Efficient leak detection in power plants and industrial facilities

Steffen Griebe, Markus Laps, Victoria and Emma Lambert

Operational efficiency, safety, and environmental compliance are paramount in modern power plants and industrial facilities. Undetected leaks, defined as unintended fluid or gas passages through enclosure walls, pose significant threats, leading to economic losses and safety hazards. This paper presents a systematic, multi-method approach to leak detection designed to minimize material losses, prevent contamination, and ensure equipment reliability. Key technologies employed and discussed include Acoustic Leak Imaging (ALI), helium/hydrogen tracer gas detection, fog visualization, and flow velocity measurements. Real-world applications are demonstrated across condensers, steam turbines, gas distribution networks, and rotary kilns in waste-to-energy plants.

Ultrasound imaging offers rapid initial overview scans and preliminary leak rate estimations, guiding subsequent detailed inspections. Complementary methods, such as highly sensitive helium leak detection, confirm leak presence and extent. The synergistic application of these techniques enhances diagnostic precision and supports tailored maintenance strategies, ultimately reducing downtime and improving operational performance. No single method is universally applicable; instead, their combined use yields the most reliable outcomes. Future developments include stationary monitoring systems for continuous surveillance of critical infrastructure, even in inaccessible operational areas. A notable deployment on the International Space Station (ISS) exemplifies the advanced capabilities and reliability of this technology in extreme environments.

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1 Introduction

In modern power plants and industrial facilities, ensuring operational efficiency, reliability, safety, and environmental compliance is essential. Even minor inefficiencies or unnoticed faults can lead to significant economic losses, safety hazards, or environmental violations. Among these challenges, leaks – often invisible and insidious – pose a particularly persistent threat.

Leaks are defined as unintended breaches such as cracks, holes, or porosities in containment barriers, allowing uncontrolled release of gases or liquids. While they may seem minor, their impact can be substantial. For instance, false air entering a combustion process can disrupt optimal fuel-to-air ratios, reducing efficiency and increasing emissions. Similarly, undetected gas leaks in waste incineration systems can release harmful substances into the environment, posing health and regulatory risks.

To address these issues, a systematic approach to leak detection has been developed, combining both broad and detailed inspection techniques. An ultrasound camera, leveraging Acoustic Leak Imaging (ALI), enables performing rapid, wide-area scans, accurately detecting and visualizing leaks from a distance. This allows for efficient identification of multiple leak points. Further methods such as helium leak detection – where helium is sprayed on critical areas and detected via mass spectrometry – offer high sensitivity for standalone leak detection or, in combination with other methods, can supplement or specify the extent of leaks.

These techniques support maintenance teams by providing both qualitative and quantitative insights. The overarching goals are to minimize material losses, prevent contamination, and ensure the reliability and longevity of equipment. By improving maintenance quality, increasing system availability, and reducing operational costs, these methods play a vital role in the sustainable and economic operation of industrial facilities.

2 Leak detection technologies

A variety of technologies are available for detecting leaks in industrial environments, each with its own strengths and limitations according to the properties and physical boundary conditions. Among these, Acoustic Leak Imaging (ALI) and helium/hydrogen (He/H_2) leak detection have proven particularly effective and are described in detail in the following sections.

2.1 Acoustic leak imaging (ALI)

Gas leaks are well-known for emitting ultrasounds when the pressure difference between the low- and high-pressure areas exceeds a threshold. These ultrasounds are generated by the turbulent flow of the gas molecules exiting at the leak orifice (Figure 1). These ultrasonic emissions are frequently the earliest indicators of failure, appearing well before thermal or infrared signatures.

Acoustic Leak Imaging not only detects but also locates the position of the ultrasound sources, i.e. the leaks. For that, this technology makes use of an ultrasound camera, which consists of an array of ultrasound-sensitive microphones arranged on a 2D front panel, coupled with a high-resolution optical camera. As an ultrasonic wavefront reaches the sensor array, each microphone records the signal at slightly different times. These temporal differences, in the scale of

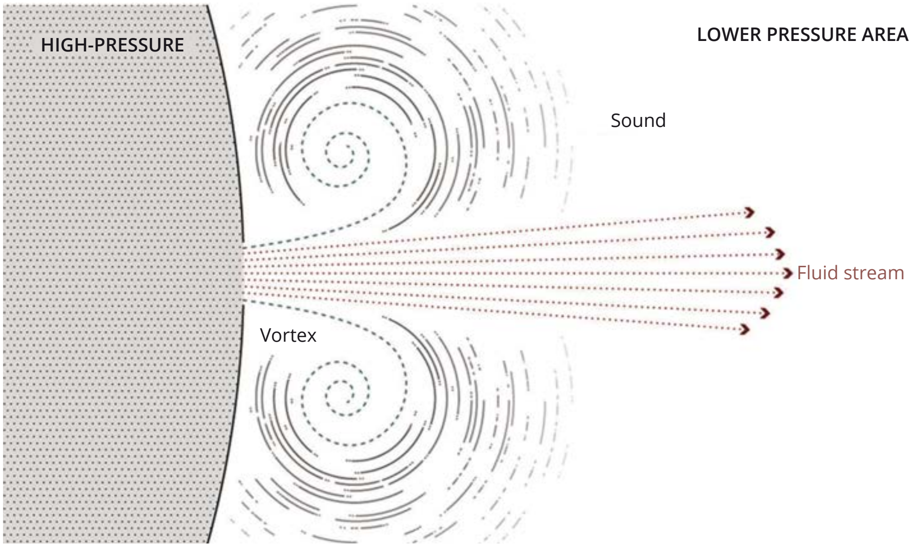

Fig. 1. Acoustic emissions generated by a fluid stream transitioning from high pressure to a low-pressure region, forming vortices that produce ultrasonic sound.

microseconds, are processed through advanced algorithms to precisely calculate the spatial origin of the ultrasound source. The resulting acoustic image is then color-mapped and overlaid in real time onto the optical image, providing a clear, intuitive visualization of leak locations.

As sound sensors, ultrasound cameras can detect any source emitting ultrasound waves at the detection frequency, including gas leaks, partial discharges, vibrations, or internal turbulences in pipelines, and can simultaneously detect and distinguish multiple sound sources, as shown in Figure 2.

In addition, the Distran cameras are able to provide accurate estimations of leak flow rates in real time in liters per hour (L/h), standard cubic feet per hour (scf/h), or grams per hour (g/h). This functionality allows users to quickly assess the leak severity, potential cost and to monitor the evolution of leaks' size over time, supporting efficient risk management and maintenance decision-making.

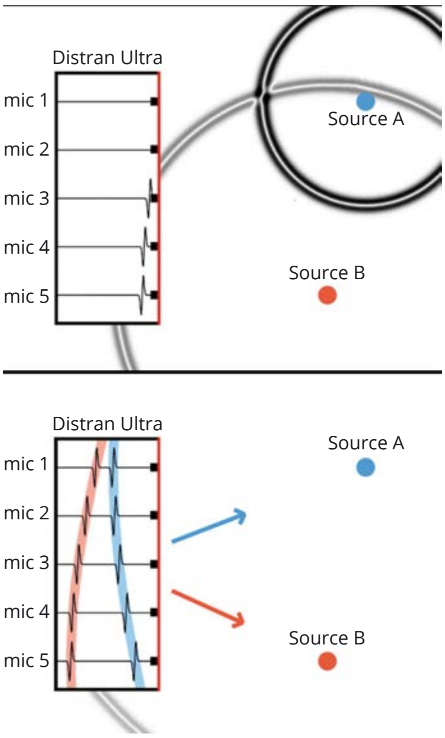

Fig. 2. Acoustic signals from two distinct sources A and B are recorded by ultrasound imaging microphones.

Figure 3 displays an image taken with an Ultra Pro X, which combines ultrasonic detection of a gas leak with high-definition optical imaging. The camera's wide field of view (>150° optical and 180° acoustic) allows efficient coverage of large areas. Additionally, the acoustic frame surrounding the optical view indicates leak sources located outside the optical field, facilitating their localization even when they are not directly visible.

The ability of an ultrasound camera to detect and quantify gas leaks depends directly on the strength of the ultrasonic signal emitted by the leak, as well as the conditions under which it propagates to the sensor array. These factors determine the smallest leak that can be reliably detected under specific conditions. This detection threshold is not fixed; it varies based on several key parameters, most notably:

Fig. 3. Ultrasonic detection of a gas leak with a flow rate of 360 L/h measured at approximately 7.5 m and indication on the acoustic frame (right).

- The distance between the leak source and the camera: Ultrasonic waves attenuate as they travel through air. The farther the leak from the microphone array, the lower the received signal strength. In other words, for the same leak size, detection becomes increasingly difficult with distance. Therefore, the minimum leak size that can be reliably detected increases with distance, as illustrated in Figure 4.
- The pressure difference across the leak orifice: A higher-pressure difference between the system and the environment results in more turbulent flow and stronger ultrasonic emissions. This effect is shown in Figure 5, where increasing pressure difference allows one to detect smaller leaks.
- Ambient ultrasound noise: In real industrial environments, background noise generated by machinery, valve actuations, or flow-induced vibrations can mask the signal emitted by small leaks. This raises the threshold of the smallest detectable leak rate. For example, in a low-noise lab environment at 1 m distance, leaks as small as 0.3 L/h at 4 bar can be detected; however, in an operational plant, this threshold may increase depending on the acoustic background. To address this, ultrasound cameras such as the Ultra Pro X continuously indicate the ambient noise level on the screen.

2.2 Helium / Hydrogen leak detection

The other measurement technique, helium/hydrogen (He/H_2) leak detection, is explained in more detail below. First, an overview of the general methods is shown, as they can be applied in various ways depending on the application.

One of the main methods for He/H_2 leak detection is the vacuum method, with a focus on the spray technique. In this approach, helium, an inert tracer gas, is sprayed around areas where leaks are suspected while the test specimen is under vacuum. If a leak is present, helium enters the system through the leak and is transported via a gas sampling line to a mass spectrometer, where it is detected and analyzed.

This method requires gas conditioning to ensure accurate measurement. Parameters such as temperature and pressure must be monitored and controlled, and a vacuum pump is used to maintain the necessary conditions. The results are recorded, visualized in diagrams, and documented to provide the customer with a detailed overview of the leak locations and their assessment (Figure 6).

Another commonly used method in He/H_2 leak detection is the sniffer technique, which is particularly effective in scenarios involving overpressure, such as near an induced draught fan in a powerhouse (Figure 7). In this method, helium is introduced into the pressurized pipe system and escapes

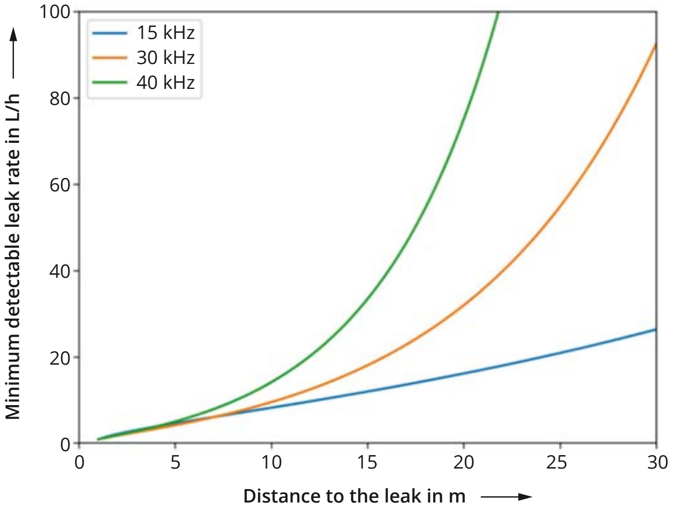

Fig. 4. Detection threshold of a 10 bar methane pinhole leak at varying frequencies

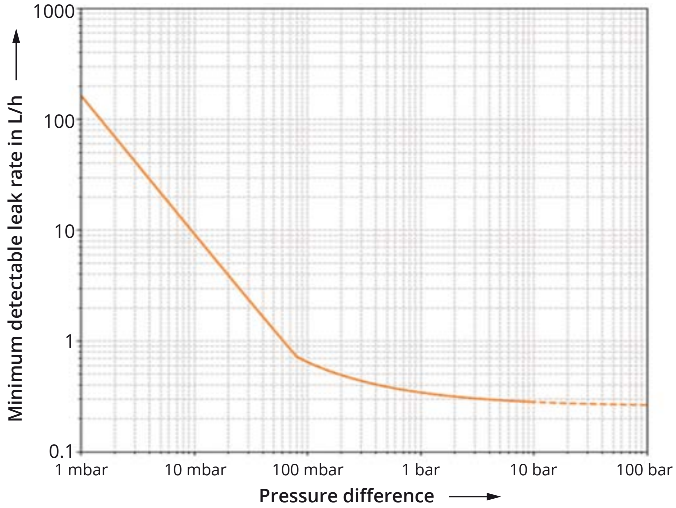

Bild 5. Detection threshold of a methane pinhole leak at 1 m at 30 kHz

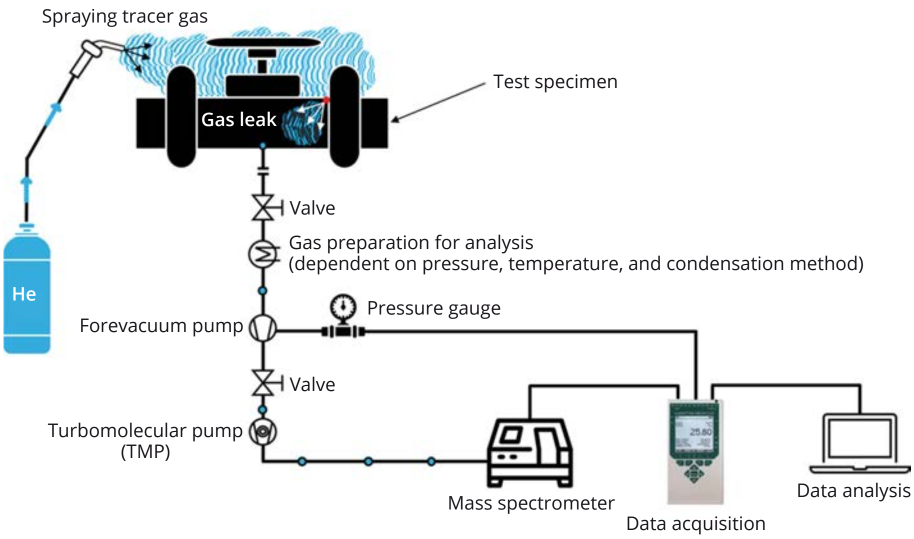

Fig. 6. Schematic of the spray technique for local leak detection using Helium as a tracer gas.

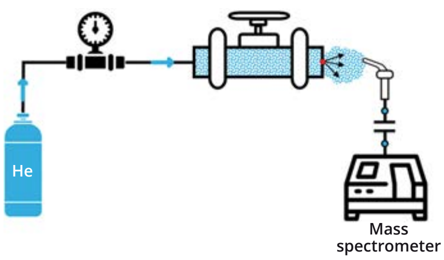

Fig. 7. Schematic of the sniffer technique for Helium leak detection under overpressure conditions. Helium is introduced into the pressurized system and detected at leak points using a sniffer probe.

through any existing leaks. The escaping helium mixes with the flue gas and is detected outside using a sniffer probe.

This technique enables the precise localization of leak points by measuring and analyzing the helium concentration at the gas exit locations, as illustrated in the accompanying schematic.

The sensitivity of the sniffer technique is influenced by several boundary conditions. Critical factors include the type and performance of the sniffer unit, the response time of the leak detector, the scanning speed, and the distance between the sniffer tip and the surface of the test object.

Building on the foundational understanding of these technologies, it is important to consider how they are implemented in actual industrial settings. Due to their complementary strengths and adaptability, the practical uses of ultrasound imaging and He/H_2 leak detection technologies span a broad spectrum of industries. These include applications in power generation and industrial processing facilities, as well as in the inspection of valves, pipelines, electronic components, and automotive systems. The following chapter presents concrete examples from these sectors, illustrating how these technologies are applied in real-world scenarios to detect and localize leaks with precision and efficiency.

3 Applications of leak detectors at power plants and industrial facilities

This section presents practical examples of leak detection applications in power plants and industrial facilities. The cases cover a range of systems, including condensers, superheated steam systems, gas distribution networks, steam turbines and rotary kilns in waste-fired power plants.

3.1 Applications in condensers, steam systems, and gas distribution networks using acoustic leak imaging technology

The following case studies demonstrate the effectiveness of acoustic leak imaging in detecting leaks within critical plant systems, where maintaining operational integrity and safety is essential.

One critical aspect of steam turbine maintenance involves the detection of vacuum leaks in air-cooled condensers (ACCs), see Figure 8. Maintaining optimal vacuum levels within ACCs is crucial for maximizing steam turbine efficiency and preventing potential equipment damage. Effective vacuum pressure management is essential for safeguarding turbine integrity and ensuring operational efficiency.

Fig. 8. Vacuum leak on an air-cooled condenser.

A notable incident at a condenser in a power plant, in the United Kingdom underscores the significance of early leak detection. Utilizing the Distran Ultra Pro X, operators identified a leak that resulted in a vacuum loss of 7.5 mbar. Although seemingly minor, this vacuum loss resulted in an estimated production deficit of approximately 7,800 megawatt-hours over six months, translating into a financial loss of about €1.4 million. This example highlights how early and accurate detection of vacuum leaks can significantly improve system reliability and economic efficiency [2].

Another critical application area is the detection of superheated steam leaks, commonly occurring at valve assemblies within power plants. Detecting superheated steam leaks is both challenging and hazardous due to the extremely high temperature and pressure, as well as their invisible nature. Traditional thermographic cameras fail to accurately locate these leaks, as they only display diffuse thermal patterns, often described as a "white curtain." In contrast, ultrasound cameras enable precise localization of those leaks from a safe distance, providing significant safety advantages by allowing operators to detect leaks without physical exposure to hazardous conditions as illustrated in Figure 9.

Fig. 9. Superheated steam leak detected at a distance with Distran Ultra Pro X.

Leak detection in fuel gas distribution systems within gas turbine engine compartments also represents an important challenge in power generation plants. These environments are characterized by turbulent airflow, rapid gas turnover, and elevated temperatures, which severely limit the effectiveness of conventional leak detection methods such as gas sniffers and soap spray. Gas sniffers fail to reliably detect leaks in such environment due to dilution and swirling airflow, and spray-based detection methods are rendered ineffective by rapid evaporation at elevated temperatures. ALI overcomes these limitations by capturing the distinct acoustic signatures of pressurized gas leaks within the ultrasonic frequency range as shown on Figure 10. These signals are filtered out from ambient noise, enabling accurate and remote localization of leaks even under harsh operating conditions.

Fig. 10. Methane leak detected in a gas turbine fuel distribution system.

3.2 Leak testing of condensers using a helium detector

As an alternative to ultrasound imaging, as discussed in the previous section for detecting and measuring leaks in condenser systems, helium leak detection offers a robust solution. This method effectively applies to condenser systems where maintaining vacuum pressure is crucial for efficient operation and turbine protection.

To effectively locate leaks using helium, several steps are followed. First, the Piping and Instrumentation Diagram (P&ID) and the system's operating parameters are reviewed to understand the system layout and its normal functioning. The next step involves installing the measurement technique, with its specifics tailored to analyze the leaks. Next, the vacuum decay rate is measured repeatedly to identify potential leak areas by observing how quickly the vacuum pressure deteriorates.

Once these areas are identified, helium leak detection is carried out. Helium is sprayed near suspected leak points; if it enters the system, the detector will pick it up. A calibrated test leak is also used to verify the detector's functionality and establish reference values for different leak sizes.

During the test, one technician monitors the mass spectrometer, which records helium concentrations at various measurement points. Meanwhile, another technician walks through the plant, spraying helium and informs his colleague about the spraying locations. The helium concentration is measured to show its movement through the system due to a leak. The results are compared against the test leak to determine whether the leak is minor or significant. For instance, as shown in Figure 11, a reading in kilograms per second (kg/s) may appear at the stuffing box of the condensate pump machine house ±0.0 m, indicating helium inflow due to a leak.

3.3 Helium leak detection in steam turbine vacuum systems

Another practical application of helium leak detection is found in the vacuum systems of steam turbines, where even minor leaks can significantly affect system performance. These systems demand a high level of reliability and are therefore subject to regular inspection. The following example, from a combined-cycle power plant, illustrates how helium is employed to detect leaks across the high-pressure (HP), middle-pressure (IP), and low-pressure (LP) sections of the turbine (Figure 12).

Prior to testing, coordination with the plant operator was essential to define the test conditions and identify critical areas for inspection. A calibrated test leak was introduced to verify system sensitivity. During operation, several leak locations were identified and marked for subsequent sealing. The results, highlighted in subsequent figures, show a range of leak sources across the turbine system.

One significant leak (Figure 13) was detected in the upper casing joint of the LP section, specifically located above bearing 1. Helium was sprayed across the entire joint area, and varying tracer gas responses were recorded, clearly indicating the necessity for resealing in this region.

Additional leaks were identified at the pressure test ports (often referred to as gauge ports or instrumentation ports) near the casing joints of the LP section, particularly

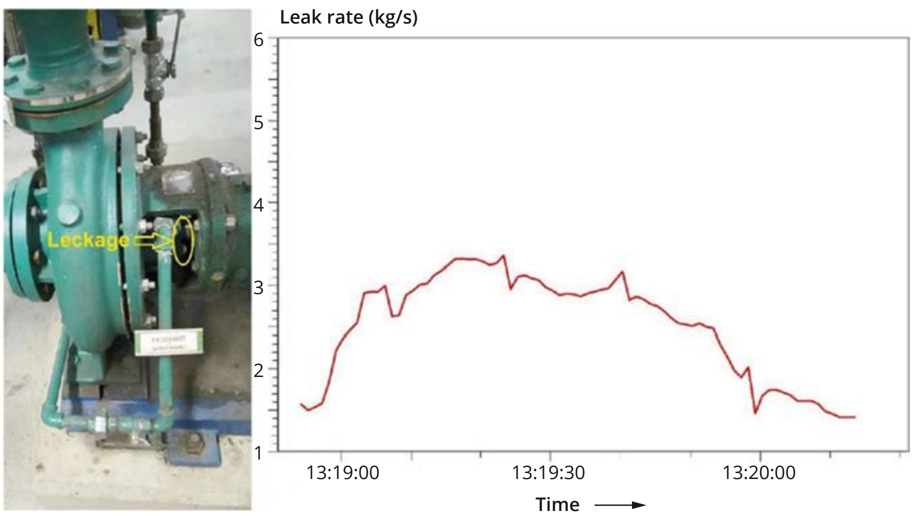

Fig. 11. Leak identified at stuffing box of the condensate pump machine house ±0.0 m, with corresponding leak detector reading.

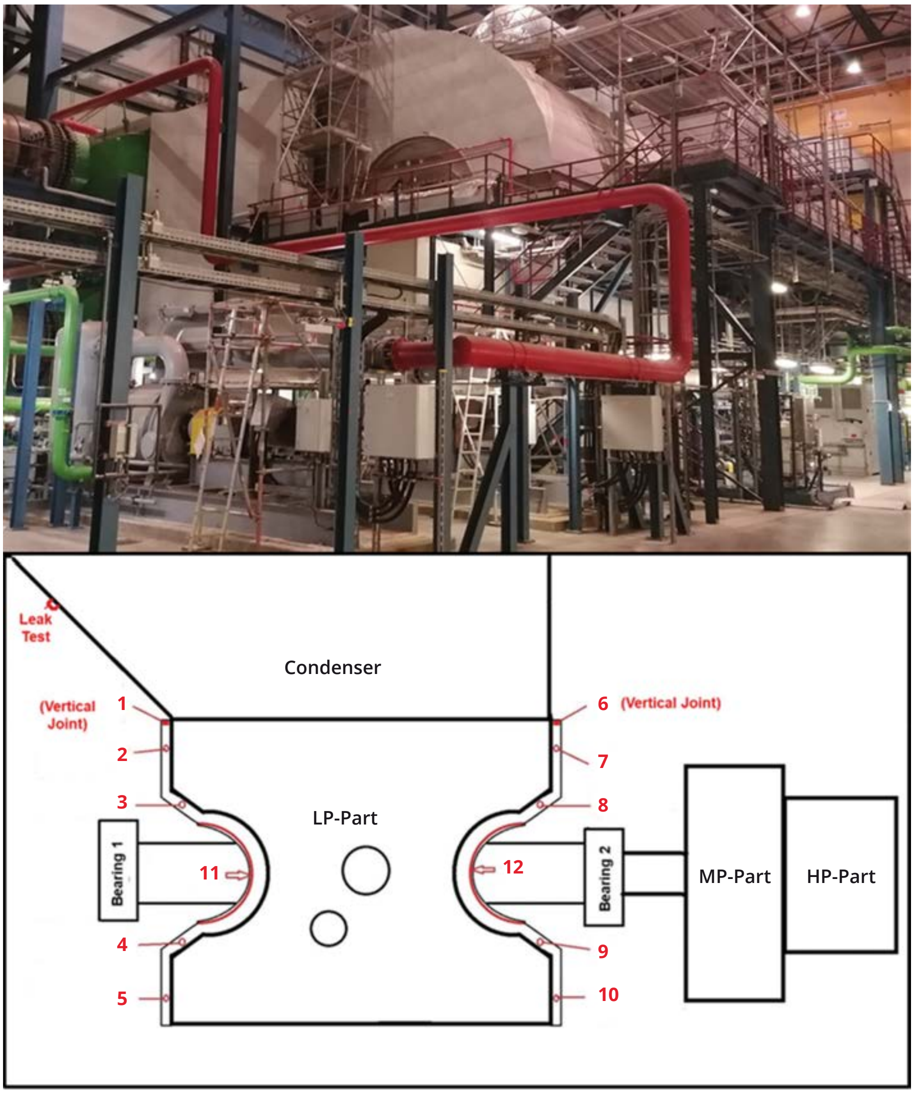

Fig. 12. Combined Cycle Power Plant with schematic diagram showing leak locations at the machine deck level (+0.7 m) in the LP section.

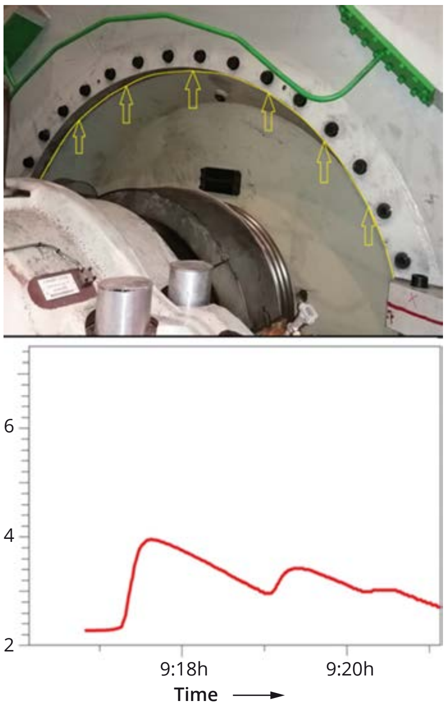

Fig. 13. Leakage 11 at the upper casing joint of the LP section above bearing 1 with its corresponding display diagram.

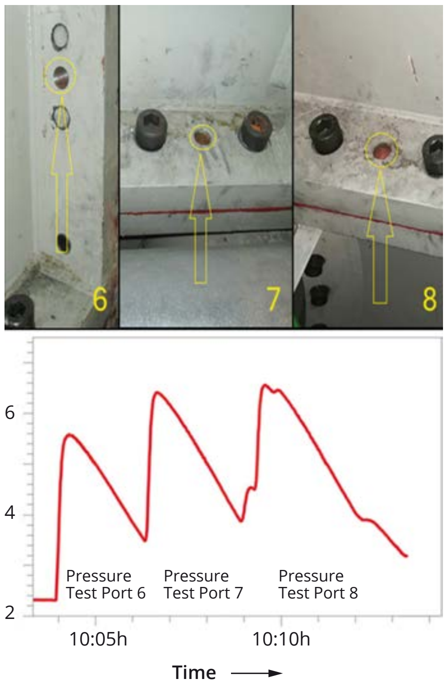

Fig. 14. Leakages at the pressure test ports near the casing joints of LP section around bearing 2 area with its corresponding diagram.

around bearing 2. Figure 14 shows that these included ports 6, 7, and 8. In each instance, distinct helium concentration peaks were observed in the mass spectrometer readings, confirming the presence and precise location of the leaks.

3.4 Combined leak detection methods in a rotary kiln of a waste-to-energy plant

This section presents an example where multiple leak detection methods – both previously discussed and additional techniques – were applied in combination. The project of the leak detection focuses on a rotary kiln incinerator within a Waste-to-Energy (WtE) plant, with the objective of optimizing furnace performance by identifying and minimizing air leakage.

In such systems, combustion must be precisely controlled. Uncontrolled combustion air inflow can significantly reduce combustion efficiency, increase emissions, and disrupt the thermal balance of the process. The plant in question processes hazardous waste, which is incinerated in an adiabatic combustion chamber. The system configuration includes an afterburner, two cross passes, two vertical passes, and a horizontal pass.

To use helium-based leak detection, a flue gas extraction probe was integrated into the system. This allowed for targeted helium tracing and verification. Figure 15 illustrates the measurement equipment utilized, providing a schematic overview of the setup.

The inspection encompassed the entire plant, including the barrel feed system, where full barrels are loaded via an elevator and fed directly into the rotary kiln. This process ensures complete combustion of the waste material, followed by required treatment in subsequent plant components.

As part of the inspection, attention was also directed to the emergency exhaust stack, which is integrated between the afterburner chamber and horizontal flue gas duct. This stack includes a flue gas flap and is designed to handle extremely aggressive substances during emergency operations. A primary concern involved the possibility of false air ingress – uncontrolled ambient air entering through the emergency exhaust stack and reaching the O_2 measurement point as short-circuit flow. Such uncontrolled combustion air would be measured as existing combustion air and would lead to a reduction in the controlled combustion air. This would result in an air deficit at the rotary kiln inlet, where it is critical.

In an adiabatic combustion chamber, the combustion temperature is adjusted using the excess air. Without adequate control, the system risks operating at too high temperatures, which can lead to overheating of the rotary kiln, damage to the refractory lining, and mechanical deformation such as ovalization of the kiln shell. These effects can

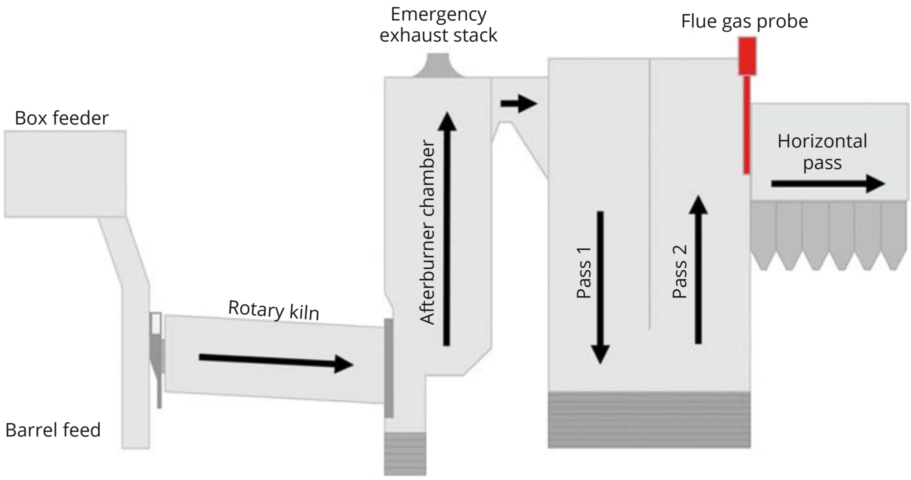

Fig. 15. Schematic diagram of incineration plant with flue gas extraction probe.

Fig. 16. Overview of leakage locations.

cause long-term damage and necessitate costly repairs.

To investigate and verify potential leak paths, a combination of diagnostic tools was employed in the following order:

- Ultrasound camera for acoustic leak imaging.
- Helium tracer gas for pinpointing leak locations.
- Fog machine to visualize airflow patterns.
- Flow velocity measurements to quantify leakage air volume flow.

The inspection revealed multiple leaks, which were documented and, in some cases, verified through follow-up testing. Leak locations were classified by their position at the furnace inlet – where fuel is introduced and combustion starts – and the furnace outlet, where flue gases exit the system.

Among the identified issues were leaking hatches and flaps, including the drum feed flap, which forms part of the hatch of the drum feed system. These components are designed to prevent ambient air from entering the combustion chamber; however, in this case, they permitted false air ingress, thereby disrupting the controlled combustion process. A leaking airlock valve and a removed burner with a compromised seal were also found to be contributing to the false air entry. An overview scan of the affected areas is shown in the accompanying Figure 16, highlighting the locations where leaks were detected.

A comprehensive inspection of the system was conducted, including measurements taken at a safe distance to assess potential leak sources. Numerous leaks were identified and documented by the ultrasound camera.

One particularly critical area was the annular gap at the furnace inlet and outlet, where leaks were detected. Interestingly, the ultrasonic signal was not strongest at the front surface of the gap but rather behind it, indicating a more complex leak path. The rotary kiln itself produced significant background noise, but leaks were still detectable across the entire annular surface as shown in Figure 17 (bottom left).

To determine the direction of flow – specifically whether flue gases were escaping or uncontrolled combustion air flowed into the rotary kiln – helium leak detection was employed. Helium was introduced at the annular gap, and concentrations were measured downstream, including after the afterburner chamber, the vertical passes, and the horizontal pass. The results confirmed a clear leak, with helium detected across a wide area, as depicted in the photograph of the leak location and its corresponding diagram in Figure 17 (middle).

In order to further investigate airflow behavior, a fog machine was utilized at the furnace inlet (see Figure 17, right). This facilitated the visualization of whether air was entering or leaving through the annular gap. The presence of glowing areas on the seal suggested thermal stress and improper sealing. The fog test confirmed that false air ingress was occurring across the entire ring, potentially introducing significant volumes of uncontrolled air into the process.

To quantify this false air volume flow, the annular gap was divided into segments (see Figure 18), and flow velocity measurements were taken using a vane anemometer and a dynamic pressure probe. These measurements revealed inflow velocities between 2.6 and 5.0 meters per second, clearly indicating incoming air. Using these velocities, along with temperature near the entry opening and calculating the area dimensions of the annular gap, the volumetric flow

Fig. 17. Diagnostic tools for leak detection in a WtE plant: (left) Ultrasound camera; (middle) Helium leak detector; (right) Fog machine.

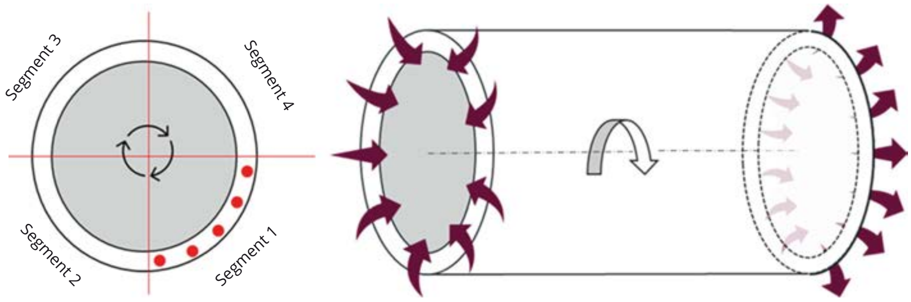

Fig. 18. Diagram of the segment division (left) and diagram of the false air inlet and outlet through the rotary kiln (right).

Tab. 1. Velocity and Volume Flow Rate of Different Segments of Rotary Kiln Inlet and Outlet.

Segment	Rotary kiln inlet		Rotary kiln outlet	
	Velocity [m/s]	Volume flow rate [Nm³/h]	Velocity [m/s]	Volume flow rate [Nm³/h]
1	4.19	>1200	Non-measureable	
2	3.66	>1000	4.56	>5400
3	2.61	>700	5.12	>6000
4	3.86	>1100	4.24	>5000

rate of false air was determined.

As presented in Table 1, the results were substantial: approximately 20,000 standard cubic meters of uncontrolled combustion air were found to be entering the system. This excess air not only increases the thermal load unnecessarily but also reduces the effectiveness of reducing the primary emissions, disrupts the combustion process at the rotary kiln inlet, and increases exhaust gas loss. Based on these findings, recommendations were provided to the plant operator: critical sealing areas must be inspected and improved to restore proper plant operation and prevent long-term damage.

4 Summary and outlook

The real-world examples presented in this paper illustrate how combining various leak detection methods can significantly improve the efficiency and accuracy of maintenance work in power plants and industrial facilities. Specifically, integrating acoustic leak imaging, helium tracer gas detection, fog visualization, and flow velocity measurements have proven effective for identifying and quantifying leaks under both operational and non-operational conditions.

Performing initial assessments with the ultrasound camera provides a rapid overview of potential leak sources, which helps the subsequent procedure. It has been demonstrated that under suitable boundary conditions, acoustic leak imaging is also capable of providing estimations of leak flow rates in real time. All results of leak detection methods support the prioritization of corrective actions.

This structured approach not only enhances the precision of leak localization but also supports the development of tailored inspection strategies. The results can be directly applied to maintenance planning, helping to reduce downtime, improve plant safety, and minimize environmental impact. As demonstrated, no single method is fully applicable on its own for such complex tasks; rather, the complementary use of multiple techniques yields the greatest effectiveness, leading to the most reliable outcomes.

Looking ahead, developing stationary ultrasound detection and monitoring systems based on presented mobile detection technologies offers new opportunities for continuous real-time surveillance of critical infrastructure. These systems can be integrated into process control environments, enabling automated alerts and data-driven maintenance decisions – even in areas inaccessible during operation. For instance, such detectors are now utilized in a nuclear power plant in Switzerland to monitor the high-pressure section of its steam turbine, an area that cannot be accessed for leak detection during full load operation. This provides real-time data collection in an otherwise inaccessible environment.

The robustness of this technology has already been proven that it also extends beyond terrestrial industrial applications. In September 2019, NASA and it´s international partners first saw indications of a slight increase above the standard cabin air leak rate on the International Space Station (ISS). Following a rapid evaluation of more than 40 existing technologies for vacuum leak detection, a novel ultrasonic imaging device at that time - the Swiss made Ultra Pro - was selected for its capabilities. In December 2020, this device was launched to the ISS aboard a Falcon 9 rocket and has been operational onboard since then [3]. This remarkable deployment highlights the advanced capabilities and reliability of this technology, serving as a testament to its recognized capability for detecting gas leaks even in the challenging environment of space.

References

[1] Distran: Technology. distran.swiss. Available at: https://distran.swiss/en/technology/ (accessed 16 May 2025).

[2] Distran: Ignite: Detect Vacuum Leaks at Power Plant and Maintain Performance. distran.swiss. Available at: https://distran.swiss/en/ignite-detect-vacuum-leaks-at-power-plant-and-maintain-performance/ (accessed 16 May 2025).

[3] Distran: NASA: distran.swiss. Available at: https://distran.swiss/en/nasa-ultra-pro-iss/ (accessed 16 May 2025).

Kurzfassung

Effiziente Lecksuche an Kraftwerken und Industrieanlagen

Betriebsleistung, Sicherheit und Konformität mit Umweltvorschriften sind in modernen Kraftwerken und Industrieanlagen von größter Bedeutung. Unentdeckte Lecks, definiert als unbeabsichtigte Flüssigkeits- oder Gasdurchgänge durch Gehäusewände, stellen eine erhebliche Bedrohung dar und führen zu wirtschaftlichen Verlusten und Sicherheitsrisiken. In diesem Beitrag wird ein systematischer, methodenübergreifender Ansatz zur Lecksuche vorgestellt, der darauf abzielt, Materialverluste zu minimieren, Verunreinigungen zu vermeiden und die Zuverlässigkeit der Anlagen zu gewährleisten. Zu den eingesetzten und diskutierten Schlüsseltechnologien gehören akustische Leckbildgebung, Helium-/Wasserstoff-Tracergasdetektion, Nebelvisualisierung und Strömungsgeschwindigkeitsmessungen. Praktische Anwendungen werden an Kondensatoren, Dampfturbinen, Gasverteilungsnetzwerken und Drehrohröfen in Müllverbrennungsanlagen demonstriert. Die Ultraschallbildgebung ermöglicht schnelle Übersichtsscans und vorläufige Abschätzungen der Leckrate, die als Grundlage für nachfolgende detaillierte Inspektionen im Rahmen der Revisionen dienen. Die weiteren Methoden dieses Beitrags, wie z. B. die hochempfindliche Helium-Lecksuche, können zur unabhängigen Lecksuche oder zur weiterführenden Präzisierung eingesetzt werden. Die synergetische Anwendung dieser Techniken erhöht die diagnostische Präzision und unterstützt maßgeschneiderte Wartungsstrategien, die letztlich die Ausfallzeiten reduzieren und die Betriebsleistung verbessern. Keine einzelne Methode ist universell anwendbar; vielmehr führt ihr kombinierter Einsatz zu den zuverlässigsten Ergebnissen. Zu den künftigen Entwicklungen gehören stationäre Überwachungssysteme für die kontinuierliche Überwachung kritischer Infrastrukturen, auch in unzugänglichen Einsatzgebieten. Ein bemerkenswerter Einsatz auf der Internationalen Raumstation (ISS) ist ein Beispiel für die fortschrittlichen Fähigkeiten und die Zuverlässigkeit dieser Technologie in extremen Umgebungen.

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Die 61. vgbe Chemiekonferenz beschäftigt sich in diesem Jahr umfassend mit der Wasseraufbereitung und Deionaterzeugung. Hierbei werden die Herausforderungen der eingesetzten Aufbereitungsverfahren hinsichtlich verschiedener Rohwasserquellen vorgestellt. Zudem wird das Augenmerk auf die veränderten Anforderungen aus der Vergangenheit und hinsichtlich der Wasserstoffelektrolyse gelegt. Auch die Möglichkeiten einer mobilen Wasseraufbereitungsanlage sollen diskutiert werden.

Dass es trotz des heutigen Wissens noch immer zu Schäden und unerwarteten Ereignissen kommt und wie diese mittels einer sinnvollen und auf dem aktuellen Stand der Technik befindlichen Probenahme und Messtechnik vermieden werden können, wird in verschiedenen Vorträgen aufgezeigt und diskutiert.

Für Elektrodenboiler sind andere Dosierungskonzepte und Werkstoffe nötig. Hierzu werden erste Erfahrungen vorgestellt.

Auch die Konditionierung, Überwachung und Reinigung des Kühlkreislaufs in Kraftwerken soll in diesem Jahr thematisiert werden.

In Zeiten des Klimawandels werden Emissions- und Abfallvermeidung, sowie der Einsatz alternativer Energieträger, wie z.B. Wasserstoff ein immer wichtigeres Thema, welches auch hier diskutiert werden soll.

Die Konferenz wird von einer Fachausstellung begleitet, die den Teilnehmern die Möglichkeit bietet, sich über die neuesten Entwicklungen und Trends in der Branche zu informieren.

vgbe energy freut sich, Sie im Oktober in Kassel begrüßen zu dürfen

Essen, im Juli 2025

Änderungen vorbehalten
Konferenzsprachen: Deutsch und Englisch mit Simultanübersetzung
Der erstgenannte Vortragstitel verweist auf die Vortragssprache.

Conference Chemistry 2025

This year, the 61st vgbe Chemistry Conference will focus extensively on water treatment and deionisation.
The challenges posed by the treatment processes used for various raw water sources will be presented. In addition, attention will be paid to the changing requirements from the past and with regard to hydrogen electrolysis. The possibilities of a mobile water treatment plant will also be discussed.

Various presentations will highlight and discuss how, despite today's knowledge, damage and unexpected events still occur and how these can be avoided by means of sensible, state-of-the-art sampling and measurement technology.

Electrode boilers require different dosing concepts and materials. Initial experiences in this area will be presented.

The conditioning, monitoring and cleaning of the cooling circuit in power plants will also be discussed this year.

In times of climate change, emission and waste prevention, as well as the use of alternative energy sources such as hydrogen, are becoming increasingly important topics, which will also be discussed here.

The conference will be accompanied by a trade exhibition, offering participants the opportunity to find out about the latest developments and trends in the industry.

vgbe energy looks forward to welcoming you to Kassel in October.

Essen, July 2025

Subject to change
Conference languages: English and German with simultaneous translation
The first-mentioned lecture title refers to the lecture language.

Online-Anmeldung | Registration

https://register.vgbe.energy/21125/

Kontakt (Teilnahme) | Contact (Participation)

Ines Moors
t +49 201 8128-222
e vgbe-chemie@vgbe.energy

Tagungsprogramm | Programme

mit Fachausstellung / with Technical Exhibition

DIENSTAG, 28. OKTOBER 2025
TUESDAY, 28 OCTOBER 2025

18:00
Get-together in der Ausstellung
Swan Analytical Instruments *lädt alle Konferenzteilnehmer zum zwanglosen Treffen ein.*
Get together in the exhibition
Swan Analytical Instruments *invites all participants to a Get-Together in the exhibition area.*

MITTWOCH, 29. OKTOBER 2025
WEDNESDAY, 29 OCTOBER 2025

08:50
Begrüßung, Eröffnung | Welcome, Opening

09:00 V1
Problems with ion exchange resins after change in raw water quality
Probleme mit Ionenaustauscherharzen nach Änderung der Rohwasserqualität
M. Nielsen, Ørsted Bioenergy & Thermal Power A/S, Fredericia / Denmark

09:30 V2
Diagnosis and remediation of performance issues in a demineralization ion exchange system: A case study on polymer fouling and calcium leakage
Diagnose und Behebung von Leistungsproblemen in einem Ionenaustauschsystem zur Demineralisierung: Eine Fallstudie über Polymerverschmutzung und Kalziumaustritt
S. Muthavhine, Eskom, Leraatsfontein / South Africa

10:00 V3
Herausforderungen bei der Bereitstellung von Deionat aus Oberflächengewässern für den Betrieb eines Dampfnetzes mit drei Akteuren
Challenges with deionized water treatment from surface waters for the operation of a steam network with three players
I. von Deschwanden, Hamburger Energiewerke GmbH, Hamburg / Germany

10:30 V4
Abwasserbehandlung für CO_2-Aminwäschen – Konzeptentwicklung auf Basis von Tests mit realem Abwasser
Wastewater treatment for amine-based CO_2 capture – Concept development based on tests with real wastewater
G. Böhm, J. Beckmann, RWE Technology International, Essen / Germany; P. Moser, G. Wiechers, RWE Power AG, Essen / Germany; R. Brambach, T. Blach, Enviro-Chemie, Rossdorf / Germany

11:30 V5
Mobile water trailer and bottle capacity calculation
Berechnung der Kapazität mobiler Wasseranhänger und Flaschen
B. Haas, Ecolutia Services, USA

12:00 V6
Mobile Wasseraufbereitung zur Kontrolle von Chemikalien und Korrosion in thermischen und industriellen Anlagen
Mobile water treatment for chemical and corrosion control in thermal and industrial plants
L. Bloss, NSI Mobile Water Solutions, Heinsberg / Germany

12:30 V7
Erhöhte Organik, trotz Umkehrosmose?
Increased organics, despite reverse osmosis?
M. Mayer, FRITZ EGGER GmbH & CO.OG, Unterradlberg / Austria; C. Holl, HYDRO-ENGINEERING GmbH, Mülheim / Germany

14:00 V8
Extremer Dampfturbinenschaden einer 700-MW-DT – Eine Fallstudie
Extreme steam turbine damage of a 700 MW ST – A case study
M. Rziha, PPCHEM AG, Hinwil / Switzerland

14:30 V9
Mindestanforderungen für die Probenahme und chemische Überwachung von offenen Kühlkreisläufen
Minimum requirements for sampling and chemical monitoring of open-circuit cooling systems
L. Dittmar, SWAN Analytische Instrumente GmbH, Ilmenau / Germany; M. Nogales, Swan Analytische Instrumente AG, Hinwil / Switzerland

15:00 V10
Sauerstoffmessung im Kraftwerk im ppb Bereich. Ein Vergleich amperometrischer und optischer Verfahren
Dissolved oxygen measurement in power plants at ppb level.
A comparison of amperometric and optical methods
S. Kamdideh, Hach Lange GmbH, Düsseldorf / Germany

15:30 V11
AutoFlow®-Ventile zur automatischen Durchflussregulierung an WDK-Probenahmen
AutoFlow® valves for automatic flow regulation in SWAS sampling
H. Woizick, RheinEnergie, Köln / Germany; F. Hilgers, Dr. Thiedig GmbH & Co. KG, Berlin / Germany

16:30 V12
Anwendung von filmbildenden Aminen in Elektrodenkesseln zur Korrosionskontrolle
Application of film-forming amines in electrode boilers for corrosion control
R. Wagner / REICON Wärmetechnik und Wasserchemie Leipzig GmbH, Leipzig / Germany

vgbe-Chemiekonferenz 2025
vgbe Conference Chemistry 2025

28. bis 30. Oktober 2025, Kassel | mit Fachausstellung
28 to 30 October 2025, Kassel, Germany | with Technical Exhibition

17:00 V13
E-Kessel: Die unterschiedlichen Anforderungen an die Speisewasserqualität je nach E- Kesseltyp – Kann das Rohkondensat aus einem Industriebetrieb diese Anforderungen ohne Aufbereitung erfüllen?
E-boilers: the different requirements for feed water quality depending on the type of e-boiler – Can the raw condensate from an industrial plant meet these requirements without treatment?
C. Holl, HYDRO-ENGINEERING GmbH, Mülheim / Germany

17:30 V14
The adverse effects of film-forming substances on analytical instruments and tactics for mitigation
Die nachteiligen Auswirkungen filmbildender Substanzen auf Analysegeräte und Taktiken zur Abschwächung
J. Guy, Waltron Bull & Roberts, LLC, USA

19:00 – 22:30
Abendveranstaltung
Die Abendveranstaltung findet im „The Shamrock Irish Pub“ mit freundlicher Unterstützung der ***Kurita Europe GmbH*** *und der* ***ECOLAB–Purolite Resins*** *statt.*
Evening Event
The evening event will take place in the „The Shamrock Irish Pub“, kindly supported by ***Kurita Europe GmbH*** and ***ECOLAB–Purolite Resins.***

DONNERSTAG, 30. OKTOBER 2025
THURSDAY, 30 OCTOBER 2025

8:30 V15
Wie sich die VE-Produktion in den letzten Jahren verändert hat – was Chemieparks schon tun, funktioniert auch bei Ihnen!
How VE production has changed in recent years – what chemical parks are already doing will also work for you!
D. Mauer, MionTec GmbH, Leverkusen / Germany

09:00 V16
Pilot-scale investigation and research on the reduction of organic matter and ozone disinfection in treated urban wastewater (used as power plant feed water)
Pilotmaßstäbliche Untersuchung und Forschung zur Reduktion von organischem Material und Ozon-Desinfektion in aufbereitetem städtischem Abwasser (verwendet als Speisewasser für Kraftwerke)
M. Ghazimirsaeid, Siemens Sherkate Sahimi, M. Daneshvar, Elnaz Hosseini, Ozon ab, Tehran, M. Hemmati, Karaj / Iran

09:30 V17
The role of water treatment in ensuring robust and reliable green hydrogen production via PEM electrolysis
Die Rolle der Wasseraufbereitung für eine robuste und zuverlässige Produktion von grünem Wasserstoff mittels PEM-Elektrolyse
J. Bacardit, DuPont Water Solutions, Tarragona / Spain; M. Slagt, DuPont Water Solutions, The Netherlands

10:00 V18
Industrielle Kühlwasserbehandlung über funktionelle Mikroorganismen
Industrial cooling water treatment using functional microorganisms
L. Havighorst, Blue Activity GmbH, Heidelberg / Germany

11:00 V19
Zero liquid discharge in Kraftwerken – 50 Jahre von der Abfallentsorgung hin zur Wiederverwendung von Wertstoffen
Zero liquid discharge in power plants – 50 years from waste disposal to resource recovery
J. Henkel, DuPont Water Solutions, Rheinmünster / Germany

11:30 V20
Identifizierung von Chloridkorrosion und Vermeidung von Ausfallzeiten im Kühlwassersystem
Discover to identify Chloride corrosion and avoid downtime in the cooling water system
N. Rademacher, HACH LANGE GmbH, Düsseldorf / Germany

12:00 V21
Off-line-Methoden zur Reinigung der Kühlsysteme. Vergleich ausgewählter Methoden. Welche Methode empfehlen wir, um eine gründliche Reinigungswirkung zu erzielen und gleichzeitig wirtschaftlich zu sein?
Offline methods for cleaning of cooling systems. Comparison of selected methods. Which method can we recommend to achieve a thorough cleaning effect while also being economical?
C. Badura, Ecol Sp. z.o.o., Rybnik / Poland

13:30 V22
Establishing a reliable chemistry baseline for flexible operation: Lessons from HL-Class CCGT
Etablierung eines verlässlichen Chemie-Baselines für den flexiblen Betrieb: Erkenntnisse aus Tests an einer HL-Klasse GuD-Anlage in überhitzten Dampfkreisläufen über 600 °C
M. Jansen, Anodamine Europe BV, Helmond / The Netherlands

14:00 V23
Wasserstoff als potentieller Energieträger: Hochlauf der Produktion von synthetischen Kraftstoffen und Grundstoffen
Hydrogen as a potential energy carrier: ramping up the production of synthetic fuels and base materials
J. Kottsieper, ILF CONSULTING ENGINEERS GERMANY GMBH, München / Germany

14:30 V24
Control of Mercury in gas emissions from coal-fired plants with mercury control technology
Kontrolle von Quecksilber in Gasemissionen aus Kohlekraftwerken mit Quecksilberkontrolltechnologie
L. Barre, NALCO WATER, Bagneux / France; Lukas Pilar, Czech Technical University, Prague / Czech Republic

15:00
Schlusswort – Ende der Vortragsveranstaltung
Closing speech – End of conference

Online-Anmeldung | Registration

https://register.vgbe.energy/21125/

Fachausstellung | Technical Exhibition

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Practical Information

VENUE
Kassel Kongress Palais
Holger-Börner-Platz 1
34119 Kassel / Germany
https://kongress-palais.de/

CONFERENCE LANGUAGES
German and English (with simultaneous translation)

REGISTRATION
Please make your registration online:
https://register.vgbe.energy/21125/

CONDITIONS OF PARTICIPATION

vgbe members	€ 820.00
Non-members	€ 980.00
Universities, authorities, retired	€ 480.00

CONFERENCE DOCUMENTS / PUBLICATIONS
A conference programme, including a list of participants, will be handed out to the conference participants. The lectures will be available for download following the event. A separate e-mail will be sent to inform you of this.

GET TOGETHER
Tuesday, 28 October 2025 at 18:00
Swan Systems Engineering invites all participants to a Get Together in the exhibition area.

EVENING EVENT
Wednesday, 29 October 2025, 19:00 – 22:30
The evening event will take place in "The Shamrock – Irish Pub" kindly supported by **Kurita Europe GmbH** and **ECOLAB–Purolite Resins**.

HOTEL RESERVATION
A limited number of rooms have been set up in the H4 Hotel Kassel, directly next to the Kongress Palais.

WEBSITE OF THE CONFERENCE
w https://t1p.de/vgbe-chem25 (external shortlink)

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