

PRESS BRIEF

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Linde at IFAT 2002:

Environmentally-friendly purification of water with industrial gases

Munich-Höllriegelskreuth, Germany, May 2002 – Industrial gases have proven to be highly effective, environmentally-friendly water purification agents. At the Gas und Engineering division of Linde AG, application engineers are constantly looking for new ways to enhance drinking, process and waste water with industrial gases. All research work is underpinned by Linde's commitment to achieving the highest standards of quality and safety with environmentally sound, economically-viable treatment processes.

Conditioning drinking and process water with oxygen
The enrichment of untreated water with pure oxygen (O₂) can go a long way towards achieving high-quality drinking water. O₂ removes undesirable components such as iron (II), manganese (II) and ammonium ions as well as organic impurities. An O₂ concentration of about 6 mg/l also protects water pipelines against corrosion.

Linde developed the SOLVOX® family of injection systems for effective water conditioning with O₂. This product line is constantly being evolved and optimised in line with customer needs. Depending on requirements, O₂ gas can be injected into the water

For copies, please contact:
MM Mertig Marktkommunikation
Nymphenburger Str. 81, 80636 Munich, Germany
Tel.: +49 (0) 89 / 12 66 69-0 • Fax: +49 (0) 89 / 12 66 69-15

Contact at Linde for editorial queries:
Tel.: +49 (0) 89 / 74 46-11 58 • Fax: +49 (0) 89 / 74 46-12 30

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line using nozzles or stainless steel reactors. The use of pure O₂ instead of air significantly improves the water quality and taste, at the same time increasing the performance of the filter system.

Treating process water with O₂

Surface water is often used for cooling and cleaning purposes in power stations and manufacturing facilities. This water is often contaminated with organic, biodegradable substances, however. The anaerobic, bacterial decomposition of these organic substances produces an offensive odour and presents corrosion problems. These problems occur in particular in circulated cooling systems in power stations and networked waterworks with long retention periods on certain stretches. The injection of pure O₂ into the cooling water system or waterworks creates an aerobic balance, preventing the formation of strong odours and corrosive substances or ensuring that they are immediately oxidised.

Establishing the lime/carbonic acid balance with carbon dioxide

Carbon dioxide (CO₂) is ideally suited to re-establishing the right balance between lime and carbonic acid in the treatment of drinking water. If there is an imbalance, water either causes corrosion

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due to aggressive carbon dioxide or it calcifies pipelines and fittings due to lime precipitation. The injection of CO₂ is an effective way of accurately adjusting the pH value without the risk of salt formation.

CO₂ is also ideally suited to balancing the lime/carbonic acid content after rapid decarbonisation or the addition of lime milk to harden the water. The slightly acidic properties of CO₂ allow for easy, accurate adjustment of the pH value.

Linde Gas developed the SOLVOCARB® family of injection systems for the efficient enrichment of water with CO₂. The gas can be injected by means of a nozzle or a reactor. CO₂ eliminates the safety and corrosion problems associated with aggressive mineral salts.

Effective water well regeneration with FRESH FLOW®

A water well's capacity for ground water extraction decreases over time due to the sediment build-up in filter pipes and filter gravel. This can be caused by mechanical, biological or chemical factors. Regular cleaning is essential to ensure optimum water extraction over time. Now available on the German market, Linde's patented FRESH FLOW® process enables cost-effective, efficient cleaning by means of CO₂. This natural process has been successfully deployed for several years in the USA and Netherlands. The well must first be emptied (i.e. all water must be

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drained). This is achieved by feeding gaseous CO₂ into the well pipe which has been sealed on top. Frozen, liquid CO₂ (-78°C) is then injected. This freezes the humidity remaining in the filter gravel. The resulting ice crystals require more space than the unfrozen water, thus displacing all deposits and sediment from the filter pipes and filter gravel. At the same time, the liquid CO₂ warms up and evaporates. This causes a certain amount of movement which facilitates the sediment displacement process. This procedure is repeated as often as necessary until all deposits have been removed. The water can then flow back into the well. Any remaining sediment deposited in the gaps between the gravel is rinsed away. These are removed from the well by means of an airlift system. The remaining CO₂ escapes into the atmosphere.

The FRESH FLOW® procedure has been tested and approved by various national water associations in Germany. This proven technology is significantly more effective than comparable chemical procedures and has established itself as the solution of choice for many drinking and process water wells.

Removing oxygen from process water

Dissolved oxygen in boiler feed water can result in corrosion and holes due to the increased pressure and high temperatures. This compromises the safety and correct functioning of boiler systems. The German Safety Inspectorate (TÜV) thus prescribes a maximum

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dissolved oxygen level of 20 µg/l (= 20 ppb) in boiler systems. In the past, physical methods were used to eliminate oxygen. These were generally followed by chemical degassing using hydrazine. This approach is extremely energy-intensive and also questionable due to the toxic and carcinogenic properties of hydrazine. Linde Gas has developed an oxygen elimination system based on the catalytic reduction of the oxygen content using a palladium catalyser. The process is extremely cost-effective as it is almost stoichiometric. Membrane-based modules are also available for treating smaller quantities of water.

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