

# Process Operational Safety Virtualization



Oil and Gas Industry



- Data contextualization;
- HAZOP and PRA input;
- 3D platform deployment;
- Scenarios simulation.

## Technologies:

- Twin Navigator
- VFiles
- Scenarios

## Challenges

Operators in the **Oil and Gas industry** are subjected to constant risks in operation, and the quick understanding of what actions they should take in case of a problem in the industrial plant can be the difference between an accident or not.

Previously, the evaluation of an intervention in a process required an extensive manual effort to analyze several engineering documents, spreadsheets, **HAZOP** (Hazard and Operability Study), **PRA** (Preliminary Risk Analysis), and multiple non-integrated data-sources. Due to the complexity of the analysis and the amount of diffused data, this evaluation is usually time-consuming and with prominent errors. For example, in a FPSO, if it was necessary to close a valve and interrupt the flow of a process, a lot of work takes place understanding the consequences that this would have on the operation as a whole and the components around it. First the managers needed to find out which of the hundreds of possible procedures were related to the particular context and which were related to the specific equipment and structures. **Without any visual contextualization, it was difficult to associate TAGs and cross data.**

This situation occurred both in emergency situations, when a problem occurred in the operation, and in times of planned shutdowns for some kind of maintenance. In either case, the diffused data didn't make things any easier.

## Solution

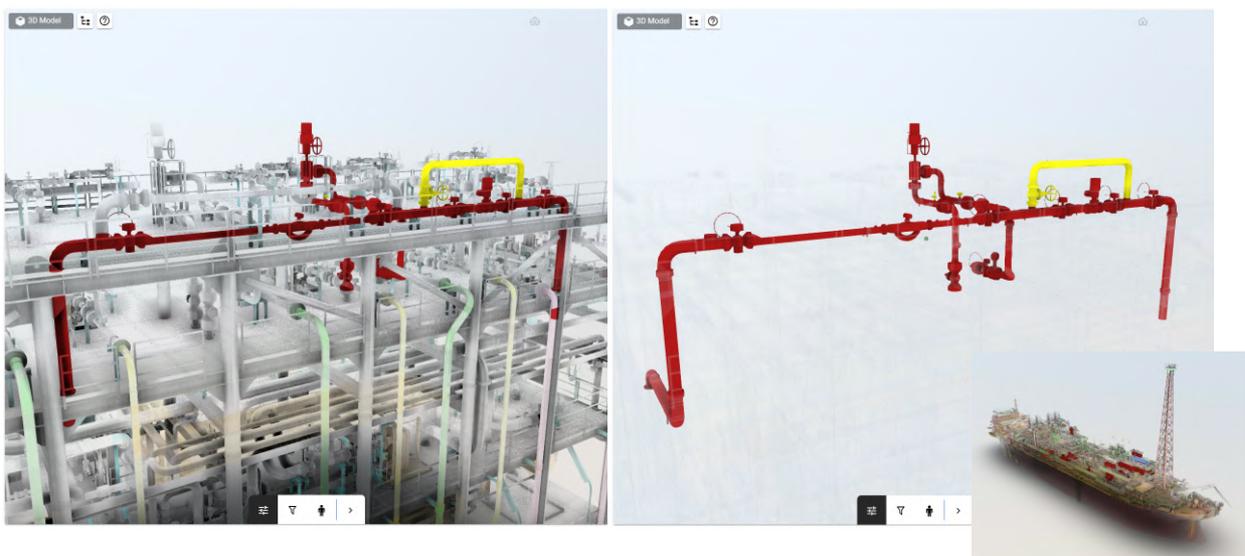
The **proposed solution** involved the **digitalization of the risk analysis process in the industrial plant**. For this, the related documents were centralized in Vidya's platform and visual simulations of the intervention process in the industry were created to understand the necessary sequencing of actions and optimize decision making.

The **first step** of the deployment was to **treat and upload the 3D model of the assets** involved in the project into the Vidya platform.

In this step, our engineering team processed and contextualized all existing information related to safety procedures, such as HAZOP and PRA, and engineering documents, like TAGlines, engineering drawings and component technical specifications. This task employs **Optical Character Recognition (OCR)**, a technology used to extract information from documents, create shortcuts and link them into the respective assets.

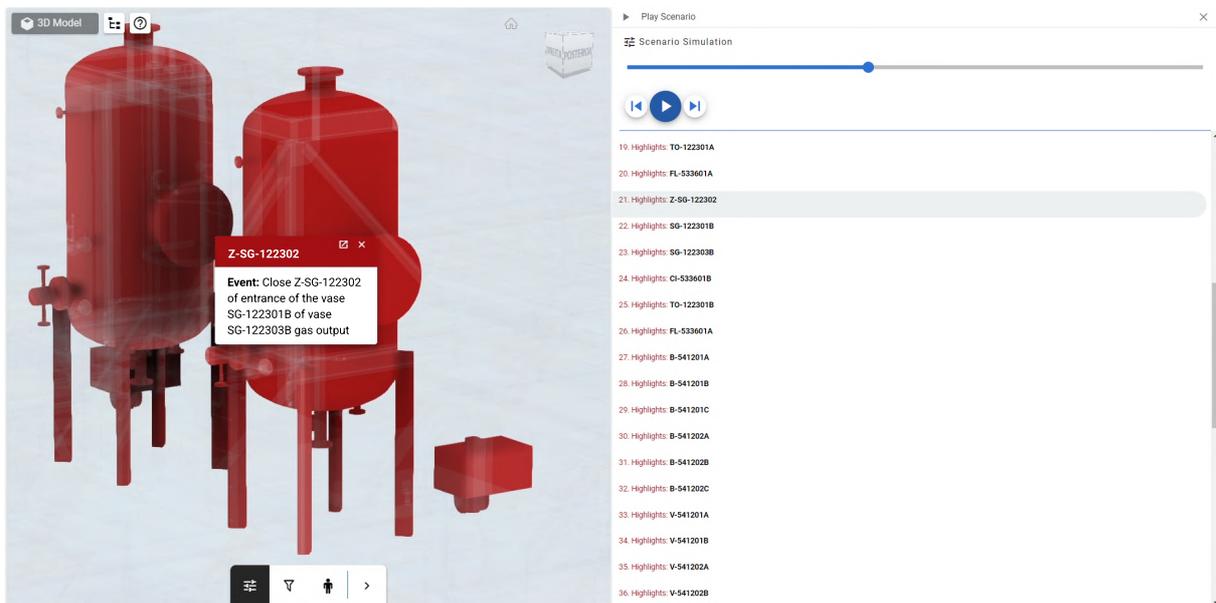
From this, it was possible to link the documents to the 3D modeling with VFiles technology and organize them in folders of their respective components, enabling the access and visualization of this information with a **few clicks**.

After contextualizing the data and separating the different procedures into their components, it was possible to feed the **Scenarios feature into the Vidya system**. This feature consists in a **visualization and animation tool capable of demonstrating events and their consequences, right in the 3D model**.



These events can be a risk, a sequence of actions, process triggers, sequence of physical processes, sequence of system processes, single operational stop procedures, anomalies or failures, that were previously mapped (in the engineering documents, HAZOP and PRA), and the actions needed to prevent or remediate these situations. Here is an example:

*"On a specific tagged piping, if a gas leak happens, the engineer will smell a strong gas odor and at the same time should proceed to close a specific valve connected to the piping in question, and this will affect another near equipment (...)"*



In this project, it was also possible to map and highlight critical elements, which are a list of Operational Safety (OS) equipment that in case of failure can cause critical or catastrophic accidents, such as pressure safety valves (PSV). By running the sequencing of actions in the platform, it was possible to visually distinguish these components with different colors, to understand the most important ones in each process, and also create filters to identify and isolate them in the 3D model.

Finally, to make the risk analysis more complete, Entities were added to the system. An entity can represent things that weren't able to be represented through 3D components itself, just as **smell, sound, hazards (like danger of falling things), isolated areas, or zones.**

These entities are visible in the 3D model, in the configured perimeter area, and complement the existing scenarios, as the one exemplified above.



## Results

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With all this developed, we were able to deliver a **100% remotely operable platform**, with visual and more agile asset safety management processes, but with the possibility to use it in the field in an offline way as well.

With the Vidya platform, the documents and time spent to evaluate an intervention procedure in the industrial plant were replaced by visual and interactive analysis models. Thus, besides the relevance for safety procedures, one of the most important applications of the technology was **the optimization of operational shutdowns**. Managers and workers were able to visualize in the actual 3D model the sequencing of actions when performing these procedures and generated a significant reduction of OPEX in the industry.

In addition, this greater agility **has allowed for a reduction in the search time for information**, now that the documents have been organized for their respective components and made available with a few clicks from the 3D model.

Finally, by operating and analyzing risks and situations remotely on the platform, it was also possible to reduce employees' time in the field, and consequently the risks that they are exposed to. From this, **the Digital Twin application has led to a reduction in the incidents and injuries reported in the industry**.

In other words, since the implementation of Vidya's Digital Twin, both workers and managers have gained the ability to:

- **Analyze** in a visual way the intervention procedures in equipment and the consequences generated in the rest of the process;
- **Perform** shutdown planning in a more agile and visual way with the sequencing of actions shown in the Scenarios feature;
- **Act** more assertively on the risks present in the industry by facilitating the understanding and analysis of information such as HAZOP and PRA;
- **Reduction** of workers in the field, with the possibility of remotely operating the system, and consequent reduction of their exposure to risks, leading to a drop in the number of incidents and injuries in the industry.

