



Quality and environment hand in hand

Industrial gases optimise paper
production



Our processes – as diverse as your tasks

From the finest handmade paper to daily newspapers – paper is produced in a wide range of qualities for a diverse range of applications. However, all types of paper have one thing in common. In addition to the raw materials of wood or recycled paper, paper production also requires large amounts of water, energy, chemicals and various process materials.

Here, know-how and gases from Messer offer alternatives that are both environmentally friendly and efficient.

Precise pH control protects against bacteria and microbes

Mixtures consisting of recycled paper and water are stored in large storage tanks. Long retention times and increased temperatures result in a high level of microbiological activity. Acid-forming bacteria lead to a lowering of the mixture's pH, resulting in the dissolution of solid calcium carbonate – a filler in the papermaking process – and the formation of free calcium. This is very reactive and leads, among other things, to the formation of calcium sulphate and unwanted deposits, so-called macrostickies. Furthermore, the chemical reactions can have a negative influence on the whiteness of the paper.

With CO₂ and know-how from Messer, the growth of microbes can be inhibited in a natural way. The process has a positive impact on the quality of the paper while at the same time being kind to the environment since Messer obtains most of the CO₂ from industrial waste gas. In the aforementioned example, it is completely dissolved in the water. This represents a major opportunity for paper mills to reduce their "carbon footprint" throughout the entire process chain.

The advantages at a glance

- Environmentally friendly method of pH control
- Reliable suppression of microbiological activities
- Prevention of unwanted deposits and quality loss
- Complete dissolution of CO₂ in the process
- Low operating costs
- Low space and personnel requirements

Removing "stickies" from recycled paper with liquid CO₂

Stickies is the term used to describe sticky substances in recycled paper, such as book-binding adhesives and post-it notes. These stickies become a problem when recycling waste paper: during paper drying, they cause production disruptions on paper machines, with residue on the rollers and dry screens leading to holes in the paper or even tears on the paper machine.

Previously, stickies were removed with the aid of chemical substances. Messer offers an environmentally friendly, patented process that involves adding liquid CO₂ to the waste paper treatment process. The CO₂ then turns into dry ice. The coldness of the dry ice causes the stickies to debond, enabling them to be removed without causing any damage. This effect works with both microstickies (< 100 µm) and macrostickies (> 100 µm). The method can also be used in the mechanical pulp and cellulose production processes to remove resins. The liquid CO₂ requirement is 2-6 kg per tonne of waste paper, making the process also economically very attractive.

The advantages at a glance

- Environmentally friendly process
- Increased productivity
- Prevention of machine disruptions or failures
- Reduction of maintenance work
- Improved paper quality





Dewatering of the pigment suspension

Clean pipes! CO₂ anti-scaling prevents calcium carbonate deposits

During paper production, calcium carbonate is produced, forming deposits in the plant's pipes and leading to possible production disruptions. Previously, chemicals were used to solve this problem. Messer offers an efficient and environmentally friendly CO₂ anti-scaling alternative, which ensures that the pH of the wastewater can be lowered and maintained in a targeted manner. In this process, CO₂ alters the carbonate equilibrium and converts calcium carbonate [CaCO₃] into the soluble salt calcium bicarbonate CA(HCO₃)₂. This salt quickly dissolves in water, thereby reliably avoiding deposits in the pipes.

Practical example: Reducing the consumption of drinking water

The efficiency of this process is demonstrated by its use in a Spanish paper mill. To operate the vacuum pumps on two paper machines, which ensure dewatering of the treated waste paper, around 1,209,600 m³ of fresh water (drinking water) was required annually. This equates to the annual drinking water consumption of approximately 6,000 four-person households.

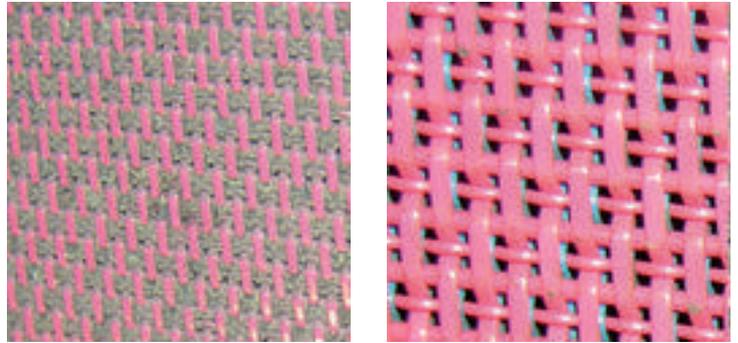
The use of CO₂ has made it possible to use wastewater instead of fresh water. The CO₂ is added to the wastewater, where it regulates the pH level, thus preventing lime deposits within the pumps that can disrupt operation.

The advantages at a glance

- Environmentally friendly process
- Precise pH control
- No handling of hazardous, aggressive acids
- No corrosion problems
- No investment costs for acid storage
- Low operating costs

Cleaning with CO₂: clean and environmentally friendly

In the paper production process, residues are deposited on various carrier surfaces, e.g. screens, cylinders or felts. In most cases, these are removed with solvents. Here, cleaning with CO₂ offers two efficient and environmentally compatible alternatives.



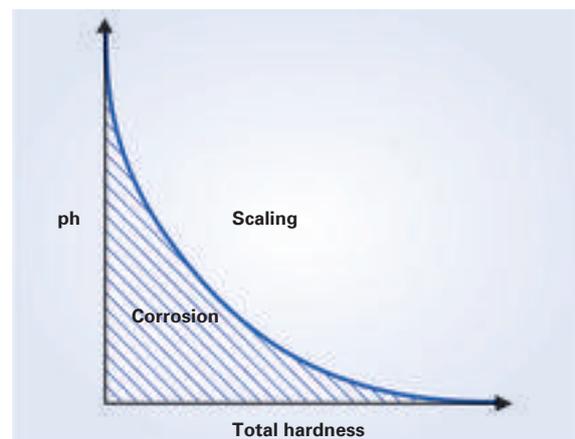
Dry screen before and after cleaning with CO₂

One of these is dry ice blasting. This cryogenic cleaning method involves solid carbon dioxide pellets (dry ice) being blown, by means of compressed air, onto the object to be cleaned. As a result of the "cold shock", the dirt contracts, becomes brittle and breaks loose from the surface. The residues are then removed by the subsequent dry ice pellets by means of their kinetic energy and without causing any damage. For this application, Messer supplies the dry ice as well as isothermal storage vessels, a complete range of dry ice blasting machines and, where there is a continuous requirement, a pelletiser for on-site dry ice production.

The second possibility for cleaning with CO₂ is our "online" cleaning system. It uses liquid carbon dioxide, for example, to continuously clean felts in the dry section without moisture formation and without the use of conventional chemicals.

The advantages at a glance

- Rapid, uncomplicated process
- No solvents
- No blast medium residues
- No water, no moisture
- Low environmental impact

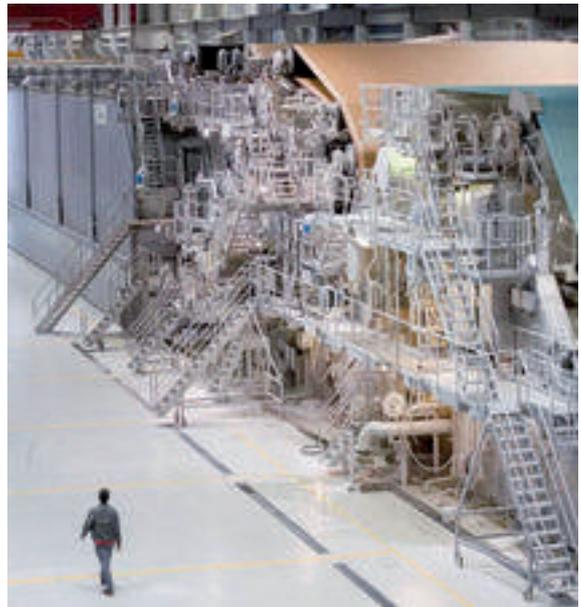


Graph showing how CO₂ anti-scaling lowers the pH of the wastewater, thereby preventing deposits in the pumps.

Open a new chapter in your paper production

Industrial gases from Messer are kind to the environment and can optimise a large number of processes within paper production, thereby contributing to high-quality products and more cost-effective production processes:

- Neutralisation of wastewater with CO₂ – the environmentally friendly, safe and cost-effective alternative to hydrochloric or sulphuric acid
- Partial oxygenation of purification plants – increased performance with pure oxygen:
- Wastewater treatment with the BIOX[®]-N process – facilitate biological processes in nitrification and denitrification in a natural way:
- Oxygen injection systems for wastewater – from aeration hoses and oxidizers to injector nozzles (partial oxygenation jet) – the optimum solution for every application:
- Ozone production from pure oxygen – an appropriate and particularly economical solution:
- Inerting of paper warehouses or tanks – a simple and efficient way of reducing fire hazards:
- CO₂ power wash – pulp washing with CO₂ – reduce the use of chemicals in pulp production:
- Pulp bleaching with oxygen or ozone – tailor-made and environmentally friendly solutions for pulp producers



Gases and know-how from Messer optimise many areas of paper production.

If you have any questions regarding our tailor-made processes for the paper industry or would like an individual consultation with our application experts, please do not hesitate to contact us.

You can also download this brochure and many others in PDF format from our website at: www.messergroup.com



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