

# PRESS BRIEF

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## Linde at IFAT 2002:

### **Efficient, cost-effective treatment of waste water**

**Linde Gas  
Division**

Munich-Höllriegelskreuth, Germany, May 2002 – Industrial gases offer a variety of advantages in the treatment of wastewaters. They are cost-effective, environmentally friendly and highly efficient. They can help meet the growing challenges presented by the rising volumes of wastewaters and increasingly stringent statutory regulations.

#### Increasing the capacity of wastewater purification plants with pure oxygen

Oxygen (O<sub>2</sub>) plays an important role in most biological wastewater treatment processes. With conventional air-injection systems (with a low O<sub>2</sub> content), the aeration system accounts for a large portion of the purification plant's total electricity costs. The direct injection of pure O<sub>2</sub> can thus have a major impact on the efficiency of purification plants. Increased wastewater flow and stricter regulations often force plant operators to extend or convert existing plants. It is, however, difficult to increase the injection capacity of existing aeration facilities and extension of an existing purification plant is extremely costly.

To meet these challenges, the Gas and Engineering Division at Linde AG developed SOLVOX®. Successfully deployed by many companies for several years, this

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proven technology offers an attractive alternative to conventional injection systems.

SOLVOX®-B uses perforated injection hoses that are attached to mats on the tank floor. This process is particularly well suited to deep (or medium-depth) tanks. The SOLVOX®-I injection system is ideal for flat tanks. It ensures an efficient feed of O<sub>2</sub> and even distribution.

These systems are particularly beneficial in treatment plants that are subject to seasonal peaks. They can also bridge peak loads during modernisation or extension work.

## Use of O<sub>2</sub> in pressure pipes

Wastewater must be pumped to the treatment plant if it does not flow automatically as a result of a difference in height. The bacterial decomposition of wastewater passing through sealed pressure pipes rapidly consumes all available oxygen. Over time, the water in the pipe begins to decompose. The resulting hydrogen sulphide can cause unpleasant odours and sulphuric acid in the presence of dampness and certain bacteria. This causes pipes and fittings to corrode. SOLVOX®-D solves these problems by injecting pure O<sub>2</sub> by means of nozzles. The volume of O<sub>2</sub> is monitored around the clock (timers). SOLVOX®-D is particularly cost-effective to install and operate.

## Continuous feed of pure oxygen in treatment plants

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LINDOX® is an activated sludge process with oxygen aeration in covered, staged bioreactors. The reactor cover minimises oxygen losses. This process is particularly suited to applications requiring a continuous supply of pure oxygen due to the high installation overhead. LINDOX® is used for the biological purification of industrial and municipal wastewaters. Key advantages include low space requirements, optimum handling of peak loads, low energy consumption, minimum off-gas rate and the suppression of odours. The resulting sludge can also be easily thickened and dewatered.

Neutralisation of wastewater with carbon dioxide (CO<sub>2</sub>)  
Wastewater cannot be discharged into sewage systems unless its pH value lies between 7.5 and 9. This presents a problem for many companies, particularly those in the brewing, paper, leather and textile industries.

CO<sub>2</sub> can be fed to wastewater to achieve a pH value that complies with the statutory requirements. The resulting carbonic acid is an effective, environmentally-friendly neutralisation agent.

Linde has developed two cost-effective systems for feeding CO<sub>2</sub> to alkaline wastewater. With SOLVOCARB®-B, CO<sub>2</sub> is injected using perforated hoses. With SOLVOCARB®-R, reactors are used to inject the CO<sub>2</sub>. The use of CO<sub>2</sub> offers a number of advantages. On the one hand, SOLVOCARB® is a gentle neutralisation process, preventing the accumulation of

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problematic salts such as chlorides, sulphates and nitrates. On the other hand, the process is extremely cost-effective, low-risk and accurate (as the CO<sub>2</sub> can be precisely measured to achieve the desired pH value).

## Linde Engineering Division

### Wastewater purification plants

Linde Engineering also offers a range of effective products to treat wastewater.

The LINPOR® process makes use of a mobile carrier material consisting of plastic foam cubes of a high porosity. These are contained in a classic aeration tank featuring fine bubble diffuser aeration. Microorganisms will grow on the carrier material in high concentration. Because virtually all proven and standardised structural and mechanical facilities of the conventional activated sludge process may be used without modifications, this process is ideal for both of new plants and the modernisation and extension of existing activated sludge systems. Additional structural work is often unnecessary in this case.

The anaerobic pre-treatment of highly polluted wastewaters is an economically-efficient purification step because the organic constituents are converted into a useful, energy-rich biogas. Linde offers a variety of reactor systems for these applications. Deployed worldwide, Linde's LARAN® technology is widely acclaimed for its pre-treatment capabilities.

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The LARAN® loop reactor is ideally suited to large-scale purification plants. This reactor is as effective in treating wastewater as it is in digesting sludge.

Wastewaters containing heavy metals, such as those produced by the printed-circuit board, electroplating and electrical industries, can be successfully treated with the biosorptive METEX® process. METEX® eliminates the need for expensive and harmful chemicals. The contaminated wastewater is pumped upwards through an anaerobic sludge bed. The heavy metals are retained in the sludge bed through a combination of sorption and precipitation. The service life of the reactor filling normally extends over several years. It may, however, be worthwhile to periodically recover valuable heavy metals as the concentration in the sludge bed rises.

With more than 50 operative plants, Linde has gathered extensive experience in the treatment of sludge – pre-thickening, stabilising and final dewatering included. Successful applications range from dewatering of inorganic and organic sludge using decanters and centrifuges to proprietary biological sludge stabilising solutions.

Linde Engineering has gathered dedicated know-how through long-term, hands-on experience particularly in the refinery, petrochemical, coking, and pulp and paper industries. It deploys a variety of processes such

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as precipitation/flocculation, flotation, filtration, stripping, adsorption and chemical oxidation to meet the specific needs of these industries.

These processes can be combined in cases where wastewater problems cannot be solved with a single standard process due to the wastewater properties, the purification requirements or local conditions. Upstream treatment has also proven highly successful in these cases.

Over 400 reference sites of varying size and complexity worldwide bear testimony to the reliability and excellence of Linde technology. These plants range from pre-treatment and partial purification to the production of usable water. Depending on individual needs, Linde offers cost-effective solutions for extending and modernising existing plants or the construction of turn-key multi-stage plants – even at difficult locations. To date, Linde has installed turn-key plants and process stages for wastewater treatment for populations ranging from 10,000 to 12,500,000.