



Minimizing non-ideal discharge effects in tangential multicyclones systems



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Outline

Overview

- What is a cyclone?
- Why study non-ideal effects on an isolated cyclone?
- How have we studied non-ideal effects?

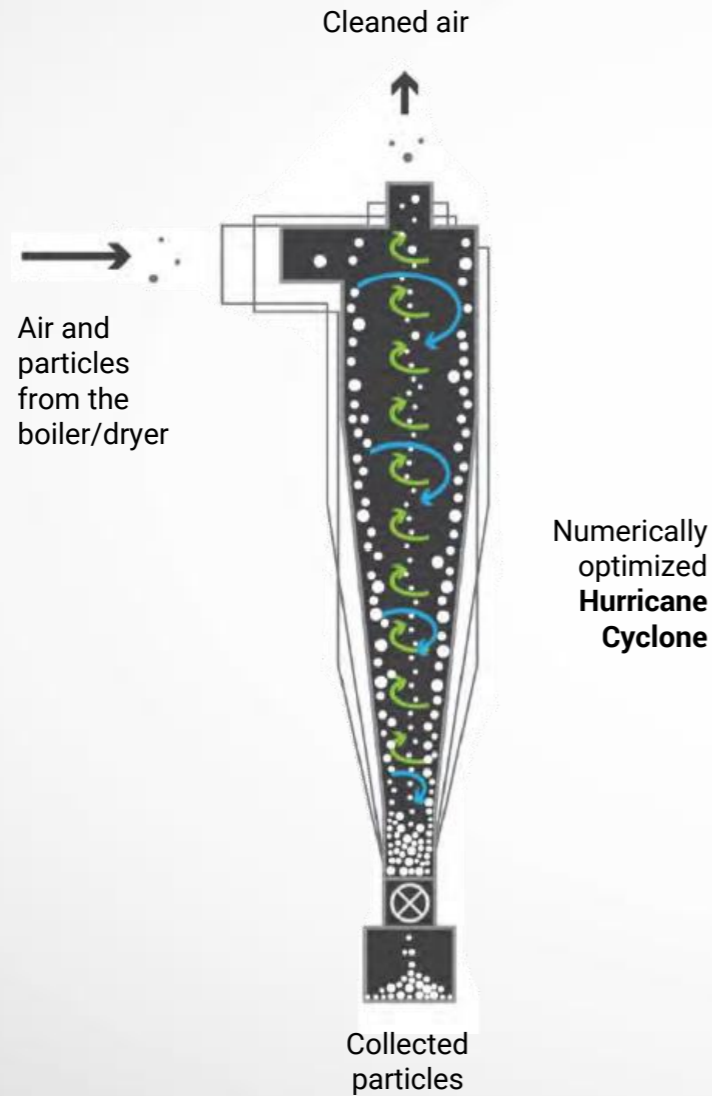
Results

- Vortex Breaker effect
- Dipleg Length effect
- System's Pressure and Leakage effect

Wrap up

- Conclusions
- Future Work

What is a Cyclone?



Problem: Low efficiency for particles $<10\mu\text{m}$

In what form is ACS different from other companies?

ACS' Goal

Wide Industrial Application in:

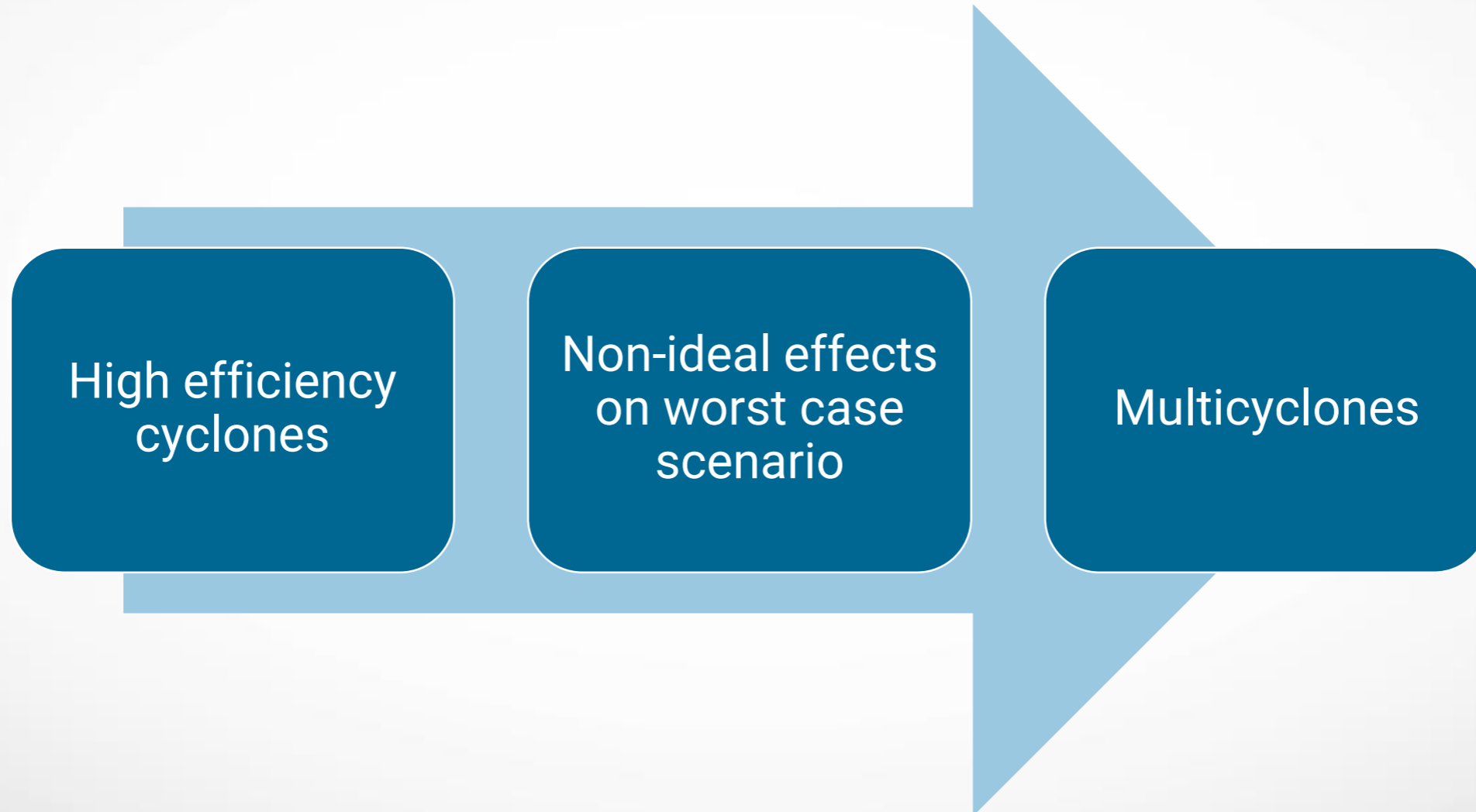
Emission Control

Environmental Improvement

Powder Recovery

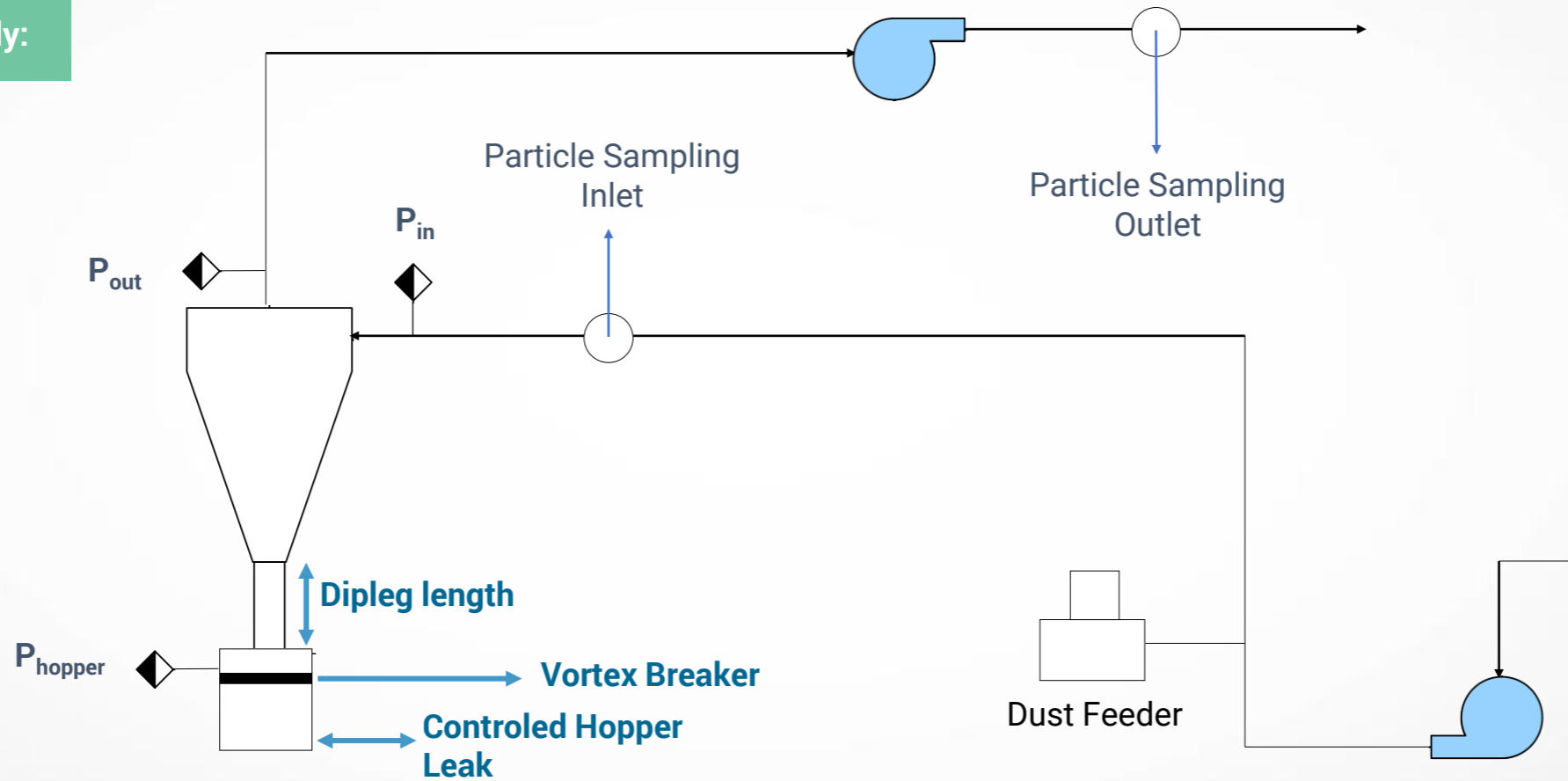
Economical Added Value

Why study non-ideal effects on an isolated cyclone?



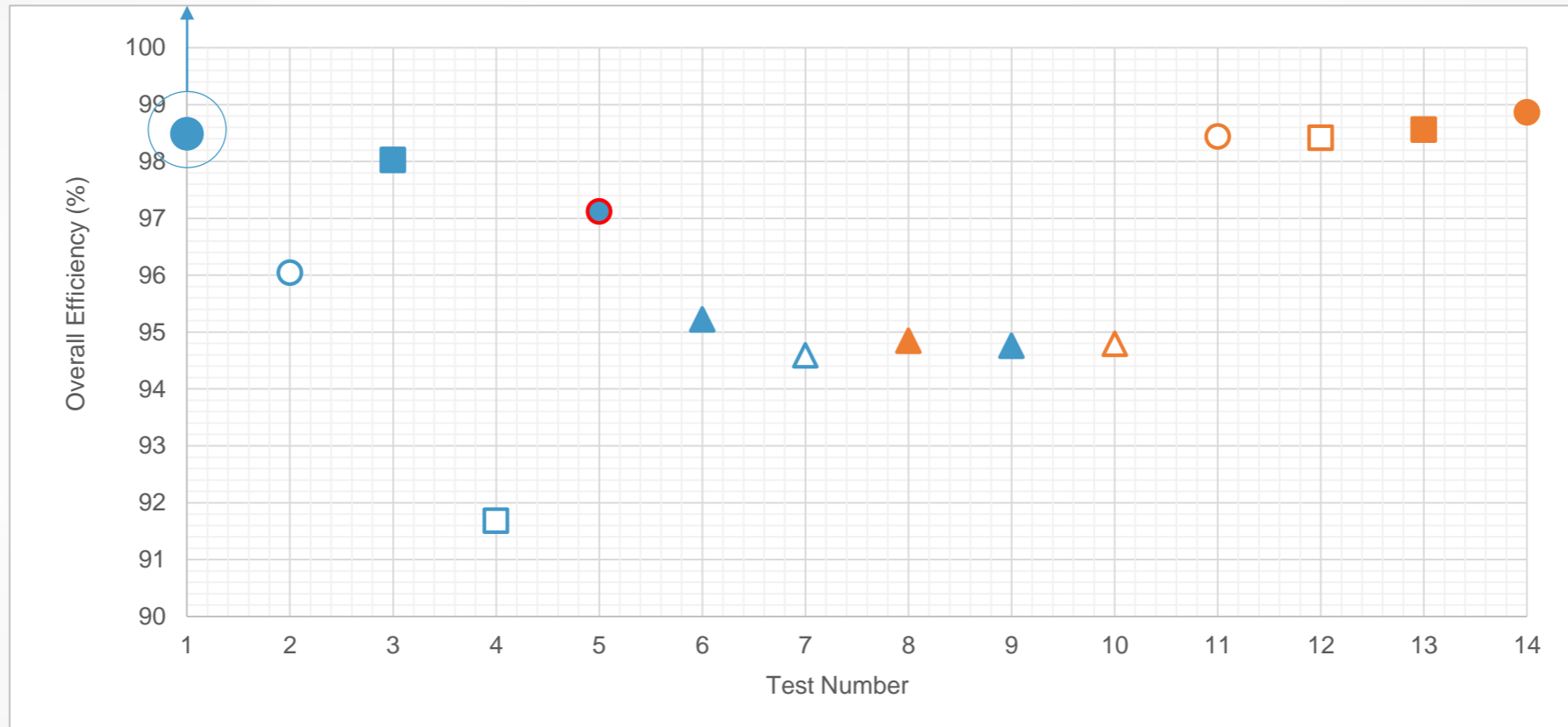
How we studied non-ideal effects?

Parameters in study:



Results: All results

Reference test: dipleg length 1.7D, system's pressure negative, without leaks and with a vortex breaker



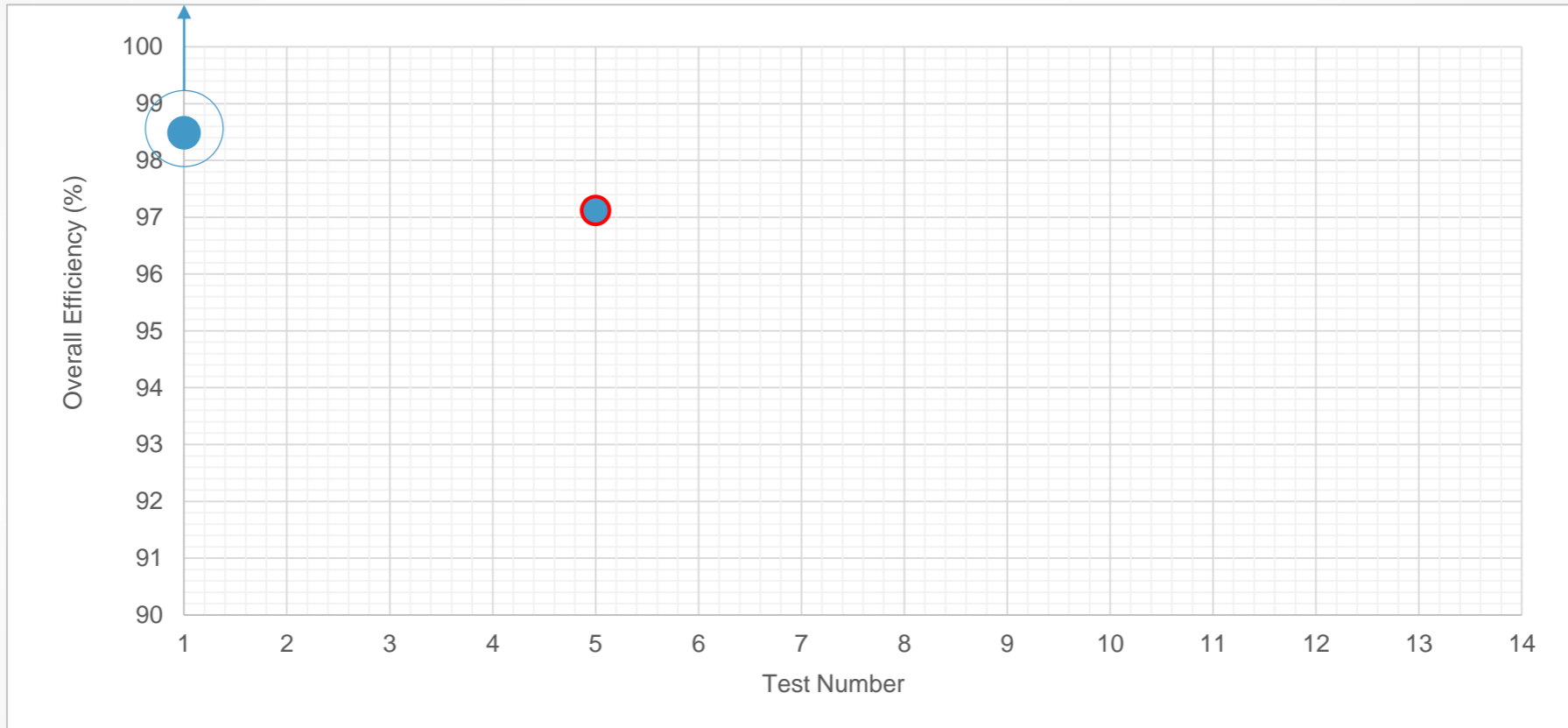
- Test 1: 1.7D_ΔP<0_NL_WVB
- Test 2: 1.7D_ΔP<0_WL_WVB
- Test 3: 2.7D_ΔP<0_NL_WVB
- Test 4: 2.7D_ΔP<0_WL_WVB
- Test 5: 1.7D_ΔP<0_NL_NVB

- ▲ Test 6: 0D_ΔP<0_NL_WVB
- △ Test 7: 0D_ΔP<0_WL_WVB
- ▲ Test 8: 0D_ΔP>0_NL_WVB
- ▲ Test 9: 0D_ΔP<0_NL_WVB
- △ Test 10: 0D_ΔP>0_WL_WVB

- Test 11: 1.7D_ΔP>0_WL_WVB
- Test 12: 2.7D_ΔP>0_WL_WVB
- Test 13: 2.7D_ΔP>0_NL_WVB
- Test 14: 1.7D_ΔP>0_NL_WVB

Results: Vortex breaker effect

Reference test: dipleg length 1.7D, system's pressure negative, without leaks and with a vortex breaker

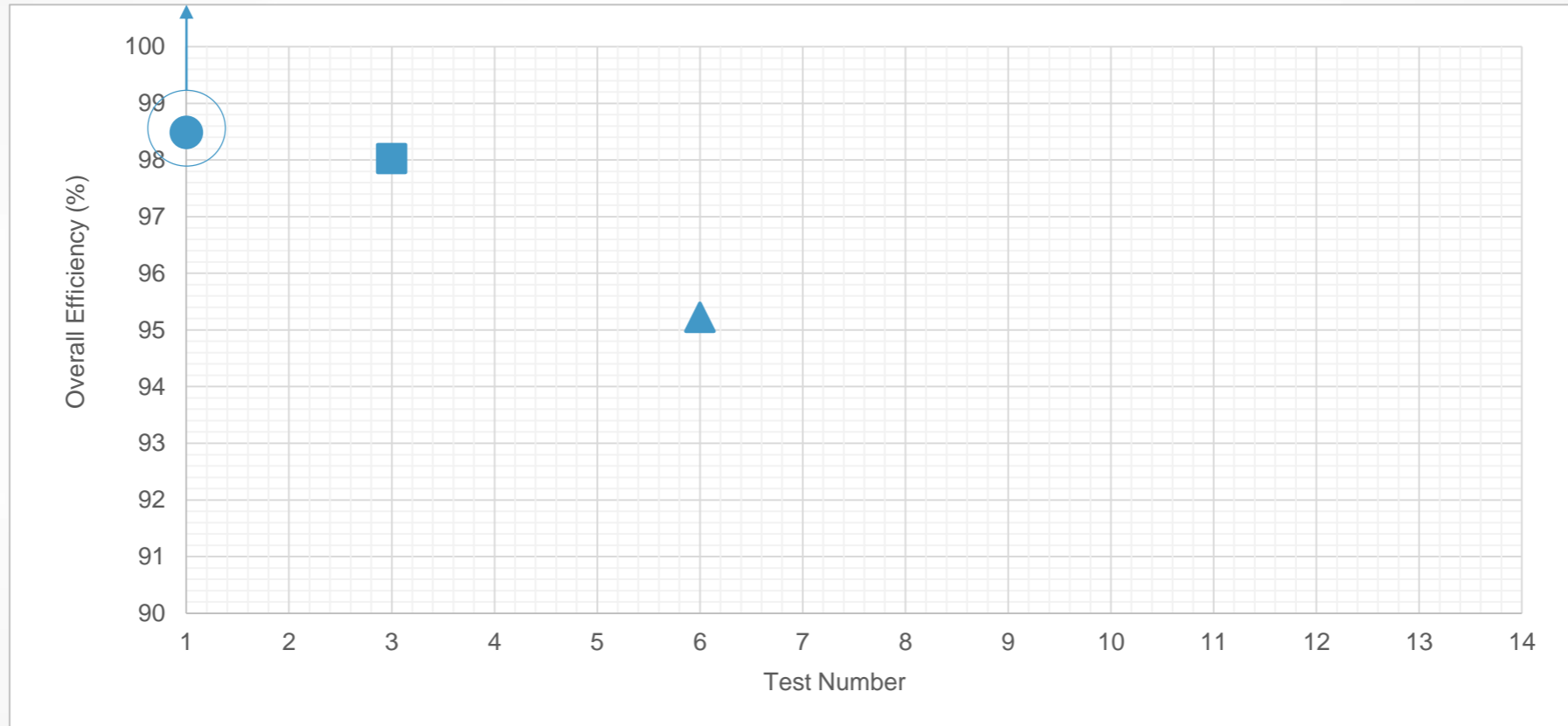


● Test 1: 1.7D_ΔP<0_NL_WVB

● Test 5: 1.7D_ΔP<0_NL_NVB

Results: Dipleg length effect

Reference test: dipleg length 1.7D, system's pressure negative, without leaks and with a vortex breaker



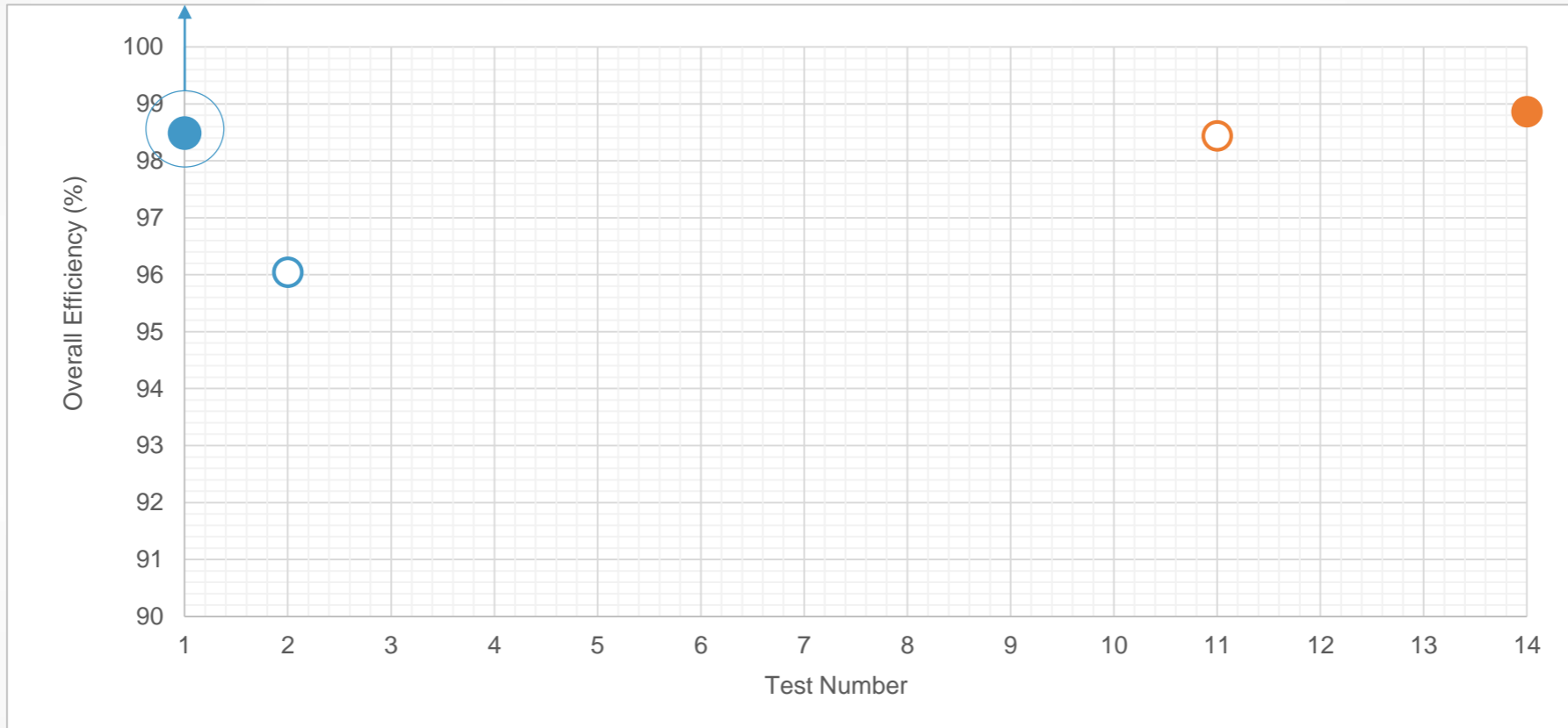
● Test 1: 1.7D_ΔP<0_NL_WVB

▲ Test 6: 0D_ΔP<0_NL_WVB

■ Test 3: 2.7D_ΔP<0_NL_WVB

Results: System's pressure and Leakage effect

Reference test: dipleg length 1.7D, system's pressure negative, without leaks and with a vortex breaker



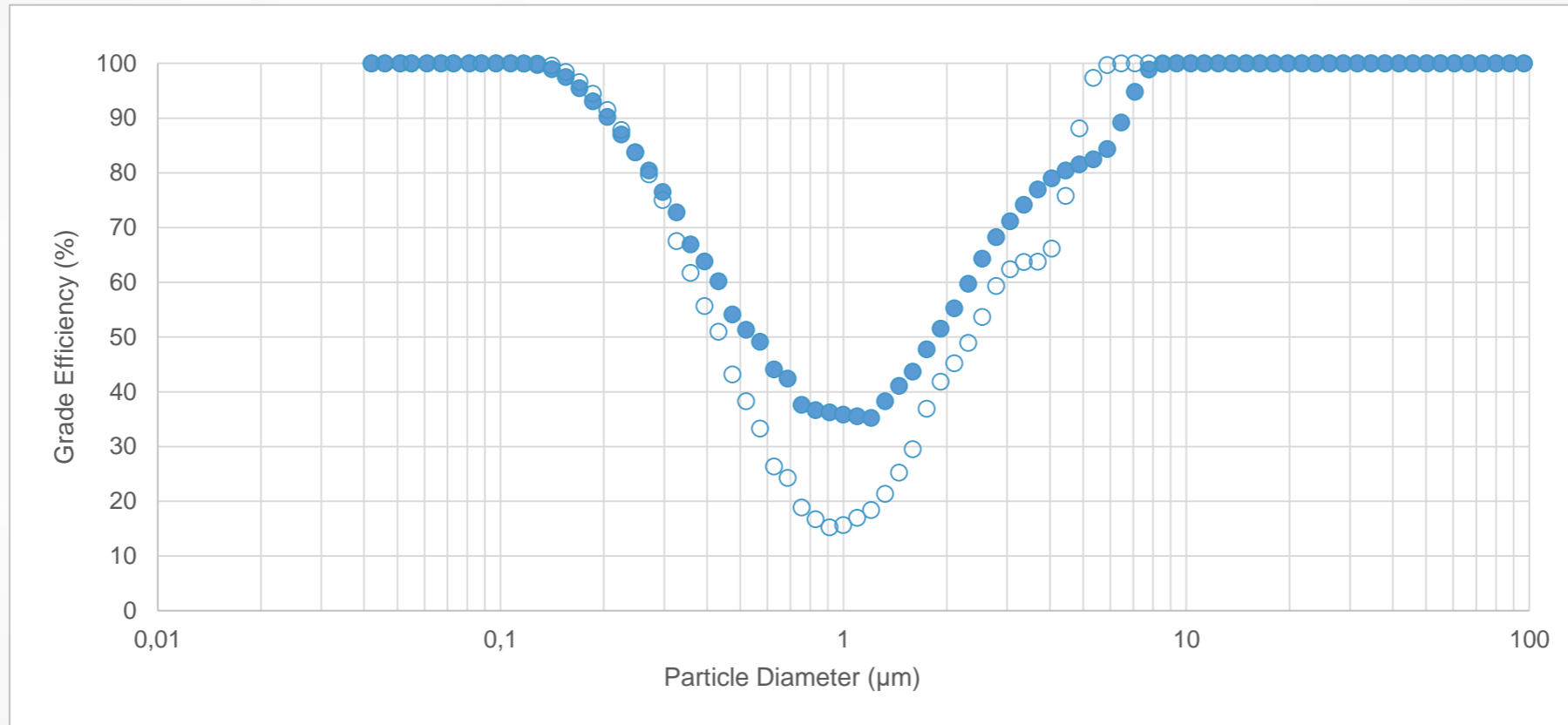
● Test 1: 1.7D_ΔP<0_NL_WVB
○ Test 2: 1.7D_ΔP<0_WL_WVB

○ Test 11: 1.7D_ΔP>0_WL_WVB

● Test 14: 1.7D_ΔP>0_NL_WVB

Results: Leakage effect

Example of impact in Grade-Efficiency curves



- Test 1: 1.7D_ΔP<0_NL_WVB
- Test 2: 1.7D_ΔP<0_WL_WVB

Conclusions

Vortex Breaker Effect

- Increases overall efficiency with the presence of a VB

Dimple length effect

- The best results were obtained with a dimple with a 1.7D length
- Not having or increasing said length decreases overall efficiency

System's pressure effect

- This effect is minimum

Leaks impact

- There is a substantial decrease in efficiency with leaks in the hopper
- This results worsen with negative pressure as compared to positive pressure



Future Work:

- Quantification of hopper leakage
- Testing in multicyclones, with an array of HE cyclones



Thank you!

Q&A

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