



We create chemistry

MOVING FORWARD WITH FARMING – THE BIGGEST JOB ON EARTH

Let's move forward together

Working to reduce
environmental impact

In line with the conservation principle of “Avoid, Recover, Recycle and Reuse”, BASF is leading the way in reducing impact to the environment. We support Responsible Care®, a voluntary initiative that strives for continuous improvement in care of the environment as well as health and safety. This is all part of our commitment to create chemistry for a sustainable future and leave a positive legacy for future generations.

We pledge to share our expertise and know-how. We know that there is more to do. We care passionately about the environment and are committed to continuing this journey.

Leading the Way in Waste Management

Change for the better

Our Schwarzheide site in Germany generates significant volumes of mixed aqueous brine – a concentrated solution of industrial salts – as a by-product of the manufacturing process. Previously, in line with industry best practice, the brine was collected and treated in evaporation plants and then incinerated at third-party facilities. While this eliminated potential contaminants from the brine, both processes were high in energy consumption. The incineration plants then discharged the treated solution to adjacent rivers.

As a company, we strive continuously for innovation and improvement, and are relentless in applying the highest possible standards. True to that vision, in 2016, we designed a new brine waste treatment process, leveraging state-of-the-art recovery and recycling technology.

Fast forward to today: using sophisticated pipeline networks, two waste streams – bromide brine and sulfate brine – are now separated on site and processed by external waste recovery specialists, enabling us to convert waste products into valuable raw materials that can be re-used.

Schwarzheide



Recycling Sulfate Brine

■ Using sulfate brine to stabilize old salt mines

The sulfate brine is chemically treated at ambient temperatures with other waste streams from the galvanizing industry to reduce organic by-products. Once the remaining sulfate brine is combined with fly ash (a separate material, generated in large quantities as a by-product of industrial incineration), the mixture settles like concrete, making it ideal for stabilizing old salt mines.

■ Helping to prevent subsidence

Why is this so important? Disused salt mines can become unstable and prone to erosion and subsidence. Collapse of the ground around the mouth of the mine can shift stress towards more confined rock. Pillars breaking off can trigger tremors, damage surface geology or in extreme cases, rupture the entire mine. Sudden sinkholes are a serious threat to human life and property.

■ Minimizing environmental impact

In Germany, the law states that all depleted underground salt mines must be stabilized. A conventional method is to mix fly ash with surface water and use it as a stabilizing material. However, the combination of fly ash and sulfate brine has now been approved by the authorities as a safe and cost-effective alternative that minimizes environmental impact.

■ Our new process at a glance

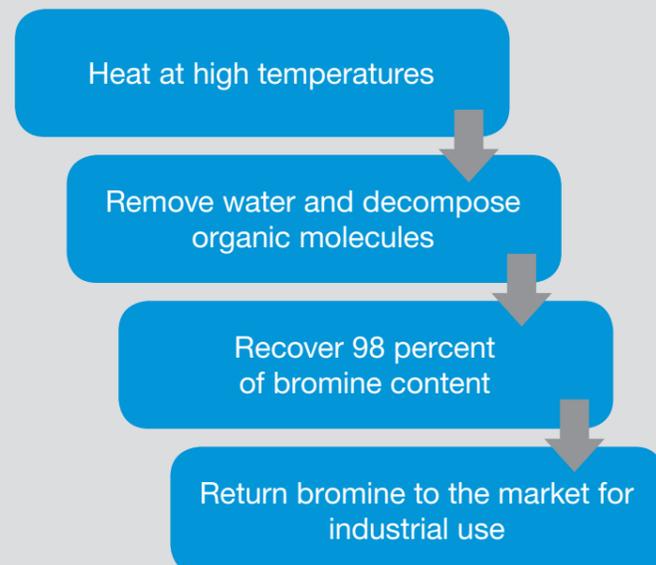


Fly ash being delivered to the disused salt mine

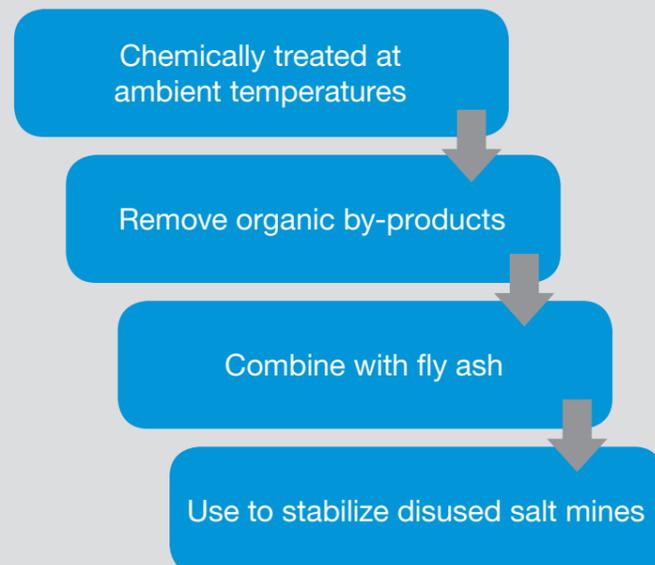


Stabilizing a disused salt mine with sulfate brine and fly ash mixture

Bromide Brine



Sulfate Brine



Recycling Bromide Brine

■ Returning bromine to the market

The separated bromide brine stream is treated at high temperatures to remove water and decompose organic molecules. The residue then undergoes a recovery process.

The result, pure bromine, is returned to the market as a valuable raw material for industrial purposes. While this recycling process consumes energy, it is highly efficient as around 98 percent of the bromine content is recovered.

■ A win-win

In addition to recovering bromine as a valuable raw material, BASF is helping to:

- Replace cement as a stabilizing material, which reduces the energy consumed in cement production plus the associated greenhouse gas emissions;
- Significantly lower the emission of salts into rivers;
- Save energy and reduce the volume of emissions, generated from the incineration process;
- Prevent costly corrosion damage to incineration plant equipment by eliminating the need to incinerate aqueous waste brines;
- Save natural resources by using sulfate brine with the fly ash instead of surface water;
- Conserve natural sources of bromine, such as the Dead Sea, by using recovered product;
- Save energy on transportation as our recovery partners are located significantly closer to BASF than the incineration plants.

■ Living our commitment

We are the first company to deploy this technology in agrochemical manufacturing. Redesigning our waste management process demanded significant investment and is a tangible demonstration of responsible business in action. We see this as part of our commitment to minimize environmental impact and enable a more sustainable future.



■ Reaction from stakeholders

“Congratulations to the team! This new process is smart. Compared to incineration, separating waste streams for recovery and underground re-use reduces costs and lowers environmental impacts.”

Andreas Kleinke, Corporate Sustainability Strategy, BASF SE

“Traditionally, mine operators have stabilized depleted salt mines with a mixture of fly ash and valuable surface water. Now we have shown that sulfate brine is a good substitute for water and can be blended with fly ash to deliver a safe, cost-efficient and sustainable solution.”

Axel Schroth, European Waste Management, BASF SE

Did you know ...?

In 2017, BASF used the new waste management process to recover approximately

20,000 metric tons

of sulfate brine and bromide brine.



In 2014, the German cement industry used **92.5 million gigajoules** of fuel while electricity consumption was

3.57 terawatt hours.



Since 1990, BASF Schwarzheide has invested more

than **1.6 billion Euro**

in production facilities and infrastructure.



3.4 billion tons of cement

are produced annually across the world.



Worldwide, cement production is responsible for

5%

of all man-made carbon dioxide emissions.

Replacing cement with one ton of fly ash mixture would avoid

0.8 tons of CO₂-equivalent greenhouse gases,

save **376 liters** of water



and reduce emissions equal to **0.2** passenger cars not driven for one year.



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