



Design and engineering analysis interoperability

Transforming workflows with
collaborative engineering

EBOOK

The challenge of modern engineering

In today's fast-paced industrial landscape, engineering projects have become increasingly complex due to various factors, including the growing bottleneck caused by a lack of collaboration and communication between various engineering disciplines and departments. Misalignment often leads to errors, rework and project delays, highlighting the need for effective interdisciplinary collaboration and integration.

This complexity is further exacerbated by the scale and scope of projects, which often span multiple geographical locations and involve a wide array of stakeholders. As a result, project management becomes challenging, with teams struggling to maintain oversight and ensure that all components align with the overall objectives and timelines.

Given the multifaceted nature of modern engineering projects, a single solution is rarely sufficient. Different aspects of a project may require specialized tools and approaches, necessitating the use of multiple software solutions and methodologies. This diversity can lead to compatibility issues, as not all tools are designed to work seamlessly together. Additionally, managing multiple solutions can be resource-intensive, requiring skilled personnel to operate and integrate each of these tools effectively.

When teams operate in silos, information and data flow is restricted, leading to possible delays and errors. This lack of integration can cause misalignment between different project phases and teams, including going from the design to analysis phase, resulting in inefficiencies and increased costs.

Effective communication is crucial for ensuring that all stakeholders are on the same page and can respond swiftly to changes and challenges.

Bridging the interoperability gap

Many organizations struggle to provide solutions that integrate all aspects of a project seamlessly. The absence of unified, seamlessly interoperable solutions means that data and information often reside in disparate systems, making it difficult to achieve a holistic view of the project. This lack of interoperability can lead to fragmentation, resulting in inefficiencies as teams spend valuable time reconciling data from different sources. Moreover, the lack of integration can compromise the accuracy and reliability of project outcomes, as discrepancies between systems may lead to errors and inconsistencies.



Uncovering efficiency barriers

Industries utilizing design and analysis tools face a myriad of challenges, from project complexity and the necessity for diverse solutions, to communication barriers and the intricacies of interdisciplinary coordination. A lack of integrated systems compounds these issues. This leads to inefficiencies and potential inaccuracies. Understanding these common problems is the first step toward overcoming them.

As we continue, it becomes essential to delve into the specifics of where these bottlenecks manifest within the facility. By identifying these pain points, organizations can unlock the potential for more streamlined project workflows. This exploration will pave the way for discovering innovative solutions that enhance collaboration, boost productivity and ultimately drive successful project outcomes.



Data compatibility and transfer

Transitioning from the design phase to the analysis phase in engineering projects often presents significant challenges related to data compatibility and transfer. Different software tools used in these phases may have varying data formats, leading to potential issues when integrating them. Ensuring these tools have compatible formats or robust integrations is crucial to maintaining data integrity. Without this compatibility, teams face the daunting task of manually converting or reformatting files, which not only consumes valuable time but also increases the risk of data loss or corruption. Such issues can halt progress, requiring additional resources to rectify the problems, and can introduce delays in project timelines.

Maintaining the integrity of design details during data transfer is paramount, as even minor discrepancies can have significant repercussions. Inaccurate or incomplete data can lead to incorrect analysis results, compromising the entire project. As projects become increasingly intricate, with more sophisticated systems and components, ensuring seamless data compatibility and transfer becomes even more critical. This complexity amplifies the need for precise data handling and underscores the importance of addressing design complexity in conjunction with data integrity to achieve successful project outcomes.

Design complexity

In facility design, engineers often grapple with the complexities of managing intricate systems comprising numerous components. These complexities can lead to significant challenges, such as management overload, where the sheer volume of components makes it difficult to maintain a clear overview and ensure accurate implementation.

To analyze these complex designs, engineers frequently resort to simplifying or segmenting models, a process that is both time-consuming and labor-intensive. This simplification can result in the loss of critical details, potentially affecting the accuracy of the analysis. Additionally, the repetitive nature of these tasks can drain resources, delaying project timelines and increasing costs.

Errors are another significant concern, as each step in the modification or simplification process introduces potential discrepancies. If not addressed promptly, these errors can lead to costly rework and design flaws.

Interoperability between design and analysis tools can offer seamless data transfer and preserve the integrity of complex designs. This eliminates the need for manual simplification, saving time, reducing error potential and minimizing rework. But what if that design does not pass validation during the analysis phase? How does an organization correct, design and re-validate without wasting valuable time?

Design changes

When design changes occur after the initial analysis phase, updating the model and re-running the analysis can be a time-consuming and labor-intensive process. This often becomes a significant barrier, especially if the design and analysis solutions are not interoperable. Without interoperability, engineers must manually recreate the design model and convert files to suit the analysis software, leading to delays and increased potential for errors.

When solutions are interoperable, design changes can be easily transferred to the analysis phase without the need for manual re-creation of the model. This not only saves time but also ensures that all design modifications are accurately reflected in the analysis.

Furthermore, interoperable solutions allow for a smooth feedback loop. Once the analysis is complete, results can be sent back to the design solution, enabling engineers to make necessary corrections and re-validate the design with ease. This streamlined process enhances efficiency, reduces the likelihood of errors, and accelerates project timelines. By enabling quick and accurate updates, interoperability empowers engineers to respond to design changes effectively, ensuring optimal project outcomes.

Integration of multidisciplinary inputs

In complex engineering projects, integrating inputs from various disciplines, such as structural, mechanical, and electrical engineering, is crucial yet challenging. Each discipline contributes unique expertise and requirements, which must be coordinated to ensure a cohesive design and analysis process. However, these teams often use different tools and methodologies, leading to compatibility issues and data silos that can hinder a unified approach.

Balancing the distinct priorities and timelines of each discipline further complicates the integration process. For example, structural engineers focus on load-bearing capacities, while mechanical engineers prioritize system efficiency. Ensuring that all inputs are accurately reflected in both the design and analysis stages is essential to avoid discrepancies and ensure reliable project outcomes. To address these challenges, fostering collaboration and utilizing interoperable tools can facilitate seamless communication and integration, enhancing the overall efficiency and success of the project.

Validation and verification

To ensure that the model is set up correctly and that the analysis results are valid it requires thorough checking and validation, which can cost time. This needs to be automated with a solution that contains all applicable codes and regional regulatory requirements.

Ensuring that designs meet all relevant codes and standards before proceeding to analysis can be a hinderance, especially if there are discrepancies or if the standards are updated frequently. In this case, the solution(s) used must have a company and development team backing it that is not only in-tune with industry trends and regulatory body updates but is also committed to providing their users with benefits and features that are fit for enhancing the work they do day-to-day.

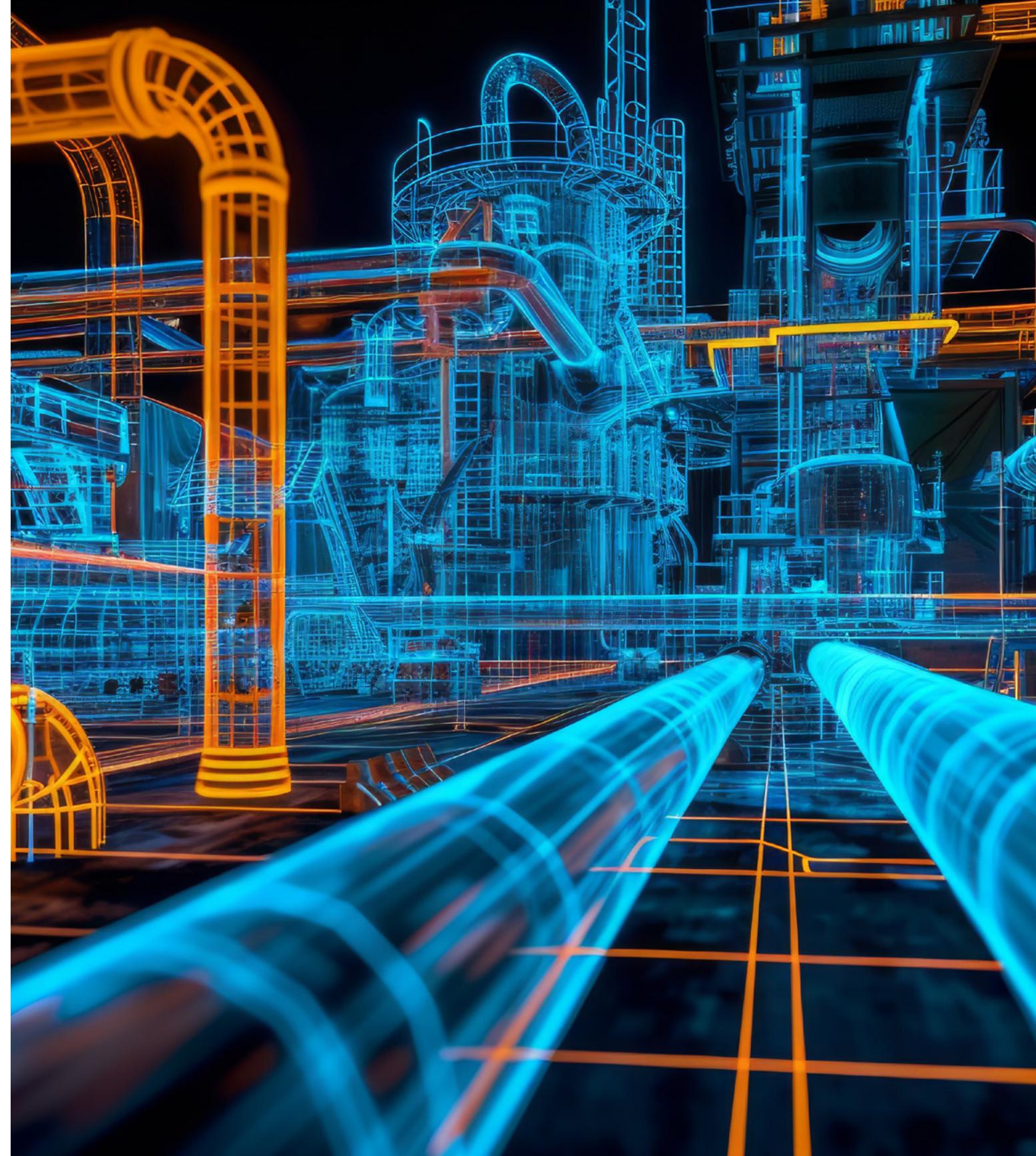


Transformative solutions for seamless integration

Octave Forte 3DWorx (formerly CADWorx Plant Professional) is a complete solution for creating intelligent 3D plant designs. By combining design solutions with engineering analysis solutions such as Aspect Pipe Stress (formerly CAESAR II), Aspect Structure (formerly GT STRUDL) and Aspect Pressure Vessel (formerly PV Elite), organizations can address all phases in a project while saving time and ensuring data integrity.

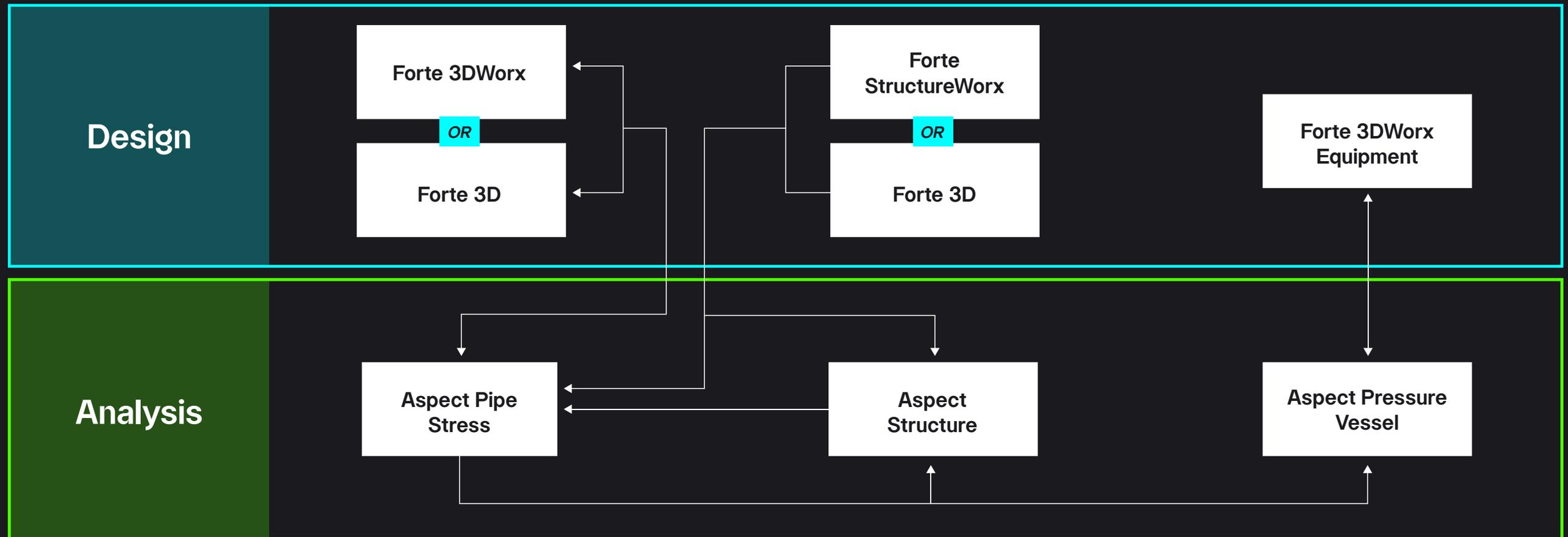
Codes and regulatory standards are updated frequently by development teams that are always striving to ensure organizations create safe and efficient designs, ensuring validation across project phases.

How exactly do we ensure efficiency while tackling the complex amount of data moving between these solutions?



Interoperability Unleashed: Bridging Design and Engineering Analysis

Experience unparalleled efficiency and optimization in design by leveraging a closed-loop process that iterates between design and analysis for continuous improvement. Octave's design and engineering analysis solutions seamlessly integrate to bridge the gap between conceptualization and implementation, ensuring precision and collaboration throughout the development lifecycle.



“Data platforms have the technical capabilities to integrate multiple sources of data, but not all technical approaches are created equally. Engineering and operations data is often sourced and structured in novel ways, and industry-built solutions offer the greatest potential to maintain data integrity and context throughout its lifecycle.”

– Jonathan Lang, Research Director, Worldwide IT/OT Convergence Strategies - IDC

Source: Unlocking Industrial. Transformation with a Unified Digital Thread from Engineering to Operations, January 2025



Bidirectionality exists through integrations between Aspect Pipe Stress and Aspect Pressure Vessel for analysis and Forte 3D and Forte 3DWorx for design. Both enable the transfer of design data, eliminating rework during project phases. Aspect Pressure Vessel shares a bidirectional link with Forte 3DWorx, allowing design alterations in either software to be synchronized with the other, reducing data entry errors and saving time. Engineers can also pass Forte StructureWorx (formerly CADWorx Structure) data into Aspect Structure, removing the need for remodeling with each of the hundreds of changes that happen in every project the need for remodeling with each of the hundreds of changes that happen in every project.

When it comes to working with experts from multiple disciplines, the ability to quickly and easily transfer data back and forth, without conversion, saves time to focus on a great design.

This leads to improved accuracy, faster project completion times, and ultimately, cost savings for the organization. Overall, the integration of Octave's design tools with analysis solutions provides a comprehensive project ecosystem that enhances the quality and efficiency of engineering projects.

For some designers, being involved in the analysis phase may not be typical for their position, but with interoperability and fast data transfer they can be encouraged to have more input as the analysis phase could prompt them to greatly improve the design.

For example, pipelines with their analysis data and conditions can be exported from design solutions to Aspect Pipe Stress and vice versa. This integration not only speeds up modeling time per pipeline but also allows both the analyst and designer to consider possible design changes or improvements within the context of the original model.

Aspect Structure also integrates with Forte 3D and Forte 3DWorx for modeling and analysis, in addition to Octave OnSite Construction Planning (formerly Intergraph Smart Construction) for modular and staged construction sequence analysis. Passing Forte StructureWorx data into Aspect Structure removes the need for remodeling with each of the hundreds of changes that happen in every project. This leads to improved accuracy, faster project completion times and cost savings for the organization.

"Forte 3DWorx and Aspect Pipe Stress are exactly what a company needs to improve project execution. The bidirectional links between the software enable easy sharing of data between different disciplines; we've improved efficiency by 100% since implementing Forte 3DWorx and Aspect Pipe Stress."

– Vladimir Cebo, owner and project manager, [Proplant](#)

Always accurate

As implied, data entering Octave's engineering analysis solutions enables fast validation and certification with the latest analysis codes from ASME, ASCE, AISC, ACI EN and more. The bottleneck of hand-off from design to analysis is eliminated, with multi-disciplinary collaboration and a digital ecosystem naturally created through integration. If design changes are needed due to the design not meeting specific needs during analysis, interoperability between solutions ensures this change can be made quickly and the design can be re-analyzed with ease.

Octave's teams strive to enhance not only the software within this ecosystem but also engineers' efficiency through contributions to regulatory bodies such as ASME Section VIII, Rules for Construction of Pressure Vessels; ASME Section II Materials and ASME FFS-1/API 579 - Fitness-For-Service.

This interoperability empowers Octave customers to cooperate on varied engineering projects with diverse teams. Harness collaboration between departments and disciplines by integrating Octave's design and analysis solutions to see improved productivity, more accurate results and a unified digital ecosystem.

"Since all Octave's software is integrated, this made it easy for our team to work on the project on different levels of engineering, and this solution proved to be quite a time saver."

– Flavio Baldiraghi, CEO and Project Manager, [DB Progetti](#)



About Octave

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property, and assets— for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency, and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.

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