

Hurricane AT System for downstream Juice Powder Recovery of a bag filling machine (3 857m³/h at 30°C)



FOREWORD

On behalf of our newest client Tang, Advanced Cyclone Systems designed and supplied five Hurricane AT cyclone systems for soluble juice powder recovery from the dedusting system of the bag filling line. Tang is a drink mix brand that was formulated by General Foods Corporation in 1957 and first marketed in powdered form in 1959. The brand is currently owned by Mondelēz International, a spin off of Kraft Foods Inc.

Mondelēz is an American multinational confectionery, food, beverage and snack food holding based in Chicago (Illinois), with an annual revenue of about \$26 billion in over 160 countries.

Their international portfolio includes several billion/dollar components such as cookie and cracker brands Belvita, Chips Ahoy!, Oreo, Ritz, TUC, Triscuit, LU, Club Social, Sour Patch Kids, Barny, and Peek Freans; chocolate brands Milka, Côte d'Or, Toblerone, Cadbury, Green & Black's, Freia, Marabou, Fry's, and Lacta; gum and cough drop brands Trident, Dentyne, Chiclets, Halls, and Stride; as well as Tate's Bake Shop.

(The system was installed at the Mondelēz International Tang plant, in Curitiba, Brazil.)

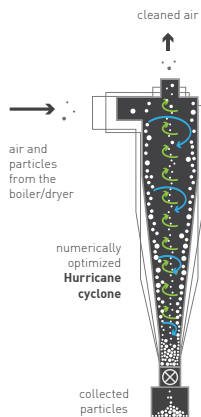
IDENTIFYING THE PROBLEM AND SOLUTION

This Curitiba plant has five machines to fill the Tang powder packs. A small portion of powder escapes the bags and flies away into the atmosphere. That powder is then exhausted through the dedusting systems installed at each machine and conveyed to a cartridge filter to clean the air before going out to the atmosphere.

This step is of importance because the product is contaminated and cannot be used which means that in the past Mondelēz was losing about 600kg of product per day across the five lines (about 120kg in each one). ACS designed and supplied five Hurricane AT systems - each composed by two Hurricane AT cyclones with a diameter of 530mm, a discharge hopper and a container to capture the collected powder.

It was a challenging project since there were some space and volume restrictions. We also supplied CIP nozzles along with the system as Mondelēz frequently changes the powder flavors and the system needs to be cleaned before the rotation.

By installing our system, Mondelēz is now able to reduce losses by about 99% - which means 600kg/day to 7kg/day.



ABOUT HURRICANE CYCLONES

Hurricane cyclones is patented numerically optimized cyclones. Its **Hurricane** design maximizes 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 recent 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 common cyclone available on the market for the same pressure drop.

Fig. 2 – Hurricane Cyclone

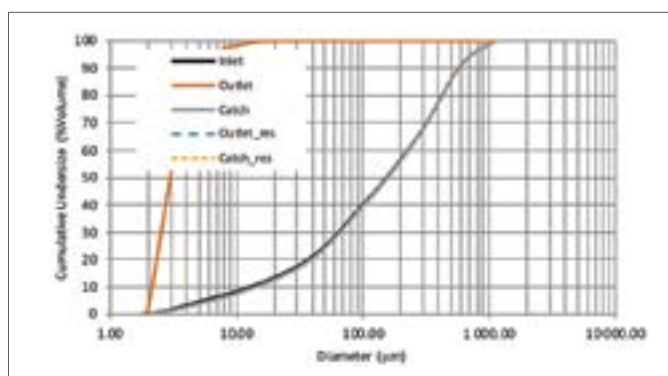


Fig. 3 - Particle size distribution used in simulations

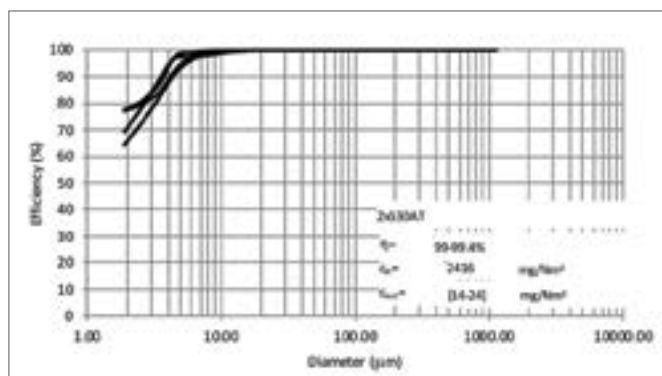


Fig. 4 – Predicted maximum and minimum grade efficiency curves with corresponding global efficiency values

DESIGN BASIS

- Powder **Soluble Juice Powder**
- Particle size distribution **Fig. 3**
- Temperature (°C) **30**
- Actual flow rate (m³/h) **3 857**
- Moisture content (% v) **0.1**
- Absolute pressure (Pa) **90 596**
- Powder concentration at inlet (Nm³/h) **2 416**
- Site location **Indoors**

SYSTEM SPECIFICATIONS | EMISSIONS

- Expected emissions (mg/Nm³_{dry}) **24**
- Guaranteed maximum emissions (mg/Nm³_{dry}) **30**
- Powder recovery rate (Kg/h) **7.4**
- Expected pressure drop (kPa) **1.47**

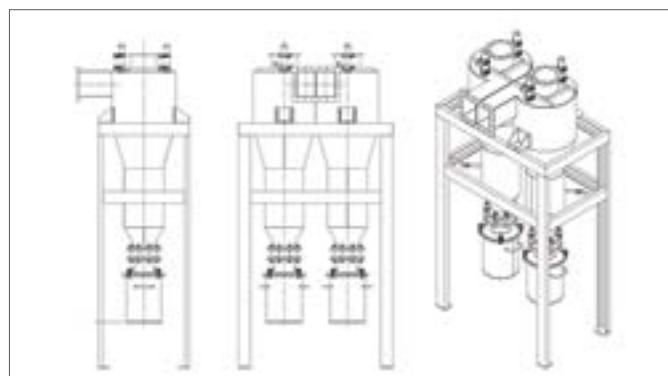


Fig. 5 – General arrangement of the Hurricane cyclone system

CONCLUSIONS

This project was a huge success. On the one hand, the client is recovering practically all the product that was lost before, around 200tons annually, which has had an immense economic impact on the company. On the other hand, the costs and frequency of maintenance on the cartridge filter decreased, reducing the downtime of the filling line.