Advanced Cyclone Systems

EMISSION CONTROL

CASE STUDY

TAFISA | Quebec, Canada | 2018

Hurricane AT Cyclones to reduce particulate matter, silica and sparks before two rotary dyers (580 000m³/h at 500°C)

FOREWORD

ACS designed and supplied a Hurricane AT cyclone system comprised of 2 batteries of 6 cyclones with ø2800mm, aiming to reduce particulate matter, silica and sparks before 2 rotary dyers, totalizing a flowrate of 580 000m³/h at 500°C.

The system was installed at **Tafisa** in Canada, a subsidiary of **Sonae Indústria Group**, one of North America's largest particle board manufacturing facilities.

Since its inception in 1992, Tafisa has consistently pushed the boundaries of what is achievable with a relentless commitment to growth. Tafisa has quadrupled its production capacity, expanded its workforce from 60 to 325 employees, and solidified its position as an industry frontrunner.

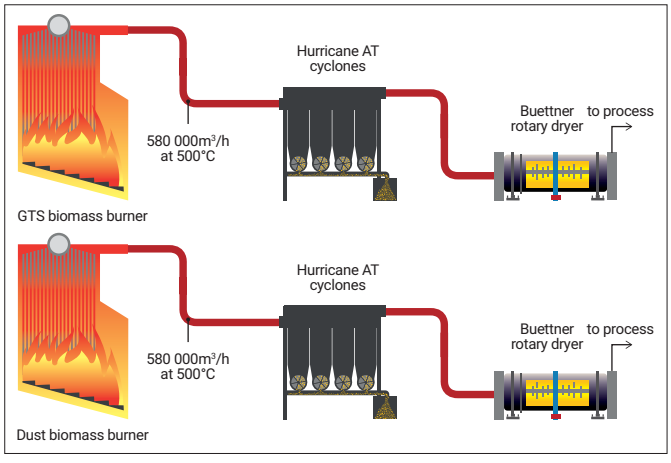

Fig. 1 – Process flow diagram from existing installation

IDENTIFYING THE PROBLEM AND SOLUTION

In 2015, Tafisa faced a critical issue in its production process.

The plant operated two rotary dryers, which were crucial for its operations and were powered by a biomass boiler that produced the necessary heat. However, when the boiler operated at maximum load, a significant problem emerged. A large number of particles and sparks generated by the boiler were being carried to the rotary dryers, posing a serious fire hazard. This situation resulted in multiple fires breaking out during this period, threatening the safety of the facility and its workforce. To mitigate the fire risk, plant operators were left with no choice but to reduce the load on the biomass boiler to 60%. While this measure helped prevent fires, it had a substantial downside: – a significant reduction in the production capacity of the plant, wich impacted the overall efficiency and profitability of the Tafisa plant.

ACS installed a Hurricane system comprised of 2 batteries of 6 cyclones (ø2800mm) with inner lining to further enhance the longevity and durability of the cyclones.

This lining protects the cyclones from abrasion, ensuring their continued effectiveness and preventing the need for frequent replacements.

The implementation of Hurricane AT systems proved to be a game-changer for the Tafisa plant. By effectively capturing and diverting the problematic particles and sparks away from the rotary dryers, the risk of fires was significantly reduced. Which allowed the use of the biomass boiler at its maximum load once again, restoring production to its full capacity.

ABOUT HURRICANE CYCLONES

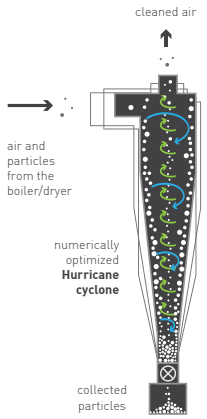

Fig. 2 – Hurricane Cyclone

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

DESIGN BASIS

- Solids **[Biomass fly ash and silica]**
- Particle size distribution **[Fig.3 & 4]**
- Temperature (°C) **[500]**
- Actual flow rate (m^3/h_{wet}) **[580 000]**
- Moisture content (% VV) **[6.3]**
- Powder concentration at inlet (mg/Nm^3) **[2 682]**
- Site location **[Indoors]**

SYSTEM SPECIFICATIONS | EMISSIONS

- Guaranteed emissions (mg/Nm^3) **[<400]**
- Expected emissions (mg/Nm^3) **[289]**
- Expected pressure drop (kPa) **[0.6]**

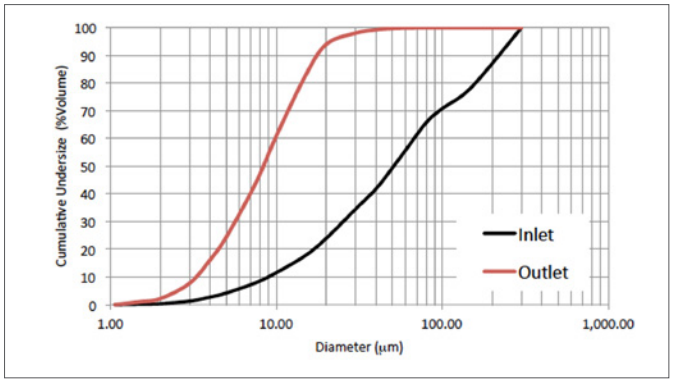

Fig. 3 – Particle Size Distribution used in simulations for maximum design flow (Sechoir_GTS)

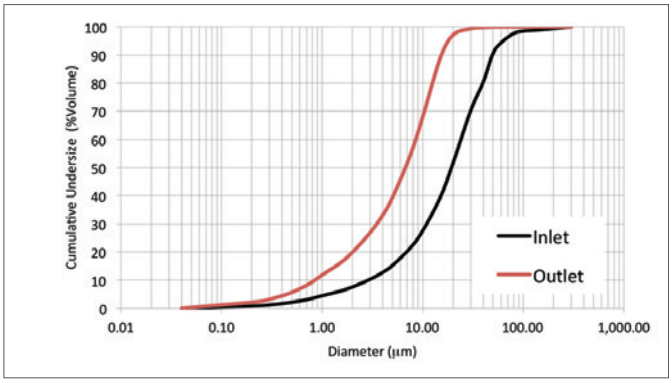

Fig. 4 – Particle Size Distribution used in simulations for maximum design flow (Sechoir_DUST)

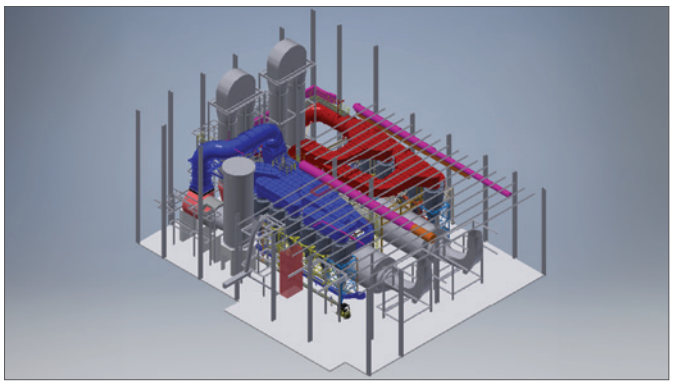

Fig.5 – ACS solution [12 AT ø2800]

CONCLUSIONS

In conclusion, the plant's commendable achievement of running at a 20% increased capacity not only indicates a substantial leap in operational efficiency but, when coupled with the successful reduction in sparks, sets the stage for a more robust and environmentally responsible production. Emission testing proved notable reductions, around 90% and 95% decrease in silica content for the respective lines, cementing the plant's commitment to excellence and sustainability.