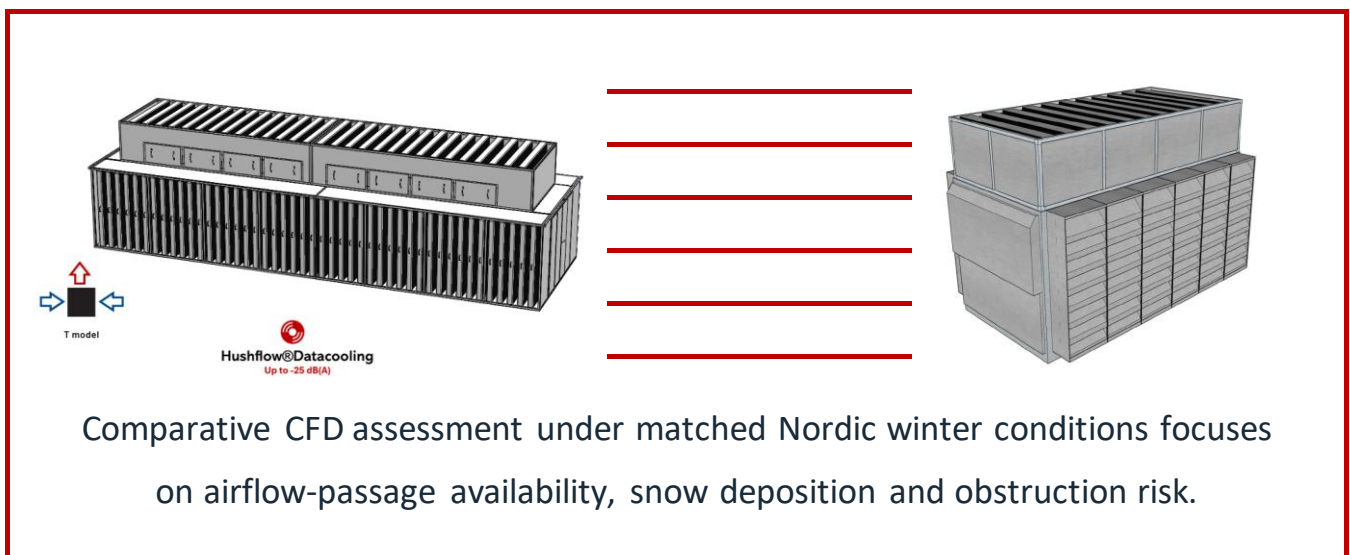


HUSHFLOW®DATACOOING

Nordics Application Case Study



Snow-Resilient Acoustic Treatment for Chiller Air Intakes



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1. Case study overview and executive conclusion

For Nordic data-centre and critical-cooling applications, achieving substantial acoustic attenuation requires more than selecting an acoustically efficient intake element. The treatment must also preserve chiller airflow during recurring snowfall and wind-driven snow exposure. This case study compares the HushFlow®Datacooling intake splitter concept with a typical acoustic-louvre arrangement using the same displayed accumulation scale and the same 55 m³/s chiller suction condition.

The HushFlow®Datacooling splitter bank and the typical acoustic-louvre configuration do not exhibit the same deposition topology. In the supplied louvre cases, deposition repeatedly follows the horizontal blade rows and, in the most exposed wind-driven cases, becomes dense over a large part of the lower frontal area.

The HushFlow®Datacooling cases show deposition distributed on individual splitter surfaces and through multiple deep vertical passages, without the same shallow, continuous frontal interception pattern. No visible obstruction of the air passages between splitters is observed in the CFD result.

Criterion	HushFlow®Datacooling splitter silencer	Typical acoustic-louvre configuration
Deposition topology	Localised on individual splitter surfaces; multiple parallel passages remain visually distinguishable.	Deposition aligns with repeated horizontal blade rows and can extend across broad portions of the frontal matrix.
Wind sensitivity	Wind increases local streaking and impact zones, but capture remains segmented by the deep channels.	Wind-driven cases show marked concentration over the windward/lower frontal louvre area.
Potential bridging path	Requires deposits to grow across relatively open passage widths or between splitter surfaces.	Closely spaced horizontal rows provide repeated neighbouring collection edges where deposits could connect as accumulation progresses.
Airflow consequence if deposits grow	Alternative parallel flow paths remain available around local deposits.	Any progressive bridging acts directly on the frontal free area and can force more airflow through the remaining openings.
Selection position	Preferred winter-operating intake geometry based on the supplied comparative CFD patterns.	Requires specific snow/ice risk mitigation before selection for recurring Nordic winter exposure.

What the CFD does and does not prove

The images establish a comparative deposition pattern, not a time-to-blockage calculation.

The contours do not by themselves quantify residual free area, pressure-drop increase, coil airflow reduction or chiller capacity loss after a defined snowfall duration.

The engineering conclusion should therefore be framed as a comparison of susceptibility to frontal snow bridging, not as a claim that one design accumulates no snow.

1.1 Geometries modelled in the comparative CFD

The comparative model uses the same overall intake-face dimensions for the two concepts: approximately 15.0 m length × 2.2 m height. The chiller suction boundary displayed in both base models is 55 m³/s. The purpose of these base views is to identify the two geometries before reviewing the snow-deposition contours.

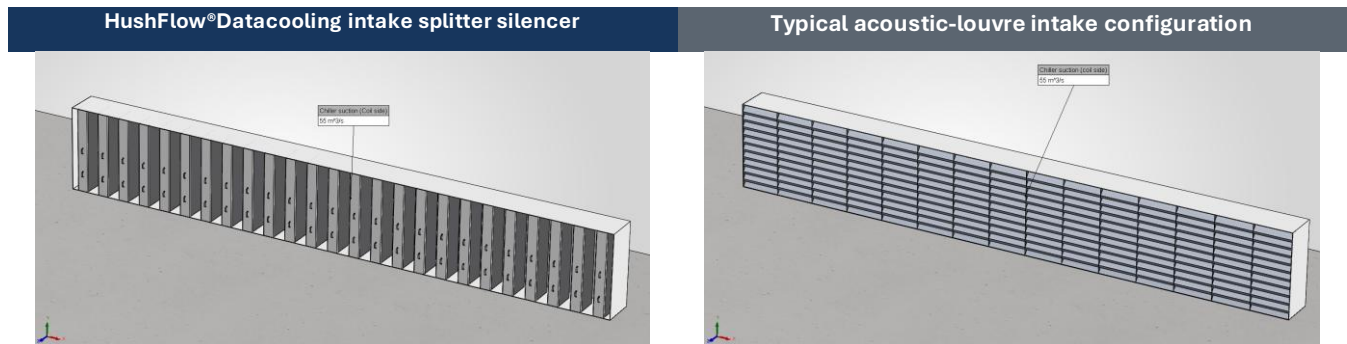


Figure 1 – Base geometries used for the CFD comparison. Both modelled intake faces are approximately 15.0 m long × 2.2 m high;
displayed chiller suction flow: 55 m³/s.

Geometry distinction. HushFlow®Datacooling uses deep vertical splitter passages, whereas the typical acoustic-louvre configuration uses a shallow matrix of closely spaced horizontal louvre blades. This geometric difference is central to the subsequent comparison of snow-deposition patterns and potential frontal snow bridging. In the simulated HushFlow®Datacooling scenarios, this geometry retains visibly open passage sections between splitters.

Snow-resilience assessment of an intake treatment intended for HushFlow®Datacooling applications targeting acoustic attenuation up to -15 dB(A). Final acoustic performance remains subject to project-specific octave-band data, geometry, airflow and insertion-loss validation.

2. CFD basis and matched test matrix

Snow density	100 kg/m ³
Snowfall intensity	10 mm/h
Chiller suction flow displayed	55 m ³ /s
Particle diameters	0.5 mm, 1 mm, 2 mm
Wind cases	No wind, 3 m/s, 8 m/s
No-wind particle introduction	From the sky, over approximately 300 m ²
Wind-case particle introduction	From the sky and a windward frontal plane, approximately 700 m ² total
Intake accumulation contour	0 to 0.0020 kg/(s·m ²) on the exported views
Ground accumulation contour	0 to 1000 mm/year on the exported views
Compared geometries	HushFlow®Datacooling deep vertical splitter bank; typical acoustic-louvre configuration with a shallow horizontal blade matrix
Outdoor air temperature	-10 °C for all simulated scenarios

All scenarios were calculated at an outdoor air temperature of -10 °C.

For visual interpretation, blue corresponds to the low end of the displayed accumulation scale, while green/yellow/red mark progressively higher local deposition. The comparison below assesses both the apparent quantity/distribution of captured snow and whether the airflow passages remain visibly open. For HushFlow®Datacooling, the assessment is based on visible airway availability rather than a generic risk rating.

Because the plots show local accumulation rate rather than deposited thickness versus time, terms such as **low, moderate, high or very high** refer to relative visible loading within this common CFD test matrix, not to a measured blockage percentage.

The ground contour expressed in mm/year is a software display convention used for particle-deposition visualisation. It does not represent the simulated event duration or a prediction of annual snow depth.

Methodological legend for typical-louvre obstruction-risk ratings

The qualitative ratings below apply only to the typical acoustic-louvre configuration and describe the visible deposition topology within the common CFD matrix. They do not represent a calculated percentage of blocked area or a time-to-blockage prediction.

Rating	Visible deposition criterion
Low	Discrete and widely spaced deposits.
Moderate	Repeated deposits across several blade rows, without extensive frontal continuity.
High	Dense and closely spaced deposits over a significant portion of the frontal area.
Very high	A dense deposition field across a large part of the frontal matrix, with strong potential for progressive connection between neighbouring deposits.

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Summary interpretation: the louvre results do not show a simple monotonic relationship between wind speed and visible deposition density.

Significant repeated blade-row deposition is already present in the no-wind cases, while wind redistributes the capture pattern and, in the more severe exposed cases, increases frontal concentration in specific regions. Across the complete HushFlow®Datacooling matrix, no visible obstruction of the air passages between splitters is observed in the CFD result.

Particle diameter	Wind speed	HushFlow®Datacooling intake splitter silencer	Typical acoustic-louvre configuration
0.5 mm	No wind	No visible obstruction of the air passages between splitters is observed in the CFD result.	High qualitative obstruction risk
0.5 mm	3 m/s	No visible obstruction of the air passages between splitters is observed in the CFD result.	Moderate–High qualitative obstruction risk
0.5 mm	8 m/s	No visible obstruction of the air passages between splitters is observed in the CFD result.	High qualitative obstruction risk
1 mm	No wind	No visible obstruction of the air passages between splitters is observed in the CFD result.	High qualitative obstruction risk
1 mm	3 m/s	No visible obstruction of the air passages between splitters is observed in the CFD result.	Moderate–High qualitative obstruction risk
1 mm	8 m/s	No visible obstruction of the air passages between splitters is observed in the CFD result.	High–Very high qualitative obstruction risk
2 mm	No wind	No visible obstruction of the air passages between splitters is observed in the CFD result.	Moderate–High qualitative obstruction risk
2 mm	3 m/s	No visible obstruction of the air passages between splitters is observed in the CFD result.	Moderate–High qualitative obstruction risk
2 mm	8 m/s	No visible obstruction of the air passages between splitters is observed in the CFD result.	Very high qualitative obstruction risk

The table below consolidates the nine matched CFD scenarios at -10 °C. HushFlow®Datacooling is reported by the observed airway condition; qualitative obstruction-risk levels apply only to the typical acoustic-louvre configuration and follow the methodological legend above.

3 Comparative scenario summary

3.1 Direct comparison: 0.5 mm particles | No wind

With no imposed wind, the 0.5 mm particles are governed mainly by downward injection and chiller-induced suction. On the typical acoustic-louvre configuration, repeated deposits are visible across many horizontal blade rows and over a broad part of the frontal matrix. The number and proximity of these collection points provide numerous potential initiation sites for progressive snow bridging if accumulation continues. The louvre is therefore assessed as high qualitative obstruction risk in this case.

HushFlow®Datacooling shows sparse, localised capture on splitter surfaces.

No visible obstruction of the air passages between splitters is observed in the CFD result.

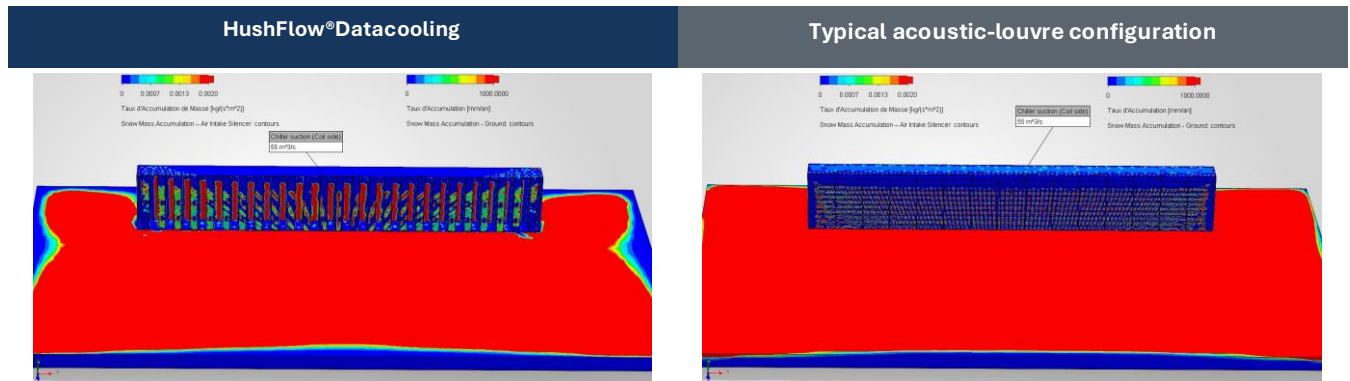


Figure 1.1 – Matched CFD view 2: 0.5 mm, no wind. Same displayed intake accumulation scale.

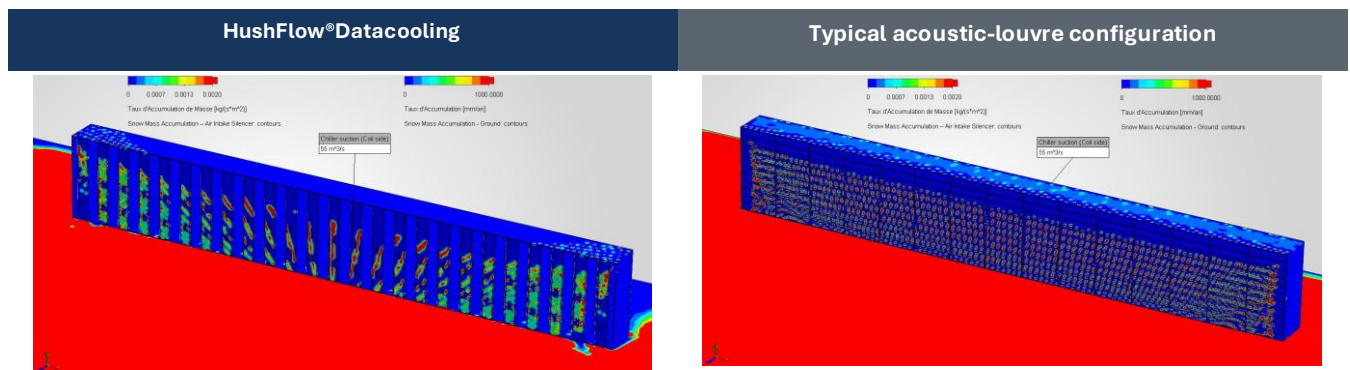


Figure 1.2 – Matched CFD view 1: 0.5 mm, no wind. Same displayed intake accumulation scale.

Airway assessment at -10 °C: HUSHFLOW®DATACOOING – NO VISIBLE OBSTRUCTION OF THE AIR PASSAGES BETWEEN SPLITTERS IS OBSERVED IN THE CFD RESULT / TYPICAL ACOUSTIC-LOUVRE CONFIGURATION – HIGH QUALITATIVE OBSTRUCTION RISK. The louvre rating compares the visible deposition topology within the common CFD matrix; it is not a calculated percentage of blocked area.

3.2 Direct comparison: 0.5 mm particles | 3 m/s wind

At 3 m/s, fine 0.5 mm particles become noticeably more wind driven. The louvre develops a larger number of aligned capture points across successive horizontal rows, especially in the lower and wind-exposed portions of the face. Wind redistributes the capture pattern along neighbouring blade edges; the no-wind case already shows substantial repeated row-wise deposition. The qualitative obstruction risk is assessed as moderate–high for the louvre if snowfall persists.

HushFlow®Datacooling also collects more particles, but deposits remain separated between deep vertical passages. The local deposits remain confined to splitter surfaces and the airways between the splitters remain visibly unaffected.

No visible obstruction of the air passages between splitters is observed in the CFD result.

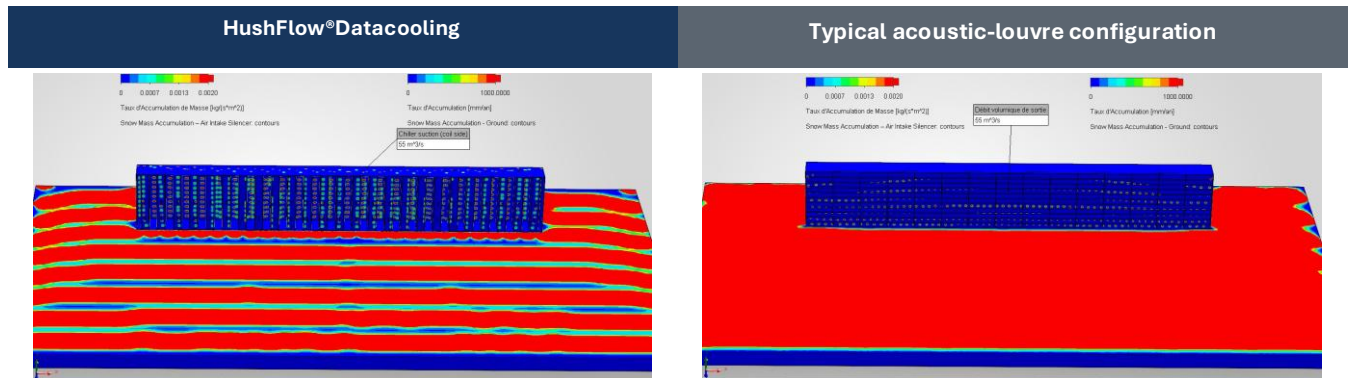


Figure 2.1 – Matched CFD view 2: 0.5 mm, 3 m/s wind. Same displayed intake accumulation scale.

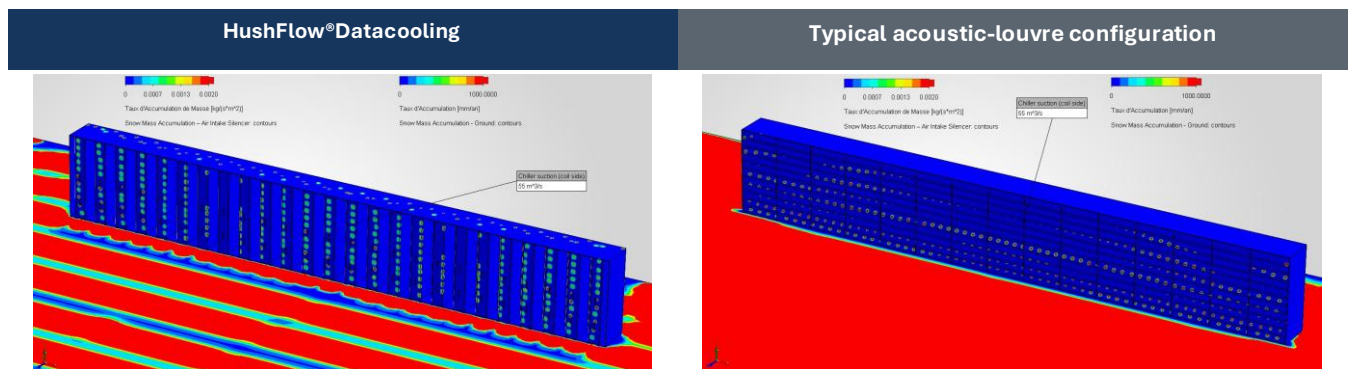


Figure 2.2 – Matched CFD view 1: 0.5 mm, 3 m/s wind. Same displayed intake accumulation scale.

Airway assessment at -10 °C: HUSHFLOW®DATACOOING – NO VISIBLE OBSTRUCTION OF THE AIR PASSAGES BETWEEN SPLITTERS IS OBSERVED IN THE CFD RESULT / TYPICAL ACOUSTIC-LOUVRE CONFIGURATION – MODERATE–HIGH QUALITATIVE OBSTRUCTION RISK. The louvre rating compares the visible deposition topology within the common CFD matrix; it is not a calculated percentage of blocked area.

3.3 Direct comparison: 0.5 mm particles | 8 m/s wind

The 8 m/s case is substantially more severe for fine particles. The typical acoustic-louvre configuration shows dense and repeated row-wise capture over a broad part of the lower frontal area, with many local zones approaching the upper colours of the accumulation scale. This pattern gives the clearest potential initiation points for snow bridges between closely spaced blades. The qualitative obstruction risk becomes high for the louvre under 8 m/s exposure.

HushFlow®Datacooling also shows stronger windward impactation and local high-accumulation spots, but these remain broken up by open vertical channels.

No visible obstruction of the air passages between splitters is observed in the CFD result.

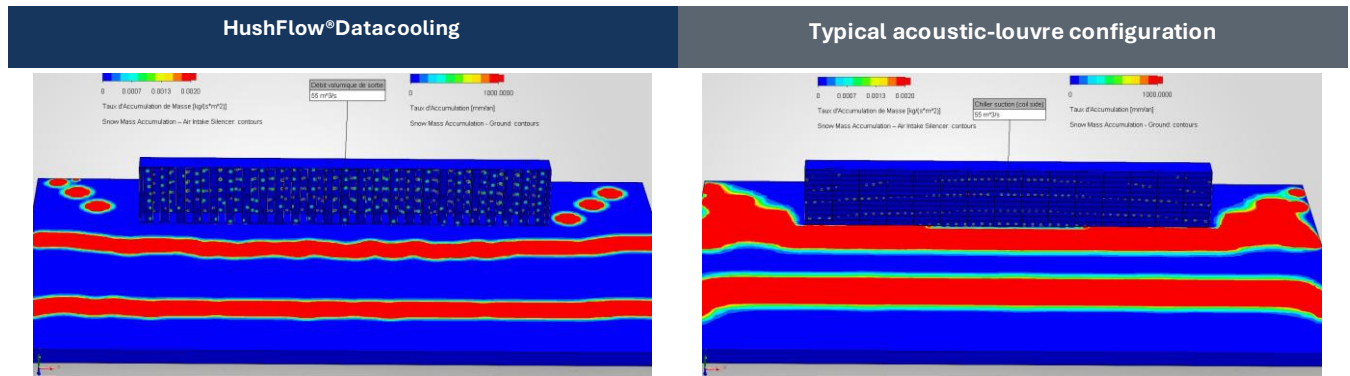


Figure 3.1 – Matched CFD view 2: 0.5 mm, 8 m/s wind. Same displayed intake accumulation scale.

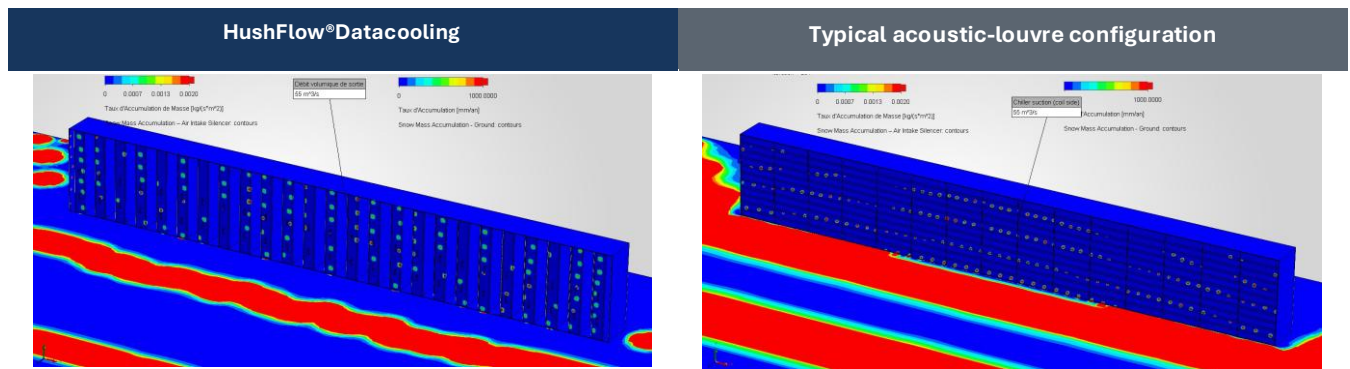


Figure 3.2 – Matched CFD view 1: 0.5 mm, 8 m/s wind. Same displayed intake accumulation scale.

Airway assessment at -10 °C: HUSHFLOW®DATACOOING – NO VISIBLE OBSTRUCTION OF THE AIR PASSAGES BETWEEN SPLITTERS IS OBSERVED IN THE CFD RESULT / TYPICAL ACOUSTIC-LOUVRE CONFIGURATION – HIGH QUALITATIVE OBSTRUCTION RISK. The louvre rating compares the visible deposition topology within the common CFD matrix; it is not a calculated percentage of blocked area.

3.4 Direct comparison: 1 mm particles | No wind

Without imposed wind, the 1 mm case still shows extensive repeated capture on the typical acoustic-louvre configuration. Deposits are visible across many horizontal blade rows and over a broad portion of the frontage rather than as only a few isolated points.

Under the methodological legend, this topology is consistent with a high qualitative obstruction risk because continued accumulation could connect neighbouring blade-edge deposits and progressively reduce frontal free area.

HushFlow®Datacooling shows local deposits on splitter surfaces without the same shallow row-wise interception field. No visible obstruction of the air passages between splitters is observed in the CFD result.

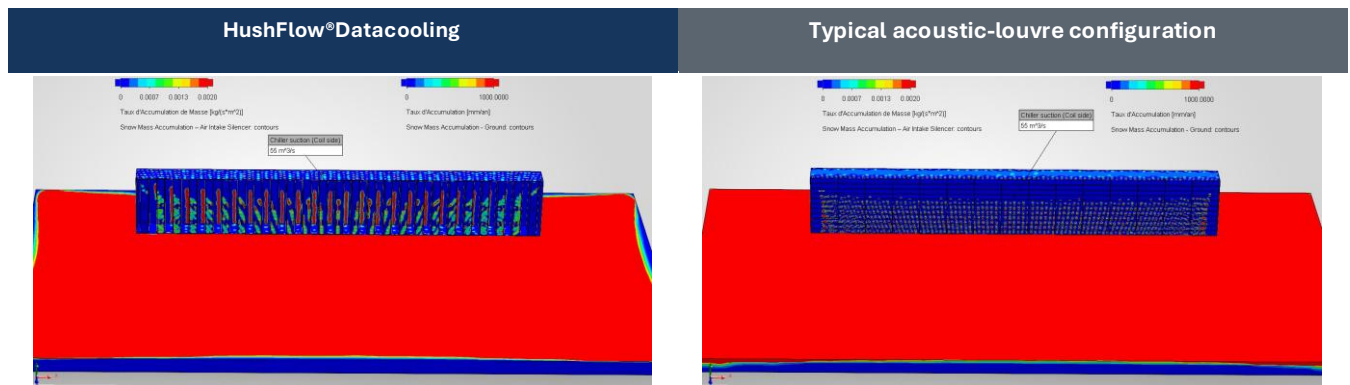


Figure 4.1 – Matched CFD view 2: 1 mm, no wind. Same displayed intake accumulation scale.

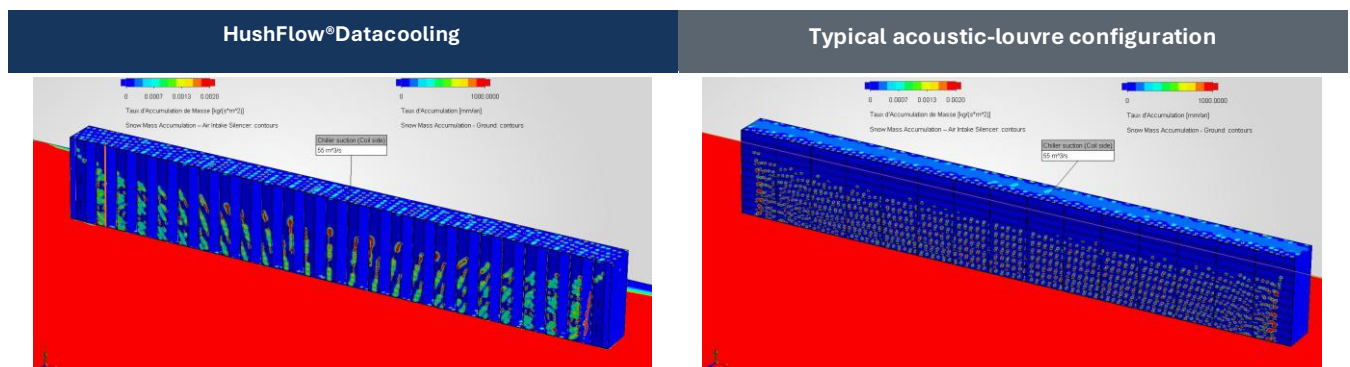


Figure 4.2 – Matched CFD view 1: 1 mm, no wind. Same displayed intake accumulation scale.

Airway assessment at -10 °C: HUSHFLOW®DATACOOING – NO VISIBLE OBSTRUCTION OF THE AIR PASSAGES BETWEEN SPLITTERS IS OBSERVED IN THE CFD RESULT / TYPICAL ACOUSTIC-LOUVRE CONFIGURATION – HIGH QUALITATIVE OBSTRUCTION RISK. The louvre rating compares the visible deposition topology within the common CFD matrix; it is not a calculated percentage of blocked area.

3.5 Direct comparison: 1 mm particles | 3 m/s wind

At 3 m/s, 1 mm particles combine appreciable inertia with lateral transport. The louvre shows a clear multiplication of deposits along several blade rows across the frontage, producing a more continuous network of potential collection points than in the no-wind case. Relative loading and bridging susceptibility are therefore moderate to high on the louvre.

HushFlow®Datacooling shows stronger local impact traces but still preserves visible gaps and alternative passage area around the deposits. Local impact traces increase, but the open sections between splitters remain visibly available across the intake.

No visible obstruction of the air passages between splitters is observed in the CFD result.

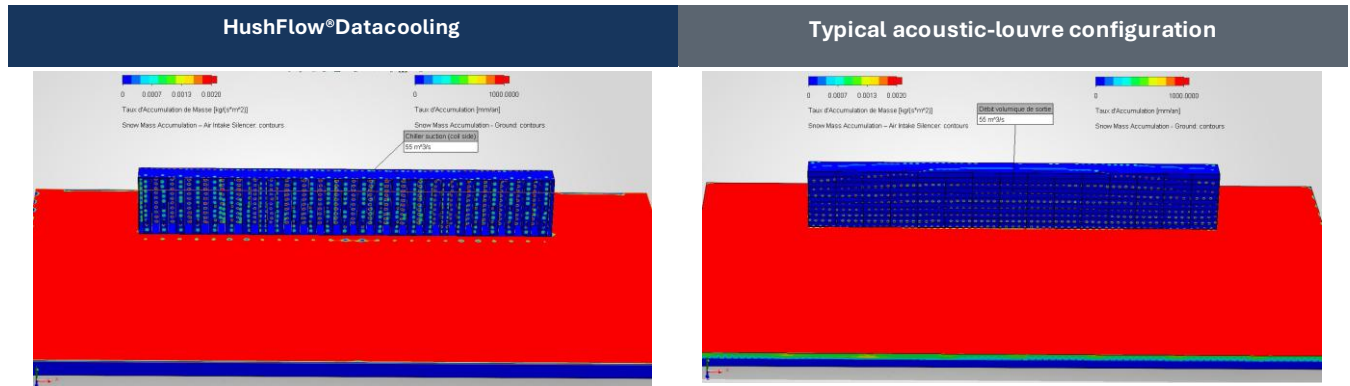


Figure 5.1 – Matched CFD view 2: 1 mm, 3 m/s wind. Same displayed intake accumulation scale.

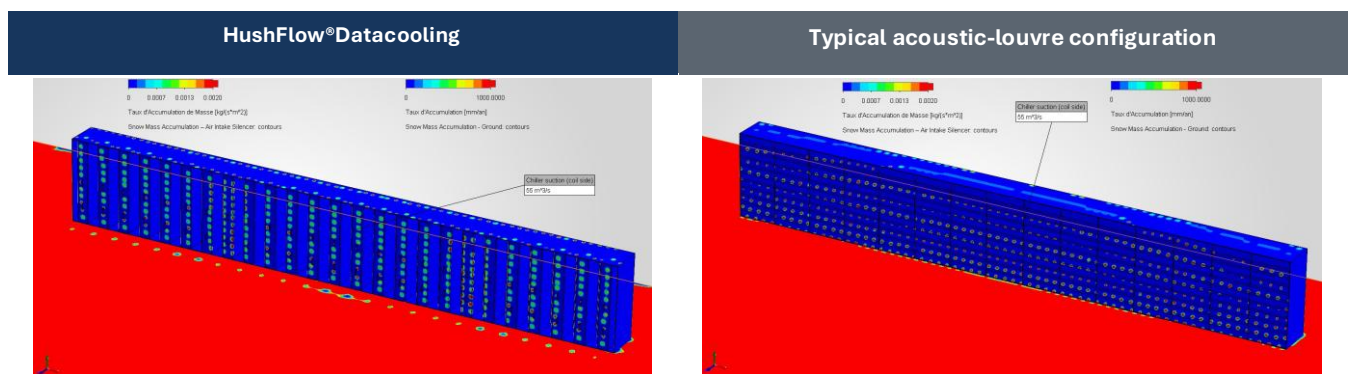


Figure 5.2 – Matched CFD view 1: 1 mm, 3 m/s wind. Same displayed intake accumulation scale.

Airway assessment at -10 °C: HUSHFLOW®DATACOOING – NO VISIBLE OBSTRUCTION OF THE AIR PASSAGES BETWEEN SPLITTERS IS OBSERVED IN THE CFD RESULT / TYPICAL ACOUSTIC-LOUVRE CONFIGURATION – MODERATE-HIGH QUALITATIVE OBSTRUCTION RISK. The louvre rating compares the visible deposition topology within the common CFD matrix; it is not a calculated percentage of blocked area.

3.6 Direct comparison: 1 mm particles | 8 m/s wind

This is one of the most discriminating scenarios. With 1 mm particles and 8 m/s wind, the louvre exhibits a dense field of yellow/orange/red capture points extending over much of the lower half of the frontal matrix. The number and proximity of loaded blade edges materially increase the plausibility of progressive bridging and free-area loss if the snowfall event continues. The qualitative obstruction risk is high to very high for the louvre.

HushFlow®Datacooling also experiences significant local deposition under the same forcing, but the high-loading zones remain spatially segmented by the deep splitter passages.

HushFlow®Datacooling shows significant local deposition on splitter surfaces, but no visible obstruction of the air passages between splitters is observed in the CFD result.

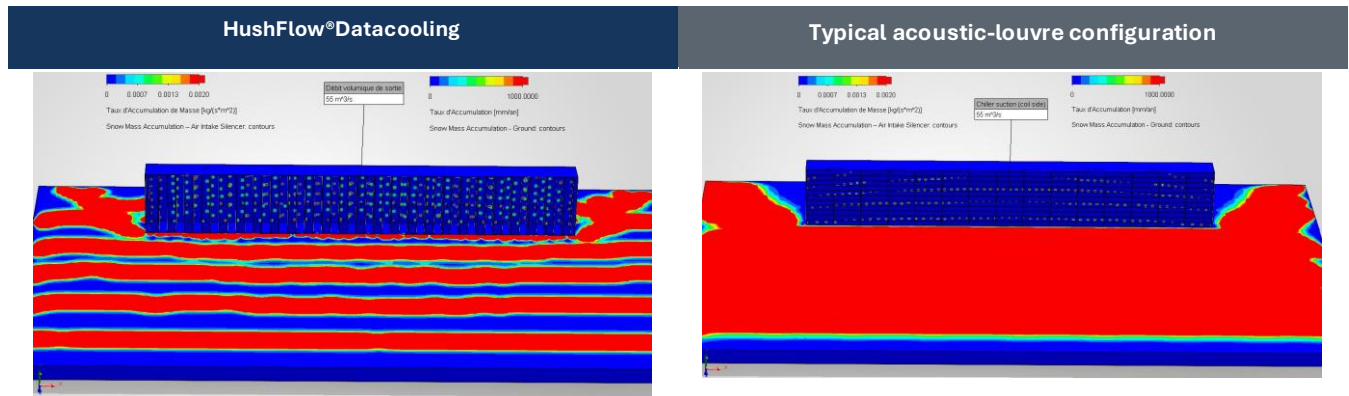


Figure 6.1 – Matched CFD view 2: 1 mm, 8 m/s wind. Same displayed intake accumulation scale.

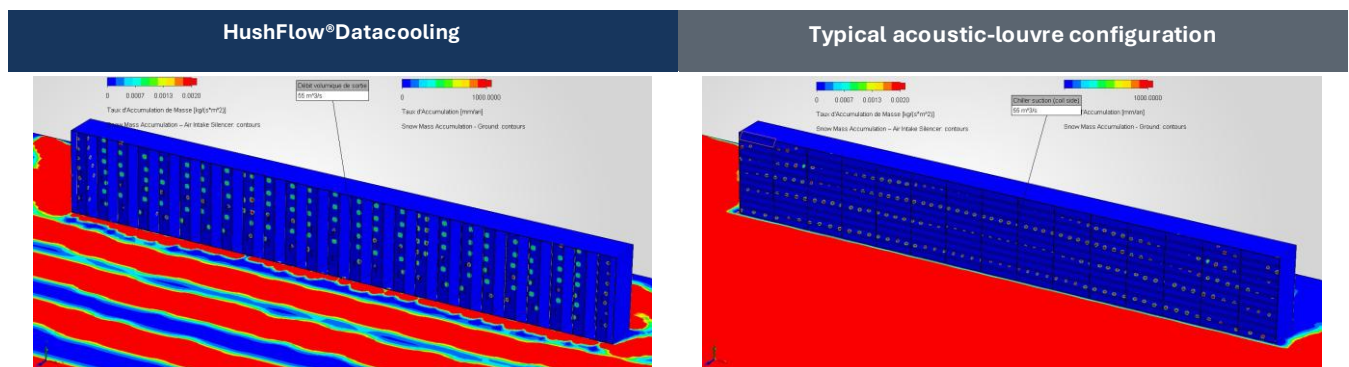


Figure 6.2 – Matched CFD view 1: 1 mm, 8 m/s wind. Same displayed intake accumulation scale.

Airway assessment at -10 °C: HUSHFLOW®DATACOOING – NO VISIBLE OBSTRUCTION OF THE AIR PASSAGES BETWEEN SPLITTERS IS OBSERVED IN THE CFD RESULT / TYPICAL ACOUSTIC-LOUVRE CONFIGURATION – HIGH-VERY HIGH QUALITATIVE OBSTRUCTION RISK. The louvre rating compares the visible deposition topology within the common CFD matrix; it is not a calculated percentage of blocked area.

3.7 Direct comparison: 2 mm particles | No wind

For 2 mm particles without imposed wind, gravitational settling is more influential, but the typical acoustic-louvre configuration still shows repeated deposition across numerous horizontal blade rows. The visible field is less intense than the most severe wind-driven cases, yet it is sufficiently widespread to justify a moderate–high qualitative obstruction risk because potential bridging nuclei are distributed across the frontal matrix.

HushFlow®Datacooling retains separated deep passages around local deposits.

No visible obstruction of the air passages between splitters is observed in the CFD result.

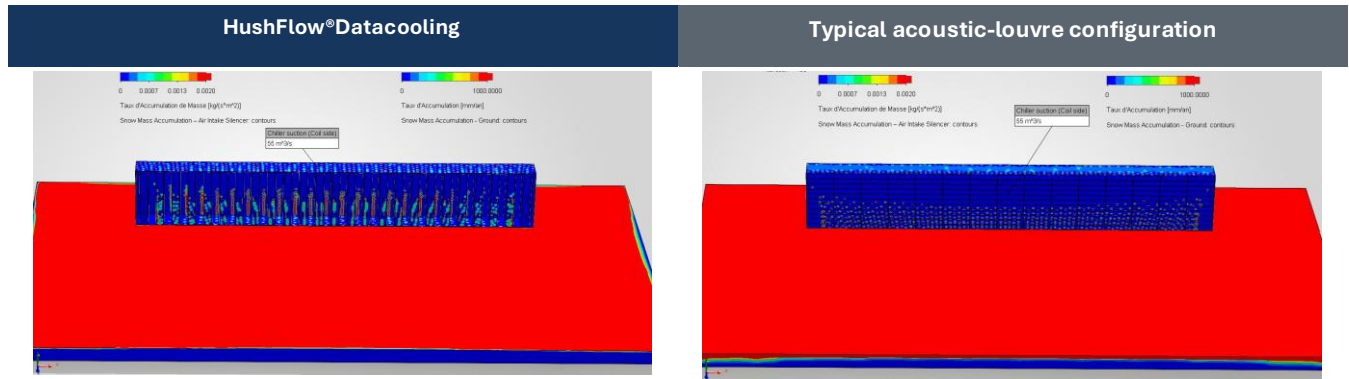


Figure 7.1 – Matched CFD view 2: 2 mm, no wind. Same displayed intake accumulation scale.

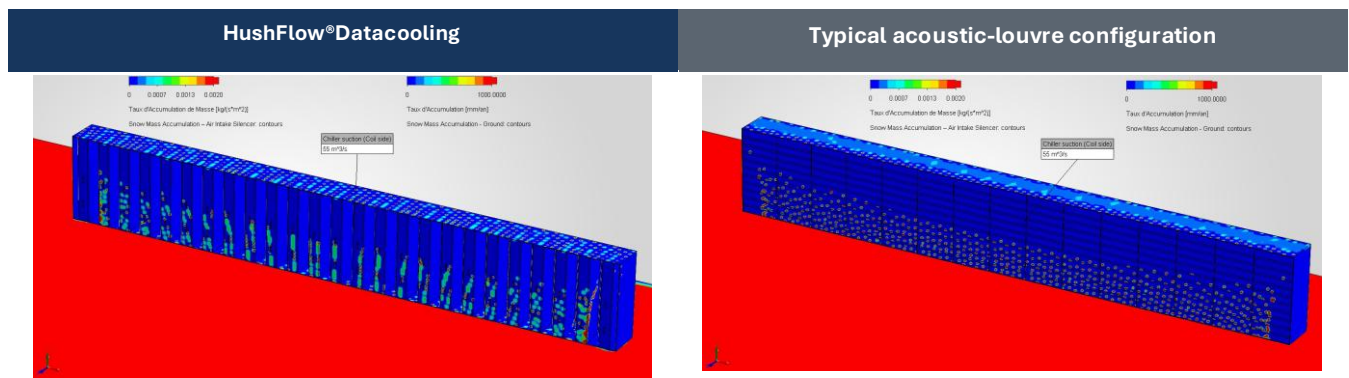


Figure 7.2 – Matched CFD view 1: 2 mm, no wind. Same displayed intake accumulation scale.

Airway assessment at -10 °C: HUSHFLOW®DATACOOING – NO VISIBLE OBSTRUCTION OF THE AIR PASSAGES BETWEEN SPLITTERS IS OBSERVED IN THE CFD RESULT / TYPICAL ACOUSTIC-LOUVRE CONFIGURATION – MODERATE–HIGH QUALITATIVE OBSTRUCTION RISK. The louvre rating compares the visible deposition topology within the common CFD matrix; it is not a calculated percentage of blocked area.

3.8 Direct comparison: 2 mm particles | 3 m/s wind

With 2 mm particles and 3 m/s wind, inertia and settling produce a stronger windward/lower-face collection pattern. The typical acoustic-louvre configuration contains numerous regularly spaced deposits on adjacent horizontal rows, creating many potential nuclei for snow bridging as deposit thickness increases. Compared with the 2 mm no-wind case, the quantity and distribution of deposits justify raising the qualitative obstruction risk to moderate/high for the louvre.

HushFlow®Datacooling receives localised impacts on splitter surfaces and lower regions, but capture remains divided among independent channels.

No visible obstruction of the air passages between splitters is observed in the CFD result.

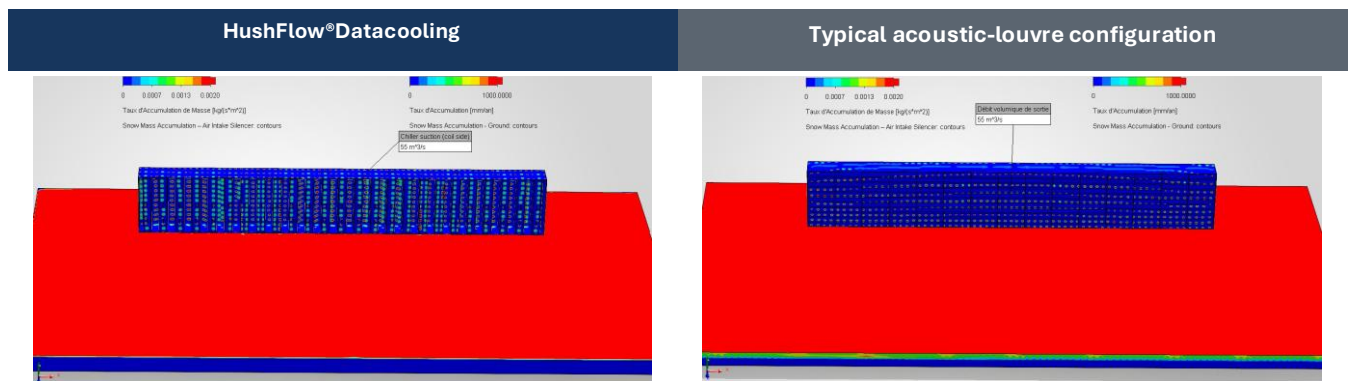


Figure 8.1 – Matched CFD view 2: 2 mm, 3 m/s wind. Same displayed intake accumulation scale.

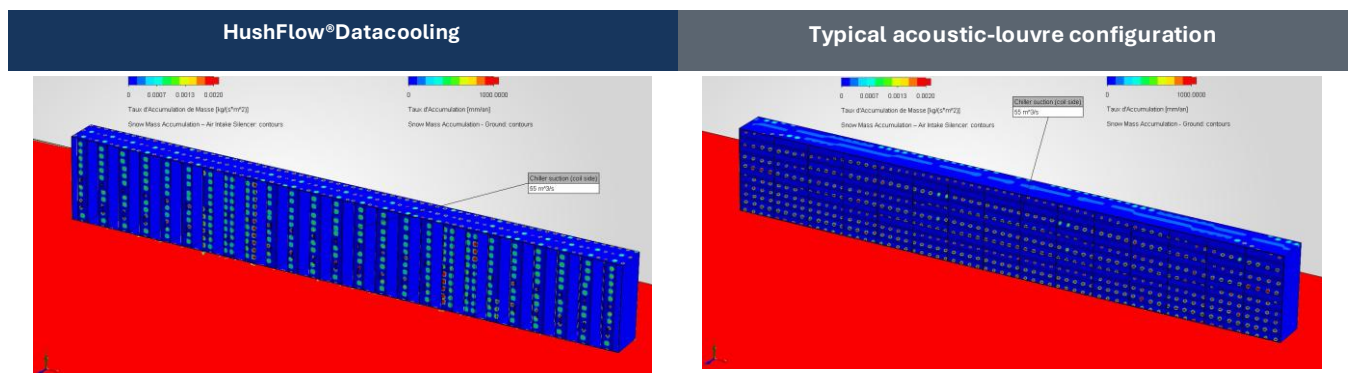


Figure 8.2 – Matched CFD view 1: 2 mm, 3 m/s wind. Same displayed intake accumulation scale.

Airway assessment at -10 °C: HUSHFLOW®DATACOOING – NO VISIBLE OBSTRUCTION OF THE AIR PASSAGES BETWEEN SPLITTERS IS OBSERVED IN THE CFD RESULT / TYPICAL ACOUSTIC-LOUVRE CONFIGURATION – MODERATE-HIGH QUALITATIVE OBSTRUCTION RISK. The louvre rating compares the visible deposition topology within the common CFD matrix; it is not a calculated percentage of blocked area.

3.9 Direct comparison: 2 mm particles | 8 m/s wind

At 8 m/s, the 2 mm case combines the largest particle inertia with the strongest lateral forcing. The typical acoustic-louvre configuration views show extensive frontal capture and dense deposition points in the lower intake region, so continued accumulation could progressively connect neighbouring blade rows and reduce effective free area. The qualitative obstruction risk is therefore very high for the louvre under this severe scenario

HushFlow®Datacooling is not insensitive to this extreme case: appreciable local deposition occurs and winter inspection remains necessary. However, the deposits are still separated by the vertical splitter passages instead of forming the same shallow frontal collection matrix.

No visible obstruction of the air passages between splitters is observed in the CFD result.

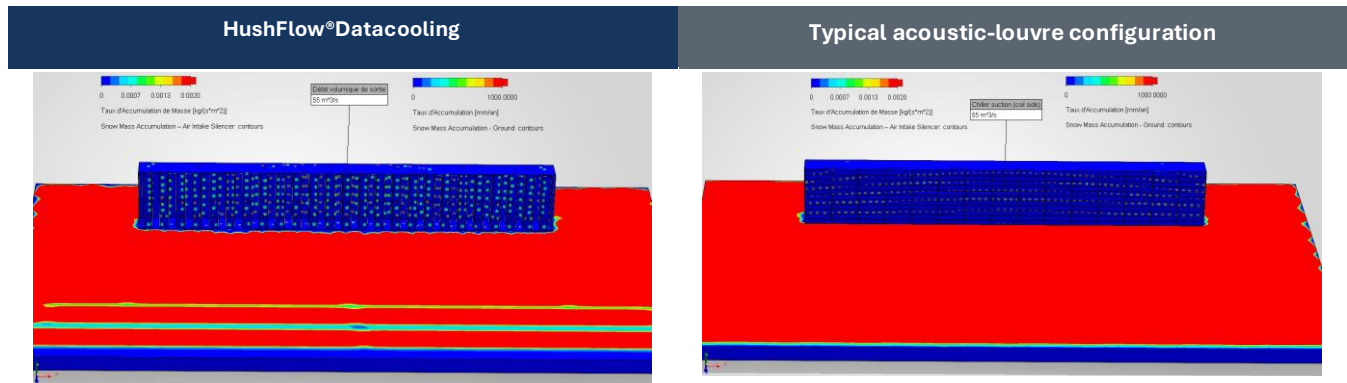


Figure 9.1 – Matched CFD view 2: 2 mm, 8 m/s wind. Same displayed intake accumulation scale.

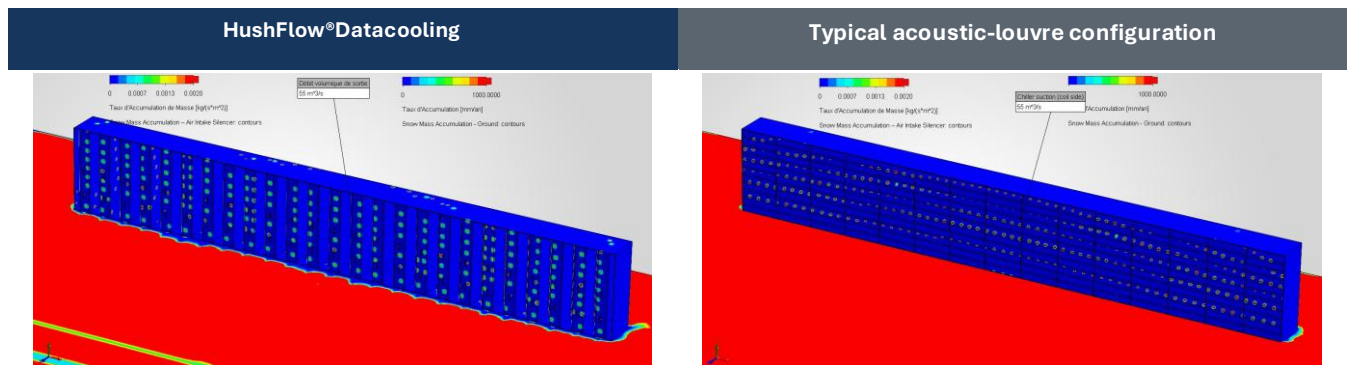


Figure 9.2 – Matched CFD view 1: 2 mm, 8 m/s wind. Same displayed intake accumulation scale.

Airway assessment at -10 °C: HUSHFLOW®DATACOOING – NO VISIBLE OBSTRUCTION OF THE AIR PASSAGES BETWEEN SPLITTERS IS OBSERVED IN THE CFD RESULT / TYPICAL ACOUSTIC-LOUVRE CONFIGURATION – VERY HIGH QUALITATIVE OBSTRUCTION RISK. The louvre rating compares the visible deposition topology within the common CFD matrix; it is not a calculated percentage of blocked area.

4. Engineering interpretation and chiller impact

4.1 Snow resilience is a key Nordic design criterion

The CFD comparison confirms that intake geometry materially changes where snow is intercepted. For a Nordic acoustic enclosure targeting attenuation of up to -15 dB(A), this is a key selection criterion because the chiller must retain its design suction flow through the coil-side intake. A deposit pattern that progressively closes frontal openings would reduce effective free area and alter the aerodynamic resistance seen by the fans and coils.

4.2 Why the typical acoustic-louvre configuration deserves particular attention

- The simulated louvre has numerous closely spaced horizontal blade edges directly across the suction face.
- Particle deposition repeatedly follows those rows in the supplied results.
- In the higher-wind cases, a dense collection field is visible over a substantial lower portion of the louvre face.
- If those discrete deposits grow and connect, the resulting snow bridge would act directly across the frontal free area.

4.3 Why HushFlow®Datacooling is more tolerant of local deposits

- The intake is formed by deep splitter passages rather than a shallow frontal blade matrix.
- Deposition is distributed on individual splitter surfaces and along the depth of the passages.
- The CFD views continue to show separated airflow channels even when local red/high-accumulation regions are present.
- Local capture therefore does not immediately translate into face-wide closure of the complete suction section.

4.4 Performance implication

The relevant advantage is therefore not “no snow accumulation”.

No visible obstruction of the air passages between splitters is observed in the CFD result.

The defensible conclusion is therefore that the tested HushFlow®Datacooling geometry preserves its airflow passages under the simulated conditions, while the typical acoustic-louvre configuration presents a greater visible propensity for shallow frontal snow bridging.

All scenarios correspond to an outdoor air temperature of -10 °C.

5. Case study conclusion and HushFlow®Datacooling value proposition

This Nordics application case study provides a technical basis for distinguishing between two intake-treatment concepts where substantial noise reduction and reliable winter operation must be achieved simultaneously.

Under the matched cases provided, the typical acoustic-louvre configuration repeatedly collects particles along its horizontal blade matrix, with especially dense frontal capture visible in the wind-driven cases. The HushFlow®Datacooling splitter silencer also accumulates snow locally, as any exposed intake treatment can, but the deposits remain distributed across separated deep passages rather than forming the same shallow row-wise frontal collection pattern.

For Nordic chiller applications seeking acoustic performance of up to -15 dB(A), the HushFlow®Datacooling enclosure with intake splitter silencers provides the preferred design basis, subject to project-specific confirmation of insertion loss, aerodynamic pressure drops, drainage and clearance, and winter inspection provisions.

The CFD does not justify claiming zero accumulation. It does, however, support the technically defensible statement that the HushFlow®Datacooling geometry is less susceptible to frontal snow bridging and consequent intake-area obstruction than the simulated typical acoustic-louvre geometry.

CASE STUDY SUMMARY

“This Nordic case study evaluates how an intake acoustic treatment can support a target attenuation of up to -15 dB(A) while preserving airflow under recurring snow exposure. A like-for-like CFD comparison was completed between the HushFlow®Datacooling deep splitter arrangement and a typical acoustic-louvre configuration, covering three particle sizes and no-wind, 3 m/s and 8 m/s conditions at -10 °C. Snow deposits remain localised on HushFlow®Datacooling splitter surfaces. No visible obstruction of the air passages between splitters is observed in the CFD result. The louvre geometry, by contrast, concentrates deposition along a shallow horizontal blade matrix and can develop a dense frontal collection pattern under wind-driven conditions. The results support HushFlow®Datacooling has the more robust intake-silencer concept for Nordic cooling applications where acoustic performance, energy efficiency and winter operating continuity must be addressed together.”