Advanced Cyclone Systems

EMISSION CONTROL

CASE STUDY

ARCELORMITTAL | GENT, BELGIUM | OCTOBER 2015

Hurricane and Dust Evacuation System To Reduce Sinter Dust From Extraction Air Of Cooling Section Of Sinter Strand

FOREWORD

Advanced Cyclone Systems, designed and supplied a system of 4 Hurricane type AT-MS cyclones for ArcelorMittal, the world's largest steel and mining industry, together with Mecwide, a Portuguese company specialized in equipment construction, assembly and safety management.

Guided by a philosophy to produce safe sustainable steel, ArcelorMittal is the leading supplier of quality steel products in all major markets including automotive, construction, household appliances and packaging. ArcelorMittal is present in 60 countries and has an industrial footprint in 19 countries.

In 2015 Arcelor contacted ACS to help designing a separation system for a completely new application within ACS previous experience for its Gent site (AMG).

AMG is equipped with two sinter plants, SIFA 1 and SIFA 2. Due to a recent alteration of second plant, the temperature in SIFA 2 was much higher than the desired one, which posed a limit to production, quality and cost of the sinter, as more consumption of solid fuel was needed for this high temperature sinter. On the one hand, temperature at the end (right part of the strand) was higher than wished for, but on the other hand, a lot of solid fuel was being spent in the beginning of the strand (left part).

In the scope of the project, the last part of the strand was intended to be cooled down through the extraction of hot gases to be recirculated back to the sinter strand and thereby saving solid fuel in the first part of the strand.

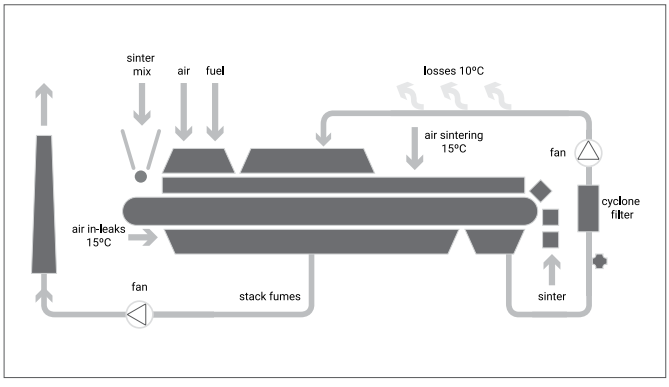

Fig. 1 – Process diagram

IDENTIFYING THE PROBLEM AND SOLUTION

The main problem for ArcelorMittal was how to protect the 2.5MWth FAN necessary to recirculate a 650 000m^3/h gas flow rate at 350ºC from very abrasive sinter particles carried with the flowrate. The very large flow rate demanded a compact equipment with low pressure drop, but still efficient enough to reduce concentration of fine particles from 500mg/Nm^3 to under 100mg/Nm^3 and altering the Particle Size Distribution from an inlet of 47µm to less than 4µm. These two factors are determinant for the useful life of the FAN.

After several rounds of simulations for Arcelor's input data (PSD, real densities, inlet concentration for different conditions, etc), ACS proposed four Hurricane AT-MS cyclones with 3750mm in diameter, fully lined with DENSIT wearflex ceramic based cement for abrasion protection.

Supply of all further peripherals, ducting, structures, assembly and global management of the project was in charge of Mecwide, a common partner for ACS' larger projects.

DESIGN BASIS

- Type of particles **[Sinter dust]**
- Particle size distribution **[Fig.2]**
- Gas flow temperature (ºC) **[350]**
- Effective flow rate (m^3/h_{wet}) **[651 000]**
- Normalized flow rate (Nm^3/h_{dry}) **[250 000]**
- Inlet concentration into ACS system (mg/m^3) **[≤500]**
- Operating Pressure (mbar) **[-110]**

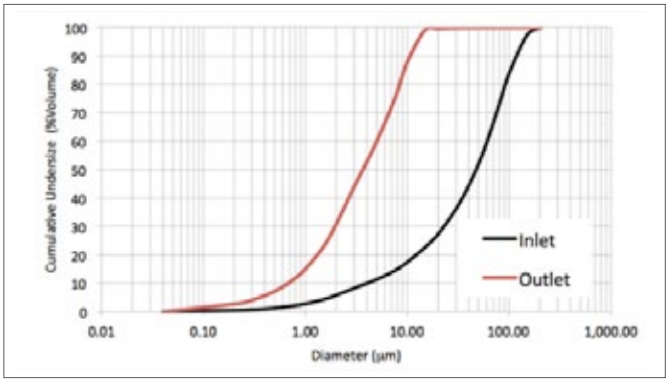

Fig. 2 - Particle size distribution used in simulation

SYSTEM SPECIFICATIONS | PARTICLE EMISSIONS

- Efficiency (%) **[80.9 – 82.7]**
- Particle emissions (mg/Nm^3) **[<91]**
- Total expected pressure drop of the system (+/- 100 Pa) **[1000]**

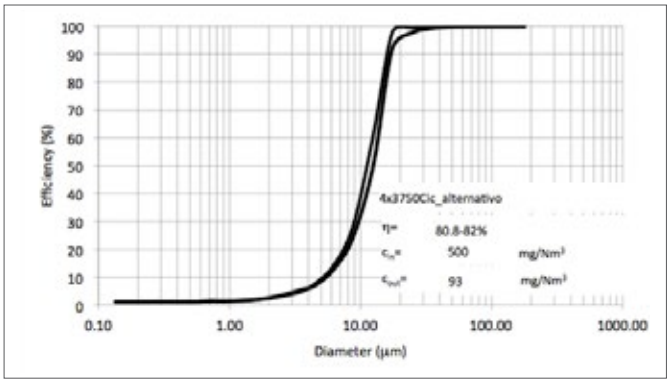

Fig. 3 – Predicted maximum and minimum grade efficiency curves with corresponding global efficiency values

CONCLUSIONS

Preliminary results from observation of the cyclones discharge and FAN behavior are very good and the sinter line is now working for several months without any problem, being a very good showcase for other energy recovery projects in other plants within ArcelorMittal.

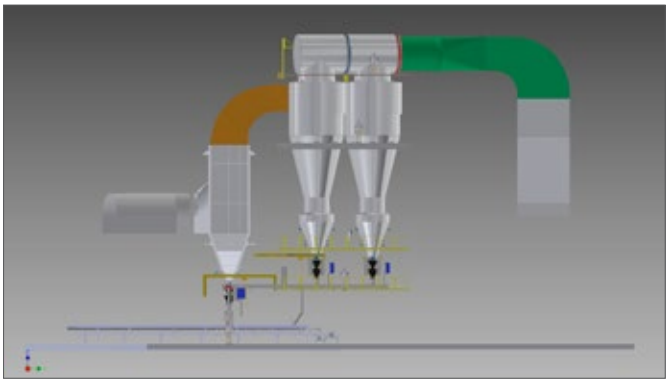

Fig.4 – General arrangement of the Hurricane cyclone system