What Does it Cost Me: The Benefit of Low E Technologies

What does it cost 'me'? This is the fundamental question at the core of the Total Cost of Ownership (TCO) discussion. Whether the 'me' is an individual, an operator, an Original Equipment Manufacturer (OEM), or the broader community, the inquiry aims to uncover the complete and actual impact of fugitive emissions on an entity and its surrounding environment.

As reducing fugitive emissions remains a critical priority for industries worldwide, it is essential for the 'me' to develop a deeper understanding of how adopting best practices and advanced technologies can contribute to a more sustainable future. By addressing the TCO and implementing strategic changes, companies can realize signi icant environmental and inancial bene its.

BY ANGELICA PAJKOVIC AND BRONSON PATE - TEADIT

What Are Fugitive Emissions

Fugitive emissions refer to the unintended and uncontrolled release of gases, often from industrial equipment such as valves, pumps, and connections. In petroleum refineries, these emissions can include methane, ethane, propane, and sometimes more harmful substances like benzene. In chemical plants, these emissions can include 1,3 butadiene, ethylene oxide, ethylene dichloride, and vinyl chloride. While these volatile organic compounds (VOCs) have a short atmospheric lifespan, they tend to have lasting adverse effects on the environment.

The loss of product due to these occurrences has a simultaneously negative impact on production efficiency, as lost product due to leaks represents a significant economic drain. Reducing fugitive emissions is, therefore, often considered not only an environmental necessity but also a financial imperative.

The TCO approach to fugitive emissions looks at the comprehensive cost implications of industrial operations, including environmental and health impacts. Understanding and addressing these emissions through a TCO lens can benefit operators, OEMs, and the community substantially.

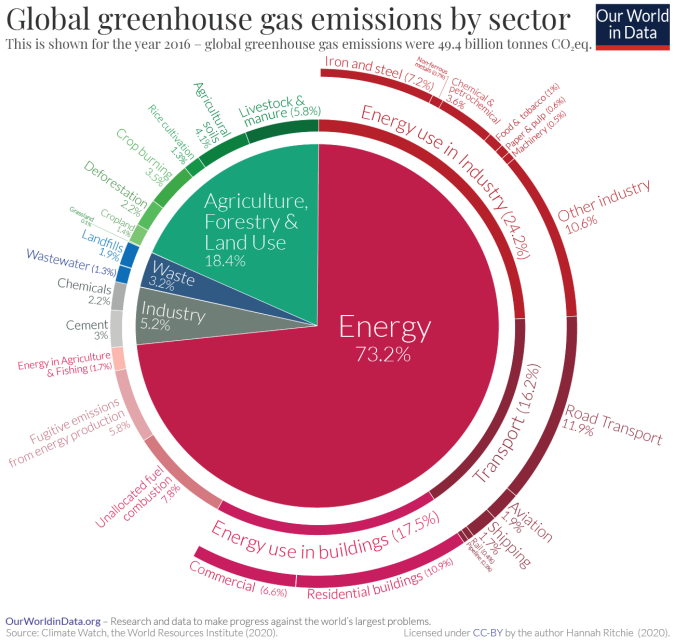
Global Efforts and Strategies

The recognition of fugitive emissions as a prevalent environmental and societal issue dates back to the 1950s when Dr. Bernie Stargwall investigated pollution in Los Angeles, CA. His findings revealed that numerous small leaks in refineries and chemical plants collectively caused significant air pollution. To combat this phenomenon, California implemented strict work practices to mitigate smog and emissions, leading to markedly clearer skies despite population growth.

Historically, different regions have adopted varied approaches to tackle fugitive emissions. With no globally standardized 'rules' or 'requirements,' the European Union focused on engineering solutions, while the United States emphasized regulatory measures. Although many credit Europe with leading the push for reduced emissions, California's success serves as a prime example of the long-term benefits of stringent emission control measures.

China's recent decision to adopt a dual-strategy approach, in which they focus on engineered solutions and regulatory measures, is, therefore, unsurprising; its implementation has resulted in a more rapid reduction of emissions. This comprehensive approach serves as a model for other nations, demonstrating the effectiveness of combining design enhancements with rigorous operational practices.

Increasing the implementation of advanced low emission technologies is, arguably, the next step in the push toward environmental sustainability.



Low Emissions (Low E) Technologies

Investing in technologies to reduce fugitive emissions offers dual benefits. Financially, it minimizes product loss and reduces maintenance and operating costs. From a community perspective, it enhances the quality of life by reducing harmful exposures, particularly in vulnerable entities such as schools near industrial sites.

More specifically, emission reduction technologies aid with:

- ***Community and environmental stewardship:*** Reducing emissions improves air quality, protects community health, and enhances the company's reputation as a responsible entity. This is particularly important when industrial sites are near residential areas, schools, or other sensitive environments.
- ***Maintenance and operational efficiency:*** Poor quality leak detection & repair programs lead to higher maintenance and operating costs. Advanced sealing technologies and rigorous monitoring can mitigate these costs and ensure smoother operations.
- ***Cost savings:*** Lost product due to leaks represents a direct financial cost. By minimizing these leaks, companies can recover product value along with the costs associated with processing and handling the material.

Addressing fugitive emissions, therefore, requires a strategic approach. Companies must assess which components will likely leak and prioritize replacement or repair.

Advanced Emission Identification and Reduction Technologies

Technologies like infrared (IR) and optical gas imaging (OGI) cameras and other leak detection tools can identify emissions that might go unnoticed between regular maintenance cycles with conventional leak monitoring tools. This enables a quicker repair to a leaking component, reduces product loss and emissions to the environment.

Technology like certified low leak packing, for example, used in valves, can significantly reduce fugitive emissions to near zero. This not only reduces environmental impact but also recovers product and lowers operating costs over time.

Practical Applications

- **PTFE Packing Innovations:** Over the past decade, advancements in graphite and graphite/PTFE packing have led to substantial reductions in emissions. API 622 standards have driven these improvements, ensuring that modern packing materials can achieve near-zero emissions. Companies should request detailed testing data from sealing manufacturers to ensure they select the best products.
- **Repacking Old Valves:** Instead of replacing entire valve systems, repacking valves with low-emission materials can yield impressive results. Testing under API 624 has shown that repacking can reduce emissions to as low as six parts per million (PPM), significantly lowering the environmental impact and product loss.

It is important to note that not all low emission technologies provide the same level of reduction. Some products may leak more than others, even if they meet the minimum set by the API standards.

The Potential Impact of API Standards

API standards, 622 for packing and 641 for quarter-turn valves, are crucial for setting low emission packing and valve benchmarks. Companies typically use these standards to develop advanced packing solutions providing near-zero emissions. While not all facilities are required to use valves that meet these standards, proactively doing so can offer substantial benefits. The cost difference between low-emission and standard technology components is often negligible, but the potential savings in reduced emissions, reduced product loss, and compliance with environmental regulations are significant.

Companies can reduce their environmental footprint while achieving cost savings by selecting components that have passed the rigorous API standards tests and by updating/including only components that meet these stringent standards in their Approved Manufacturer Lists (AMLs).

It is best to view these changes not as regulatory burdens but as strategic investments that can provide a positive return. By doing so, businesses can enhance their reputation, meet stakeholder expectations, and contribute to a sustainable future.

Case Study

Consider a hypothetical facility with 30,000 valves and 105,000 connectors. By replacing 90,000 flange connections (connectors) with ASME 16.20 low-emission spiral wound gaskets and repacking 5,000 valves with API 622 compliant packing, the facility can drastically reduce emissions. Utilizing EPA emission calculations, this change can lower fugitive emissions from 639 tons to just 1 ton per year, with an annual savings of $900,000. This example highlights the immense potential for cost savings and environmental benefits through strategic upgrades and maintenance.

Understanding the Latent Benefits

Addressing fugitive emissions through the lens of TCO involves evaluating the costs and benefits of various technologies and practices. By leveraging the best available control technologies and adhering to stringent standards, companies can make data-driven decisions to achieve substantial reductions in emissions while enhancing their financial performance. As the global push for sustainability intensifies, the adoption of these practices will not only meet regulatory requirements but also position companies as leaders in environmental stewardship.

The focus on TCO to reduce fugitive emissions underscores the importance of a holistic approach that considers both financial and environmental impacts. Investing in advanced technologies and adhering to best practices significantly reduces fugitive emissions, generates a financial return, and positions companies for the future while complying with current regulations.

About the Expert

Bronson Pate is currently the Environmental Consulting Manager for Teadit North America. He has more than 15 years of experience dealing with regulatory and technical issues related to Leak Detection and Repair (LDAR) for numerous industries both here and abroad, specifically within refining, petrochemical, and chemical industry plants. As one of the world's leading experts on equipment leak fugitive emission source monitoring, tagging, and LDAR database management, he has participated in and/or led 375 audits at multiple facilities on U.S. EPA LDAR Consent Decree (CD) requirements. In addition to being able to provide all levels of training for EPA Method 21 monitoring and other LDAR-related Technician training, he also has experience dealing with air quality compliance and permitting issues for refining, petrochemical, and natural gas processing industries.