serious risks. While hydrogen often takes centre stage, oxygen safety is just as essential.

Minimizing risk requires a fully integrated approach – from material selection to design, manufacturing, and system integration. Only through a closed process chain can oxygen-related hazards be effectively mitigated.

ADHESIVES: THE HIDDEN RISK

Conventional gasket designs often use adhesives, which carry a hidden risk. In oxygen-bearing environments, adhesives can ignite spontaneously, leading to fires. They also jeopardize valve performance and may trigger corrosion when in contact with metal components. In hydrogen systems, such vulnerabilities are unacceptable.

IDT's LE-Safe series eliminates these risks. These gaskets are constructed with metallic carriers and pure graphite elements – without adhesives. This design significantly reduces risk while delivering outstanding mechanical strength and top-tier leak tightness.

In fact, LE-Safe frequently surpasses traditional bonded gaskets in performance. The use of long-term stable materials ensures consistent function



Source: IDT

IDT's LE-Safe product line is designed to minimize risks in oxygen-bearing applications.

across the entire lifecycle.

HYDROGEN READY. OXYGEN SAFE.

The LE-Safe line has undergone batch-controlled testing by Federal Institute for Materials Research and Testing (BAM), Germany's internationally respected authority on safety in technology and chemistry. The results: performance levels close to those of pure graphite foil – an in-

dicator of premium quality. While many gaskets appear compliant, few consistently meet BAM's stringent standards.

The commitment to safety begins at the manufacturing stage. LE-Safe gaskets are cleaned in accordance with BAM guidelines, assembled under cleanroom conditions, and vacuum-sealed for transport. All auxiliary ma-



Source: IDT

Minimizing oxygen-risk requires a fully integrated approach, including clean room handling.



Source: IDT/stock

Europe's hydrogen initiatives need cross-border solutions and advanced technologies.

materials used in production either fully evaporate or meet oxygen compatibility requirements. This ensures that no oils, solvents, or particles compromise performance in critical oxygen applications.

MEETING GLOBAL HYDROGEN DEMANDS

The hydrogen economy has outgrown national frameworks and is now part of international energy and industrial strategies. Electrolysers in Spain now supply German industries; cross-border pipelines connect northern and southern Europe; and continental-scale storage solutions are in development.

This complex ecosystem demands components that perform reliably across climates, legal systems, and standards. In practice, this translates into smoother approval processes, easier

material selection, and compatibility with existing infrastructure. European engineering standards remain a global benchmark – especially for

high-reactivity gases like hydrogen and oxygen.

Gaskets that consistently meet de-



Source: IDT

LE-Safe completely foregoes adhesives and uses graphite that's tested for oxygen usage by BAM.

manding criteria give global operators a technical edge and regulatory peace of mind. In a field driven by speed, safety, and standards, this is a decisive advantage.

In addition, oxygen offers untapped potential as a feedstock in adjacent sectors. From pharmaceutical synthesis and medical applications to oxy-fuel combustion and glass manufacturing, purified oxygen can contribute to a more efficient and sustainable use of energy. Future-oriented electrolyser strategies therefore increasingly factor in the dual use of hydrogen and oxygen – technically, economically, and ecologically.

ONE GASKET. TWO APPLICATIONS.

LE-Safe was specifically developed for two key applications: the peripheral systems of electrolysers and the flange connections used in hydrogen transport and storage. These gaskets allow operators to handle both oxygen and hydrogen with a single solution, streamlining supply chain, storage, assembly, and documentation. In addition, the dual compatibility of LE-Safe speeds up documentation and certification processes – especially in international rollouts. In recent multi-site electrolyser installations, standardized sealing solutions helped reduce onboarding times and minimize risk in mixed-me-

dia operations.

RELIABILITY IN A CHANGING REGULATORY LANDSCAPE

As regulations around process emissions tighten and the recent push to restrict Per- and Polyfluoroalkyl Substances (PFAS) – a large group of synthetic chemicals known for their exceptional resistance to heat, water, and chemical reactions – shakes the industry, we are seeing a shift toward sustainable, high-purity materials and responsible production methods.

Solutions like LE-Safe, made from graphite and metal without synthetic coatings or adhesives, are well positioned to meet these evolving regulatory requirements. Meanwhile, ongoing standardisation initiatives – from BAM to ISO/EN – are raising the bar for industrial sealing performance.

THINKING EUROPE. ENGINEERING THE WORLD.

Europe's hydrogen initiatives – like the European Hydrogen Backbone (EHB) – show that stable energy futures require cross-border solutions. Advanced technologies such as LE-Safe, developed to rigorous standards, offer international usability and scalability.

As a member of the HZwo Hydrogen Innovation Cluster and a participant



Cleaning gaskets for oxygen use requires a certified cleanroom.

in the first German-Spanish Hydrogen Conference in Madrid – an event that brought together 100+ experts from industry, science, and policy to explore the future of hydrogen production, infrastructure, and storage – IDT is actively contributing to European collaboration, because international projects require compatible, forward-looking technologies.