# PlantStream

**WHITEPAPER**

# Addressing Challenges and Streamlining the FPSO Design Process

## Executive Summary

FPSO (Floating Production Storage and Offloading) projects in the energy industry face several challenges, such as conducting early-phase feasibility studies, shortening the construction period, and securing highly skilled designers. This white paper introduces PlantStream, a 3D software solution aimed at addressing these challenges and streamlining the FPSO design process. By leveraging advanced features like FBX integration, auto-routing piping, and Equipment Header functions, PlantStream offers a faster, more efficient, and collaborative approach to FPSO modeling, ultimately leading to improved project outcomes.

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# PlantStream - A Solution for Challenges in FPSO Projects

### Introduction

PlantStream is a joint venture between Chiyoda Corporation and Arent Inc. PlantStream's revolutionary 3D CAD software is our solution to many problems that are faced by the EPC industry, and has given our clients the power to streamline their plant design operations and cut down significantly on project time and cost.

FPSO projects demand close collaboration between plant owners and constructors. The traditional 3D modeling process can be time-consuming, resulting in delays, higher costs, and difficulties in decision-making. PlantStream presents a unique approach to FPSO modeling, focusing on the early-stage of design. This white paper explores how PlantStream addresses the challenges faced by FPSO projects, empowering both plant owners and constructors to achieve successful project outcomes.
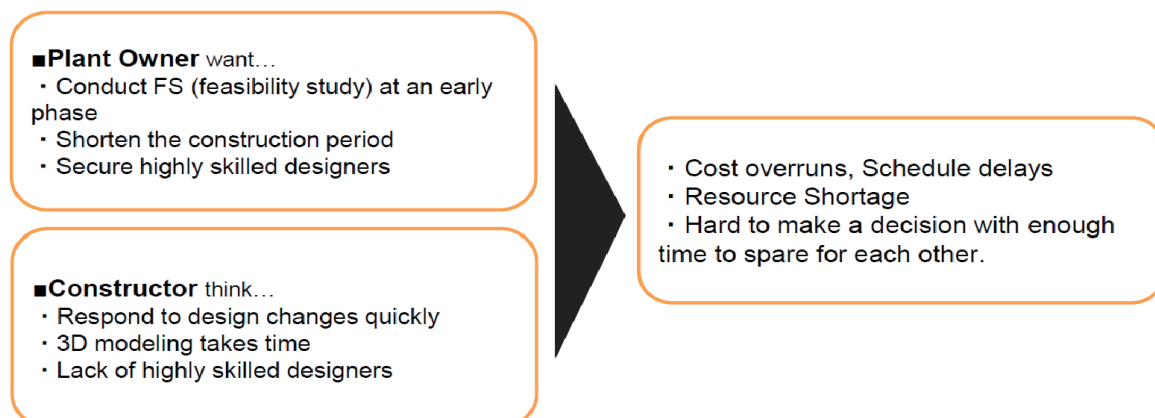
## Challenges in FPSO Projects
## FPSO projects face several challenges:

Conducting Feasibility Studies at an Early Phase: Plant owners want to explore the feasibility of the project at an early stage to make informed decisions. However, the lengthy 3D modeling process often delays the feasibility study.

Shortening the Construction Period: Minimizing the construction period is crucial to reducing overall project costs and increasing project efficiency. Traditional 3D modeling techniques are time-consuming, hindering a swift construction timeline.

Securing Highly Skilled Designers: FPSO projects require highly skilled designers who can navigate complex 3D modeling tasks. However, such skilled designers are often in short supply, leading to project bottlenecks.

**Challenges**

■**Plant Owner** want…
・ Conduct FS (feasibility study) at an early phase
・ Shorten the construction period
・ Secure highly skilled designers

■**Constructor** think…
・ Respond to design changes quickly
・ 3D modeling takes time
・ Lack of highly skilled designers

・ Cost overruns, Schedule delays
・ Resource Shortage
・ Hard to make a decision with enough time to spare for each other.

## Introducing PlantStream: Features and Benefits

● **FBX Integration**

PlantStream introduces FBX integration, allowing FPSO hull models generated using Navis software to be imported seamlessly. This integration streamlines the initial modeling process and ensures that the hull is accurately represented within PlantStream. The FBX model is classified as an envelope element, and its appearance is easily customized.

● **Auto-routing Piping**

PlantStream offers a powerful auto-routing piping functionality that enables quick and clash-free pipe routing. By selecting the "From" and "To" points, the software automatically calculates the most optimal route, avoiding clashes with other pipes, structures, and hull elements. This feature significantly reduces the time required for piping design and ensures accuracy in the overall model.

● **Equipment Header Function**

The Equipment Header function in PlantStream simplifies the creation of distribution headers. This feature allows for the quick combination of outlet or inlet sets, resulting in symmetrical process requirements. Designers can use preset header layouts or customize them to meet specific project needs. The Equipment Header function, when combined with other piping methods, enables rapid and efficient modeling.

● **Block Patterns**

PlantStream includes Block Patterns, which are pre-designed configurations of equipment and piping. These patterns allow for the quick placement of common piping layouts, such as pump piping and valve sets. Users can modify parameters like piping size, arrangement, and valve selection, further enhancing modeling efficiency.

## Applying PlantStream to FPSO Modeling

## PlantStream's capabilities significantly expedite the FPSO modeling process:

### 1. FBX Integration: Importing the FPSO Hull Model

**Application:** Using PlantStream, designers seamlessly import the FBX model by clicking a single button.

**Result:** The imported FBX model is classified as an envelope element and allows for customization of appearance, color, and transparency. This ensures an accurate representation of the hull in the PlantStream model.

Sample Model of FPSO (with FBX feature of PS)
3. Envelope elements in PS can be 'grouped' together.
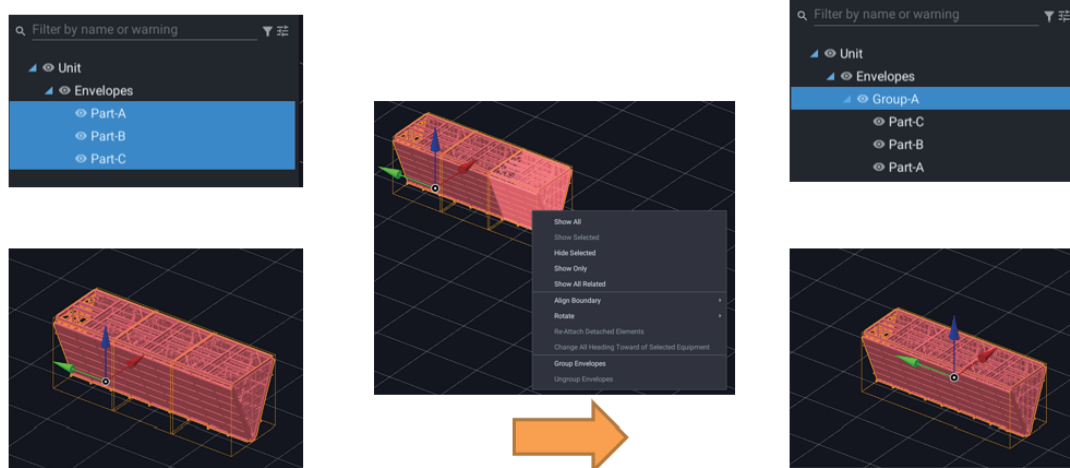
Sample Model of FPSO (with FBX feature of PS)

1. Import FBX File of FPSO Hull, This FBX file is an output data from Navis. This will be used as the model for hull part.

2. Imported FBX model will be classified as an Envelope element. Color and transparency can be user defined.
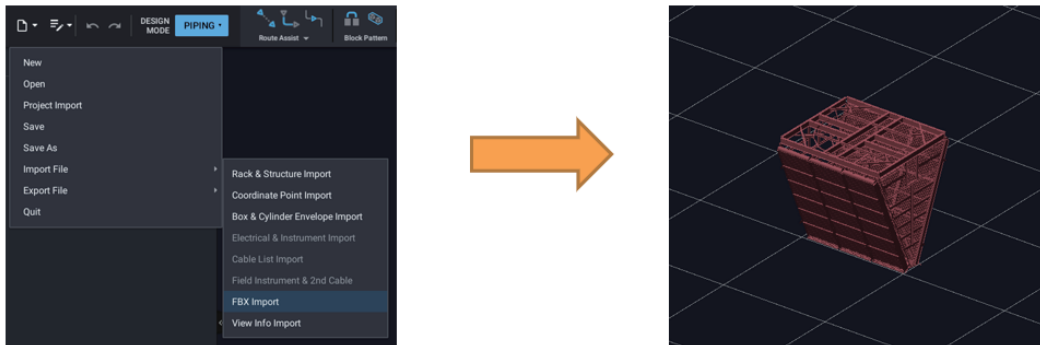


## 2. Auto-routing Piping: Efficient Piping Design

**Application:** The software automatically calculates the most optimal route, ensuring clash-free piping. Designers can set elements as "Collidable" to avoid clashes with essential components like the hull and equipment. Conversely, "Non-collidable" objects won't obstruct the piping, resulting in optimized and clash-free routing.

**Result:** Rapid creation of accurate and optimized piping routes, reducing design time and preventing costly clashes during the construction phase.

Sample Model of FPSO (with FBX feature of PS)

4. FBX Model can be set as collidable or non-collidable element. Setting it as collidable object will make auto route piping avoid the clash.

## 3. Equipment Modeling: Placing Common Equipment

**Application:** PlantStream provides a library of preset equipment models, enabling designers to easily drag and drop common equipment components into the FPSO model.

**Result:** Time-saving design method that ensures consistent representation of common elements.

Sample Model of FPSO (with FBX feature of PS)

5. Create model of piperack and equipment structure using structure element of PS

6. Equipment structure element of PS has floor or stage expansion, However this is not yet included in MTO report. Additionally, handrails are not yet correctly configured for adjacent floor expansion. PS will develop this feature in future versions.
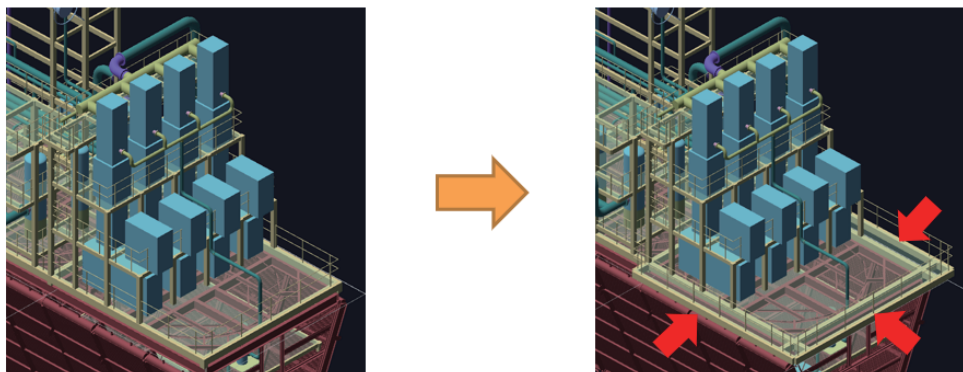


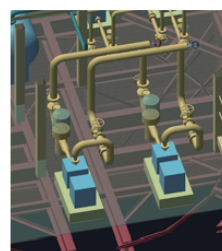Sample Model of FPSO (with FBX feature of PS)

7, Create model of equipment, PS has basic equipment models that are ready to be placed in the main view. Heat Exchangers, Vessels and Pumps are available in PS. For complex equipment, generic equipment can be used.
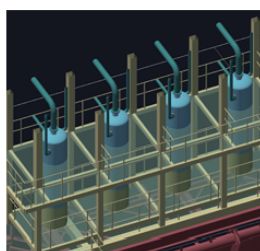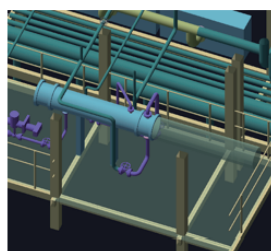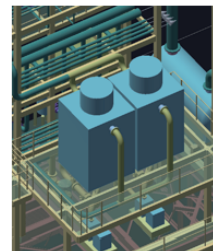


Vessels     Heat Exchangers     Pumps     Cooling Tower (by generic eqpt)

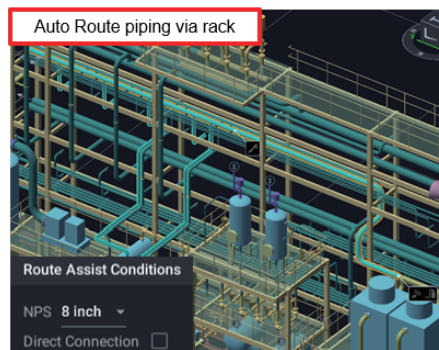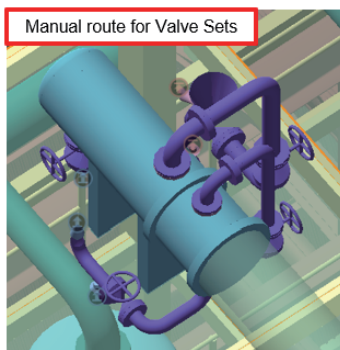## 4. Combination of Piping Methods: Precision and Customization

**Application:** Manual piping is ideal for designing around equipment with intricate arrangements and precise requirements. Designers can use individual pipe components to ensure precise alignment and avoid clashes in these critical areas. To meet symmetrical process requirements, designers can leverage Equipment Headers, quickly creating uniform layouts.

**Result:** The FPSO model benefits from a well-balanced combination of precise manual adjustments and time-saving symmetrical layouts, enhancing overall project productivity.

Sample Model of FPSO (with FBX feature of PS)

8. Manual Piping modeling can be used to model valve sets in detail. PS has the basic components that are commonly used in piping design.

9. Auto route Piping modeling can be used to model piping by selecting the 'From' and 'To' points. It will create piping route avoiding clash. Auto route piping can be direct connection or via rack connection.


Manual route for Valve Sets


Auto Route piping via rack
Route Assist Conditions
NPS 8 inch
Direct Connection ☐


Auto Route piping direct connection
Route Assist Conditions
NPS 18 inch
Direct Connection ☑

Sample Model of FPSO (with FBX feature of PS)

10. Auto route piping can be modified in such cases like a compact plant. Use of Pass points will guide the auto routed piping to its desired location.

11. Auto route piping can also be combined with manual piping.


Use of Passpoints


Auto routed piping – Green
Manual routed piping - Violet
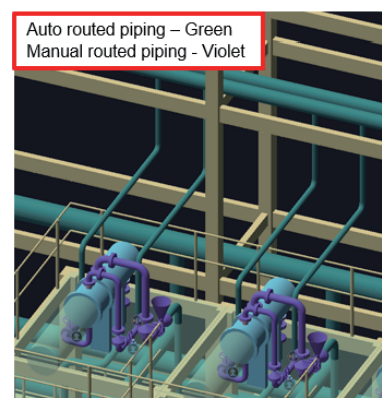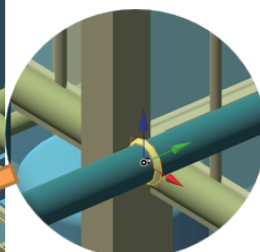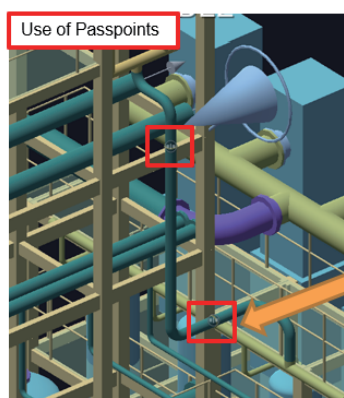
Sample Model of FPSO (with FBX feature of PS)

12. A function called 'Equipment Header' can create distribution headers. With this function you can create piping layouts with symmetrical process requirement. Selecting same connection types and applying equipment header will lessen modeling time.

13. This equipment headers can also be combined with manual route piping and auto routepiping.
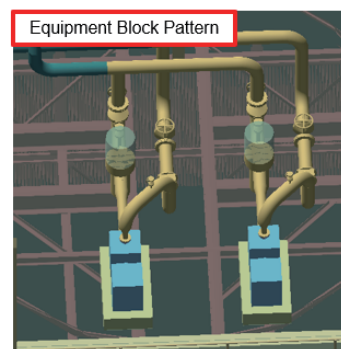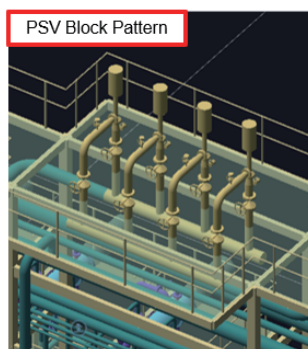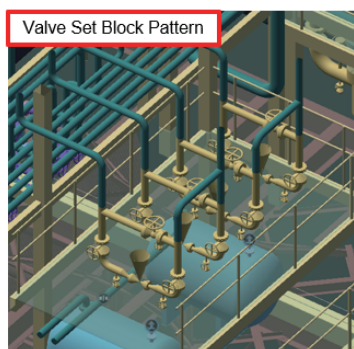


Equipment header – Yellow
Manual routed piping – Violet
Auto routed piping - Green
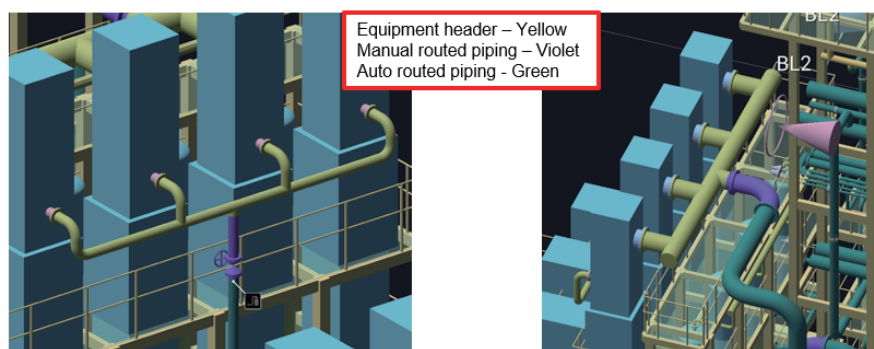
## 5. Block Patterns: Rapid Placement of Common Piping Layouts

**Application:** PlantStream's Block Pattern feature enables quick placement of common layouts with customizable parameters.

**Result:** The FPSO model gains consistency in representing standard layouts, saving time and effort otherwise spent on repetitive design tasks.

Sample Model of FPSO (with FBX feature of PS)

14. PS has Block Pattern' elements in which common piping layouts such as pump piping layout and valve sets are already in a block. It will be placed as one set and its parameters such as piping size, type of arrangement and valve selection can be modified.



Valve Set Block Pattern



PSV Block Pattern



Equipment Block Pattern

## Conclusion

By combining advanced features like FBX integration, auto-routing, the Equipment Header function, and Block Patterns, PlantStream streamlines the 3D modeling process, enabling early-phase feasibility studies, shortening the construction period, and optimizing resource allocation. This innovative software fosters collaboration between plant owners and constructors, resulting in successful FPSO projects with reduced cost overruns and schedule delays. As the energy industry continues to evolve, PlantStream offers a competitive advantage for FPSO projects, ensuring project success and increased efficiency.

PlantStream

## Boost your Plant Layout Design and Accelerate Engineering Workflow with PlantStream
### -- an advanced 3D CAD Software to realize fast and precise 3D plant layout

PlantStream is an advanced 3D CAD with phenomenal accuracy and speed to improve the efficiency of 3D plant design. This results in improved overall project efficiency, leading to reduced lead times, cost savings, quality improvements and numerous other benefits.From energy to infrastructure, chemicals and beyond, PlantStream is helping a wide range of plant owners and constructors around the world improve the efficiency of their 3D plant design.
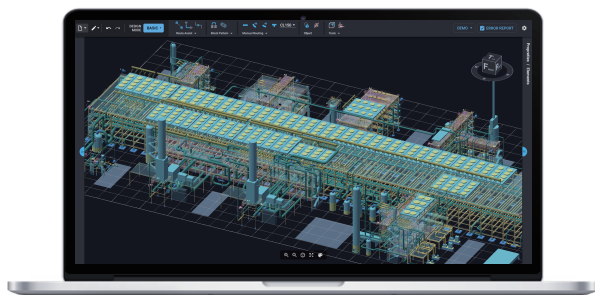


1,000 piping in only 1 minute

Accelarate Design Process and Reduce Man-Hours

Multiple Layout Study in Early Design Phase

Cost Reduction through More Accurate Estimates

Better Quality of Inital Spatial Design

## Ready to learn more? Explore our solutions.

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