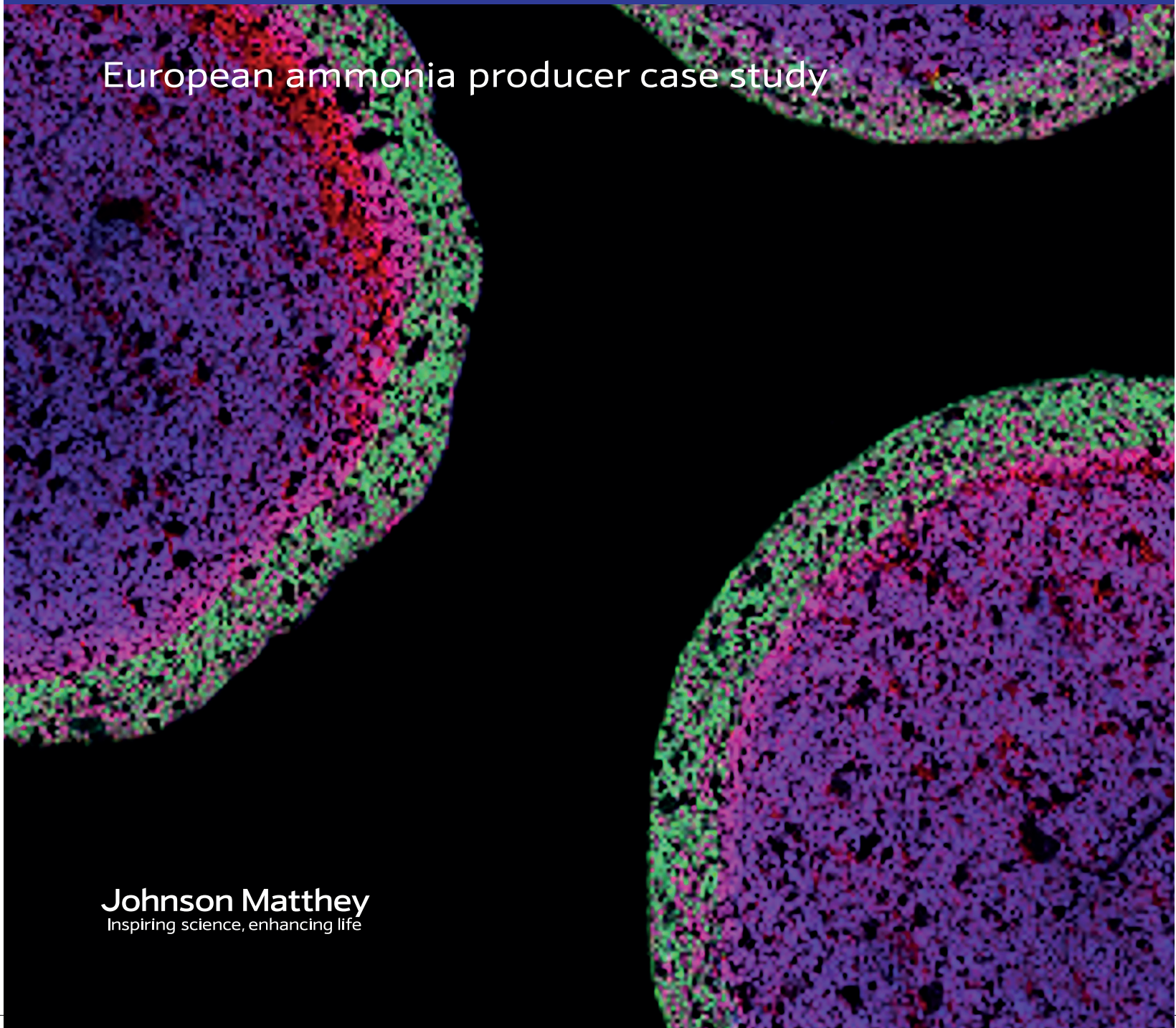


# JM

## Improving purification life with **KATALCO 33-1**

European ammonia producer case study

**Johnson Matthey**  
Inspiring science, enhancing life



# KATALCO 33-1 performance

## Background

Feedstock purification in an ammonia plant is a key process as it ensures the efficiency of downstream catalysts. If this step is not carefully managed, catalysts can be poisoned which can lead to significant costs in down-time while the plant is cleaned, and, also while the expensive catalysts are replaced. By using purification catalysts with high activity and excellent absorption capabilities, the lives of downstream catalysts are maximised.

The most common catalyst poisons found in ammonia plants are sulphur and its derivatives such as hydrogen sulphide, carbonyl sulphide and mercaptans. Most plants operate a two-stage sulphur removal process. In the hydrodesulphurisation (HDS) stage, the organic sulphur compounds are catalytically converted to liberate sulphur as hydrogen sulphide (H<sub>2</sub>S). The second stage is the removal of this hydrogen sulphide using absorbents based on zinc oxide (ZnO). In certain plants an ultra-purification stage can be used to reduce the sulphur content of the feed to extremely low levels.

## The customer and Johnson Matthey's solution

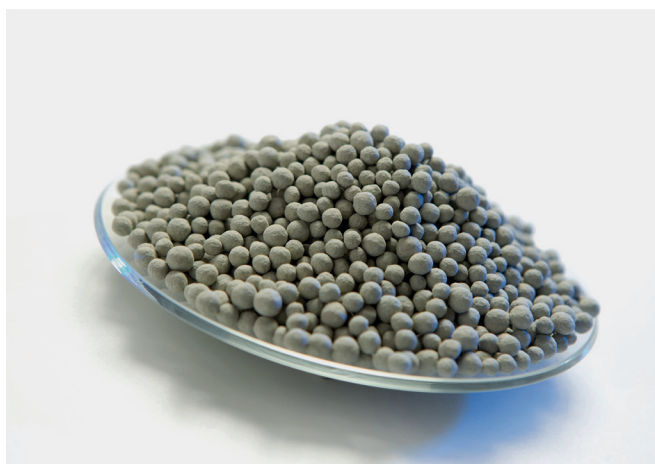
The customer is a leading producer of agricultural and industrial chemical products and solutions in Europe. One of the chemicals it produces is industrial ammonia which is used as a raw material for fertilizers as well as being used in the production of other products such as urea and nitric acid.

With a growing global population and the increasing need for food, demand for ammonia is high. It is vital that this customer continues to meet these increased demands by running efficient plants and optimising production of ammonia using catalysts.

The ammonia plant has two purification vessels which previously contained a HDS catalyst and two types of ZnO absorbent which needed emptying and replacing every 4½ years. This led to significant downtime while the vessels were cleaned, and the catalysts replaced.

In 2021, this ammonia producer decided to replace the two-stage sulphur removal catalyst process for one stage using KATALCO™ 33-1.

KATALCO 33-1 has combined functionality providing; hydrodesulphurisation, H<sub>2</sub>S removal, and ultra-purification, to provide a total sulphur removal capability yielding less than 10 ppbv (< 0.01 ppmv) H<sub>2</sub>S slip.



The KATALCO 33-1 formulation is proprietary, using promoters, with ZnO, and binders.

KATALCO 33-1 will deliver reliable performance and long predictable lives.

The material does not require sulphiding to activate the HDS functionality. In addition, no reduction step is required; it will reduce and activate as recycled hydrogen is brought on line as part of the normal plant start-up.

The customer's decision to use KATALCO 33-1 was based on extending the catalyst's life; by using the same catalyst in both vessels, it doubled the life of the catalyst to 8 years. However, this decision also resulted in many other significant benefits:

- Simplicity in loading and operation
- Flexibility of use of the two vessels, i.e., if one is down, you can use the other or you can use both vessels
- Reduction in the volume of catalyst required from approximately 45m<sup>3</sup> to 34m<sup>3</sup>
- Long lifetime so less downtime

# The benefits of using KATALCO 33-1

## Simplicity

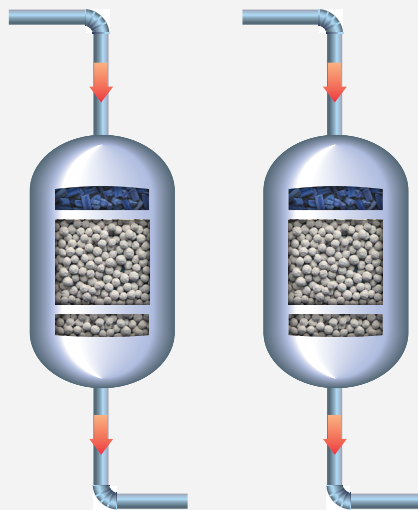
- A single catalyst combining HDS, H<sub>2</sub>S removal and ultra-purification
- A single product application for easier handling, loading and disposal
- No special procedures during start up and operation, with no need to pre-sulphide

## More from less

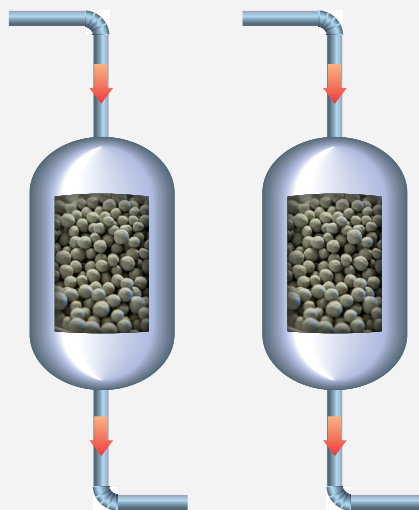
- Smaller installed purification catalyst volume for equivalent life
- Longer downstream catalyst lives due to improved protection
- Capex and Opex saving for new and existing units

## Security

- Improved catalyst protection by assured removal of simple organic species such as Carbonyl sulphide, Tetrahydrothiophene and Dimethyl sulphide



Product	Vol, m <sup>3</sup>	Lifetime	Years
KATALCO 41-6 – HDS	25	1976 -> 2021	47
KATALCO 32-5 – High density ZnO	17.5	2017 -> 2021	4
KATALCO 32-4 – Low density ZnO	3.1	2017 -> 2021	4



Product	Vol, m <sup>3</sup>	Lifetime	Years
KATALCO 33-1 – 3 in 1	34.5	2021 -> 2029	8

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