WHITEPAPER

Bust through barriers with Octave InConcert Core Connector for plant maintenance

Digitally transform your asset lifecycle

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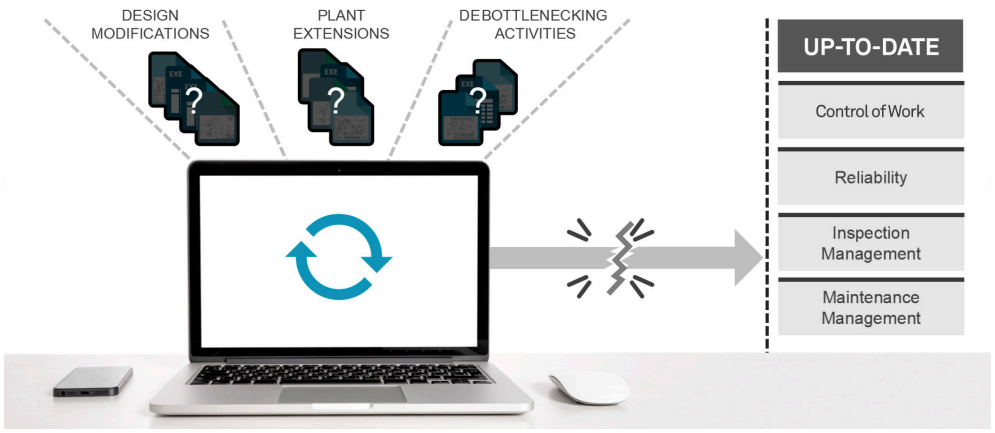
01 Introduction

High-quality engineering data and plant documentation are essential for efficient, safe and reliable maintenance activities. Effective utilization of SAP® Plant Maintenance (PM) requires reliable, up-to-date master data for functional locations (FLOCs). Even as the importance of this is widely acknowledged within the industry, surveys consistently reveal most companies face significant challenges turning it into reality. The impact of poor-quality information in SAP PM includes equipment being incorrectly maintained or not maintained at all. This maintenance deficit may contribute to a high risk of equipment failure and incorrect purchases of replacement equipment and parts.

Incomplete, outdated and missing FLOC structures and master data frequently linger within SAP PM systems because of non-integrated management of change (MoC) processes that fail to adequately address information requirements and maintenance system administration that doesn't keep information evergreen. Even in cases where the owner's and operator's engineering department has defined a clear handover specification or are using data-driven design tools, such as Octave Forte and Octave Facets solutions, maintenance systems are fully disconnected from this data.

Owner and operator challenges



Frequent causes of this disconnection include:

Inadequate handover specification

When contracting with engineering, procurement and construction firms for capital expenditure (i.e., greenfield) or operation expenditure projects, unclear specifications can result in incomplete, incorrect or inconsistent project data being handed over.

- For every project (small, big or mega), we recommend comprehensive data handover specifications be included as a contractual requirement and enforced among all project participants.

Overarching protection of the SAP system

Many companies, understandably, protect their SAP system against data manipulation by completely blocking other systems from connecting to SAP.

- We recommend evaluating and comparing the risks associated with opening SAP PM trusted interfaces against ongoing risks that result from manual data manipulation for the plant, plant safety and plant effectiveness.

Aging plants

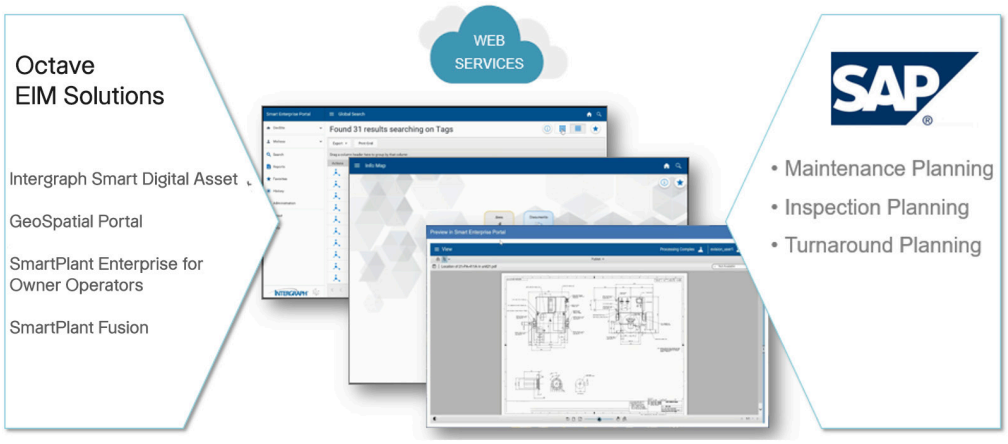
For decades, aging plants have operated without maintaining data and documentation, resulting in information unsuited to feed the maintenance management system.

- We recommend implementing a brownfield data collection and clean-up program, which will improve your asset data health and help with building a digital twin of your plant.

Octave solutions, including InConcert Core (formerly HxGN SDx), SmartPlant Foundation, SmartPlant Fusion and SmartPlant for Enterprise Owner Operators (SPO), have established a more than two-decade track record for effectively collecting, maintaining, updating and generating an engineering design basis (referred to as the asset's digital twin).

The remaining sections of this white paper elaborate on how Octave products, depicted on the left side of the below diagram, seamlessly integrate with SAP PM via InConcert Core Connector for PM. This integration is designed to alleviate or mitigate the challenges previously mentioned.

InConcert Core Connector for Plant maintenance



02 Integrating the design basis – Digital Twin with SAP PM

There are four important work processes needed to ensure tight integration between the digital twin held in Octave products and any computerized maintenance management system (e.g., SAP PM):

1. Synchronizing engineering tags with operational FLOCs
2. Asset information link for SAP
3. Synchronizing operational equipment with Octave
4. Synchronizing engineering changes with operational notifications in SAP PM

2.1. Synchronizing engineering tags with operational FLOCs

This is the fundamental work process for integrating the engineering world with the operational world. While the industry debates whether "tag" and "FLOC" are congruent, there is agreement that those two objects are the binding elements when it comes to integrating these two information worlds.

In the engineering world, a tag represents a function at a location within a facility so it can be designed. It is embedded into a plant hierarchy and has properties describing the requirements for the technical object and function within a process that should be fulfilled by the object. Tag is the commonly used term on all major deliverables (e.g., piping and instrumentation diagram, loop diagrams, 3D models and isometrics).

The current, most promising standard for handing over data, Capital Facilities Information Handover Specification, sets the definition as follows:

> *Functional specification: Tag*
>
> *Physical specification: Asset or Equipment*[1]
>
> *Purchasing information: "***Model** *is another object that can be used inside an engineering information management system that represents the typical material description, such as purchasing information."*

Similarly, the **SAP wiki** defines FLOC as follows:

> *"The functional location is an organizational unit within logistics that structures the maintenance objects of a company according to functional, process-related or spatial criteria. A functional location represents the place at which a maintenance task is to be performed."*

[1] See chapter "Synchronizing operational equipment with Octave asset"

To summarize, tag is used to represent the design created to fulfil the function and describes requirements for technical items to be engineered, purchased, installed, commissioned and then taken over by the operations team for production and maintenance. FLOC is used to organize maintenance and reuses a subset of the data required for the tag. Of note, InConcert Core Connector for PM can combine information from tags and models into FLOCs, if required.

As explained, there are instances of overlap in the definitions, but maintenance stands out as the most pivotal aspect. Maintenance teams require a comprehensive understanding of engineering specifications and requirements pertaining to an item to guarantee its proper functioning. Consequently, while an engineering system may address numerous information needs for a FLOC, it may not necessarily encompass all of them.

The following are use cases of an engineering system enriching knowledge required for operations and maintenance:

- **Existence of tag**
  Knowing which tags have been engineered is important for operations and maintenance. Many organizations lack this crucial information.
- **Tag requirements and properties**
  While designing each process, engineering had a specific function in mind and a specific tag to correlate to it. Maintaining this information while the tag is operational and under maintenance helps properly select equipment replacements and spare parts.
- **Tag documentation**
  Vendor and design documentation extends and completes the tag information.

Technically, the integration works as follows:

Synchronizing engineering tags with operational FLOCs

Tags existing within an engineering system, including Octave's, contain lists of related data and documents. Identifying and determining which tags should and shouldn't be transferred to SAP PM depends on various factors, such as:

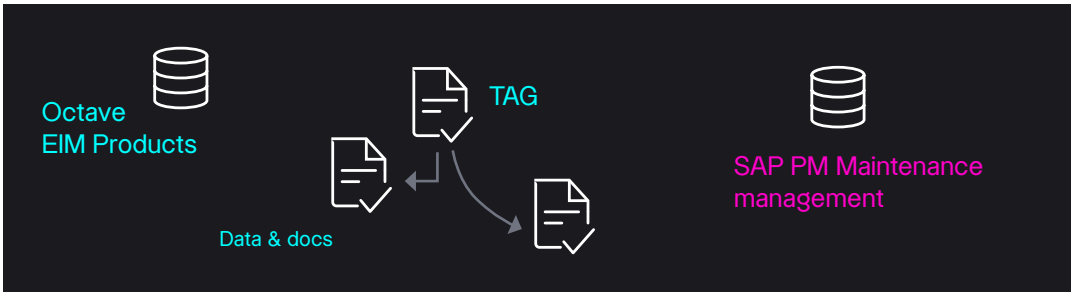
- **Tag is a maintained item**
  This definition can be customized based on maintenance requirements, which may vary from customer to customer. For instance, while rotating equipment and vessels always require maintenance, cables may not always be considered maintenance items. Nevertheless, maintaining a record of cables related to equipment and their associated drawings is essential for proper maintenance. Only tags relevant to maintenance are transmitted to SAP. This determination can be configured through the interface.

- **Tag has a status that allows transfer to SAP**
  A tag can have a status value to indicate it currently only exists for engineering purposes and there's nothing else to indicate if it will ever be physically implemented in the plant. The tag may be removed prior to physical implementation of the design. There may be other tags in an engineering status that justifies their transfer to SAP because they're physically installed at the plant alongside equipment to be installed. The status at which a tag is transferred to SAP PM is configurable in the interface.
- **Tag transfer status**
  The interface will only transfer new, updated or deleted/terminated tags.

For tags that meet all the previously outlined requirements, the interface can initiate a transfer. These requirements can vary from one case to another and the interface offers several options for determining when and how such transfers should be initiated. These options can include:

- Automated periodically scheduled transfer jobs
- A transfer is executed automatically based on a fixed schedule (e.g. every hour, every night, weekends).
- User manually triggers transfer
- A transfer is only executed when a user initiates it.
- Tag change-based transfer
- A transfer happens automatically when a predefined number of tags has been created or updated.

InConcert Core Connector for PM



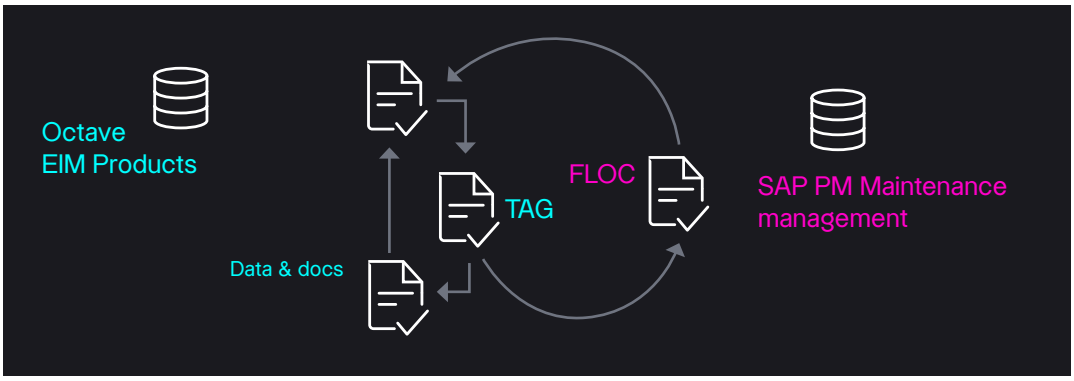
Once a transfer is initiated, the integration mechanism then:

1. Collects tag data to be transferred
2. Maps the engineering system properties to the transport mechanism
3. Applies transformations (e.g., adding a facility code prefix to the tag number to create the FLOC) if the tag naming convention differs from the FLOC naming convention
4. Creates a data container
5. Hands over the data container to the SAP interface component

The integration workflow is then continued on the SAP side by:

- Receiving the data container in SAP
- Mapping data to SAP system requirements
- Handing over data to the correct SAP Business Application Programming Interface for creation to update FLOC data

InConcert Core Connector for PM



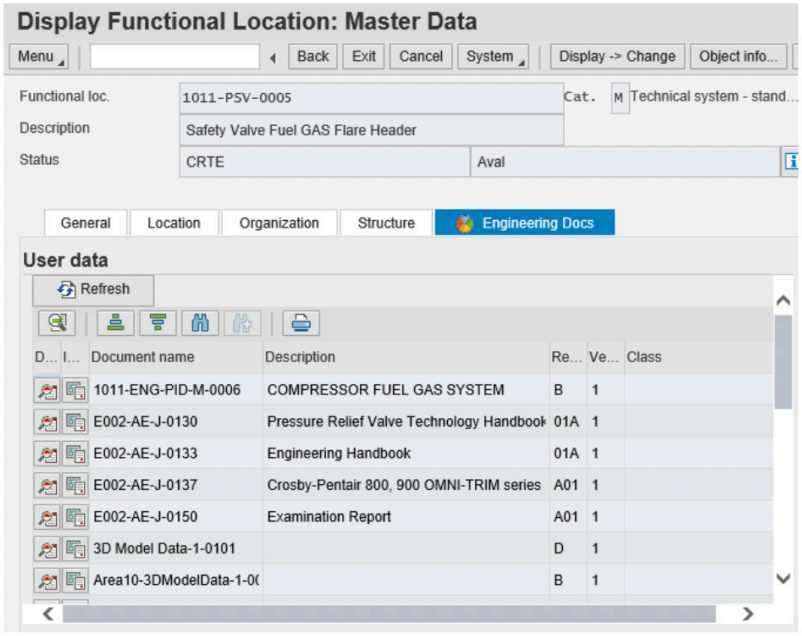
Finally, SAP collects response data for either success or error messages and sends back information about the created FLOC.

Here's how the end-to-end integration works between the two systems:

- Enables SAP PM to directly receive comprehensive engineering information for all maintainable and engineered items
- Ensures ongoing synchronization and keeps engineering and maintenance data up-to-date via fully automated processes
- Validates and transmits only trusted data to SAP, reducing the risk of errors associated with manual intervention
- Both systems gain awareness of the relationship between corresponding objects (i/e/, tags, FLOCs) on the opposite side, allowing for the establishment of downstream processes
    1. One downstream process example is the Asset Information Link for SAP (detailed below)
- Maintains a log of all transactions, successful and failed, which enables administrators to easily review changes made in InConcert Core Connector for PM

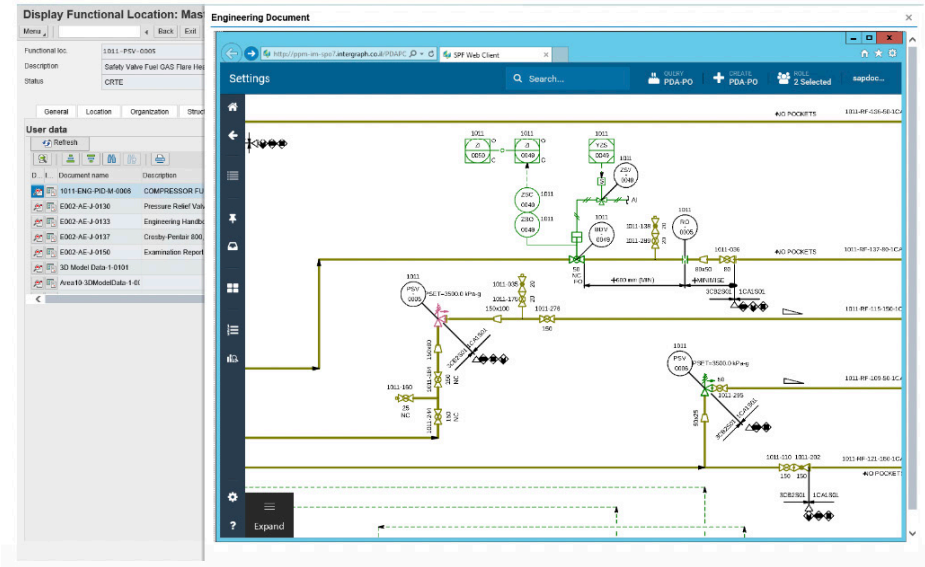
2.2. Asset information link for SAP

The Asset Information Link for SAP displays a list of relevant documents from Hexagon ALIM tools inside the SAP PM user interface for a FLOC. Thanks to the synchronization process described earlier, Hexagon ALIM tools already possess the relationship between FLOC and tag, allowing the display of relevant documents.

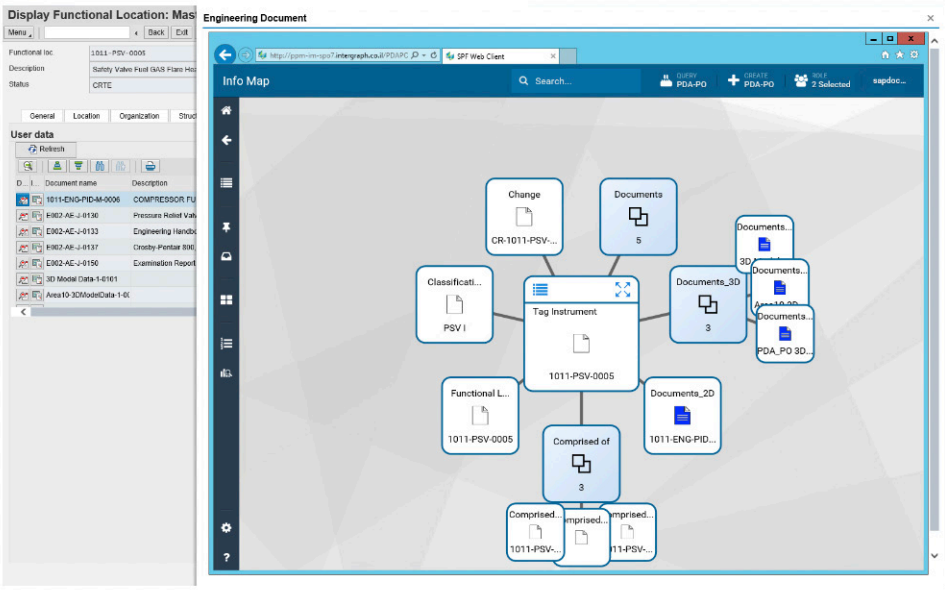


Depicted above, when a functional location object is synchronized, the SAP PM user interface presents an embedded list of documents from the Octave EIM solution

Users can access and view documents from this list via the SAP PM interface, without the need to exit or switch to another platform (or even know it originated from an external source).



For sophisticated users and deeper analysis of a certain engineering data sets, users can view an Info Map graphical representation of related data in a Octave system (see below) to view and browse related information.



With this seamless end user integration between SAP and Octave tools, SAP PM users gain the following advantages:

- Quick, integrated access to engineering documents with up-to-date engineering revisions
- Simple viewing options for documents stored outside SAP PM
- Octave's Info Map, which:
    - Requires minimal configuration and administrative expertise to manage effectively
    - Necessitates only minimal end-user training
    - Serves as a unified search, viewing and user-friendly navigation tool for engineering data and documents
    - Operates on thin client architecture, leaving no trace in a web browser and delivering a lightweight and efficient user experience

2.3. Synchronizing operational equipment with Octave

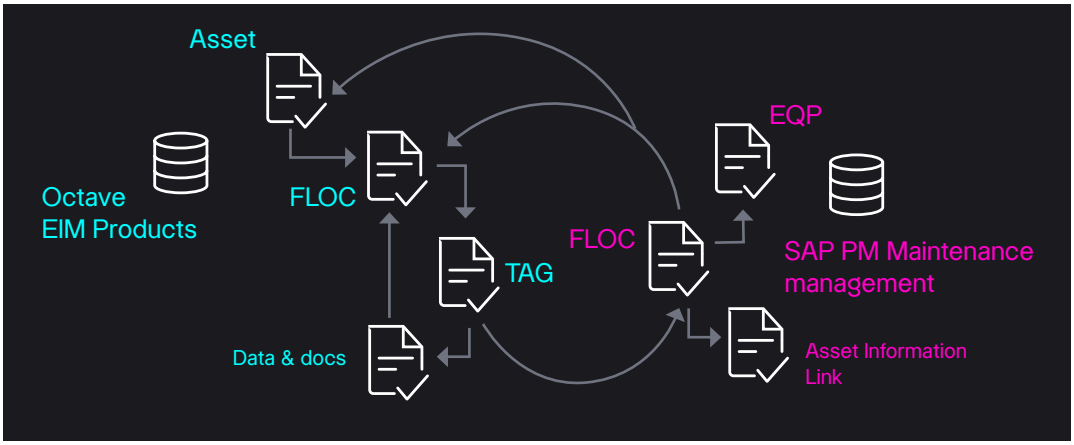
In this workflow, Octave tools that facilitate asset integration receive updates from the SAP PM integration regarding the installation and dismantling of equipment associated with a FLOC. Octave categorizes this equipment as an "asset," which is functionally equivalent to what SAP terms an "equipment object."

"Equipment" refers to a physical item that can be relocated from one FLOC to another (such as rotable equipment (e.g., electric motors) or taken out of service completely. It can also be situated in a warehouse or undergoing repair offsite. Major equipment typically bears a nameplate displaying crucial information (i.e., manufacturer's serial number, production date). Smaller equipment, like valves and compensators, may not always have a nameplate.

It's imperative to know which equipment has been installed on which FLOC because plant reliability, operations, safety and maintenance require the installed item to satisfy the requirements defined at the FLOC level. Maintenance history is stored against the equipment in SAP. For this work process, SAP PM is assumed as the master for equipment data, along with the following:

- SAP offers a procurement and logistics solution that, when fully utilized, streamlines the supply chain process. This encompasses the entire journey starting from the initial requirement for new equipment through the stages such as inquiry, purchasing, delivery and commissioning. Ultimately, the purchased item is seamlessly integrated into the equipment list of a plant.
- The result of this streamlined process is the accessibility of all pertinent information for each purchased item directly within SAP PM.

Synchronizing operational equipment with Octave Products



The above graphic illustrates the process.

Once the synchronization between tag and FLOC is established, the installation of equipment related to a FLOC can happen at any time within SAP PM. Likewise, the subsequent dismantling of equipment from the FLOC is also accommodated. The SAP connector employs a "user exit" within SAP PM that identifies these activities, triggering the invocation of a web service in Hexagon's information management tools. This web service creates an asset object within the corresponding Octave EIM tool, establishing a connection to the FLOC object. This triangular relationship — tag, FLOC, asset — paves the way for numerous future work process integrations (e.g., unlocking additional options for the Asset Information Link for SAP).

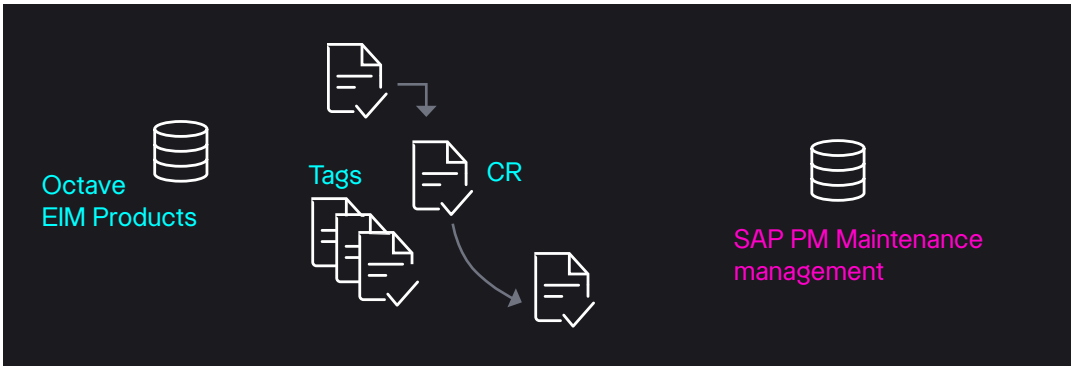
2.4. Synchronizing engineering changes with operational notifications

Octave SPO supports an engineering management of change process for operations.

> *Maintaining the accuracy of essential plant engineering, maintenance and operations information is vital to safe and efficient plant operations. MoC is a safety-critical process.*
>
> *Traceability of plant changes and auditability of the MoC process are essential to demonstrate compliance with regulatory requirements. Intergraph, a subsidiary of Hexagon, designed the MoC in Operations business package to provide rigorous MoC of engineering information with full traceability and audit trail.*[2]

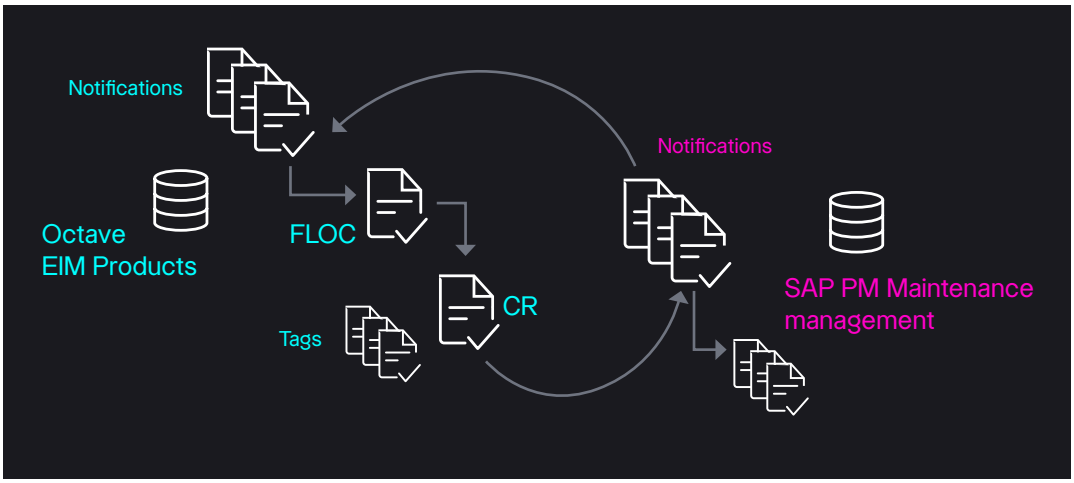
InConcert Core Connector for PM allows the integration of the SPO MoC process with SAP notifications, ensuring engineering changes executed in Octave SPO get implemented/installed in the plant by maintenance teams controlled by SAP.

Synchronizing engineering change with operational notifications

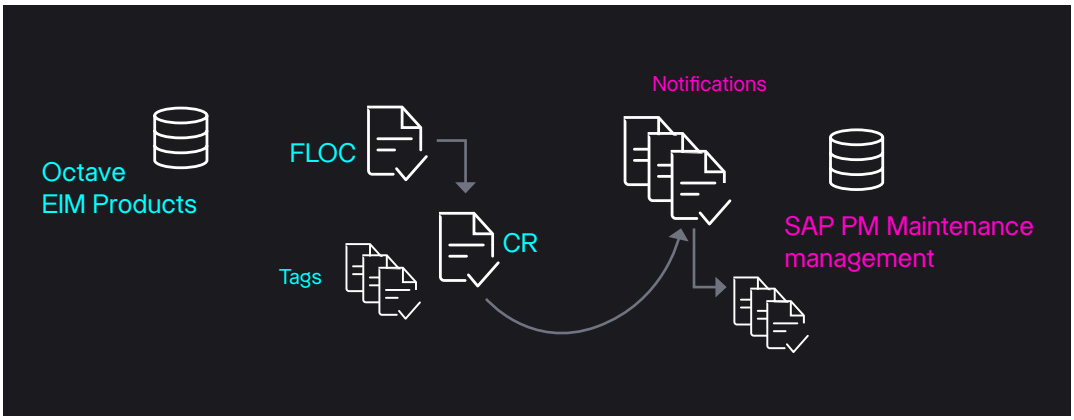


Once a change request (CR) in SPO has reached the approval stage, it signals to SAP maintenance to start planning execution. The SAP connector then grabs and transfers the change object to SAP PM. After data transformation, the CR/tag pair creates one SAP maintenance notification with one related FLOC.

[2] Leverage the Engineering Design Basis Across the Life Cycle, 2015



The same happens for each additional tag that's part of the SPO CR. In other words, a CR with relations to three tags will produce three notifications in SAP, each with its own relation to a FLOC.



Finally, the SAP connector sends the notification name and its relation to the tag back to Octave SPO so it can generate an object for each.

03 Conclusion

SAP PM is the leading solution for asset maintenance in asset-intensive industries like oil, gas, chemicals and power. However, it's limited in its ability to manage engineering design information and all the information impacted during MoC. Octave offers several products specifically designed to do both.

InConcert Core Connector for PM seamlessly integrates the best features of Octave's and SAP's system. Users can access all necessary information within SAP without needing to double-check its currency, completeness or consistency. This results in reduced time spent on non-productive tasks and more time for activities crucial for safety and operational efficiency.

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.