

WIND EFFECTS ON AIR-COOLED CONDENSERS – MITIGATING HIGH SEASONAL WINDS

Jeff Ebert

- Intro to Galebreaker
- Wind Effects
- The Project
- Questions

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ABOUT **GALEBREAKER**

- Over 35 years' experience with the elements
- Wind Screen solutions all over the world
- Power, petro-chemical, industrial, agricultural and off-shore
- Market leader
- Specialists in engineered fabric design
- 40,000 sq ft factory



HOW WIND EFFECTS ACC PERFORMANCE

Thermal Performance

- Reduce air movement through the fans
- Fan trips on overload
- Reduce power plant output

Mechanical Load/Stress

- Fan blade loading/unloading
- Motors & gearboxes vibration

Fouling

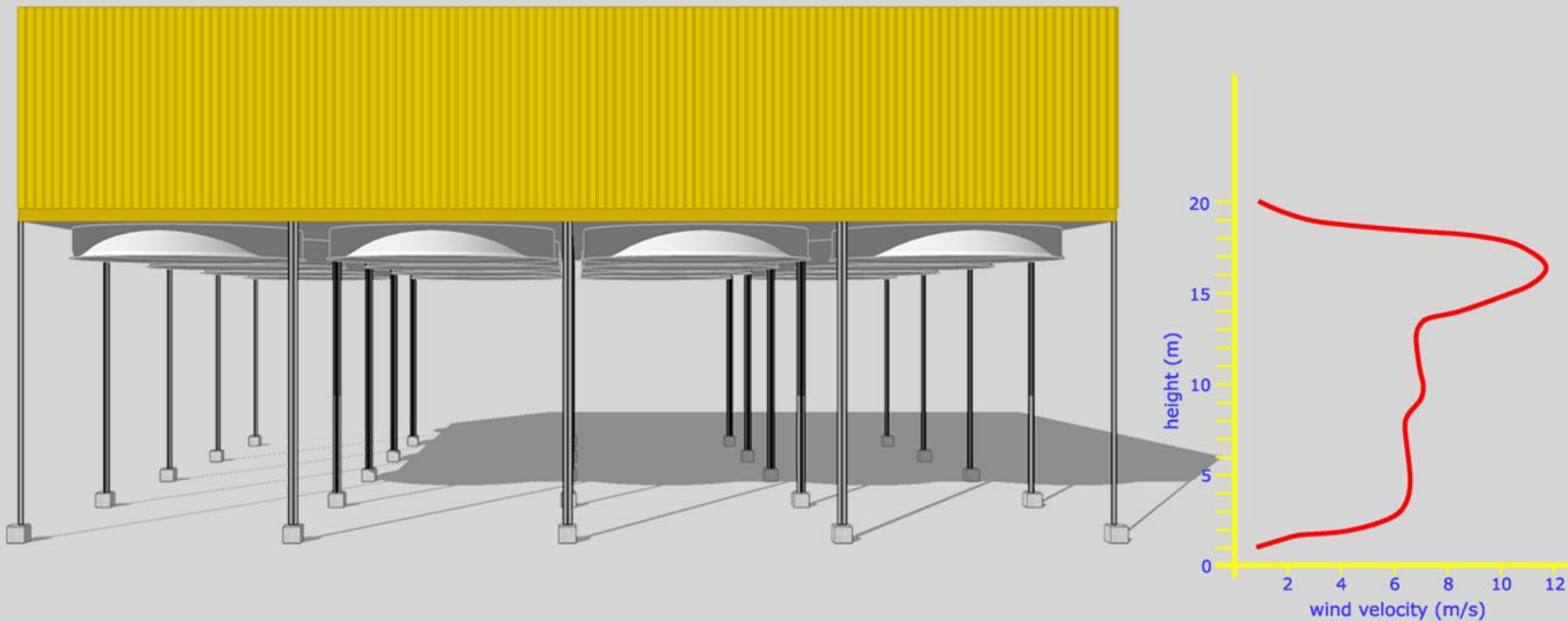
- Debris
- Leaves
- Airborne Seeds

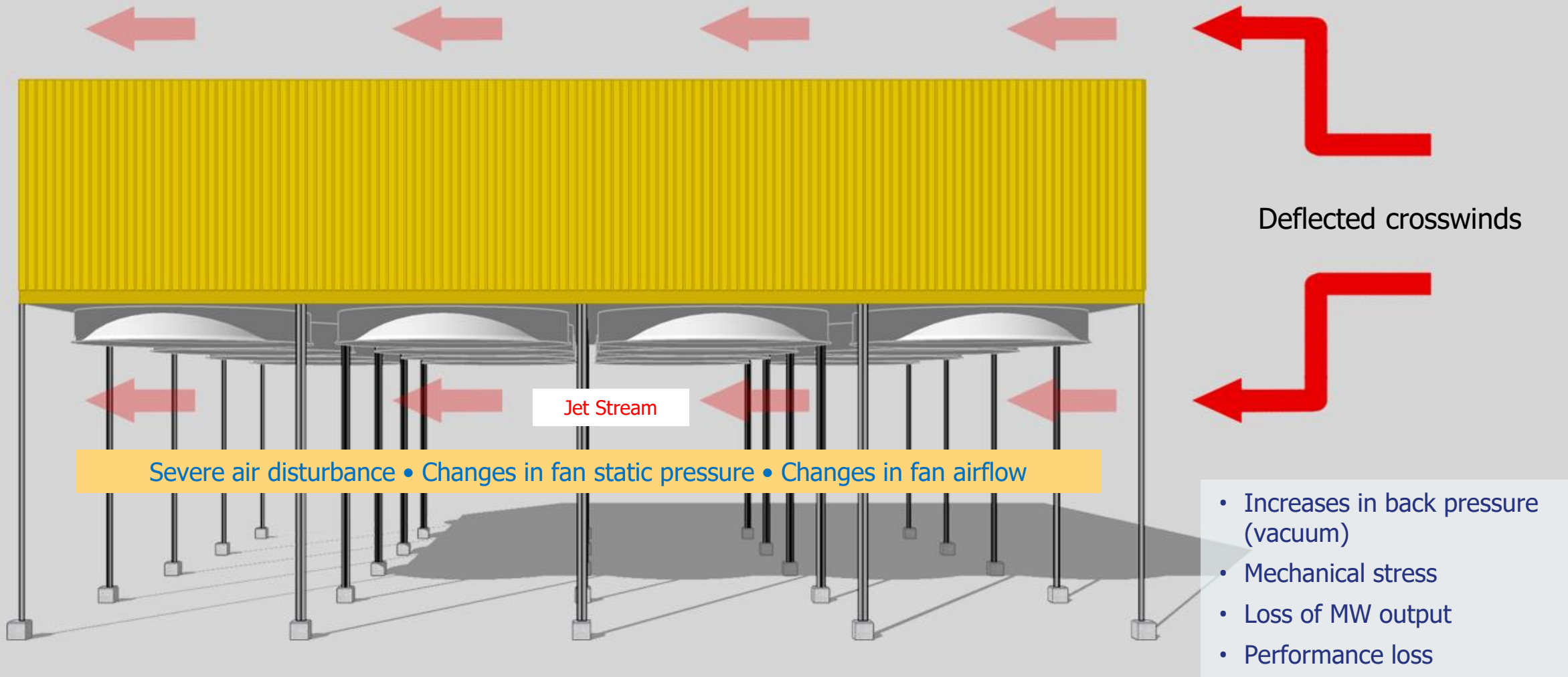


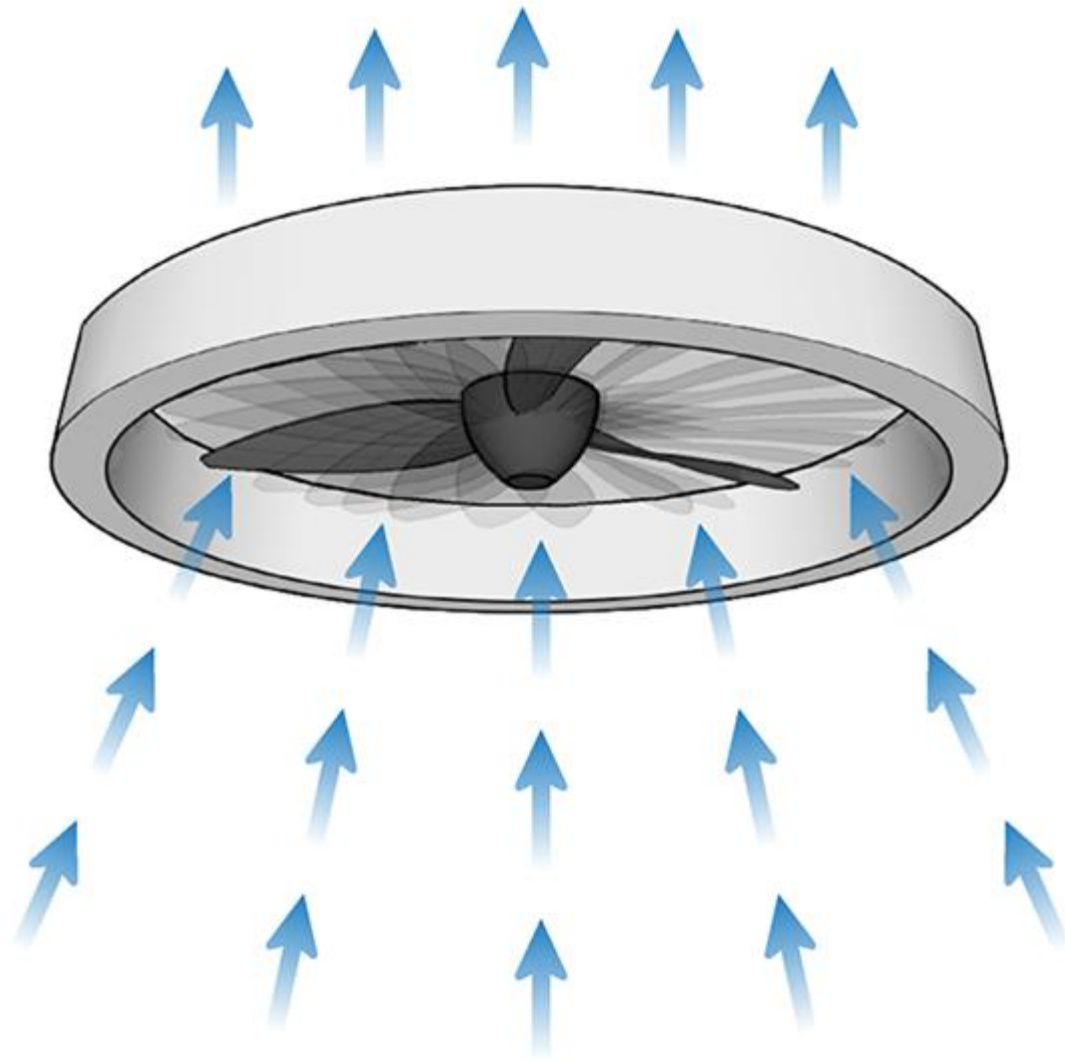
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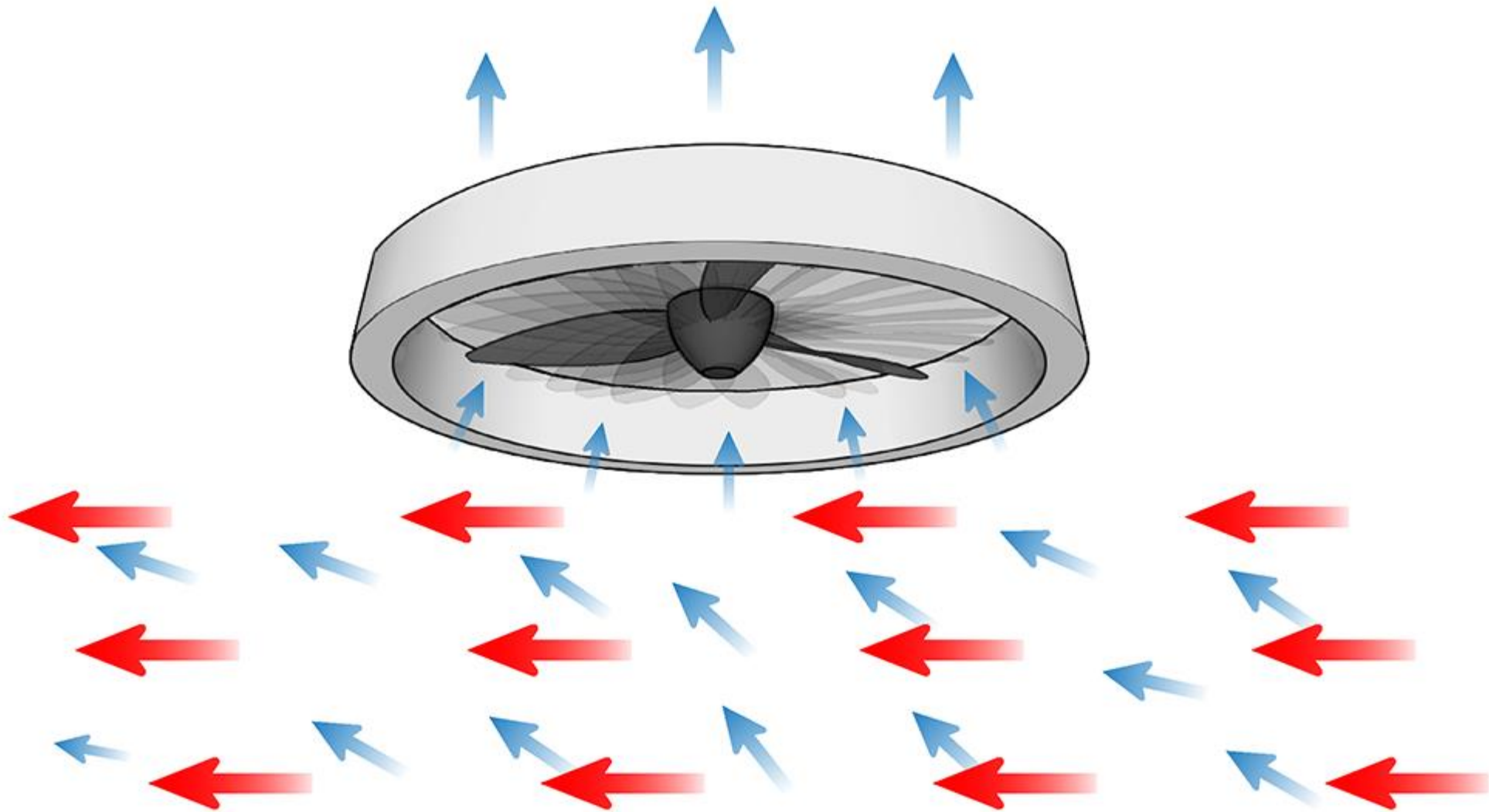
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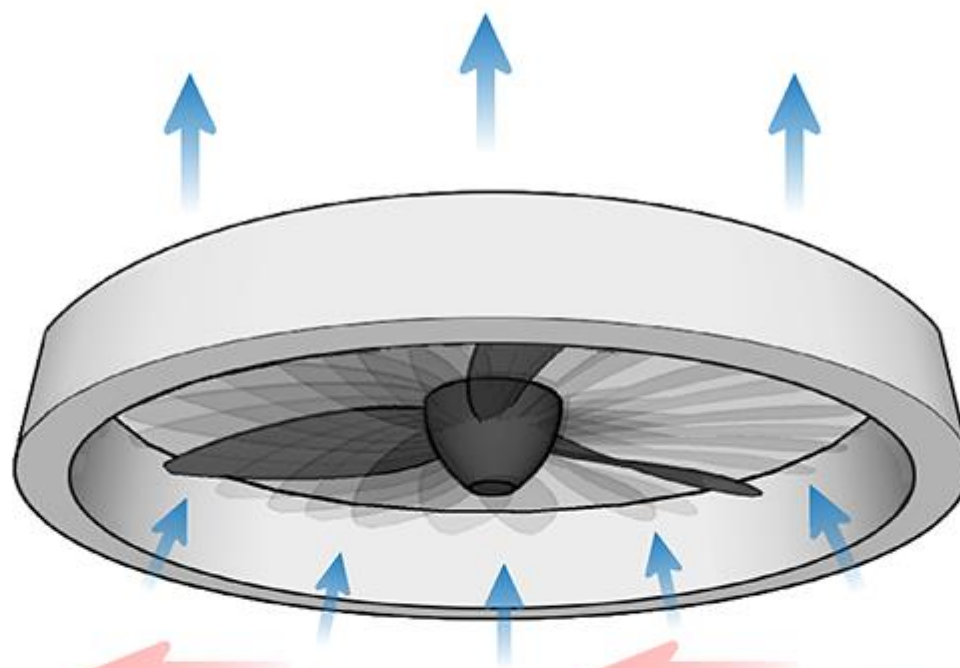








Static pressure increase =
airflow reduction – GEA



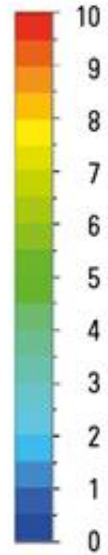
20% airflow reduction =
33% back pressure increase
– Conco Services

>5m/s = 30% airflow
reduction – Cofimco

Dynamic blade loading and
vibration - Howden

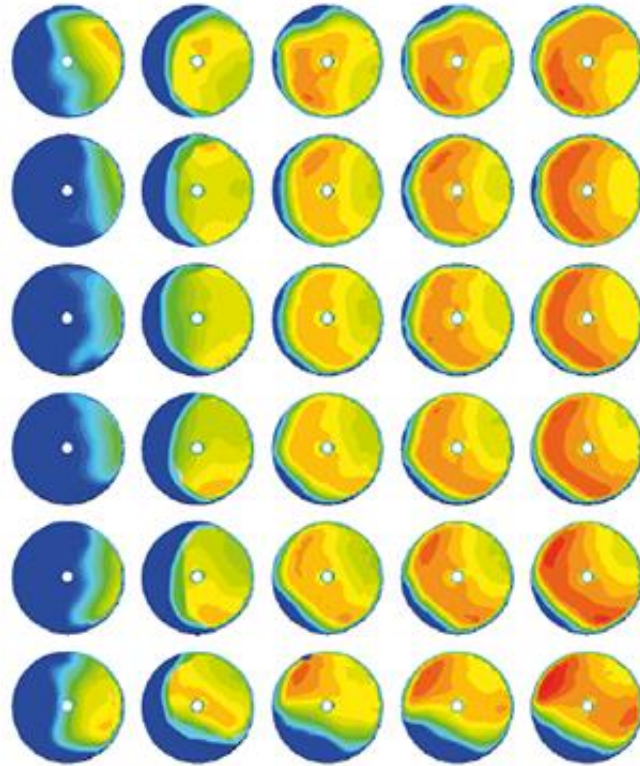
Fan & mechanical damage –
PS Colorado

Vertical Velocity
(wind speed 10mph)

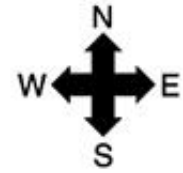
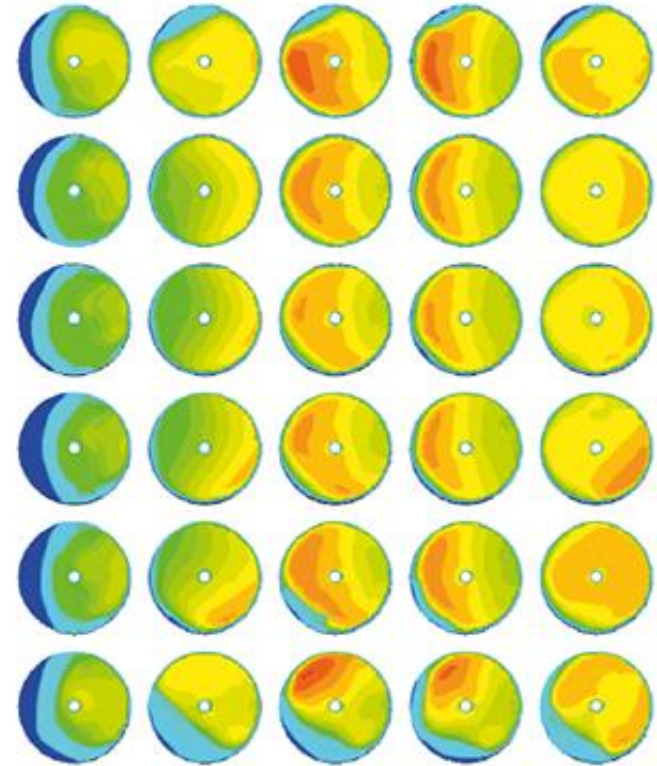


Air Velocity through
the Fans (m/s)

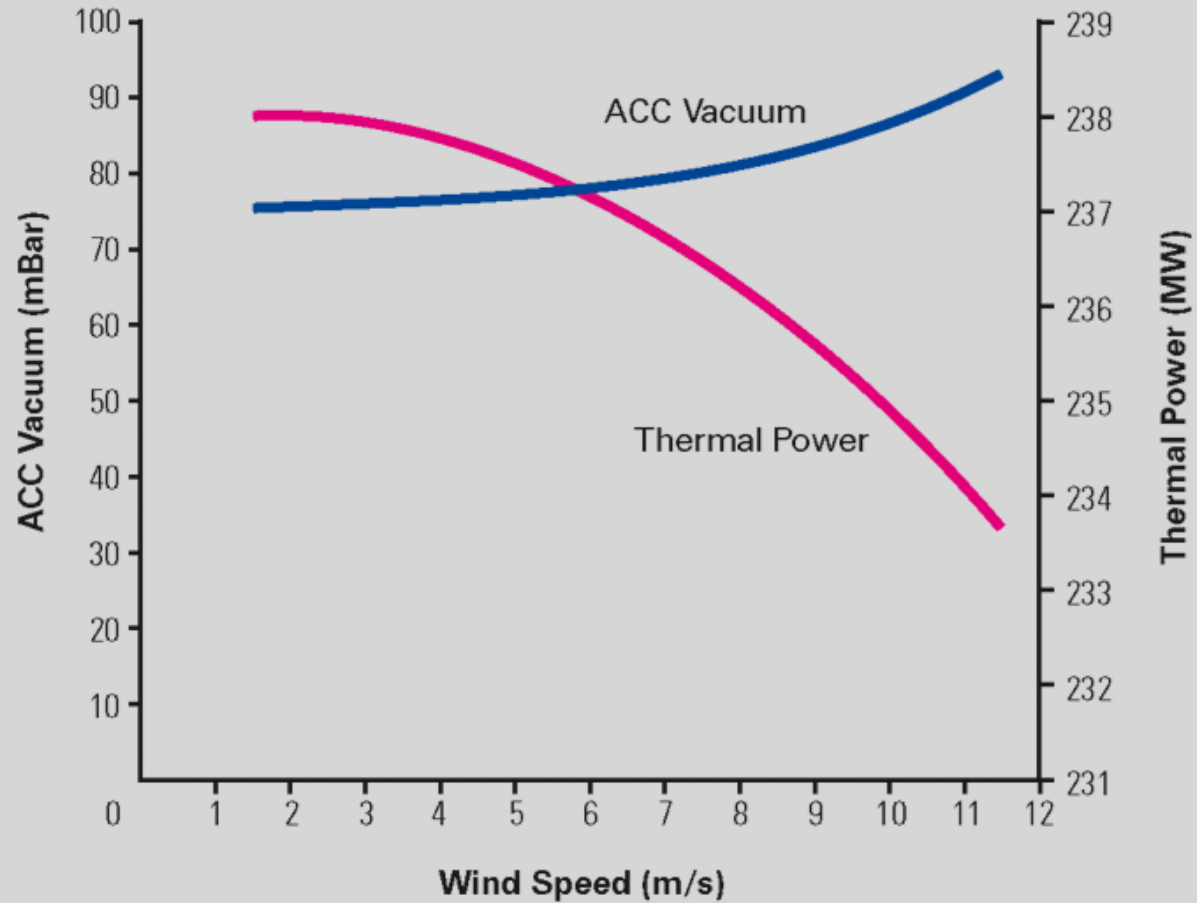
No Wind Screens

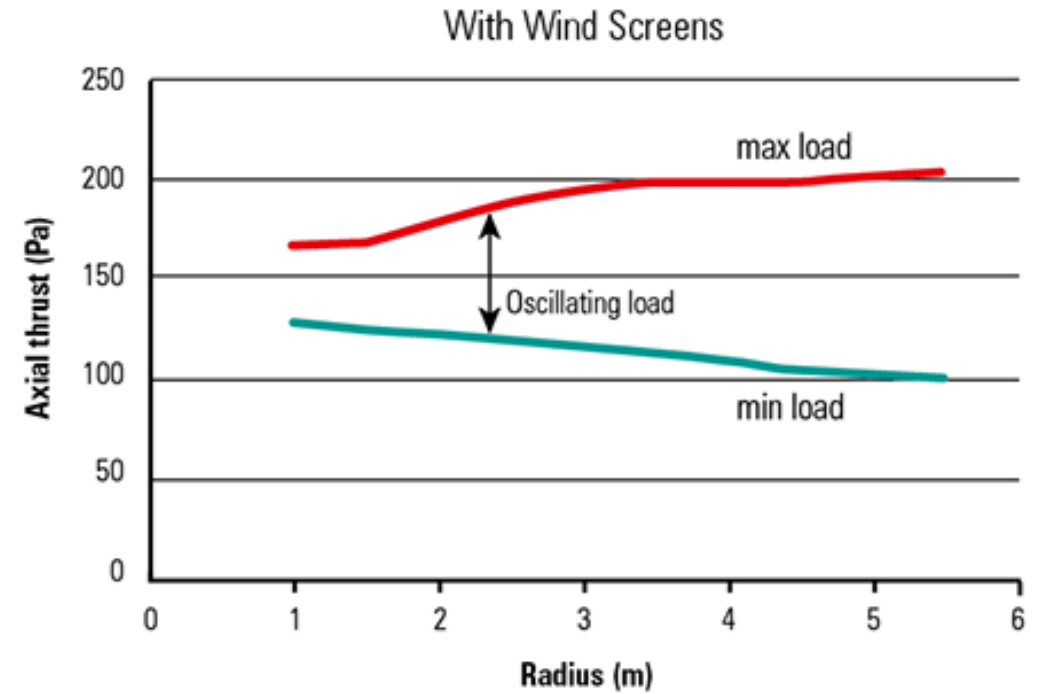
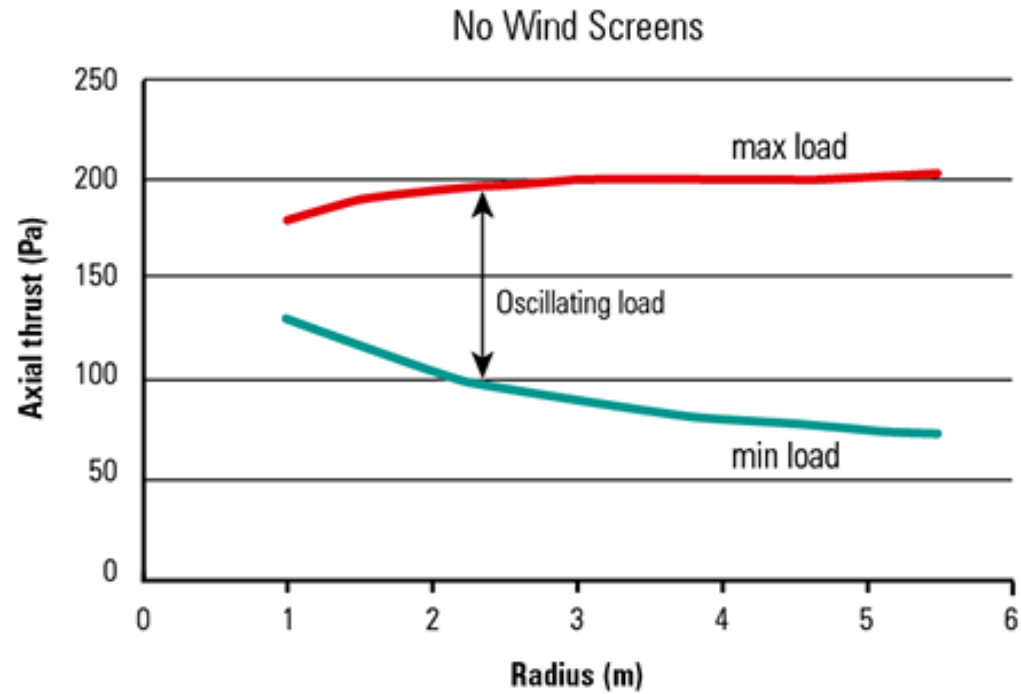


With Wind Screens



ACC Vacuum/Thermal Power v Wind Speed





HOW WIND EFFECTS ACC PERFORMANCE

- Airflow reduces as a wind speed varies.
- Wind turbulence induces a dynamic blade loading that cycles as the fan rotates.
- Blade stress is created.
- Cycling loads induced on the blade hardware can cause fatigue failures

Wind is:

- Unpredictable and powerful.
- Prevailing wind direction may not represent the highest wind speeds.





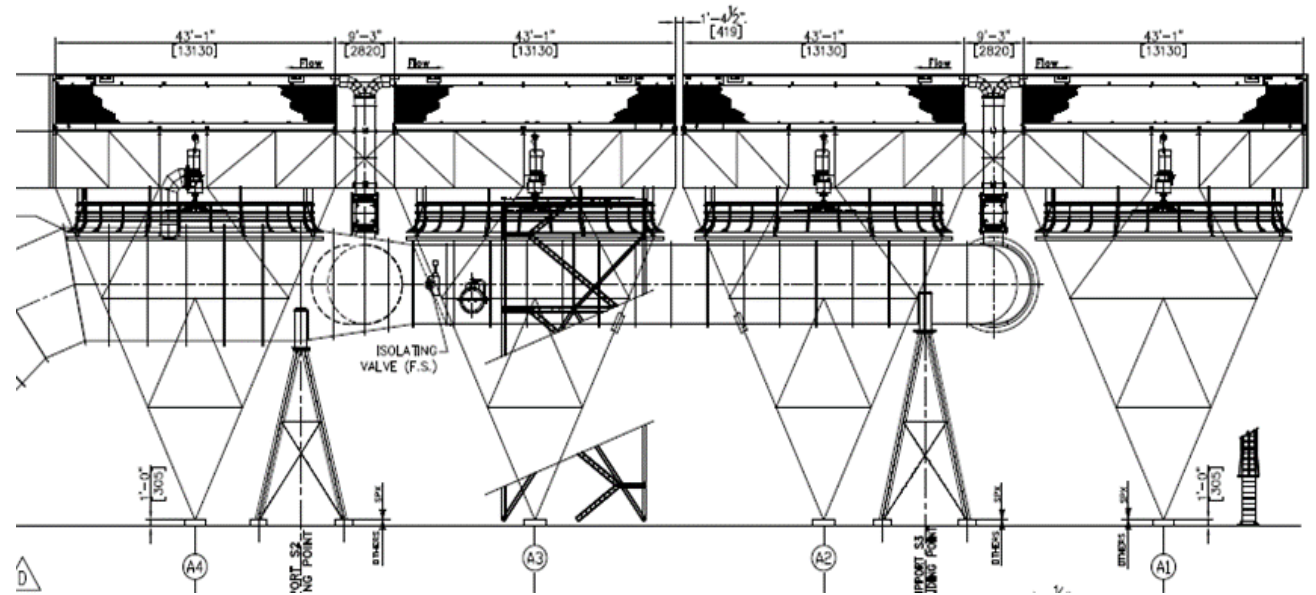
- 353 MW Gas Fired power plant in Saskatchewan Canada
- Online December 2019
- Contacted Galebreaker June 2020 regarding fan failures, performance loss during high winds

Project Scope

- Our first Sloped Structure ACC
- Seasonal Winds 19 M/S vs 5 M/S
- CFD to model existing conditions, evaluate ACC windscreens
- Provide loads created by windscreens
- Provide debris screens for ACHE with doors
- Design, manufacture, deliver to site.
- Provide Field Tech Rep
- Performance Evaluation

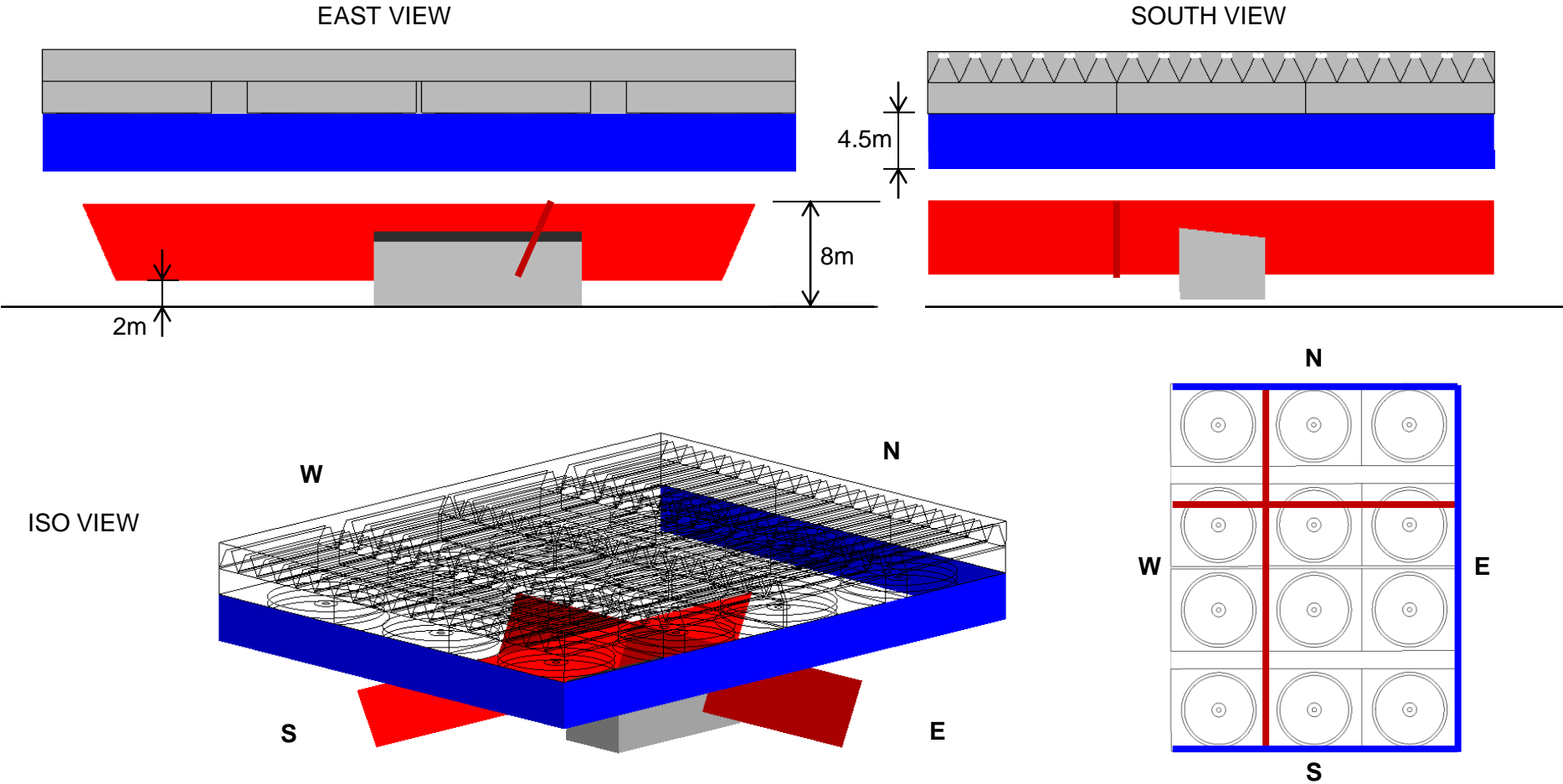


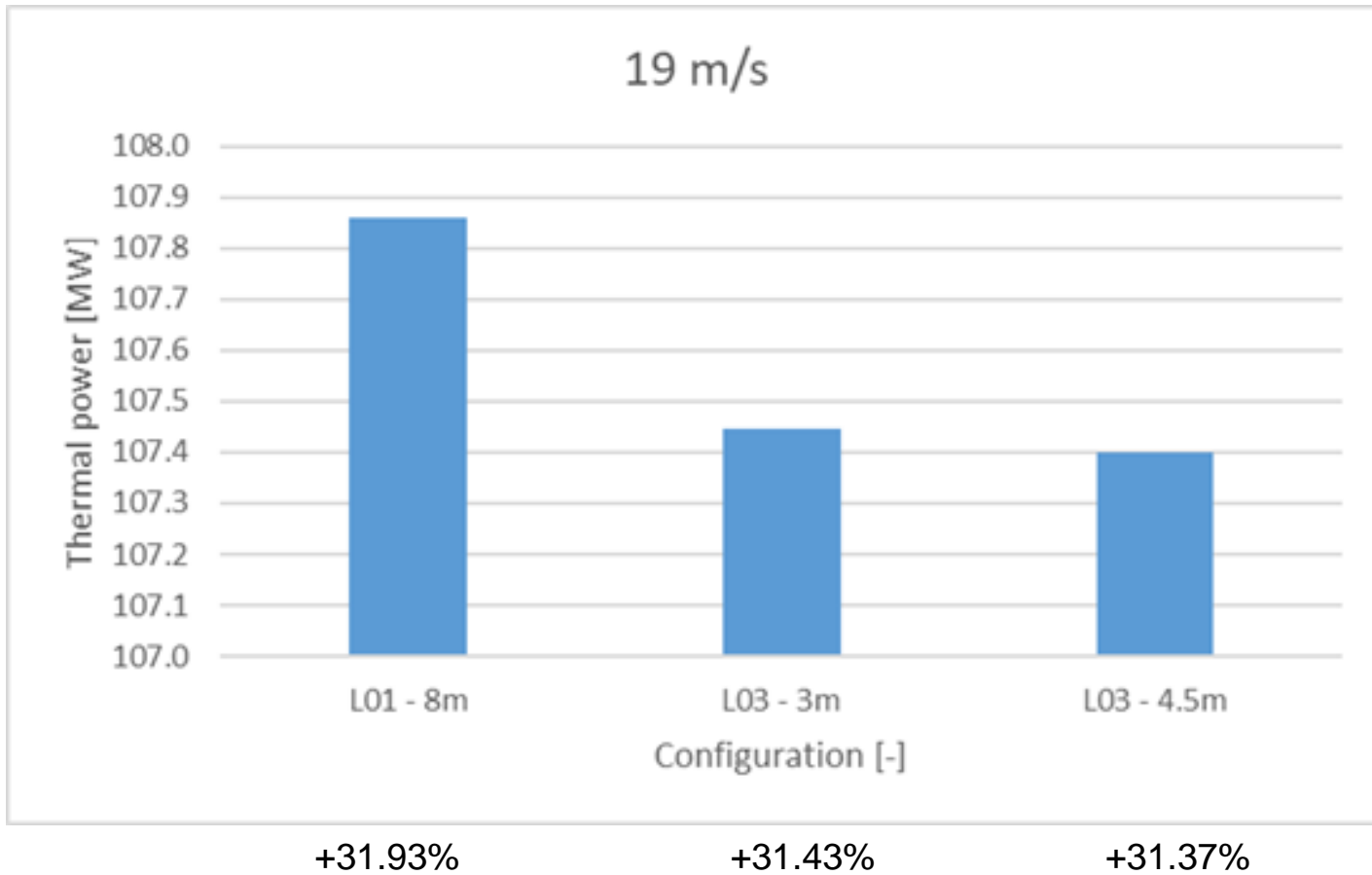
- SW wind predominant
- Relevant for high speed (19M/S)
- Vary windscreen configuration
- Vary windscreen height and solidity
- Many iterations with Perimeter and Cruciform windscreens



Windscreens configurations

- Layout L03 4.5m – Cruciform height=8m Solidity=75%, Perimeter height=4.5m Solidity=60%





L03-4.5m, 60% solidity is considered the best for its beneficial impact in terms of fan blade loading and cost.

Project Execution

- Material delivered in October 2022
- Some structural reinforcement required
- Installation April 2023
- 3 weeks duration
- Performance Evaluation Q3 2023





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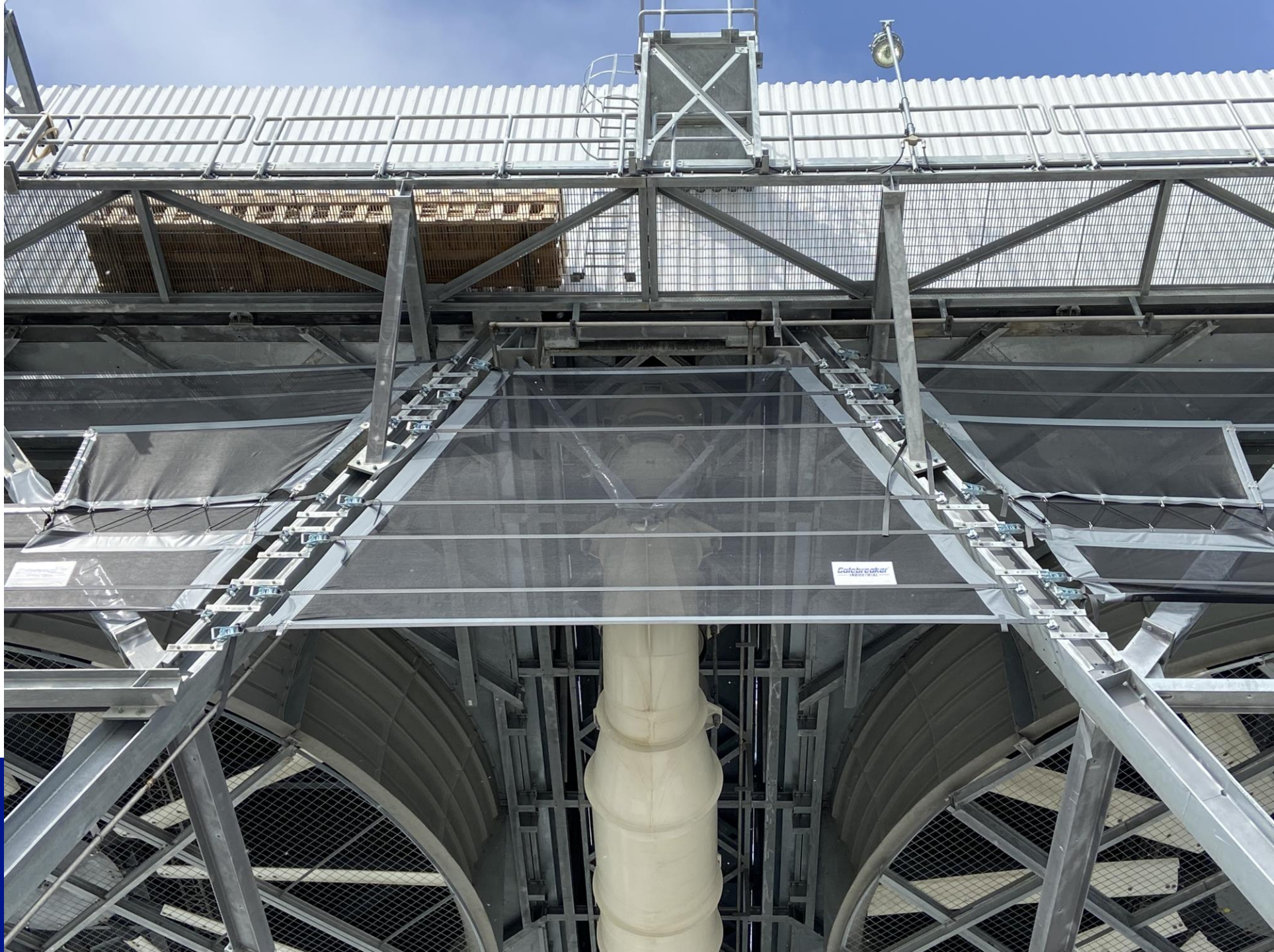
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Thank You !

Questions?

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