

CASE STUDY

Actavis Elizabeth LLC | Elizabeth, New Jersey | 2015–2016

Hurricane HR System To Capture Pharmaceutical Waste Particles From The Combined Flow Of A Deduster And A Tablet Press Machine For Product Waste Compliance.



FOREWORD

Advanced Cyclone Systems (ACS), designed and supplied a total of 10 Hurricane Cyclones for Actavis Elizabeth LLC a former subsidiary of Allergan, plc. In August 2016, Teva Pharmaceutical Industries Ltd bought Allergan’s generic business (“Actavis Generics”) to strengthen their position in the US and global generic market*.

ACS has already supplied Teva directly back in 2012 with a Hurricane cyclone to improve a pharmaceutical product recovery after a spray drying process for their India manufacturing center in Gajraula.

For Actavis, ACS supplied 10 cyclones to capture pharmaceutical waste particles in the exhaust air stream from each tablet press room. After the installation of the first cyclone system in 2015, Actavis ordered 9 more at the beginning of 2016 in two different sizes for the two sizes of tablet presses.

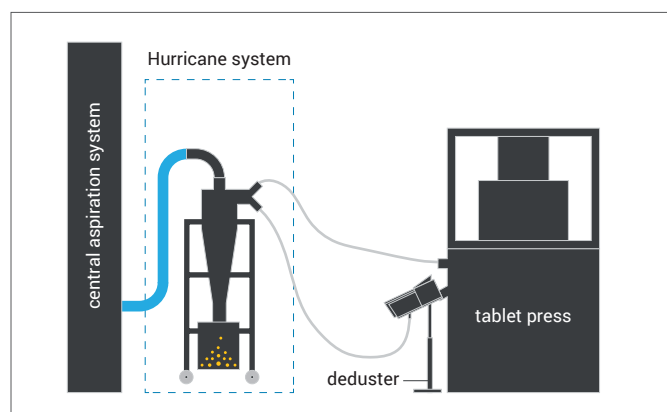


Fig. 1 – Process diagram

IDENTIFYING THE PROBLEM AND SOLUTION

Actavis Elizabeth LLC has a central aspiration dedusting system that combines the exhaust air flow from all tablet press rooms into a single barrier filter to capture the waste product from the pressing operation.

Having a cyclone system in each room allows Actavis to isolate the waste powder of each tablet press and dedusting set individually, making it possible to determine the waste of each machine separately.

To design the most compact system with the highest removal efficiency, Actavis provided the operating conditions and a sample of the pharmaceutical powder to ACS. Using ACS’s numerical simulation tool – PACyc (Particle Agglomeration in Cyclones), ACS designed 8 systems HR_TMØ275 for the smaller tablet presses and 2 systems HR_TMØ400 for the larger ones.

The system is comprised by a cyclone in AISI 316L, a catch pot in the same material with sight glass and a support structure with wheels for easy mobility. All pieces are attached with quick clamps for easy assembly. An additional quick clamp with 2 blind flanges is supplied to isolate the catch pot and the cyclone when they are separated for the catch pot to be emptied.

**Teva is the leading generics company in North America, where 1 of every 7 generic prescriptions in the US and 1 of every 6 generic prescriptions in Canada is filled with a Teva product. Teva is committed to the development and production of high-quality, affordable generic medicines for doctors, pharmacists, and most importantly, patients.*

ABOUT HURRICANE CYCLONES

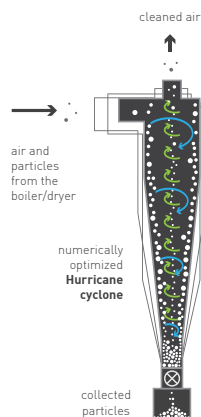


Fig. 2 – Hurricane Cyclone

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 $5\mu\text{m}$.

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 known cyclone available in the market for the same pressure drop.

DESIGN BASIS (SMALL CYCLONE Ø275)

- Fuel [Waste particles from a pharma tablet press and a deduster] [1096]
- Particle density used in simulations (Kg/m^3) [1096]
- Particle size distribution [Fig.3]
- Gas composition [Air]
- Temperature ($^{\circ}\text{C}$ | $^{\circ}\text{F}$) [Ambient]
- Total design actual flow rate (cfm | m^3/h) [245 | 416]
 - Actual flow rate (m^3/h | acfm) [45]
 - Normalized flow rate ($\text{Rm}^3_{\text{dry}}/\text{h}$) [200]
- Product load into cyclone (mg/m^3) [1222]

SYSTEM SPECIFICATIONS | RECOVERY (SMALL CYCLONE Ø275)

- Diameter (mm) [275]
- Material (all material in contact with the powder) [AISI 316L]
- Expected pressure drop (kPa) [1.8]
- Expected removal efficiency (%) [98.3-98.6]

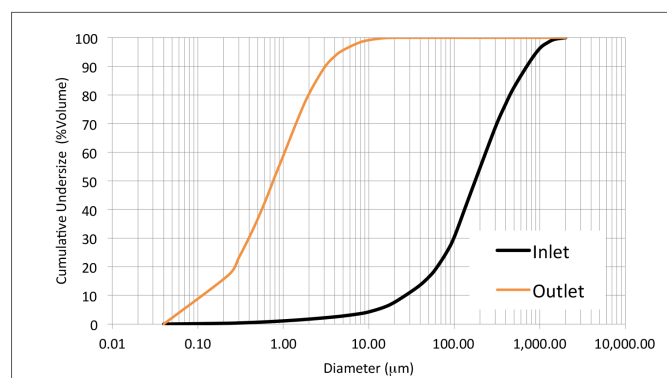


Fig. 3 – Particle size distribution used in simulation

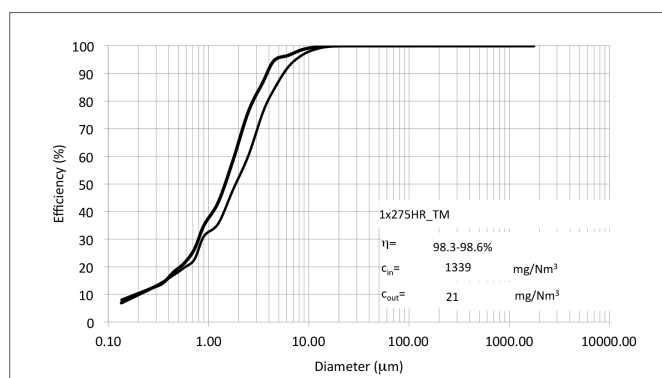


Fig. 4 – Predicted maximum and minimum grade efficiency curves with corresponding global efficiency values (small cyclone Ø275)

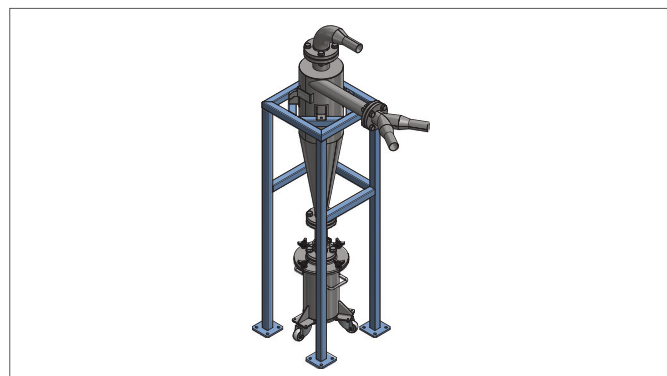


Fig.5 – General arrangement of the Hurricane cyclone system

CONCLUSIONS

The customer was very satisfied with the first system and the captured efficiency was on target. Working in close relationship with Actavis ACS further optimized the systems to Actavis specific needs in the second order.

ACS can manufacture the cyclones following the most stringent pharmaceutical requirements. When the product can be reused to increase production yield, ACS systems guarantees a product recovery without cross-contamination.