Advanced Cyclone Systems

EMISSION CONTROL

CASE STUDY

Eurosérum | Quimper, France | 2020

Hurricane RE Cyclones
for Premium Product Collection and Emission Control (98 317m^3/h$_{wet}$ at 70°C)



FOREWORD

Advanced Cyclone Systems designed and supplied a Hurricane Cyclone System to comply with emission limits and recover high value dairy ingredients downstream of a GEA dryer for Eurosérum.

Eurosérum is the world leader in demineralized whey powder, producing over 300 000 tons of dairy ingredients annually, across 11 plants in both France and the rest of Europe. Since 2011, Eurosérum has been a part of the SODIAAL group which is the 3rd largest dairy co-op in Europe and 5th worldwide.

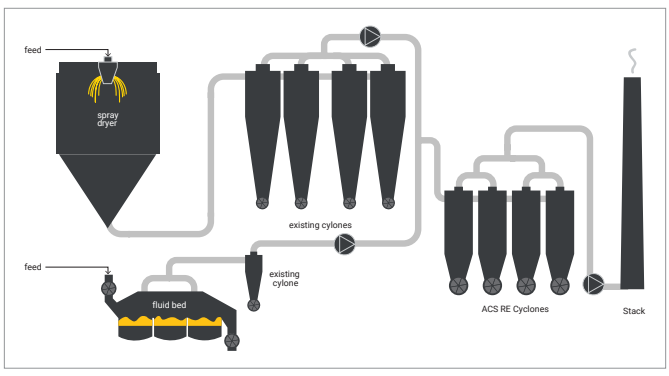

Fig. 1 – Process scheme

IDENTIFYING THE PROBLEM AND SOLUTION

The dryer is a traditional dryer with a fluid bed, 4 process cyclones and a 5th cyclone for the vibrofluidizer line. The product collected from all 5 cyclones was circled back to the FB for bagging. Fines escaping the cyclones were led to a WS to clean the air.

Since this plant produces premium demineralized whey powder used as an ingredient for infant and newborn nutrition, rising hygienic concerns and demands have precluded the use of a WS which is a health hazard. A baghouse would not be able to collect 1st grade product due to fiber and cross contamination.

Eurosérum needed, therefore, a solution for the low regulatory emission limits without compromising food safety and this is where ACS high end agglomerator cyclones can make the difference.

ACS supplied and installed ducting to bring the main line and vibro line together and carry it to a set of 4 new RE2900 cyclones to clean out the air and catch premium product. We also replaced 2 older fans, supplied a new one to overcome the pressure drop from the new cyclone system and installed the whole project at the client´s site in Brittany.

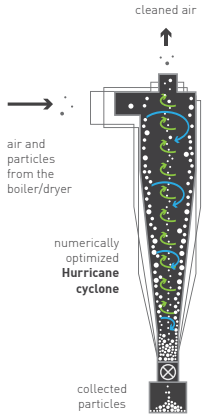

Fig. 2 – Hurricane Cyclone

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 efficiencies 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 recenet findings of 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.

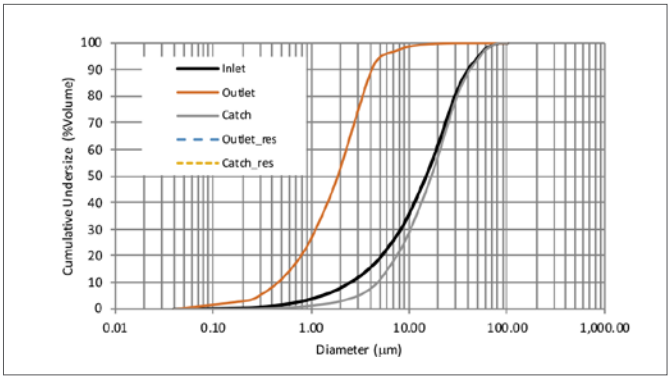

Fig. 3 - Particle size distribution used in simulations (Coulter)

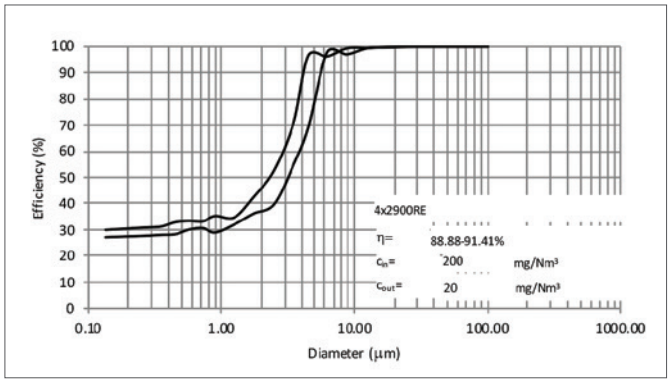

Fig. 4 – Predicted maximum and minimum grade efficiency curves with corresponding global efficiency values

DESIGN BASIS

- Powder **Demineralized Whey Powder**
- Particle size distribution **Fig. 3**
- Temperature (ºC) **65**
- Actual flow rate (Am^3/h_{wet}) **98 317**
- Normalized flow rate (Nm^3/h_{dry}) **75 913**
- Concentration into final system (mg/Nm^3_{dry}) **200**

SYSTEM SPECIFICATIONS | EMISSIONS

- Expected emissions (mg/Nm^3_{dry}) **20**
- Guaranteed emissions (mg/Nm^3_{dry}) **30**

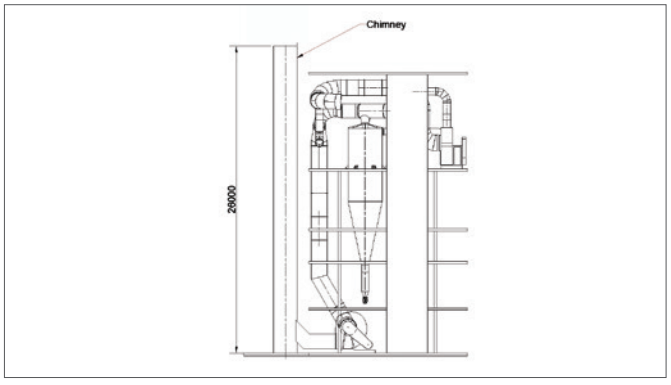

Fig. 5 – General arrangement of the Hurricane cyclone system

CONCLUSIONS

ACS has successfully supplied and installed this system, working closely with the client for design and engineering.

Eurosérum is already looking into purchasing another similar installation for a plant close by.