Increasing ReCyclone performances with an optimized Post-Cyclone recirculator

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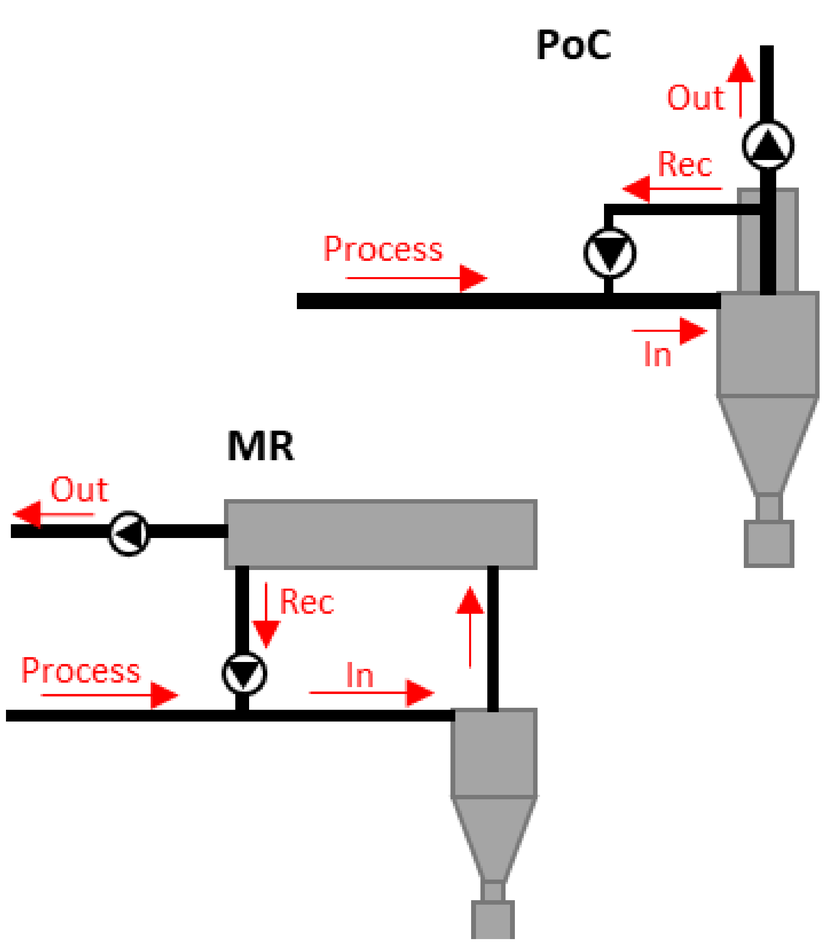
Major Highlights

Previous works show that tangential inlet, reverse-flow cyclones can be coupled with straight-through cyclones (also known as mechanical recirculators, MR) to increase overall efficiency. On the other hand, pressure drop also increases, negatively affecting the energy efficiency of the system.

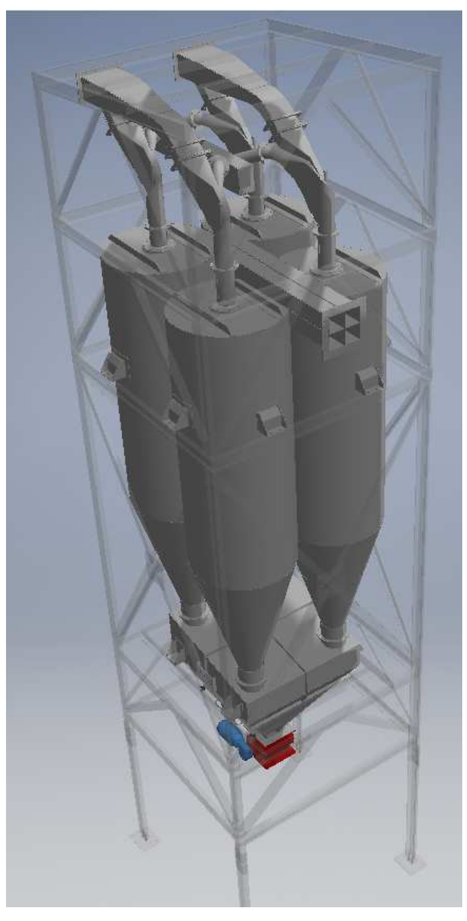
Unlike mechanical recirculation, post-cyclone (PoC) systems take advantage of the remaining swirl on the cyclone vortex finder.

ReCyclone evolution: concept from MR to PoC



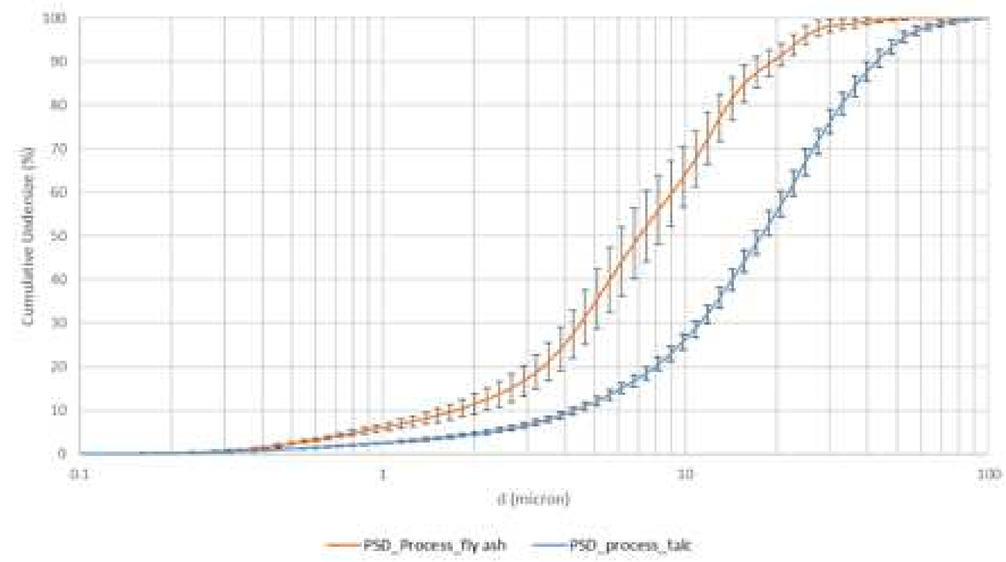
ReCyclone (using MR) vs. Compact ReCyclone (using PoC)

Typical ReCyclone MH using MR



Compact ReCyclone MH using PoC

Tested Powders and Particle Size Distributions

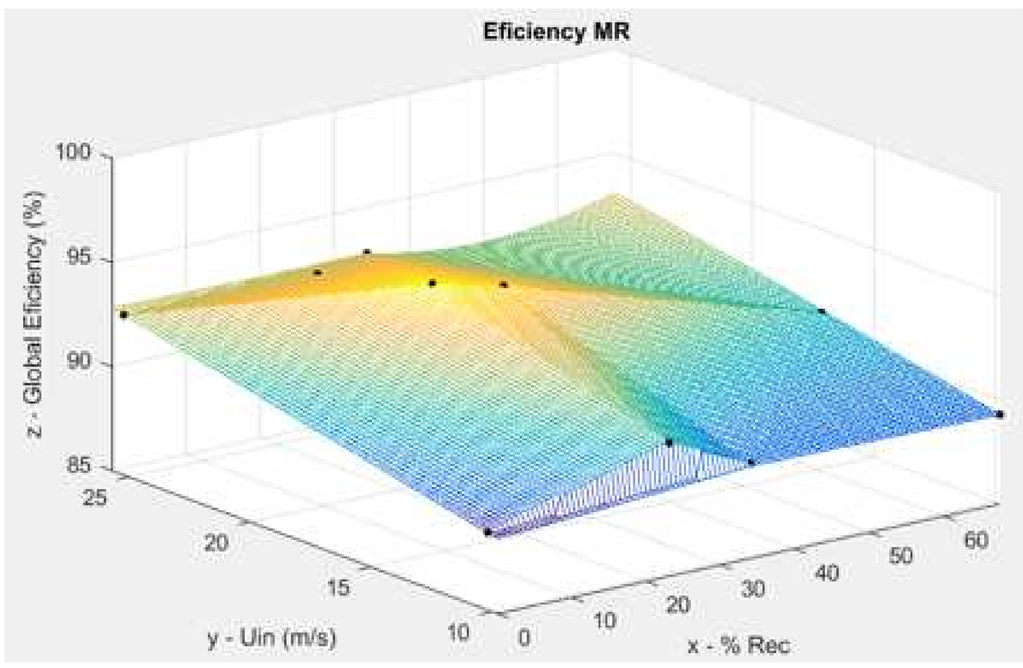


Overall Efficiencies using Talc

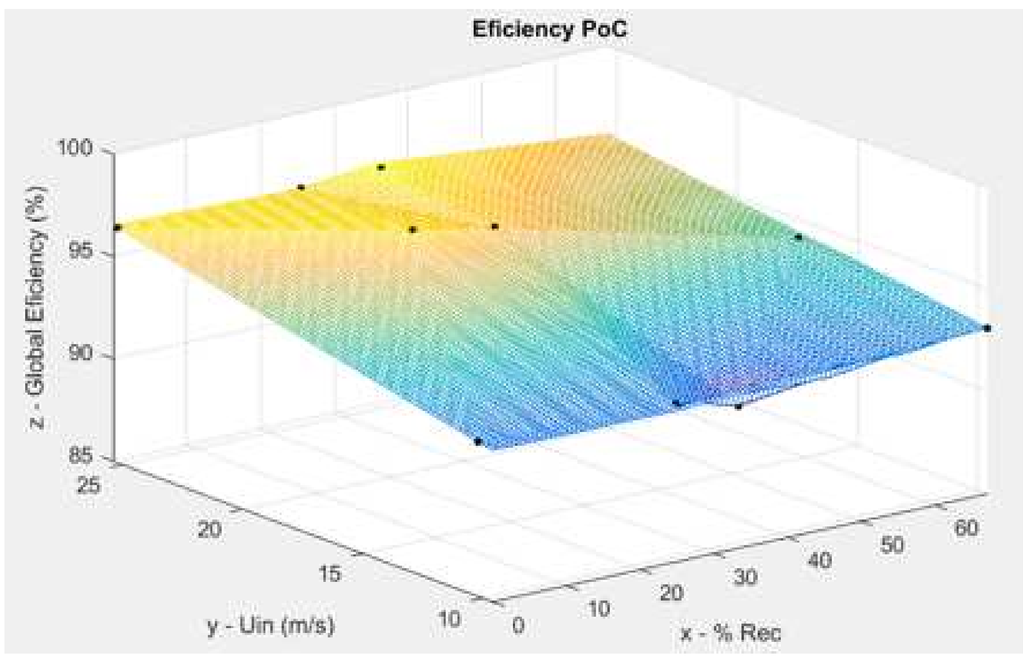
			Isolated Hurricane
ReCyclone w/	Post-Cyclone	Mecanical Recirculator	
Efficiency (%)	97.9	97.4	96.8
ΔP (kPa)	3.6	2.9	1.9

Overall Efficiencies using Fly Ash (interpolation surfaces)

Mechanical Recirculator



Post-Cyclone



Conclusion

The results showed an improvement of the cyclone performance when coupled with post-cyclone devices as compared to the MR or to the single cyclone setups (using recirculation shows better efficiencies as compared to the single cyclone

The maximum efficiencies were obtained for both recirculation systems at an inlet velocity of 20 m/s and 25% recirculation.

The PoC setup showed a greater sensitivity to non-ideal effects and this can be inferred from the grade efficiency curves (not shown here).

The PoC setup showed higher efficiencies in the range [0.2, 2.0] micron particle diameter, as compared to the MR setup.

The major single parameter to contribute to the maximum overall efficiency is the cyclone inlet velocity, provided that non-ideal effects are minimized.

Both recirculating systems showed higher efficiencies than the single cyclone.