PHOENICS Newsletter

Welcome to the Summer 2026 edition of the newsletter.

This issue reflects the continuing evolution and integration of Computational Fluid Dynamics (CFD) within modern engineering workflows. From innovative approaches to hybrid fluid-flow computing and advances in particle simulation, to the expanding capabilities of PHOENICS-based solutions and the launch of new integrated platforms, the articles in this edition demonstrate how simulation technology is becoming more accessible, efficient, and practical for engineers across a wide range of industries.

We are also pleased to highlight the strengthening collaboration between CHAM and ZWSOFT, whose shared vision is driving the development of next-generation CFD solutions while building on the trusted heritage of PHOENICS. Together, we remain committed to supporting our users with robust technology, technical expertise, and innovative tools that help solve real-world engineering challenges.

We hope you enjoy this edition and find inspiration in the developments and applications featured throughout these pages.

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Concentration, Heat and Momentum Limited (CHAM)
Bakery House, 40 High Street, Wimbledon Village, London, SW19 5AU, England
Tel: +44 (0)20 8947 7651 Email: phoenics@cham.co.uk Web: www.cham.co.uk

SUMMER 2026

Hybrid fluid-flow computing with PHOENICS

Dr. R. P. Hornby, Independent Researcher, FIMA

Introduction

For large scale, complex fluid-flow simulations using Computational Fluid Dynamics (CFD), computing costs can still be significant, so ways of reducing the overall costs need to be investigated. It may be the case that some sections of a fluid flow can be treated as approximately one dimensional (1D) and so can be computed without recourse to a full CFD representation. For example, consider a fluid flow simulation that can be broken down into 3 systems, the first and third systems being respectively the input to and output from the second system (see Figure 1). The first and third systems could be pipe networks (so essentially 1D) feeding into and from the second system which requires a full CFD representation (being 2D or 3D). Systems one and three can be represented by flow resistance networks linking into system two which is represented using PHOENICS. Linking the three systems together is the subject of this article and can be considered as a form of 'hybrid' fluid flow computing where separate fluid systems are linked together to form an integrated system.

Analysis

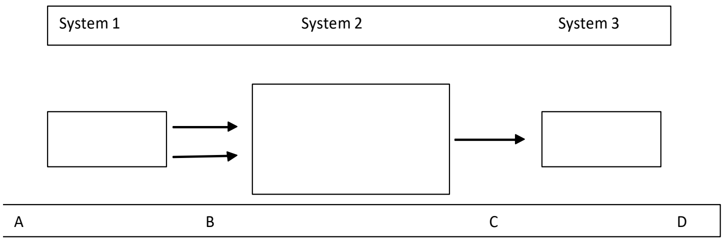


Figure 1 . Fluid flow system comprising 3 separate systems which are to be linked together, Systems 1 and 3 can be represented using fluid flow networks while system 2 requires a full CFD analysis. Fixed boundary conditions are set at positions A and D and link conditions set between the systems at B and C.

The fluid flow in systems 1 and 3 are approximated as 1D and so can be described using flow resistance networks where the pressure drop, Δp, in each branch of the network is given by (ignoring buoyancy effects)

$$\Delta p = R w^2$$

where R is the branch flow resistance and w is the branch mass flow rate. The energy equation for the branch is

$$Q = w c_P \Delta T$$

where Q is the rate of energy input to the branch, c_p the specific heat at constant pressure and ΔT the temperature change across the branch. Solution procedures for fluid flow networks are well documented and computing requirements relatively small.

System 2 is a 2D open flow area and so requires a full CFD treatment which is provided by PHOENICS. Note a flow variable *X* in system *i* at inlet or outlet *j* is represented as *Xsij*. A fixed flow variable is represented as *Xfij*.

System 1 consists of 2 flow inputs to system 2, and system 3 has 1 outflow from system 2. For simplicity, system 1 is represented by 2 separate branches with fixed entry pressures *pf11*, *pf12* and temperatures *Tf11*, *Tf12* at position A. System 3 is represented by a single flow branch to a fixed outlet pressure *pf31* at position D. These 3 systems require stitching together to provide the overall fluid flow solution.

If the pressures at locations B (*ps11*, *ps12*) and C (*ps23*) are guessed then system 1 can supply the mass, momentum and energy inputs for the first sweep of system 2 (PHOENICS). This first sweep of PHOENICS will also supply the outflow at position C into system 3. In addition the PHOENICS sweep will supply new pressures at locations B (*ps21, ps22*) and C (*ps23)*. These pressures have to be consistent with those derived in systems 1 and 3 using the flow-resistance equations.

The solution is achieved when ps11 equals *ps21*, *ps12* equals *ps22* and *ps23* equals *ps31* and is accomplished iteratively over each sweep carried out by PHOENICS (so some GROUND coding is required). In order to aid convergence a relaxation factor, *a*, is used, so that a system 2 (*i=2*) input (*j=1,2*) or output (*j=3*) pressure is updated using the boundary flow resistance values as

$$p_{ij}^{n} = p_{ij}^{n-1} + \alpha\left(p_{ij}^{n} - p_{ij}^{n-1}\right) , \qquad \alpha \leq 1$$

where *n* is the sweep number.

Results

System 2 (solved with PHOENICS) is a 2D region with inputs (system 1) and output (system 3) as shown in Figure 2. Apart from the mass, momentum and energy inputs from the flow resistance networks (system 1) there are no other sources. The flow is assumed laminar and solved over a number of iterative sweeps as a steady-state flow. This is no restriction, as a transient is similarly solved over a number of sweeps on each time step. All results are non-dimensional.

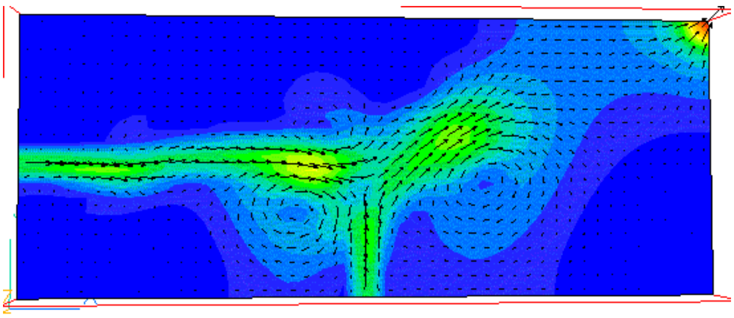


Figure 2. System 2 velocity plot showing inputs from system 1 on the left and bottom boundaries and output to system 3 at the top right.

Figure 3 shows the pressure variations on each side of the boundaries between the flow systems, and the pressures converge to common values over a few tens of sweeps. Figure 4 shows that mass conservation is achieved over a similar number of sweeps. For transient calculations, the same behaviour is expected as usually a few tens of sweeps are sufficient over each time step.

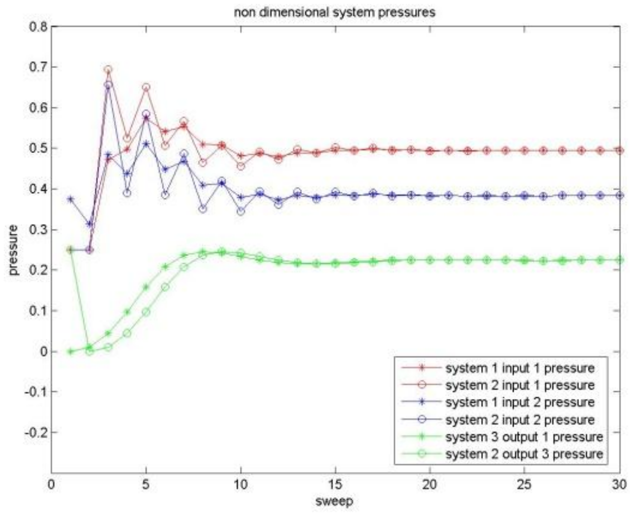


Figure 3. Plots of the pressures on each system boundary (locations B and C of figure 1) showing a fairly rapid convergence to a common pressure.

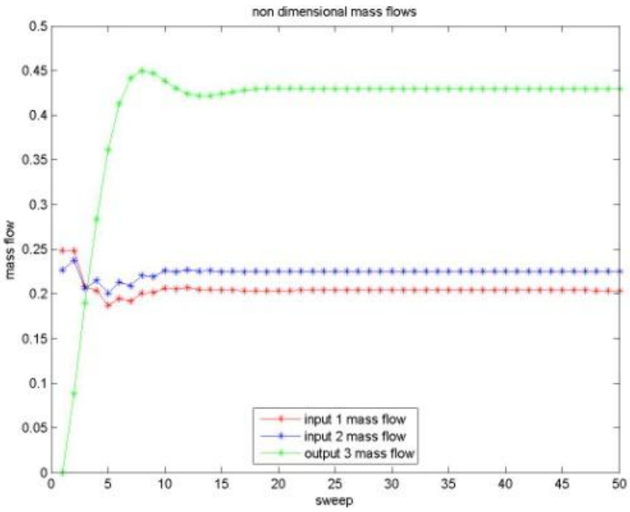


Figure 4.System mass flows as a function of sweep number showing overall mass conservation (output mass flow equals input mass flows).

Conclusions

This article has illustrated in a simple fashion how different fluid-flow systems can be linked together, but the methods used can be easily extended to more complex flow systems. The techniques are particularly useful, and can result in significant reduction in computer time and cost where areas of the overall system that are essentially 1D can be linked to areas of the fluid flow that require a more comprehensive analysis using CFD.

ZWSim-DEM Software for Flow through a Hopper

Kathryn Kleijn, CHAM, UK

Introduction

The following article presents a validation of ZWSoft's new ZWSim-DEM software, which is used to model particle interactions using the Discrete Element Method (DEM). This method models the movement and interaction of particles by predicting the forces acting on them. It is a useful tool for modelling large numbers of discrete particles in industrial situations, and can be used for predicting blockages and analysing flow patterns and bulk behaviour. The ZWSim-DEM software comes with an easy-to-use graphical user interface integrating both pre- and post-processing, with in-built CAD modelling capabilities. A set of example cases showing flow through a wedge-shaped hopper are presented here to demonstrate the software's capabilities and validate against known results.

ZWSim-DEM Model

Background

The cases modelled are designed to show the bulk-behaviour of some granular material flowing into and out of a wedge-shaped hopper and demonstrate the prediction of so-called flow-modes. There are two main types of flow-mode - mass flow and funnel flow. In mass-flow, which is also known as "first-in, first-out", the material filling the hopper discharges from the bottom in a steady stream with the lower portion all exiting first. This is in general the optimum for industrial processes as it avoids loss of material due to sticking and uneven movement of material. In contrast, in funnel flow, the material pours out from a central channel which forms in the hopper before the material to the side discharges – this leads to stagnant zones where material which entered the hopper near the start of the process is last to exit. In extreme cases, the stagnant zones do not discharge, and a rathole is formed, where the material at the side of the hopper remains stagnant and trapped inside the hopper.

The cases presented here are based on the work of Ketterhagen [1], who simulate these different types of flow using DEM. His work is, in turn, based on a set of design charts for hoppers, which were developed by Jenike [2] in the 1960s. These charts relate friction forces and hopper wall angles to the mode of flow, and determine the parameters used to set up the cases. The main objective of these simulations is to predict the qualitative behaviour of the particles, although a quantitative check is calculated on the results. A number of modelling assumptions were made due to the lack of information presented in the Ketterhagen paper, and the limitations of the software. However, as anticipated, these factors did not affect the qualitative bulk-behaviour of the flow. In all these cases, a hopper is filled, allowed to settle, and then discharged.

Modelling Assumptions and Strategy

Four cases were simulated: two different wedge-shaped hoppers, each of which was simulated twice. The hoppers differed in wall angle – the angle of the out slope – with the first, steep-sided (15-degree wall angle) and the second with a 55-degree wall angle, giving a flatter bottom to the wedge. The two simulations of each hopper had different wall friction angles – related to the amount of friction between the particles and the hopper's walls. The first simulation has low friction between the particles and the hopper, so that the particles slide out easily. The second has high friction, so that the particles slide past each other more easily than they slide past the hopper. *Table 1* shows the cases with their parameters and expected behaviour, including the friction coefficients used in the contact model.

Case	Hopper Wall Angle (º)	Wall Friction Angle (º)	Internal Friction Angle (º)	Friction Coefficient between Wall and Particles	Friction Coefficient between Particles	Expected Flow Mode
1	15	5	16	0.1	0.2	Mass
2	15	20	16	0.8	0.2	Intermediate
3	55	5	16	0.1	0.2	Intermediate
4	55	20	16	0.8	0.2	Funnel

Table 1 - Case parameters

The particle-particle friction and particle-wall friction coefficients are taken directly from Ketterhagen [1], which gives the relationships between the stated wall and internal angles and the friction coefficients. In all cases, the internal friction angle is 16 degrees, and similar to the wall friction angle, it is related to the amount of friction between the particles. The internal friction angle is the ability of the material to withstand shear stress. In tests, the internal angle is the angle measured between the normal and resultant forces at the moment of failure due to shear stress.

Ketterhagen uses the hysteretic spring contact model to model particle collisions. This contact model is not available in the ZWSim-DEM software, so the cases presented here use the linear spring model. Similar to the hysteretic spring model, forces are calculated as directly proportional to the particle overlap; and where the paper did not specify the parameters for the contact model, they are left as the default in the software.

The hoppers are modelled as a thin slice to reduce computational time. This simplification is acceptable provided the width of the hopper is sufficiently large compared to the particle diameter to prevent bridging; using a thinner hopper does not affect the behaviour of the particles.

Particles were injected into the hopper in batches to represent layers of particles separated by time.

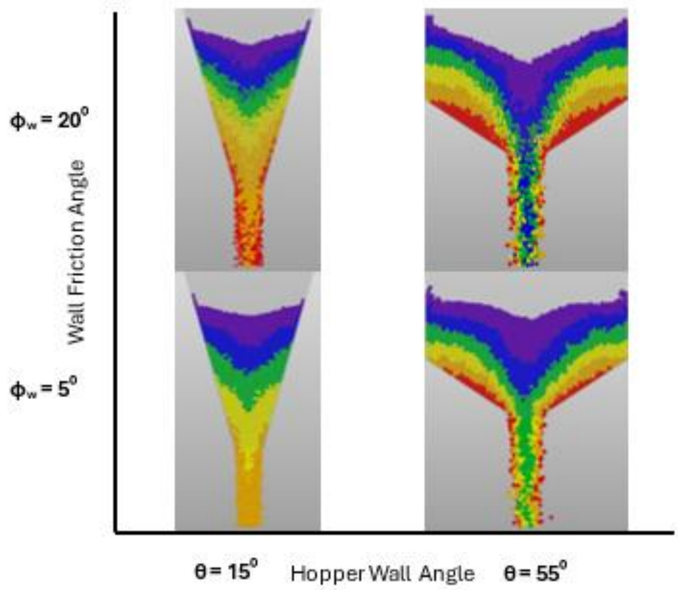


Figure 1 - Hopper discharge results with particles coloured by injection batch.

Geometry

The particles simulated are spherical with a normal distribution of sizes around the mean of 2.24cm in diameter. The hoppers are 1m wide with a 20cm opening. These dimensions are estimated from the images available in the Ketterhagen paper, where the actual dimensions were not stated. The model is scaled up compared to the paper 10 times. The increased size reduces the runtime of the tests, as smaller particles require a smaller timestep to prevent unrealistically large forces. A scale up of all dimensions does not affect the bulk behaviour.

Physical Properties

Materials were not specified in the Ketterhagen paper, and so a steel-like material was chosen for the hopper based on real hopper materials. The particles are modelled as glass-like, since glass beads are often used in the literature for the testing of bulk behaviour.

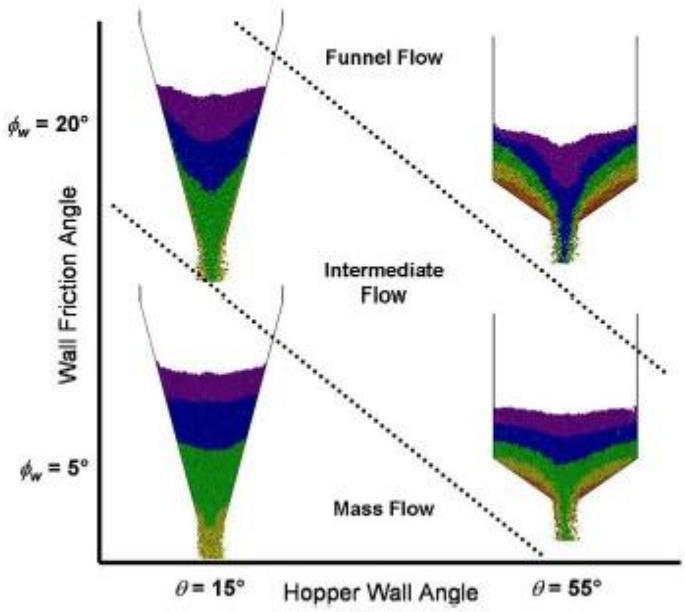


Figure 2 - Ketterhagen et al. [1] results (Fig. 8).

Results

All four cases showed the expected bulk-behaviour, matching the qualitative behaviour shown by the equivalent simulation from Ketterhagen. Figure 1 shows the four cases with particles coloured based on their injection batch. Figure ***2*** is the equivalent figure from Ketterhagen [1].

The bottom left image of Figure 1 shows the steep-angled hopper with low wall friction, and demonstrates mass flow, with the layers discharging approximately layer-by-layer. The particles flow along the edge of the hopper easily because of the low friction – this matches the bottom left part of Figure ***2***. The result here is not quite the perfect mass flow as the Ketterhagen result which can be seen by the triangular nature of the layers, but it is certainly within the mass flow regime. The difference is likely due to the number of necessary assumptions.

The top left and bottom right images in Figure 1 show the two intermediate flow regimes, where the flow does not correspond to the proper mass flow, nor to funnel flow. In the steeper-sided hopper, the particles slide more easily past each other than along the edges of the hopper due to lower friction between the particles, leading to earlier layers of particles becoming stuck on the edges of the hopper. Similarly, in the less steeply-sided hopper, some particles remain stuck due to the flatter sides. The low friction between the particles and the wall prevents the flow from becoming full funnel flow.

The final image in the top right shows clear funnel flow, with the upper layers already exiting and the earlier layers discharging slowly.

From a quantitative standpoint, Ketterhagen [1] measured the average velocity along the centreline of the hopper and the average velocity parallel to the angled wall, for cases 1 and 4 (see Table 1). The wall value is then divided by the centreline value to give the Mass Flow Index (MFI). The MFI is a function of time over the emptying of the hopper, reaching a steady state during that time. It has been calculated by Johanson and Jenike [3] that the MFI is above 0.3 for mass flow modes, and below 0.3 for funnel flow. The results of the cases presented here are shown in Table 2.

Case	MFI (Ketterhagen et al. [1])	Current
1	0.91	0.88
4	0.17	0.12

Table 2 - Mass Flow Index comparison.

Conclusion

In conclusion, the cases presented here show a good match for qualitative behaviour to the expected flow modes, demonstrating the capability of the ZWSim-DEM software to replicate known results. The software can be used for a range of industrial applications, with further capabilities under development. One-way coupling with CFD is also available in the software, with the possibility of extension to two-way coupling in the future, opening up a wide range of possible applications.

Licencing inquiries can be made through CHAM.

References

[1] Ketterhagen et al. Predicting the flow mode from hoppers using the discrete element method. *Powder Technology.* 2009; 195: 1-10. https://doi.org/10.1016/j.powtec.2009.05.002

[2] Jenike, A.W., Bulletin No. 108: Gravity Flow of Bulk Solids. *Bulletin of the University of Utah*. 1961; 52 (29).

[3] Johanson, J.R. and Jenike, A.W. Bulletin No. 116: Stress and velocity fields in gravity flow of bulk solids. *Bulletin of the University of Utah*. 1962; 53 (21).

ZWSOFT's PHOENICS-Based CFD Portfolio Explained.

Dr Zhao Jiaxin, *ZWSoft, Guangzhou, China.*

As part of ZWSOFT's All-in-One CAx strategy, CFD technology is being integrated across multiple engineering workflows and platforms. Powered by the proven PHOENICS-solver technology, **ZWFlow** brings simulation directly into the ZW3D design environment, enabling manufacturing engineers to perform CFD analysis for applications such as piping systems, valves, and electronics cooling within a seamless CAD-CAE workflow. **ZWPHOENICS** combines the advanced geometry capabilities of ZW3D with the familiar PHOENICS user experience, providing existing PHOENICS customers with a modernized platform while preserving their established workflows. **RhinoCFD** extends these capabilities to the Rhino ecosystem, serving Architecture, Engineering and Construction (AEC) customers with integrated airflow and environmental simulation tools. Meanwhile, **PHOENICS** itself continues to advance through ongoing solver development and technology innovation, remaining the foundation of ZWSOFT's CFD portfolio and supporting a growing ecosystem of simulation solutions across manufacturing and AEC industries.

The Next Version of PHOENICS will be PHOENICS 2027

Dr Timothy Brauner, CHAM, UK

PHOENICS 2027 is currently in development, with an anticipated release in Q4 of 2026! PHOENICS 2027 will see extensions to its Volume-of-Fluid (VOF) methods, the Thin-Plate model gets additional functionality, and the current USP (Unstructured PHOENICS) development program inches closer to completion. The long-standing ESTER (Electrolytic SmelTER) module will also receive some quality-of-life upgrades, alongside fixes of some subtle bugs.

VOF: Extensions have been made that significantly improve, and increase the robustness of, the surface tension and interface reconstruction methods. These improvements include:

- Height Function (HF) method for surface curvature and normal.
- Hybrid HF / Brackbill CSF switching strategy.
- Improved normal reconstruction (THINC-compatible).
- Optional smoothing techniques (Gaussian filtering, divergence-preserving filters) for α (phase traction) and gradients.
- Consistent surface-tension force discretization to minimize spurious currents.
- Enhanced integration into the interface-capturing scheme CICSAM, HRIC, MHRIC, STACS and THINC-WLIC.

Thin-Plate: The Thin-Plate Object now supports separate settings for the High and Low sides, similar to the Plate Object: wall functions, roughness heights, slide velocities and, crucially, user defined heat transfer coefficients can now be set separately on either side.

USP: The grid generator has been improved to better capture complex and overlapping geometry.

Solver stability has also been enhanced under niche conditions, and additional validation cases are under construction. Parallel execution is now supported for conjugate heat transfer problems, while the IMMERSOL radiation model has been added. Library cases have been revised, convergence issues resolved in several cases, and post-processing extended to better visualise results stored in VTK files within VRV.

ESTER: Improvements have been made to the geometry visualisation and input accuracy, along with the addition of new output facilities, and improved result visualisation for simulations of multi-anode, Hall-cell aluminium smelters.

Bug-fixes: A range of bugs has been fixed, including issues related to: GROUND calls, k-ω turbulence model settings, total heat-source consistency, redundant residual calculations, outflow conditions in PHOENICS-MARINE, parallel restarts with interpolation, fan-curve convergence, anisotropic diffusion, and export files. In addition, our internal testing facilities have been reworked for more consistent testing.

More details will be made available closer to the time of release.

RhinoCFD v3.1.1 for Rhino 8 is Here

Nimi Urunta & Dr Timothy Brauner, CHAM, UK

The latest version of RhinoCFD is here: RhinoCFD version 3.1.1 for Rhino 8, which officially makes RhinoCFD compatible with Rhino 8. This version also brings additions and improvements to pre-processing, post-processing and the solver (the PHOENICS Earth program), providing improved usability, new UI features, and expanded physical modelling capabilities.

Interface and Responsiveness

RhinoCFD v3.1.1 is streamlined for use with Rhino 8, offering better integration and a more responsive interface. The computational grid now reacts more quickly to geometry changes, whether objects are added, moved, or copied, thereby making setup more intuitive. Menu and file loading speeds have also been improved.

A new Monitor Plot Window provides real-time tracking of residuals, corrections, spot values, and other solver data during a run, helping users assess simulation progression and convergence. The monitor and simulation have been decoupled to make interaction more responsive.

New Physics and Modelling Options

The one-equation Spalart-Allmaras turbulence model has been added. Pasquill stability criteria are now available within the Wind Object, enabling better characterisation of atmospheric conditions. The Ergun equation and porous-material pressure drop calculations within BLOCKAGE regions have been added, along with support for thermal capacity effects in surface heat-balance calculations.

Inlet Object settings have been updated with two new options for defining turbulence: Intensity + Viscosity Ratio and Intensity + Length Scale. These give users greater flexibility when setting up boundary conditions across different flow regimes.

Post-Processing Improvements

Mathematical expressions can now be used directly within post-processing through scalar fields (e.g. “U1+V1”). Scalar minima and maxima are displayed as spheres in the viewport, result probe colours can be customised, and warnings are shown when a probe falls outside the calculation domain.

Fixes, Stability, and Known Limitations

This release addresses a range of issues reported by users, including corrected display of probes, improved stability when copy-pasting while RhinoCFD is active, safe handling of intermediate output files during a simulation, and UI consistency improvements including font scaling in the pre-processing panels.

Note: S-PARSOL is now the default cut-cell method. As Rhino cannot currently display the cuts, users who wish to revert to PARSOL can do so via Main Menu → Geometry. Two known limitations remain for a future release: cylindrical-polar grids are not yet fully compatible with Rhino 8, and VOF model changes require further work on RhinoCFD Marine.

RhinoCFD v3.1.1 is available now via the food4rhino page. Enquiries: rhinocfd@cham.co.uk

ZWSOFT Showcases Integrated Engineering Solutions at HANNOVER MESSE 2026

ZWSoft CFD Team, Guangzhou, China.

integrated CAx technologies are helping manufacturers improve engineering efficiency, accelerate product development, and streamline workflows across design, simulation, manufacturing, and collaboration.

Figure 1: The largest booth for the company on any HANNOVER MESSE to date, strategically positioned amongst leading tech companies.

Located at Hall 16, Stand C16, the company showcased its all-in-one 3D platform ZW3D through real-world application scenarios from industrial equipment, automotive components, and consumer electronics industries. The demonstrations focused on practical engineering workflows, including large assembly management, structural simulation, machining preparation, ECAD-MCAD collaboration, and collaborative product development.

Figure 2: The company displayed several samples designed using its integrated 3D Platform, ZW3D.

This year's exhibition highlighted the growing importance of connected engineering environments, as manufacturers face increasing pressure to shorten development cycles, while managing more complex products and distributed teams. ZWSOFT demonstrated how integrated workflows can improve data continuity from design to manufacturing, while reducing repetitive processes across departments.

Simulation and AI-driven productivity features also attracted strong interest from visitors. ZWSOFT presented integrated structural simulation capabilities covering vibration, fatigue, thermal, nonlinear, and drop-test analysis, alongside AI-assisted engineering functions embedded directly into CAx workflows to support everyday engineering tasks more efficiently.

The event also reflected ZWSOFT's continued international growth and its mission of Empowering Sustainable Innovation. Throughout the week, the company engaged with manufacturers, engineering teams, ecosystem partners, and technology professionals from around the world to exchange insights on the future

Simulation and AI-driven productivity features also attracted strong interest from visitors. ZWSOFT showcased its integrated CAD-CAE solution, bringing together design and simulation within a unified engineering environment. The portfolio includes ZWStructural for vibration, fatigue, thermal, nonlinear, and drop-test analysis, as well as ZWFlow, powered by the proven PHOENICS CFD technology. Designed for engineers rather than CFD specialists, ZWFlow enables fast and intuitive simulation for applications such as piping systems, valves, electronics cooling, etc. By integrating simulation directly into the design workflow, ZWSOFT helps customers reduce development cycles, improve product quality, and make engineering decisions earlier in the design process. In support of its All-in-One CAx vision, ZWSOFT continues to advance the convergence of CAD, CAE, and AI technologies. ZWSOFT also demonstrated AI-assisted engineering capabilities embedded directly into CAx workflows, helping engineers automate routine tasks, access technical knowledge more efficiently, and further enhance productivity.

ZW Flow: An Integrated CFD Solution for Engineering Design

Xingzhou Wang, ZWSoft CFD Team, Guangzhou, China.

In recent years, the demand for digital design and simulation-driven engineering validation in China's manufacturing industry has continued to grow rapidly. An increasing number of engineers are incorporating CFD analysis into the product design process in order to shorten development cycles, reduce trial-and-error costs, and improve both product performance and engineering efficiency.

In comparison with traditional standalone CFD software, simulation solutions embedded directly within CAD platforms are gaining increasing attention from both enterprises and engineers. For many design engineers, it is far more efficient to perform geometry preparation, model modification, and simulation analysis directly within a familiar CAD environment, rather than constantly switching between multiple software packages.

This trend is particularly evident in China's manufacturing industry, where companies are increasingly focusing on:

- More efficient design-iteration workflows
- Lower barriers to simulation adoption
- More convenient geometry-handling capabilities
- Tighter integration between CAD and CAE workflows
- Faster localized technical support

Driven by these industry demands, ZWSOFT officially released **ZW Flow** in May 2025 ZW Flow is built upon the Overdrive geometric-modeling kernel of ZW3D, and integrates the mature CFD technology of PHOENICS, creating an integrated CFD platform specifically designed for engineering-driven applications.

In comparison with traditional CFD workflows, ZW Flow places greater emphasis on:

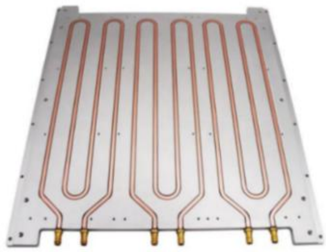
- Seamless CAD–CFD integration
- Improved pre-processing efficiency
- Enhanced geometry repair and model-preparation capabilities
- Enhanced post-processing and result-analysis capabilities
- Fast and practical simulation workflows for engineering applications

Key Industry Focus Areas

Based on current customer demands and the existing product capabilities, ZW Flow is currently focused on the following key industry applications:

- **Piping and Valve Systems**

Simulation and analysis of flow resistance, pressure drop, flow distribution, and internal valve flow characteristics.



- **Electronics Cooling**

Supports thermal management and cooling optimization for applications such as electronic devices, control cabinets, and power-supply systems.

- **HVAC Applications**

Including air-conditioning systems, indoor ventilation, airflow distribution, and thermal comfort analysis.

R&D and Technology Development

In terms of geometry processing, powered by the Overdrive geometric-modeling kernel of ZW3D, ZW Flow is capable of handling complex CAD models more efficiently, while continuously enhancing its capabilities in model repair, geometry editing, and multi-format data compatibility.

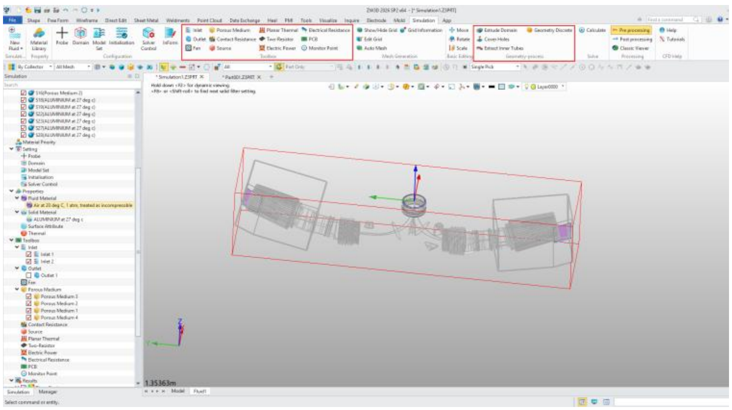
At the same time, ZW Flow provides dedicated fluid-domain extraction capabilities, enabling rapid extraction of fluid regions from internal flow channels, piping systems, and complex cavity models. This significantly reduces the extensive manual geometry cleanup and preparation work traditionally required during CFD preprocessing, thereby improving the preprocessing efficiency for complex engineering models.

In addition, ZW Flow continues to enhance its preprocessing Toolbox, supporting the rapid definition and setup of various common engineering objects. Examples include:

- Planar heat sources
- Thermal resistance models
- Two-Resistor thermal models
- Joule heating
- Printed Circuit Boards (PCB)

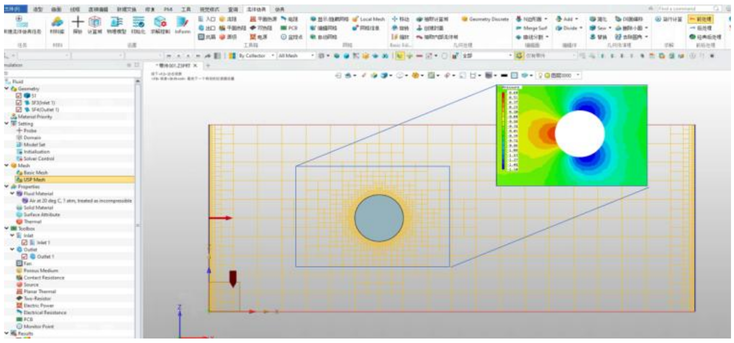
These features allow users to complete model setup and parameter definition in a more streamlined and engineering-oriented manner, reducing the significant amount of repetitive work typically involved in conventional CFD modeling workflows.

Through continuous improvements in geometry processing, rapid model setup, and mesh preprocessing capabilities, ZW Flow is progressively building a more complete, efficient, and integrated CFD preprocessing workflow.



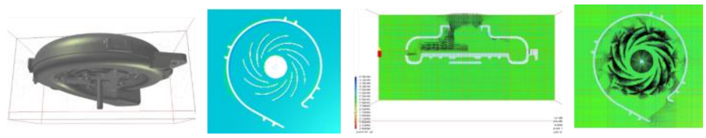
In terms of solver technology, ZW Flow is built upon the mature CFD framework of PHOENICS and is continuously being enhanced and optimized for practical engineering applications.

In terms of meshing technology, ZW Flow is progressively integrating Unstructured (USP) meshing technology to further improve mesh adaptability and computational efficiency for complex geometric models.



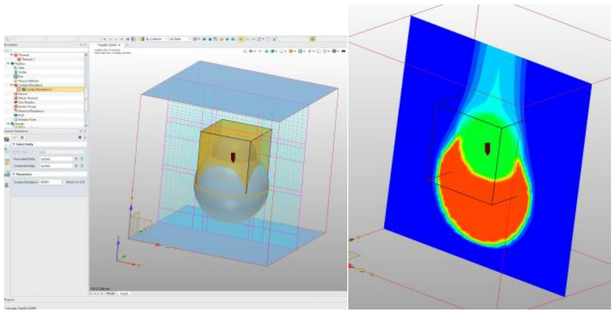
USP Mesh Generation

For rotating machinery simulations, we are continuously optimizing solver algorithms to support engineering analysis of typical rotating flow applications, including fans, pumps, and compressors.



Velocity Vectors and Pressure Contours of a Centrifugal Pump

In terms of engineering-oriented modeling capabilities, ZW Flow is gradually expanding its support for the recognition and treatment of engineering components such as thermal resistances, electrical resistances, and heat sources. The functionality is evolving from planar-based definitions toward support for surface-based thermal and physical-property definitions, thereby improving the versatility and applicability of the software across different engineering scenarios.

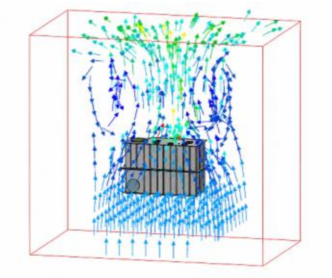


Thermal resistance effect of curved surface

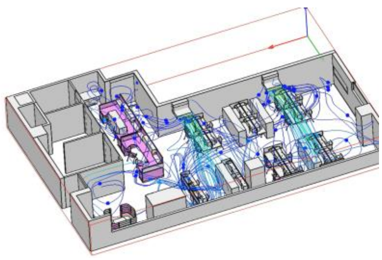
In addition, we are also advancing the development of one-way fluid–structure coupling capabilities in order to support a broader range of engineering applications involving fluid–structure interaction analysis.

Conclusion and Future Outlook

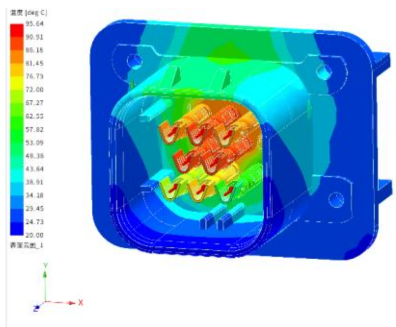
Since the release of ZW Flow, we have accumulated a growing portfolio of real-world engineering application cases and have gradually progressed from product verification to practical engineering deployment.



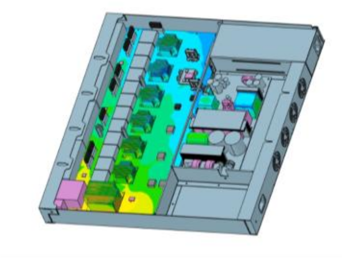
Natural Cooling of Electrical Cabinets



Indoor Ventilation



Electrothermal Analysis of Connectors



Thermal Analysis of a Network Switch

Through continuous communication with customers and ongoing project implementation, we have not only validated the practical value of ZW Flow during the engineering design stage, but also gained deeper insights into industry requirements and real-world engineering scenarios. At the same time, we have identified many areas that still require continuous improvement and optimization, including:

- Solver capabilities for complex engineering applications
- More efficient meshing technologies
- More comprehensive engineering-oriented features and workflows
- More intelligent simulation workflows

Feedback from real-world engineering projects continues to drive the ongoing development and iteration of ZW Flow.

Looking ahead, we will continue to focus on the integration of CAD and CAE, further strengthening the overall capabilities of ZW Flow in preprocessing, solver technology, and engineering applications. We will also continue to enhance collaboration and communication with customers and industry partners.

Our vision is for ZW Flow to evolve beyond a CFD simulation tool, but also to an efficient collaborative platform for engineers throughout the product design and engineering analysis process, delivering a practical, user-friendly, and continuously evolving CFD solution for the digital transformation of the manufacturing industry.

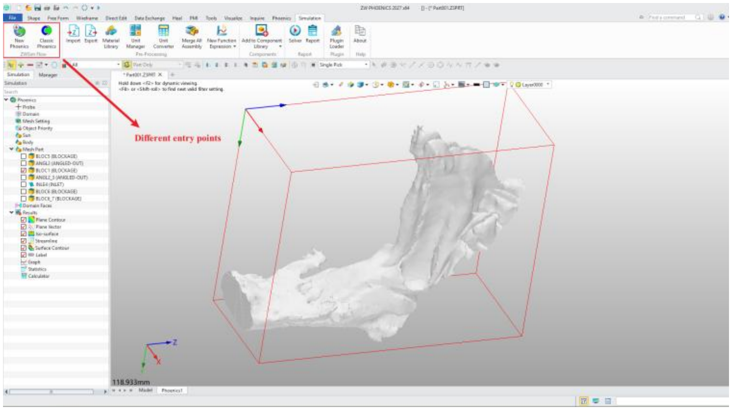
ZW PHOENICS: Industry Application Strategy and Promotion Plan

Xingzhou Wang, ZWSoft CFD Team, Guangzhou, China.

1. Introduction

ZW PHOENICS is a CFD simulation platform created by deeply integrating ZWSOFT's geometric-modelling technology with the classic PHOENICS solver. During pre-processing, the platform combines the geometry modelling and repair capabilities of ZW3D, allowing users to work directly with CAD models for CFD analysis. This streamlines the handling of complex models and improves both efficiency and practical engineering usability. Within the simulation environment, ZW PHOENICS preserves the core solver capabilities and workflow of classic PHOENICS, enabling existing users to continue using familiar simulation processes with minimal changes or retraining.

Currently, ZW PHOENICS has integrated the Core and FLAIR modules of classic PHOENICS, supporting major industrial thermo-fluid analysis applications such as fluid flow and heat transfer, combustion simulation, HVAC environmental analysis, and multi-component flow analysis. At the same time, the platform also preserves access to the classic PHOENICS environment to maintain application continuity for specialized modules such as MARINE and CVD.



This "dual-environment collaborative" product architecture not only strengthens the integration between CAD and CFD, but also preserves the mature industry capabilities and established user network of classic PHOENICS to the greatest extent possible.

2. Target Customers

As a general-purpose CFD simulation platform, ZW PHOENICS primarily targets the following three categories of customers:

Industrial Manufacturing and Engineering Customers

- Furnace, combustion, and chemical equipment companies
- HVAC manufacturers and building engineering companies
- Mixing equipment, pump & valve, and fluid machinery companies
- Marine, energy, and industrial equipment enterprises

Environmental and Engineering Consulting Customers

- Environmental assessment and consulting companies
- Water treatment and environmental engineering enterprises
- Government agencies and third-party testing institutions

Emerging Application and Research Customers

- Medical device companies and biomedical research institutions
- Universities and research institutes
- Functional apparel and sports equipment brands

3. Promotion Strategy

ZW PHOENICS will promote market development through a dual-track strategy of "deepening traditional industries and expanding into emerging fields."

In traditional industrial sectors, the platform will continue strengthening its engineering application capabilities in mature industries such as combustion, chemical processing, and HVAC, highlighting its advantages in complex thermo-fluid analysis, energy efficiency optimization, and equipment performance validation.

In emerging fields, ZW PHOENICS will actively promote the application of CFD technologies in areas such as medical engineering, biotechnology, and human thermal-comfort analysis. Through industry collaboration, research projects, and representative application cases, the platform will gradually enhance its influence in emerging industries.

Combustion / Chemical / Furnace Industries

- Strengthening combustion simulation and chemical-reaction analysis capabilities
- Promoting applications for energy saving, emission reduction, and exhaust optimization
- Expanding market influence through industry exhibitions and technical seminars

HVAC / Building Equipment Industry

- Indoor airflow organization analysis
- Thermal comfort evaluation
- Data centre cooling analysis
- Cleanroom and ventilation optimization

Medical and Biomedical Industry

- Respiratory airflow analysis
- Flow optimization for medical devices
- Blood flow and drug transport studies
- Operating-room airflow-organization analysis

Functional Apparel and Human Comfort Industry

- Thermal comfort analysis
- Airflow simulation around the human body
- Heat dissipation performance analysis of materials
- Micro-environment thermal management analysis

4. Promotion Channel Development

ZW PHOENICS will continue expanding its industry influence through a combination of online and offline marketing channels, including:

- Industry exhibitions and technical forums
- Online webinars and technical sharing sessions
- Collaboration with universities and research institutions
- Publication of industry white papers and application case studies
- Promotion through industry media and technical communities

Through these efforts, ZW PHOENICS aims to gradually establish a CFD-technology ecosystem covering industrial manufacturing, scientific research, and emerging application fields.

5. Conclusions

ZW PHOENICS is more than an extension of classic PHOENICS on the ZWSOFT platform, it is also an important step in ZWSOFT's "CAD + CAE integration" strategy. While preserving the mature industrial-solving capabilities and extensive industry experience of classic PHOENICS, the platform further strengthens the integration between geometry, design, and simulation, enabling CFD technology to evolve from a specialized analysis tool into a broader engineering application solution.

Looking ahead, ZW PHOENICS will continue to focus on both industrial manufacturing and emerging application fields, promoting the engineering adoption, accessibility, and industry expansion of CFD technologies. The platform aims to gradually build a comprehensive ecosystem covering design, simulation, and industry applications, providing continuous support for digital product development and engineering innovation.

ZWORLD 2026

ZWSoft CFD Team, Guangzhou, China.

The **ZWORLD 2026** conference to be held this September offers a comprehensive look at the future of ZWSOFT and the global design community. ZWSOFT's latest CAx innovations are featured through hands-on product experiences, expert-led sessions and practical demonstrations that transform technology vision into real-world value.

Bringing together customers, partners and industry experts from more than 40 countries, the event creates a platform with our teams for exchanging ideas, exploring emerging technologies, and shaping the future of digital design and engineering.

Join global innovators, industry leaders, and design professionals, as we explore how intelligent design and digital transformation are shaping a smarter, more connected world.

Inspiring Keynotes: Hear from global visionaries shaping the future of design and technology.

Product Innovation: Discover the latest ZWSOFT solutions and next-generation capabilities.

Expert Insights: Learn from industry experts through real-world stories and best practices.

Connect & Collaborate: Build meaningful connections and explore new opportunities with our global community.

Dates - September 15–17, 2026

Location - Guangzhou, China, Global ZWSOFT Event

Website - https://www.zwsoft.com/event/zworld-2026

CHAM wishes farewell to retiring colleagues

Dr Mike Malin, Technical Support Manager, CHAM

CHAM bids a fond farewell to two long-serving colleagues whose dedication, expertise and commitment have made a lasting contribution to the company.

Jill Rayss, who retired from CHAM on 26 June 2026, joined CHAM in 1989 as Professor Brian Spalding's Personal Assistant following his retirement from Imperial College. This demanding and rewarding role eventually grew into something much broader, reflecting her considerable ability, versatility and willingness to take on new responsibilities.

Over the years, as Company Secretary, Jill became involved in almost every aspect of the business, including accounts, contracts, human resources, recruitment, and liaising with external organisations such as accountants, business advisors, banks and HMRC. Following CHAM's acquisition by ZWSOFT in October 2023, she also played a major role in coordinating with our parent company. Dr Jose Jiaxin of ZWSOFT comments that "*her dedication, professionalism and commitment have played an important role.*" Throughout her many years at CHAM, Jill's extensive knowledge and unwavering support have been invaluable to colleagues across both CHAM and ZWSOFT.

Dr Geoff Michel retired on 29 June 2026, having first become involved with CHAM more than twenty-five years ago as an external consultant during what some affectionately remember as "The Age of Brian". As Professor Brian Spalding's personal CFD engineer and programmer, Geoff brought exceptional technical expertise, creativity and remarkable resilience to one of the company's most demanding roles.

Following Brian's passing ten years ago, Geoff then worked for CHAM's Development team, initially under the leadership of Dr John Ludwig, and later Dr Timothy Brauner. During this period, he continued to make significant technical contributions, particularly in the development of pre- and post processers, interfaces with other software applications, and RhinoCFD. In more recent times, Geoff has worked almost exclusively with ZWSOFT, helping to transfer his extensive knowledge to their CAE Department. Dr Jose Jiaxin remarks that "*Geoff has devoted an enormous amount of knowledge, energy and passion*" and "*has also been an excellent mentor*."

CHAM extends its sincere thanks to both Jill and Geoff for their many years of outstanding service and for the lasting impact they have made on the company. They leave with our deepest appreciation and will be greatly missed by colleagues throughout CHAM and ZWSOFT. We wish them every happiness and success in their well-deserved retirement.

CHAM

CHAM Welcomes Deputation from ZWSOFT

In March this year, CHAM received a deputation from our parent company ZWSOFT to discuss the business alignments between ZWSOFT International Business Group (IBG) and CHAM UK. The Lead member of the visiting group was Owen - (Ou Junwen, General Manager of International Business Division & Manager of Process Management Group). He was joined by Leo – (Qu Beixing ,Middle East & Africa (MEA) Acting Regional Director); and Jose - (Dr Zhao Jiaxin, Director of the CAE R & D Centre). Thank you, Jose, for the above photo.

IBG has been in operation since 2004. It now covers 90+ countries over their 300 channel partners. It had a growth of 35% in Financial Year 2025 and has doubled in size over the past 3 years. Moving forward, CHAM's defined role is to be a R&D and Technical Services Centre. CHAM will cover pre/post-sales support, consultancy and existing customer maintenance. Europe is the largest revenue region ahead of APAC, the Americas, MEA and Japan. This gives CHAM UK the perfect positioning as it sits within the European market.

The broader future strategy involves targeting specific industries with precise, repeatable applications, and scaling marketing and sales activity through ZWSOFT's existing global channels.

Contact Us:

CHAM's highly skilled, and helpful, technical team can assist in solving your CFD problems via proven, cost-effective, and reliable, CFD software solutions, training, technical support and consulting services. If YOU have a CFD problem why not get in touch to see how WE can help with the solutions?

See us on social media sites shown below: