



HURRICANE® SYSTEMS FOR WOOD DUST EMISSION CONTROL
IN PELLET PLANTS



THE PROBLEM WITH EMISSION CONTROL IN WOOD ROTARY DRYERS

Pellets are typically manufactured from wood chips and sawdust. The material is dried in a rotary dryer, which is heated by a biomass furnace and finally collected in so called dryer cyclones.

The whole dried material is carried over to the dryer cyclones. In addition to the wood particles a much smaller amount of fine ash from the biomass combustion is released and captured in the cyclones. The total concentration of wood dust and ash entering the cyclones is typically 200 to 300g/Nm³.

Usual cyclone dryers are capable of capturing the particles to a quite high degree (>99%) **but often still have emissions of 200-350mg/Nm³**. This level of concentration of particles is too high for most countries regulatory emission limits and therefore the plants have to be equipped with an end stage deduster to bring emissions under 50mg/Nm³.

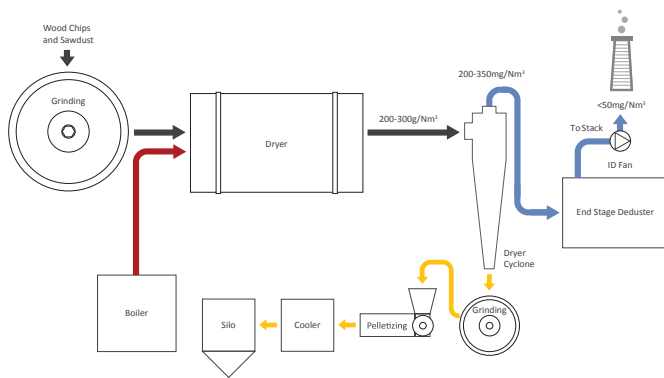


Figure 1. Pellet Plant Scheme



Figure 2. Pellet Plant

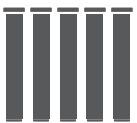
USUAL DEDUSTERS CANNOT TECHNICALLY SOLVE THE PROBLEM



- **Multicyclones** have an efficiency of less than 50%



- **Venturi Scrubbers** are not used due to high energy consumption, erosion, corrosion and secondary pollution



- **Bag Filters** are not used due to tars, which stick to the collecting surfaces.



- **Dry ESPs** are not used because of explosion risks due to organic (wood) particles

WESP: A SOLUTION WITH HIGH INVESTMENT AND OPERATING COSTS

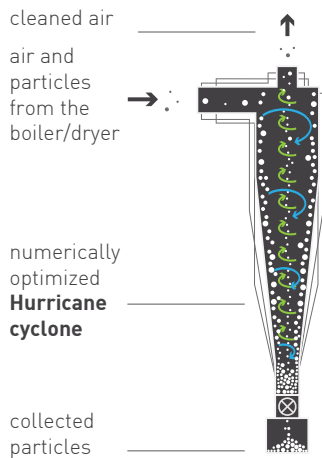
+ PROS +

- Very efficient for PM10 and PM2.5
- Can handle sticky tars

- CONS -

- Very high investment cost
- Wastewater treatment requirement
- Clean water consumption or treatment requirement
- Operational problems in the water treatment process (corrosion, plugging...)

THE SOLUTION: NUMERICALLY OPTIMIZED CYCLONES (HURRICANES)



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. These cyclones demonstrate impressive efficiencies in capturing very fine powders with a Median Volume Diameter (MVD) of less than $5\mu\text{m}$. Hurricanes are the output of nonconvex nonlinear problems formulated and solved after years of work in partnership with the Faculty of Engineering of Porto, incorporating the recent findings of Agglomeration in Cyclones (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.

Hurricane cyclones demonstrate its superior efficiency, especially in capturing fines escaping other cyclones, which explains its performance in pellet lines. **Hurricanes can reduce emissions from $300\text{mg}/\text{Nm}^3$ to less than $50\text{mg}/\text{Nm}^3$ when placed after the dryer cyclones.**

ABOUT ADVANCED CYCLONE SYSTEMS

Advanced Cyclone Systems, S. A. (ACS) is a company exclusively dedicated to the development of high efficiency cyclone systems worldwide. ACS' mission is to achieve total particle capture exclusively with cyclone systems through continuous investment in Innovation and R & D.

Numerically optimized cyclones **Hurricane** and **ReCyclone**® systems contradict the general thinking that cyclones are inefficient powder collectors. These cyclone systems can replace bag filters in many demanding operating processes.

EXAMPLES OF HIGH EFFICIENCY CYCLONES INSTALLATIONS



Hurricane® system to capture particles from a sawdust dryer operating in a wood pellet plant, with a flow rate of $8,074\text{m}^3/\text{h}$ at $110\text{ }^\circ\text{C}$. System is located after the rotary dryer with the objective of achieving $150\text{ mg}/\text{Nm}^3$

Client: Vimasol | **Location:** Portugal | **Year:** 2011

Inlet Concentration: $293,923\text{ mg}/\text{Nm}^3$ | **Emissions:** $< 150\text{ mg}/\text{Nm}^3$



Hurricane® system to capture particles from a sawdust dryer operating in a wood pellet plant, with a flow rate of $71,839\text{ m}^3/\text{h}$ at $88\text{ }^\circ\text{C}$. System is located after the existing dryer cyclones with the objective of achieving $50\text{ mg}/\text{Nm}^3$

Client: Glowood | **Location:** Portugal | **Year:** 2014

Inlet Concentration: $500\text{ mg}/\text{Nm}^3$ | **Expected emissions:** $< 50\text{ mg}/\text{Nm}^3$



BIOMASS & COAL BOILERS FUEL OIL BOILERS STEEL & FERROUS ALLOYS CLINKER COOLER AIR DEDUSTING PYROLYSIS, INCINERATION & GASIFICATION CALCONATION PROCESSES GLASS & CERAMIC FURNACES AIR CAPTION AND DEDUSTING HIGH TEMPERATURE SEPARATION PROCESSES

Advanced Cyclone Systems

Development, Commercialization and
Installation of Industrial Filtering Systems

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