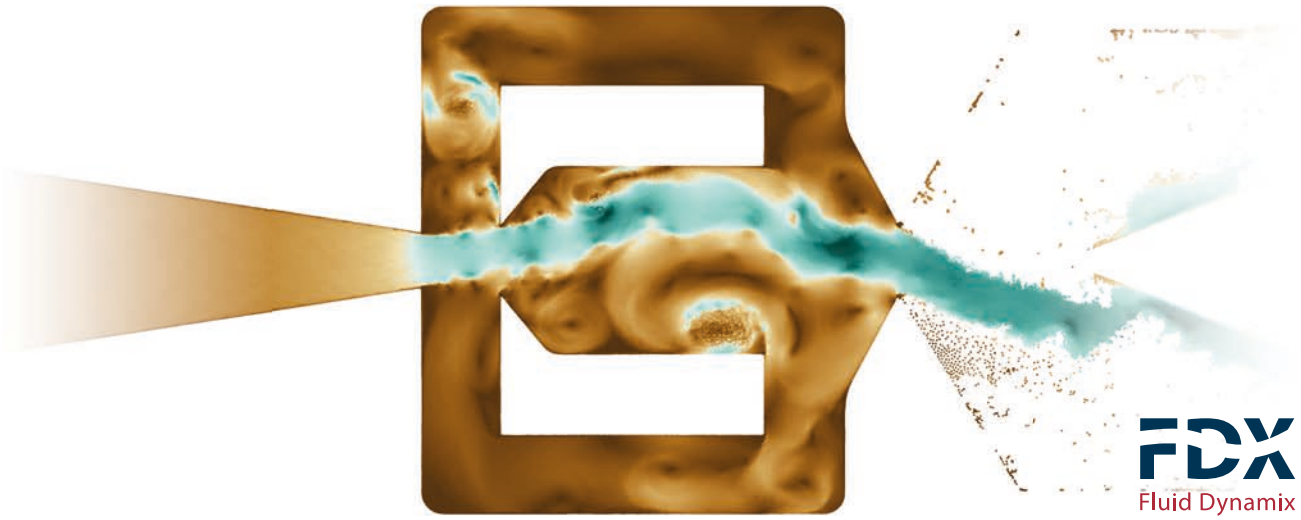
USE CASE
Fluidic Oscillator

Pushing the limits of SPH

DIVE SOLUTIONS

The fluidic oscillator is an impressive use case for SPH with challenging physics.
The nozzle creates an oscillating jet without any moving parts and is employed in diverse applications (e.g. mixing or cleaning processes). A correct calculation of the boundary layer is as important as the precise representation of flow instabilities at high Reynolds numbers (≈16,000).
The work presented here is the result of a cooperation between FDX Fluid Dynamics GmbH and dive solutions GmbH. It's goal was to explore the potentials of meshfree methods in nozzle applications and develop a methodology to accurately simulate the fluidic oscillator. SPH has significant advantages over classical CFD in nozzle applications, due to the ease of handling free surface flows. A few innovations were required to improve the results over a standard SPH approach.



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STEPS TAKEN

DIVE SOLUTIONS

New Boundary

The CAD output can be used directly, without any remeshing required.

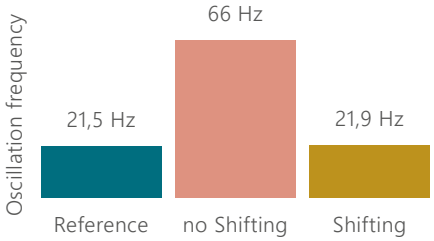
- Trouble-free handling of complex shapes.
- Minimal CAD overhead.
- Increased Performance.

New Feature

Shifting enforces a homogenous particle distribution by applying a diffusion term. This increases the simulation quality significantly.

- No voids in areas of high vorticity.
- Increased interpolation accuracy.
- Overall improvement of simulation quality.

Validation



In comparison with experimental reference data, the effect of shifting becomes clear: the oscillation frequency is now accurately predicted.

Implicit Phase Interface

Negligible Air Phase

User-friendly Preparation

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