Advanced Cyclone Systems

EMISSION CONTROL

CASE STUDY

NTE Process | Konin, Poland | 2021

Hurricane HR System
for powder capture after a lithium hydroxide spray dryer (51 000m³/h at140°C)

FOREWORD

ACS designed and supplied a Hurricane Cyclone System to maximize lithium hydroxide recovery from an Okawara spray dryer for **NTE Process** in Konin, Poland.

NTE Process is a single source provider of turnkey industrial plants, Industry 4.0 solutions, and process technologies for various sectors.

The final is client is **Johnson Matthey**, a global leader in sustainable technologies and specialty chemicals for over 200 years.

JM is a multinational company with operations in over 30 countries and more than 15,000 employees worldwide. In the financial year 2020/21, it generated a revenue of £15.7 billion.

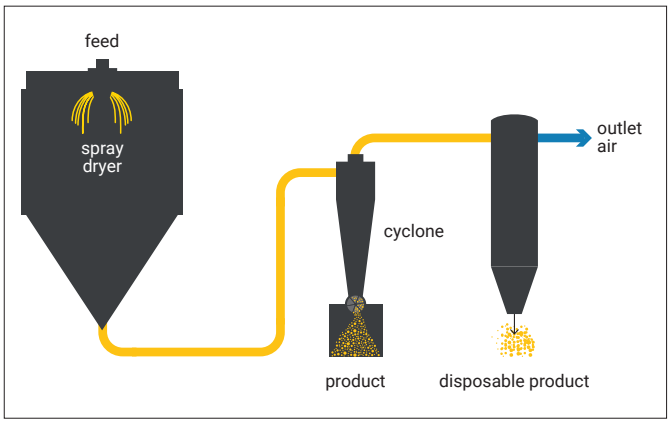


Fig. 1 – Process diagram

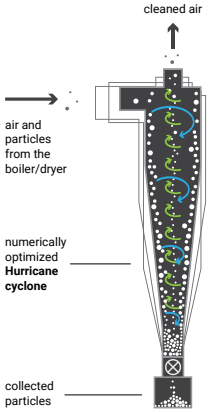
IDENTIFYING THE PROBLEM AND SOLUTION

Johnson Matthey were looking for maximum powder collection given the high value of the product. The goal was to capture over 98% of the total amount of spray dried lithium hydroxide, with the rest being captured in a bag house downstream.

All necessary operating conditions were provided, including PSD from the feed and final product tested in a pilot unit, air flow (51 000m³/h), temperature (140°C) and load into the cyclone (2200 kg/h).

ACS designed a set of 2 Hurricane HR cyclones, operating in parallel, to achieve the client´s demands. These are tried and tested process cyclones that have yielded excellent results time and again.

The cyclones were manufactured in SS316L and fully lined with alumina tiling on the inside, they were also insulated on site with 50mm rockwool.



ABOUT HURRICANE CYCLONES

Hurricane cyclones are patented numerically optimized cyclones. **Hurricane** geometries maximize powder collection for each different application, while minimizing reentrainment and keeping pressure drop at reasonable levels. Hurricane cyclones demonstrate impressive efficiency in capturing very fine powders with a Volume Median Diameter (VMD) of less than 5µm.

These cyclones are the output of nonconvex nonlinear problems formulated and solved after years of work in partnership with the Faculty of Engineering of Porto and incorporate the most recent findings on the impact of agglomeration in the cyclone collection efficiency (Chemical Engineering Journal 162 (2010) 861–876).

A single Hurricane is more efficient than any other known cyclone available in the market for the same pressure drop.

Fig. 2 – Hurricane cyclone

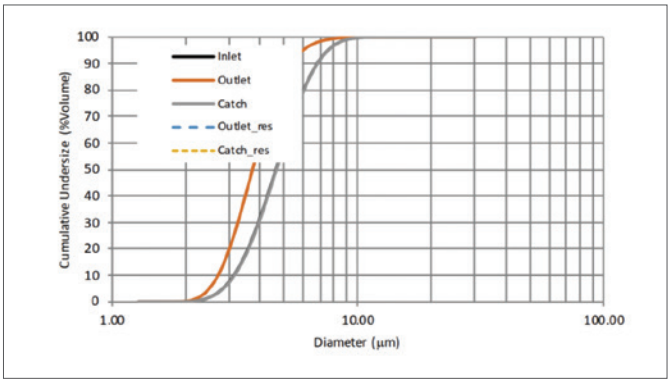


Fig. 3 - Particle size distribution used in simulations

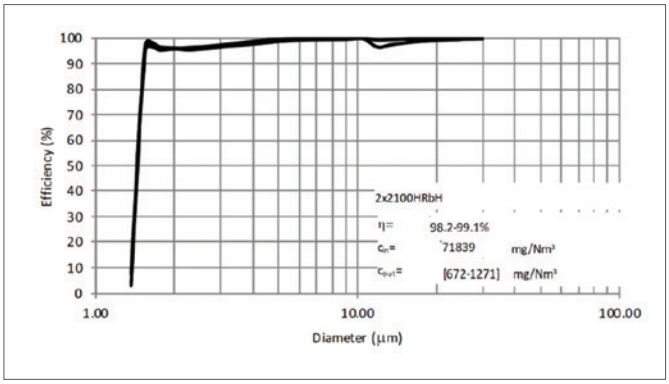


Fig. 4 – Predicted maximum and minimum grade efficiency curves with corresponding global efficiency values

DESIGN BASIS

- Powder **[Lithium Hydroxide]**
- Particle size distribution **[Fig. 3]**
- Temperature (°C) **[140]**
- Actual flow rate (m^3/h) **[51 000]**
- Inlet concentration (mg/Nm^3_{dry}) **[71 839]**
- Site location **[Indoors]**

SYSTEM SPECIFICATIONS | EMISSIONS

- Predicted efficiency with new Hurricane cyclone (%) **[98.2-99.1]**
- Expected emissions (mg/Nm^3) **[672-1271]**
- Powder recovery rate (Kg/h) **[7.4]**
- Expected total pressure drop (kPa) **[2.1]**

GENERAL ARRANGEMENT

The system is composed by 2 Hurricane cyclones ø2100mm installed in parallel, each one with a hopper above the air lock. All equipment was manufactured in stainless steel AISI 316L with alumina ceramic tiling for abrasion protection and rockwool insulation.

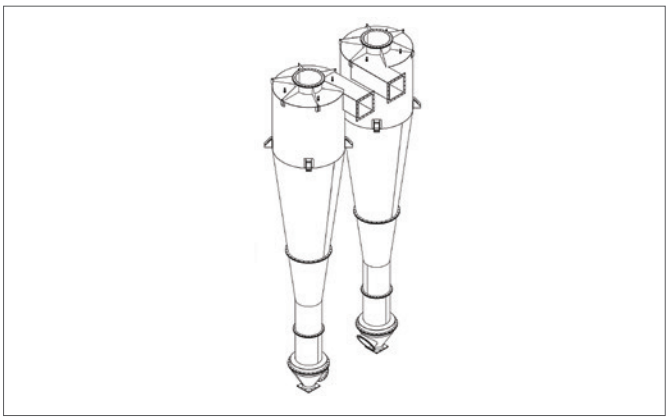


Fig. 5 – ACS solution [2 HR ø2100]