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Capital Asset Lifecycle Management

Digitally Transforming Capital Asset Creation and Operation

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Takeaways

What you need to know

Takeaway #1
The complexity of information-age capital assets, e.g., powerplants, factories, other types of facilities, and infrastructure, and the explosion of data they generate throughout their lifecycles—contract requirements, design, construction, operations, and dissolution—create a massive challenge for organizing and managing these physical and virtual assets throughout their lifecycles.

Takeaway #2
Siemens and Bentley Systems have integrated Siemens Digital Industries Software's extensive manufacturing and lifecycle data management capabilities with Bentley Systems' expertise in plant design and infrastructure data management. The result is the Teamcenter® for Capital Asset Lifecycle Management (CALM) solution, designed to enable Owner/Operators, Engineering Procurement Construction firms (EPC's) and OEMs to more effectively manage the valuable information supporting the lifecycle of their capital assets.

Takeaway #3
Teamcenter for CALM enables Owner/Operators (O/O) to consolidate technical data supporting their assets and facilities generated by their engineering, procurement, construction (EPC) firms; associated service providers; and their supply chain into a single collaborative environment as a "digital twin", and manage those digital assets more efficiently and effectively to better support asset operations and maintenance.

Takeaway #4
What makes Teamcenter for CALM transformational is its ability to integrate intelligent facility and component design data, that is usually isolated, with other sources of technical and business information to support digital transformation and fully manage all capital asset-related information.

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Introduction

The need for a Capital Asset Lifecycle Management (CALM) solution

The Last Mile of Digital Transformation

A capital asset is a tangible item with a useful life longer than a year that is not intended for sale in the regular course of its operation in the business. Property, plant and equipment are the capital assets that form the productive base of an industrial organization and they invest a large portion of their funds into them.

Capital assets are built through capital projects which have historically been plagued with low labor productivity. This can be partly attributed to a of lack of digitalization and system interoperability as well as the fragmented nature of the businesses participating in a capital project. When a capital project is completed, its planning, design, and construction data interoperability issues have likely already had a negative impact on the efficiency of the project deliverables (e.g., a process plant or building). Furthermore, these problems are typically transferred to the Owner/Operator who may not be provided with sufficient design and project data needed to truly increase operational efficiencies throughout the capital asset lifecycle.

Despite years of investing in software and technology, capital asset owners still have a long way to go to get full value from their technical information compared to many other manufacturing industries. Unlike their transactional information which, to a greater degree, has been consolidated following decades of ERP implementations, their capital asset-related technical information is often still scattered across different locations with incompatible data formats. To make matters worse, data from multiple projects and facilities use different technology stacks and tool suites from a variety of vendors, each with unique standards and specifications that lead to further data incompatibilities and process mismatches.

Regardless of the industry or what is being produced, the processes that manage lifecycle information are largely the same. Each stakeholder along the lifecycle of the project still needs controlled access to complete, correct, and consistent information where changes are managed and processes are optimized to meet measured execution goals.

This eBook defines the need for Capital Asset Lifecycle Management (CALM), the characteristics needed for a CALM solution, describes how Siemens Digital Industries Software (Siemens) has partnered with Bentley Systems to develop and deliver a CALM solution, and highlights how that solution uniquely addresses the needs of the Energy and Process industry.

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Capital Asset Management Challenges

What is Capital Asset Lifecycle Management?

Beyond Stick-Built Plant Design

Capital asset lifecycle management is the adaptation and application of product lifecycle management (PLM) concepts and techniques to the planning, design, construction, and operation of a plant, facility, or factory. Many of the concepts are the same as those across manufacturing industries but from the capital asset perspective there is a core focus on the integration of physical, logical, and technical data in a single model.

In generic terms, a lifecycle management solution must manage the complex product or asset information, enabling the associated workflows and collaboration that connect people and processes across functional silos along a single digital thread. It must contain defined elements that facilitate the effective management of information across the capital asset's lifecycle, enabling traceability, adherence to requirements and better decision making. Putting this in context of the fourth industrial revolution, which has made significant progress in many sectors, these defined elements have evolved to enable Industry 4.0 concepts such as data reuse, simulation, modularization, the digital twin, and IoT.

The basis of this industrial revolution is digitization, which refers to the creation of a digital representation of a physical object, such as scanning a paper document and converting it to a digital format. However, digitization by itself provides little business value. Organizations must leverage digitized data and progress to digitalization which is "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business." [1]

From a lifecycle management perspective, this is about automating and streamlining an organization's business processes to integrate and digitalize the entire value chain—from design to operations. Suppliers and logistics are integrated through a consistent collaboration platform, allowing organizations to start with digitalization at any step of their value chain as shown below.
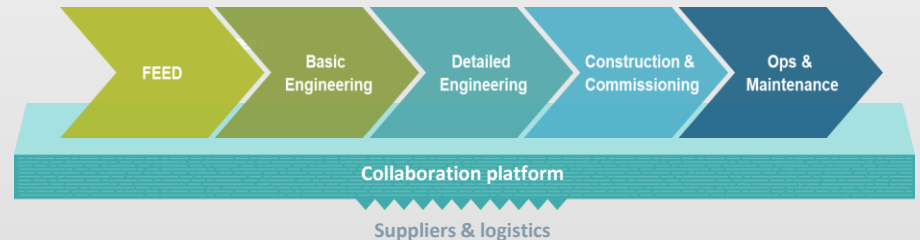
Elements of Digitalization

The six elements of a digitalized capital asset lifecycle include

1. Digitized data, to enable digitalization via digital technologies
2. A central repository of digitized information
3. A collaboration platform for the entire value chain
4. Connections to various business systems along the value chain
5. Data-driven business processes to manage the evolution of data across the lifecycle
6. The digital twin of the capital asset

Digital Thread—The digital thread refers to the communication framework that allows a connected data flow and integrated view of an asset's data (i.e., its digital twin) throughout its lifecycle across traditionally siloed functional perspectives.

Digital Twin—A virtual representation (i.e., digital surrogate) of a physical asset or collection of physical assets (i.e., physical twin) that exploits data flow to/from the associated physical asset(s).

[1]https://www.gartner.com/en/information-technology/glossary/digitalization

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CALM Asset Management Challenges

Simple concept, but, until now, a production-capable solution has been elusive

Asset Management is Complex

Today, many capital asset stakeholders (those who design, construct and/or operate capital assets) struggle to fully and effectively digitalize the asset definition and use that data to improve efficiencies and performance. EPCs are primarily concerned with meeting cost, performance, and delivery/commissioning requirements. Owner/operators want to leverage new technologies to monitor and improve their assets' performance through simulation, analytics and controls. This is made more difficult by the complexity of fully aggregating and managing the capital project with operational information and processes at an enterprise level. Struggles here lead to notable efficiency losses in the capital project delivery but also throughout the entire asset lifecycle.

Incomplete or document-centric transfer of project & asset data

Asset Management Challenges

Major capital asset management challenges include:

- Poorly executed projects—Lead to capital project delays and budget overruns that can, in part, be attributed to inefficient project planning and execution and lack of system interoperability. They also result in assets that perform below standards and negatively impact production, margins and cost recovery.

- Disparate data systems—O/O's typically do not have adequate solutions to ingest data from EPCs resulting in incomplete data or forcing the EPC to export data into alternative formats that are supported by the O/O's solutions adding unbudgeted time and cost to the project while risking loss of data.

- Incomplete transfer of project and asset data—The data generated by an engineering firm during the design of an asset that meets requirements and supports construction is often not complete enough for the O/O to be able to operate, maintain, and upgrade their assets and facilities.

- Lack of information life cycle management—Necessary to provide visibility into the asset build and its maintenance status over time, as well as the schedule's relationship to important milestones that trigger procurement activities, such as material orders and contractor payments. EPC and Operator risk and safety are directly impacted as well.

- Inconsistent data and slow change processes—May lead to low construction labor productivity and introduce errors in design and execution.

- Digital data explosion and impact of big data—Creates a challenge for companies to find the information needed for optimizing assets throughout their lifecycles—design, construction, and operations.

- Increased project size and complexity—A shift towards lump-sum turnkey contracts (LSTK) where the EPC bears the project and cost risk while guaranteeing operational readiness.

- Increased rate of technology innovation—Capital project stakeholders need to proactively test and implement new technology to remain competitive and deliver efficient projects, on time and within budget.

- Increased global competition—Increases pressure on cost and margin. Companies are challenged to design, build, and operate capital assets in more innovative and cost-effective ways.

- Decreased labor force—Fewer younger workers entering the EPC industry. This creates risk to the security of a company's IP as retirees leave and further drives down productivity.

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CALM Data Management Challenges

Improving project execution and delivery

Data Management is a Barrier

Capital projects that are designed and built by multiple companies and teams typically have data siloed in multiple information systems such as plant design and BIM tools. Project stakeholders need an enterprise-wide lifecycle collaboration solution to manage higher frequency and volumes of data generated while simultaneously connecting the right stakeholders to the right information—shifting away from document-intensive processes, towards proven, data-driven business processes that align to both the stakeholders and their data.

O/Os often lack the project data necessary to properly maintain the facility and, over time, improve costs and throughput. Often a document-centric data handover occurs at the end of a project, leaving operators with a stack of documents that have no inherent data reuse value and are difficult to keep current. **Continuous digital handover of structured project data is necessary for O/O's to make sense of the equipment and systems that exist inside the facility, and leverage the data for simulations, integrated planning, and future modernizations.**

Resolving these issues improves project execution and leads to higher quality assets that perform better and are more-likely to meet the requirements defined in project contracts.

Image courtesy of Siemens

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CALM Solution Characteristics

A holistic lifecycle view of capital assets is required

Solving System Complexity

A CALM solution enables a company to aggregate, simulate, analyze and transform data captured from facility operations and assets into actionable information that can be reported back to both facility operators for production planning and to the EPC with suggested design changes. By creating this decision support environment, enabled by a closed-loop digital twin, organizations begin to form the means of continuous performance optimization.

On this basis, an effective CALM solution should also provide or include:

- A single point of access to federated data about the facility and the managed capital assets (as shown in the figure)
- Enterprise collaboration, insight, and visibility
- Advanced program management capabilities
- Simulation for design, construction, and operations

The closed-loop digital twin includes the virtual process design that defines the equipment, systems and process flow necessary to produce the required amount of specified output (example: LNG plant specifies an output of 1,000 metric tons per day). The digital twin will take the parts, equipment, and systems that have been created

and optimized in detailed design and virtually place them within the plant site layout or construction work areas. From here, sequencing of construction activities, clash detection, and virtual commissioning are all possible. Once the project or facility is operational, this comprehensive digital twin reflects the as-built facility, which will continually be updated by computerized maintenance management systems (CMMS), such as IBM Maximo, to virtually represent the facility's as-operated/as-maintained condition. As new projects such as facility turnaround or modernizations occur, the digital twin will be leveraged by design and engineering to plan, simulate, and optimize the equipment and systems that make up the new project—closing the information loop between operations, service, and engineering.

Lastly, analytics and dashboards are needed to keep users informed of project performance while key project metrics are analyzed and measured to help stakeholders keep the project on time and within budget and to make informed, timely asset management decisions.

Federated Data—Federated data architecture is a form of system structure that accommodates multiple heterogeneous databases. Federated data architecture recognizes that information required to execute business processes usually resides in multiple repositories, which often represent a completely heterogeneous mix of technologies and implementation approaches. When federated, data appears to the user to reside in a single repository and is referenced via a federation connection between databases. Referenced data appears to be native, can have the full range of CRUD (create, read, update, and delete) rights, and respects the combined security policies of the source and refencing systems.
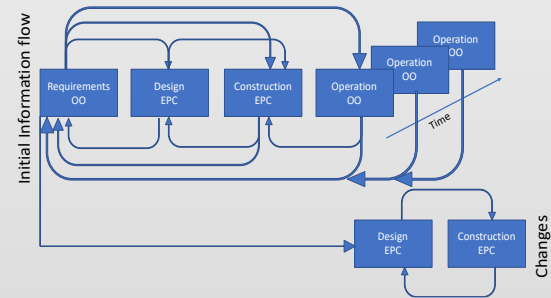
Information Flow Over the Capital Asset Lifecycle

Image courtesy of CIMdata

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Siemens/Bentley Relationship

Both companies provide complementary technology and domain expertise

The Strategic Alliance

In 2016, Siemens and Bentley Systems Inc. established a strategic alliance to drive new business value by accelerating digitalization in both infrastructure and industry project delivery for improved asset performance. Through a joint investment fund, new software solutions are developed to address the challenges of today's industry through digitalization. The primary driver was the convergence of digital engineering models from both companies, enabling the creation of a more comprehensive digital twin—the virtual representation of a physical asset—used to optimize the performance of capital projects as well as the operational performance of the plant, facility, or factory.

In 2019, Siemens and Bentley announced the availability of Teamcenter® for Capital Asset Lifecycle Management (CALM) which connects the facility design and product lifecycle management

(PLM) domains. In this partnership, Siemens brings its data-driven business processes, such as change, requirements, and program management, as well as its systems engineering, enterprise collaboration and simulation capabilities. Bentley contributed its expertise in infrastructure projects and facility design data exchange to address the issues of engineering interoperability and access that persist through the lifecycle of today's capital assets. The combined approach helps companies establish a digital thread across the entire CAPEX/OPEX lifecycle, enabling the creation of a capital asset digital twin that can then be used to optimize the project while reducing costs and improving operational margins and performance.

Both partners have provided technology and domain expertise which have been integrated to create the Teamcenter for CALM solution.

Image courtesy of Siemens

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The Solution: Teamcenter for CALM

Siemens and Bentley Systems have worked together to create a CALM solution

A Jointly-Developed Solution

Developed collaboratively by Siemens and Bentley Systems, Teamcenter for Capital Asset Lifecycle Management is designed to optimize the performance of capital assets, such as a plants, facilities, or factories, during both project delivery and operations. Teamcenter for CALM helps companies make the transition to digitalization for the planning, design, procurement, construction, and operation of a capital asset. By consolidating asset data and weaving a digital thread through the asset's lifecycle, the solution enables the creation of a comprehensive closed-loop digital twin to visualize and simulate project designs, construction execution, and operational performance.

The Teamcenter lifecycle collaboration platform from Siemens has been integrated with the iModel technology from Bentley Systems to digitalize and consolidate capital asset data from multiple sources to facilitate the effective management of it

throughout the entire asset lifecycle.

Teamcenter for CALM:

- Integrates Bentley iModel data translation capabilities into Teamcenter

- Dynamically manages complex capital projects

- Optimizes the performance of operational capital assets

- Enables the creation of a comprehensive, actionable digital twin of the intelligent facility

Teamcenter for CALM is designed to:

- Provide actionable insight and visibility by aggregating and unifying project and operational data from disparate systems inside an enterprise data management platform to create a single point of access to federated data that is inclusive of design and information models from third-party CAD/CAE/BIM authoring systems.

- Deliver capital project program management through proven, data-driven, business processes that manage project complexity, the evolution of data, and enable decision-support capabilities such as analytics, dashboards, and visualization.

- Yields a comprehensive digital twin that provides valuable insights and helps companies realize continuous optimization through the visualization, simulation, and optimization of project designs, construction execution, and operational performance.

Teamcenter for CALM was initially released in September 2019. This first release was developed for both EPC companies and O/Os as they often collaborate and work together to bring new capital projects online. In a typical project, the engineering design, procurement, and construction Statements of Work (SOWs) are subcontracted to an EPC who may further subcontract work to other organizations. Here's the value from each's perspective:

CALM From an O/O perspective—the EPC's primary interface to the capital project is Bentley Systems iModel (further described below). This approach allows the EPC to choose the design and engineering authoring tools that best fit their business while enabling the O/O to gain insight into the progress of the project through program management capabilities that connect the program plan, work breakdown, and facility breakdown in a single platform. The alignment of stakeholders and data is facilitated through automating and streamlining key business processes such as change management. At project handover, the O/O will be in possession of the contracted digitalized data that can be reused and further leveraged going forward.

CALM From an EPC perspective—the solution enables their multi-disciplinary organization to digitalize the data they produce and easily exchange it with the O/O, providing value as a contractor in the marketplace. Additionally, the EPC can gain a new level insight into their subcontractors' scope of work, helping ensure deliverables are designed right the first time while keeping the project on schedule. The EPC will gain the same ability the O/O does regarding the streamlining of key business processes which help facilitate the effective management of project data.
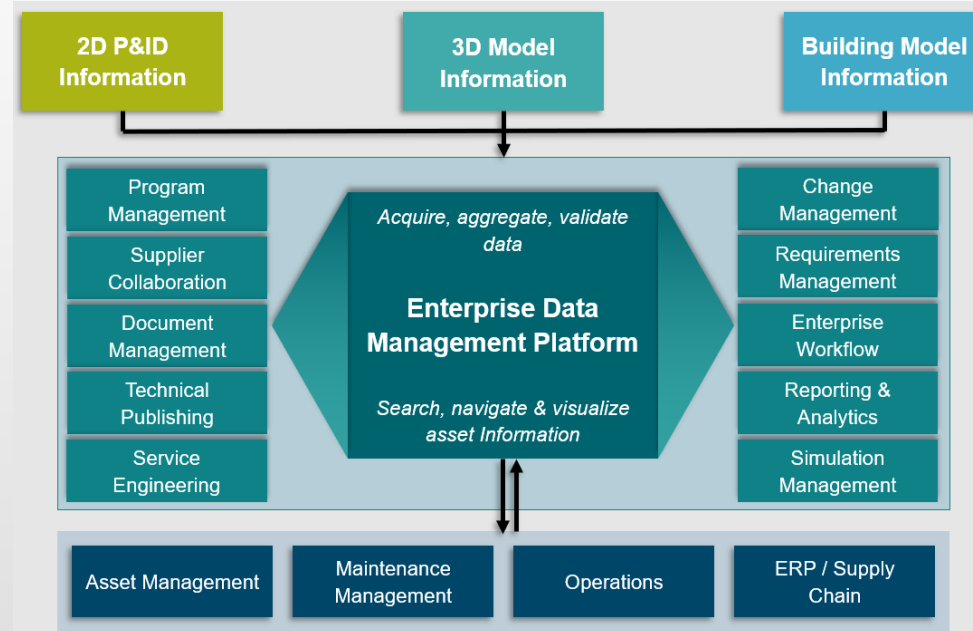
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Architecture

Teamcenter for CALM: Elements of the Siemens/Bentley solution

Both Siemens and Bentley Systems have provided technology and domain expertise which have been integrated to create the Teamcenter for CALM solution. The Siemens technology includes Teamcenter software which enables related solutions such as open IoT via MindSphere and rapid application development via Mendix.

The figure illustrates the architecture of Teamcenter for CALM.

The Teamcenter for CALM solution is a combination of new and proven applications designed to help companies consolidate asset data to form a digital thread from project delivery into operations, enabling the creation of a comprehensive, closed-loop digital twin—the virtual representation of a physical asset—to visualize, simulate, and validate project designs, construction execution, and operational performance. It manages a capital asset's lifecycle, from capital project delivery into operations, to drive new efficiencies in design, construction, and operations.

2D P&ID Information | **3D Model Information** | **Building Model Information**

Program Management
Supplier Collaboration
Document Management
Technical Publishing
Service Engineering

Acquire, aggregate, validate data

Enterprise Data Management Platform

Search, navigate & visualize asset Information

Change Management
Requirements Management
Enterprise Workflow
Reporting & Analytics
Simulation Management

Asset Management | Maintenance Management | Operations | ERP / Supply Chain

High Level View of Teamcenter for CALM and Related Architecture *Image courtesy of Siemens*

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iModel is an Integration Hub

Teamcenter for CALM: Elements of the Siemens/Bentley solution provided by Bentley Systems

iModel

As described earlier, perhaps the most significant aspect of capital projects is that they use many different design-related solutions across engineering disciplines to bring an asset from concept to full production operation. A special capability of Teamcenter for CALM is its integration with Bentley's iModel technology, which is used to enable interoperability with common plant and building design tools. The data structure that iModel is based on provides a common method of communication among EPC companies as a data exchange mechanism to view the design and engineering data that is normally siloed in commonly-used design and engineering authoring tools. An iModel contains all of the data, graphics, and the schema that structures the content being sent to Teamcenter. Data describing the site, building, and building contents, including equipment and piping are also included in the iModel. All elements of the iModel are mapped to Teamcenter items as first-class objects with attributes, enabling change management and comparative processes to be executed. Of particular importance is the technologies' ability to maintain a timeline of change, a record of who did what, while allowing all versions to be accessed and significant versions to be named.

The iModel connection allows EPCs and O/Os to bridge the gap between CAD/CAE/BIM authoring systems and Teamcenter. This federated model points to the appropriate elements within the iModel as the master.
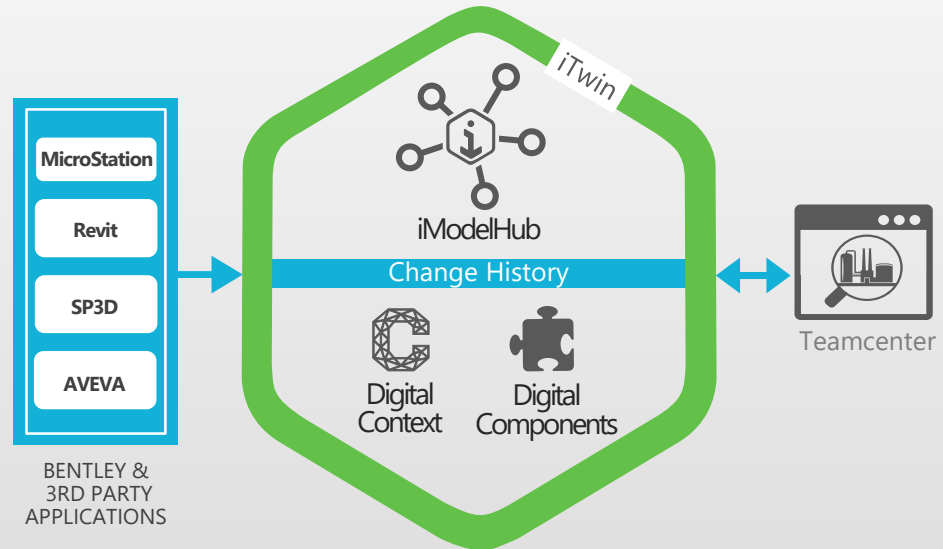

Image courtesy of Siemens & Bentley

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Functionality

Teamcenter for CALM: Elements of the Siemens/Bentley solution provided by Siemens

Teamcenter:

Teamcenter for CALM is based on new and existing Teamcenter capabilities, including:

- Extended enterprise-wide collaboration
- Requirements management
- Plant and work breakdown structure management
- Milestone tracking
- Program planning
- Analytics and reporting
- Visualization
- Workflow for the modeling of business processes as well as out-of-the-box workflows to support project and as-maintained change management

Collaboration:

Siemens Teamcenter software supports collaboration to connect people and processes among functional silos, creating a digital thread that enables innovation. Everyone who manages and participates in the lifecycle can easily find up-to-date information to act on make to the best decisions.

Business-wide lifecycle management and collaboration begins with the basics—consolidating and synchronizing designs, documents, and processes. Then bringing in more domains and departments—including those in the supply chain.

Specialized capabilities support business processes like program planning, technical publishing, and document management—or strategic priorities like cost, quality, and sustainability. By bringing together asset data, a holistic approach can be taken to the management of the capital asset and producing a comprehensive digital twin to simulate, analyze, and predict performance before a company invests in the next piece of equipment, system, or capital project.

Complex Analysis:

Connecting the P&ID (2D representation) to its 3D representation and associated geometry is an important aspect of Teamcenter CALM. The

solution supports cross probing of plant data in 1D, 2D, and 3D, all in a single view as shown in the figure. This means, for example, that selecting an item in a P&ID will highlight its related data in the 3D model and the 1D structure. Not only are facility objects associated to their visual representations, but they are also connected and trace linked to items such as the requirement specification and the correlating change management workflows. This type of connection and interrogation helps facilitate a holistic understanding of the facility, reducing time spent searching through multiple systems for the right information in the right context.

Cross-Probing Speeds Analysis by Linking Items, P&ID Diagrams, and 3D Models

Image courtesy of Siemens
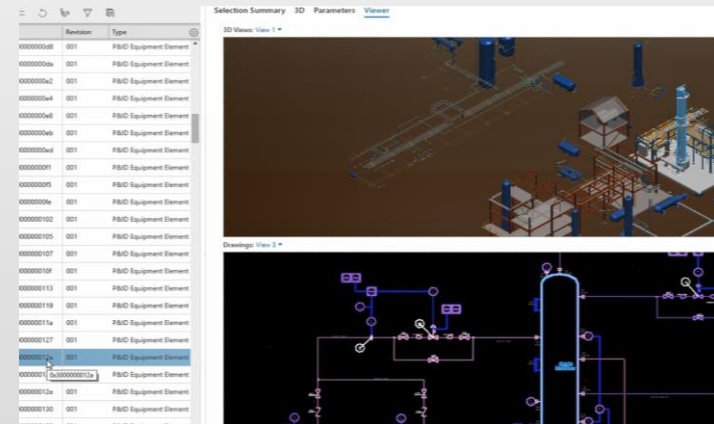
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Ability to Manage Milestones

Teamcenter for CALM: Elements of the Siemens/Bentley solution provided by Siemens

Visualization and Search

Today's plants contain legions of pipe, instrumentation, and equipment, forming the critical base of the organization's operations and production. The piping and instrumentation diagram (P&ID) is the functional blueprint for the facility design, showing the interconnection of process equipment and instrumentation used to control the process. This is delivered as a 2D schematic and is used by facility personnel to better understand the process. An integration with Siemens COMOS supports P&ID and E&IC data, and an interface is provided to allow other electrical suppliers to integrate data as well.

Comparing Milestones

The EPC creates the plant design in their design environment, and exports data in the iModel container at a defined time or an appropriate milestone for import into Teamcenter. Graphics and data are mapped into the Teamcenter environment including facility and equipment geometry as well as related data. The O/O can easily browse the EPC data without it being structured into traditional BOMs and/or hierarchies due to Siemens technology. As milestones progress,

the O/O can validate the design against the requirements and compare progress between milestones. When a change is required, Teamcenter's collaborative change management processes are initiated, connecting the O/O and the EPC.

Image courtesy of Siemens

**Teamcenter Compare Function Showing
Changes from One Milestone to the Next**

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Project Planning

Teamcenter for CALM: Elements of the Siemens/Bentley solution provided by Siemens

Program and Asset Management:

With Teamcenter's program management capabilities, the program plan, work breakdown, and facility breakdown are connected in a single platform, meaning there is a single collaboration environment to help stakeholders understand when, how, and what to build. The facility breakdown structure defines what to construct while the work breakdown structure, via work packages, defines how to construct.

These are then connected to the program plan, providing an integrated view of engineering and construction. Teamcenter's analytics and reporting capabilities are used to create dashboards that help keep everyone informed of program performance while key metrics are analyzed and measured to help stakeholders keep the project on time and within budget.

- From the O/O perspective, this may be as simple as starting with high level planning inside MS Project or Primavera and, as the project progresses past conceptual design, transferring this information to the EPC as well as Teamcenter. From this point, the EPC can send the O/O iModels that relate to this plan and that are in the context of work-in-progress or defined milestones. This gives the O/O the opportunity to participate in the project, ensure designs are meeting requirements, and facilitate digital,

traceable change processes as necessary.

- From the EPC perspective, this can be interacting with the O/O as described above or taking the role of the O/O with their subcontractors.

As the project progresses and data from the iModels populate Teamcenter, the digital twin is established and evolves. In design and engineering the digital twin helps the organization visualize the design to simulate and optimize it prior to moving into the virtual build phase. This phase is about virtual construction and commissioning—sequencing and simulating construction activities to ensure efficient constructability. As the project

moves towards commissioning, the final release of data from the EPC forms the as-built digital twin of the facility and equipment. The as-built digital twin can be used as a baseline for future plant changes and improvements as well as drive maintenance planning solutions. Teamcenter provides this connection via an enterprise integration to IBM Maximo, enabling proactive CMMS to keep the digital twin current in its as-operated/as-maintained phase. As new projects initiate, the digital twin is current and ready to help deliver the next efficient project and to increase operational efficiency and throughput.
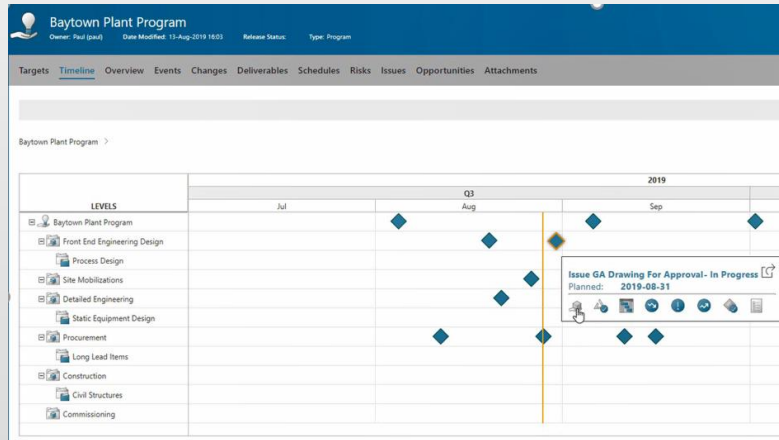
Project Planning / Scheduling in Teamcenter for CALM

Image courtesy of Siemens

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Teamcenter for CALM in the Energy & Process Industry

Centralize project and asset data into a single lifecycle application

CALM Addresses a Key Gap

The Energy and Process (E&P) industry has been relatively slow to adopt new digital technologies and processes. Because of this slow adoption of concepts like PLM companies in the E&P industry struggle to evolve and optimize the management of large capital asset projects and resources such as refineries, oil rigs, process plants, etc.. This impacts all phases of an E&P industry project from design, through construction and commissioning, and throughout the production life of the asset. Facilities are built once and then operated nearly continuously, often for longer than 50 years, with continuous capital project enhancements before they are decommissioned.

 The facility lifecycle in the E&P industry is separated into a design and construction phase and an operations phase. Information silos are developed in each of the phases due to disparate tools that address the problems of each phase, with little consideration for longevity of the facility. It is only recently that this industry has realized the value of taking delivery of the asset information developed in the early stages of the design, during analysis and Front End Engineering Design (FEED) phase, to be leveraged during operations and maintenance. Teamcenter for CALM at its core addresses this gap in the industry.

Value of Capital Asset Information

In the Energy and Process industry, a capital asset can be a facility, a sub-assembly, a sub-system, a piece of equipment, or an inline component and can be created in various authoring tools ranging from Microsoft Excel to 2D and 3D design applications. The assets are identified by a tag number which is unique and maintained throughout the entire lifecycle of the facility from basic design through operations. Once the facility is commissioned, the design database is handed over by the EPC to the O/O for operations and maintenance. Teamcenter for CALM, over the lifecycle of the facility, can be the single point of access to design and operational asset data through the digital twin, which is representative of the virtual and the physical model of the facility.

Historically, the global Energy and Process industry has struggled to fully realize the value of their capital asset information due to incompatible file formats and silos of information. This has restricted their ability to integrate and apply it in a way that generates and optimizes business value. Today, there are existing enterprise solutions, e.g., PLM, that are broad, deep, highly configurable and have been rigorously used by industry leaders in highly competitive industries for many years, i.e., discrete manufacturing. The applicability of using a PLM approach to project and asset lifecycle management in the Energy and Process industry is now being

recognized and the upside potential for the industry is substantial.

All In One Place

With Teamcenter for CALM, capital asset stakeholders can gain the ability to centralize virtually all their data and documents for a given capital asset or portfolio of assets and integrate it with their other enterprise systems.

Teamcenter for CALM consolidates project and asset data into a single lifecycle application, where it can be rigorously managed and controlled, but also applied and re-used as needed. The facility model in Teamcenter is kept up-to-date through the design and construction phases by integrating the design tools using the iModel technology and through maintenance and change phases of operations and capital projects. It is important that through all the physical changes, the facility model (digital twin) is kept current so that design, maintenance, and operations teams have accurate information to manage the plant. With this approach, the staff is much better prepared to rigorously manage and control the many changes to that asset information once operations commence, ensuring their repository stays current and reliable.

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Conclusion

CIMdata's final thoughts

As described herein, the complexity of modern capital assets creates a huge challenge for creating and managing large and complex capital asset data throughout their lifecycles. With facility and component data created and maintained in diverse authoring tools and often managed in silos of information, EPCs and O/Os historically have struggled to manage both the construction and operational phases of these long-life assets for maximum efficiency and profit.

EPCs and O/Os are recognizing the need to step up in the digitalization and digital transformation arena. The need is driven by customer, regulatory, and business performance requirements. To satisfy these needs, EPCs and O/Os are transforming their businesses to integrate data from initial requirements through design, construction, and operations to achieve real benefits related to cost, timing, and asset performance.

Bentley Systems and Siemens Digital Industries Software have combined forces to address the issue of lifecycle integration for capital assets by creating Teamcenter for Capital Asset Lifecycle Management (CALM). Bentley Systems provides the data using its iModel format and Siemens Teamcenter consumes iModel data via federated services enabling data and process management to support a single logical source of truth for the asset: a comprehensive digital twin.

CIMdata is impressed by the pragmatic approach taken to use iModel as a federated data source in the facility and digital twin structures. Teamcenter provides capabilities to manage the overall lifecycle while leveraging the data created in best of breed EPC design solutions. This appears to be a sustainable approach that will improve the engineering and business efficiencies of both the EPCs and the O/Os and should be investigated by all capital asset value chain participants.

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