

# Making PDS Interoperable

A Bentley White Paper  
Version 2.0

**Published**  
March 2012



[www.bentley.com](http://www.bentley.com)

## Table of Contents

<b>Introduction</b> .....	<b>3</b>
<b>Bentley’s “Smart Plan” for PDS Users – Summary</b> .....	<b>3</b>
Bentley “Smart Plan” and OpenPlant – THE future path forward .....	5
<b>1. Using PDS in a MicroStation V8i Project Environment</b> .....	<b>5</b>
Licensing is not an issue with SELECT .....	6
Integration with engineering analysis.....	7
<b>2. Using PDS in a ProjectWise V8i Project Environment</b> .....	<b>7</b>
<b>3. Bentley OpenPlant Suite</b> .....	<b>8</b>
Standards-based interoperability to meet the demands of today’s projects.....	9
Bentley OpenPlant is a managed environment for plant information.....	10
Support for all disciplines across the plant lifecycle .....	11
<b>4. Protecting PDS Data Investments using PDx Dynamic Review</b> .....	<b>13</b>
Choices empower innovation and creativity .....	13
PDx Dynamic Review – Live connection to PDS project .....	13
Translation of PDS Data into ISO 15926 format.....	13
Integrating PDx Dynamic Review with ProjectWise .....	13
Under the hood .....	14
<b>5. PDS Data Handover</b> .....	<b>14</b>
PDS data in a standard, open format .....	14
Data warehouse ensures PDS data fidelity.....	15
A scalable approach to data handover.....	15
<b>6. Value Proposition of Bentley’s OpenPlant</b> .....	<b>16</b>
Global user resource pool.....	17

A survey conducted by Bentley in 2008, 90 percent of users said the transition from PDS was important to their business. Yet only 28 percent said they had sufficient information to make a decision on which forward path to take.

## Introduction

Since the launch of PDS in the mid 1980s, the users of this software for plant design have made substantial investments in time creating project data, related catalogs, and specifications within PDS. In parallel, most PDS users have incrementally developed and evolved comprehensive business workflows, work processes, and system interfaces to complement the PDS 3D modeling environment. Together, these efforts have improved overall project execution efficiencies over the course of the past three decades.

Now, with the introduction of SmartPlant, the user community faces the imminent end of PDS's product life without a clear, cost-effective transition and migration plan from the software's proprietor, Intergraph. With SmartPlant, PDS users are being forced to learn yet another proprietary system. Moreover, this system has taken so long to become barely viable that its fundamental design premise – rigidly enforcing centralized, monolithic, and static project structures – has arguably already become functionally obsolete. This is evident today by virtue of changes in the plant creation marketplace that economically favor globally sourced, loosely coupled project environments.

In response to PDS users caught in this predicament, Bentley has developed a fundamental migration approach that minimizes project and business risk during this "Smart Plan."

A survey conducted by Bentley in 2008 found that 90 percent of users said the transition from PDS was important to their business. Yet only 28 percent said they had sufficient information to make a business decision as to which path forward to take. This white paper closes that information gap by describing:

- Bentley's "Smart Plan" for PDS users, offering a clear migration path to broad interoperability for reuse and choice;
- Bentley's comprehensive application portfolio as an alternative, encompassing all infrastructure disciplines for all plant projects;
- Ways in which return on existing equity in PDS can be sustained.

## Bentley's "Smart Plan" for PDS Users

Based on discussions with users over the past decade, Bentley has incrementally committed resources as part of a continuous innovation strategy to support PDS users as they develop their use of PDS while considering their future transition options. This included a commitment in 2002 to provide continued support and development of a specific version of MicroStation/J used as the underlying technology platform on which PDS is based today. Bentley continues this commitment with "Smart Plan."

Bentley's approach centers on providing PDS users with the ability to:

1. Continue to leverage MicroStation and ProjectWise platforms;
2. Natively access all PDS data for reference outside of PDS;
3. Publish PDS models, piping catalogs, and specifications by way of ISO 15926 for other applications;
4. Transition to and adopt OpenPlant applications to modify existing PDS projects or use OpenPlant applications for new projects.

***Continue to leverage MicroStation and ProjectWise platforms:*** Bentley's MicroStation, the market-leading platform for plant creation applications, provides intrinsic interoperability with second-place Autodesk's DWG platform, assuring universal accessibility for dispersed project teams and for lifecycle data reuse. MicroStation robustly supports applications for every infrastructure discipline and will always proactively evolve to incorporate new data types, such as 3D PDF and point clouds.

Bentley's ProjectWise collaboration servers are used by the majority of PDS user organizations (even to manage PDS DGN deliverables) and are mission critical to managing distributed enterprise workflows across other disciplines and projects.

***Natively access all PDS data for reference outside of PDS:*** The ProjectWise PDX Dynamic Review Service natively references and extracts all PDS model and file data with full fidelity directly from PDS's existing Oracle or SQL Server databases without requiring PDS software. Unlike the traditional DGN/DRV file route, ProjectWise PDX Dynamic Review Service opens up the entire PDS project database and provides read access to anyone using Bentley's MicroStation, Bentley Navigator, or ConstructSim.

***Publish PDS models, piping catalogs, and specifications by way of ISO 15926 for other applications:*** The Bentley OpenPlant ModelServer V8i automates the migration of full PDS models, as well as piping catalogs and specifications, to ISO 15926 so that PDS data can be readily shared across enterprise lifecycle applications.

***Transition to and adopt OpenPlant applications to modify existing PDS projects or use OpenPlant applications for new projects:*** PDS models that have been automatically migrated to OpenPlant ModelServer are available to be edited and reused by any OpenPlant application, such as Bentley OpenPlant Modeler V8i – with changes and new models being maintained by OpenPlant ModelServer. This enables the secure management of both components and files, and avoids writing back to PDS. So while the integrity of any existing PDS database can never be jeopardized, owner-operators can generate increasing returns on the investment it represents.

Bentley has absolutely established the viability of natively referencing complete PDS models, and of bringing forward their value through ISO 15926-based interoperable accessibility.

## Bentley “Smart Plan” and OpenPlant – THE future path forward

PDS users can now leapfrog into a modern, agile, open software environment that assures them data reuse and interoperable choices among multiple toolsets for integrated projects across all aspects and all types of plant creation, operations, and adaptation. Bentley’s new OpenPlant offerings uniquely combine the most robust platform and dynamic collaboration servers for accessibility, concurrent component- and file-based workflows, and comprehensive applications and services. At the same time, Bentley “Smart Plan” makes the unwarranted overpricing of current proprietary 3D piping applications as obsolete as the expensive UNIX workstations used for ‘shading cylinders’ – so users can save while advancing. However, it’s because these gains can be compounded with continued returns on PDS ‘equity’ that Bentley now offers “Smart Plan” to PDS users.

Many PDS users have already taken the first steps in their “Smart Plan.” Bentley Systems has consistently proven that by assuring forward interoperability, such “succession” strategies – for instance, with DGN and DWG – offer compelling business opportunities. Bentley has absolutely established the viability of natively referencing complete PDS models, and of bringing forward their value through ISO 15926-based interoperable accessibility.

### 1. Using PDS in a MicroStation V8i Project Environment

MicroStation has remained the preferred graphics platform for PDS users for more than 20 years, and continues to be integrated and used within PDS as the core of the system. MicroStation V8i brings unparalleled advances to the core platform technology, offering opportunities to expand into new markets, extend business competitiveness, and increase overall productivity. However, because PDS does not run on the latest MicroStation V8i platform, current PDS users are not able to take full advantage of its productivity and time-saving enhancements.

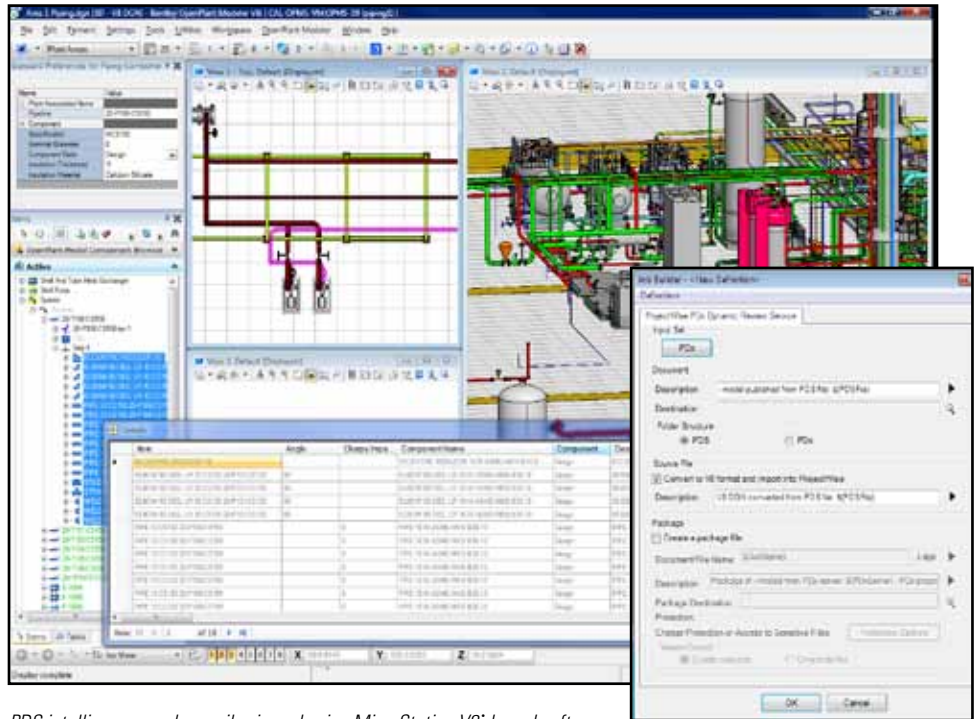
But all is not lost. Many PDS users are already benefiting from the latest MicroStation V8i features while continuing to work in the MicroStation/J environment on which PDS is based.

Without additional configuration or compromising file fidelity, PDS users can take full advantage of MicroStation V8i functionalities to:

- Plot 2D views to PDF, with PDS attributes attached to components, in a way that’s similar to features offered in high-end visualization applications;
- Plot 3D models to PDF, and benefit from advanced printing features in MicroStation V8i;
- Assign materials to PDS models and use MicroStation V8i’s high-end visualization capabilities;

Many PDS users are already taking full advantage of the latest MicroStation V8i features while continuing to work in the MicroStation/J environment on which PDS is based.

- Integrate with other discipline-specific environments already using Bentley applications, such as for civil engineering, building design, and geospatial referencing;
- Use MicroStation V8i for point cloud integration while referencing PDS models;
- Take full advantage of DWG file interoperability referenced together with PDS models.



*PDS intelligence can be easily viewed using MicroStation V8i based software.*

## Licensing is not an issue with SELECT

Today's plant design projects require combinations of software applications to accommodate specific disciplines or tasks. Applications may also be provided by multiple vendors. Depending on what applications are required, users may need to switch between MicroStation/J and MicroStation V8i on the same workstation. For PDS users, this work process is supported by Bentley, giving them more choice to extend the business value from current software investments.

As part of Bentley's effort to continually add SELECT value, PDS users are able to apply MicroStation/J licenses to MicroStation V8i projects using SELECTserver. Licenses can be switched on and off as required, allowing PDS users to employ the same pool of MicroStation/J licenses for MicroStation V8i projects as demand varies over the life of a PDS project.

Bentley's OpenPlant suite supports both desktop and server-based licensing together with practitioners' Passport Subscriptions, which in many cases cost less than the

Bentley's OpenPlant suite supports both desktop and server-based licensing together with Practitioners Passport licenses which in many cases cost less than the maintenance charges for other vendor's propriety software systems.

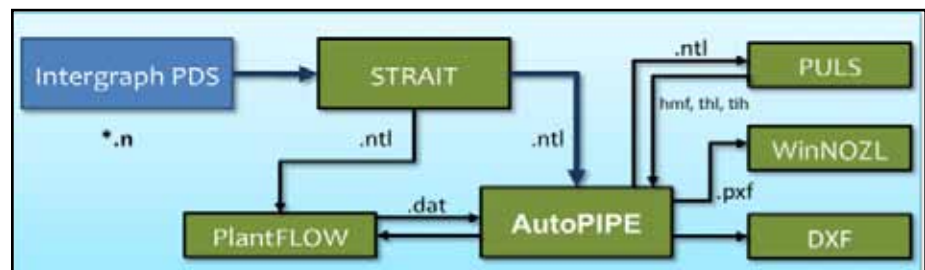
maintenance charges for other vendor's propriety software systems. In practice, this means users can select and use the right combination of seats and discipline-specific software to match the profile and variations in project demand.

## Integration with engineering analysis

Bentley's engineering applications can also read PDS models through a single interface, which allows users a choice when it comes to pipe stress, nozzle stress, and fluid or pulsation analysis tools. Through this common interface, PDS users can accurately and efficiently evaluate pipe geometry, loads, pipe properties, support types, and locations.

Through a common neutral file, Bentley's engineering applications enable PDS users to perform a wide range of integrated analysis tasks including:

- Gas or liquid flow analysis in process piping networks using an object-based graphical interface for fast creation and modification of the piping flow model to determine network flow analysis and pressure-drop calculations;
- Pulsation analysis of piping networks for analyzing compressor and pump piping; and estimation of acoustic mode shapes and frequencies, and pulsation shaking forces on vessels and bends;
- Analysis of local stresses at vessel/nozzle intersections for cylindrical, spherical and conical vessels, and elliptical heads;
- Pipe-stress analysis – delivered with a total of 26 piping codes, capable of supporting 20 thermal load cases, 10 wind load cases, and 10 earthquake load cases totaling 250 load combinations per model.

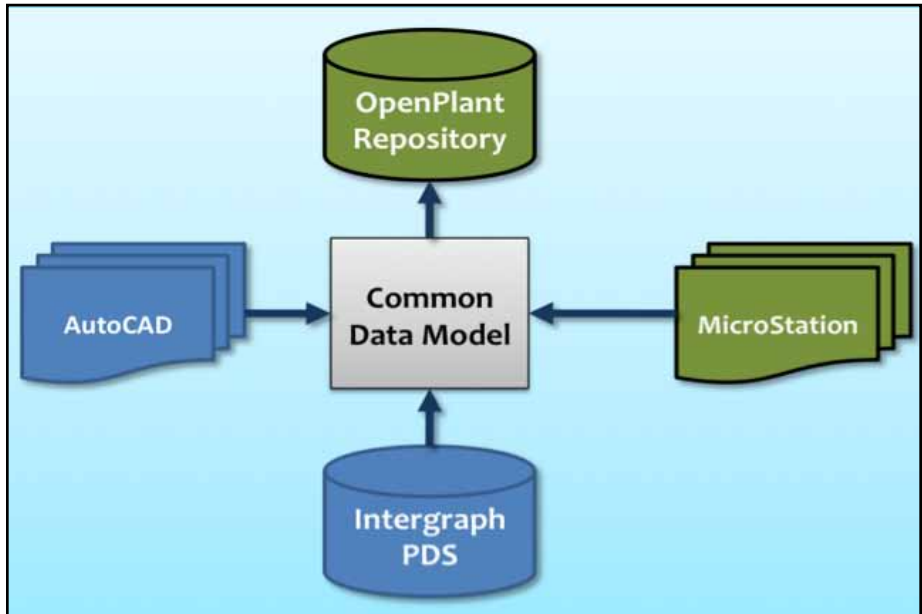


The Bentley PDS analysis interface (STRAIT) is used to read the PDS stress module neutral files (\*.n).

## 2. Using PDS in a ProjectWise V8i Project Environment

Today, PDS users can index and query the PDS data within ProjectWise. By querying the PDS data from the component index, users can view components and their associated intelligence using MicroStation or Bentley Navigator to synchronize the PDS data

source with the ProjectWise component index using a common data model. The common data model provides integration by using the same ProjectWise content management environment to transact all project data, including PDS, MicroStation or AutoCAD files, and other CAD data files.



ProjectWise is also used to effectively manage PDS outputs. PDS production deliverables (for example piping isometrics and orthographic drawings), can be automatically tagged and routed to ProjectWise folders using the integration capabilities within ProjectWise. Project team members can share the PDS model as a reference file within other V8i-compatible applications. This work process also takes full advantage of ProjectWise features, including change control, distribution, and archiving at various stages in the document lifecycle.

The Bentley OpenPlant suite has been developed to uniquely meet the new requirements of today's globally sourced, loosely coupled project environments ...

### 3. Bentley OpenPlant

Bentley OpenPlant has been developed to uniquely meet the new requirements of today's globally sourced, loosely coupled project environments addressing the following requirements: universal accessibility, concurrent file- and component-based workflows, and comprehensive applications and services.

The OpenPlant breakthrough is that it uniquely addresses all of these modern requirements in combination:

**Universal accessibility:** OpenPlant incorporates Bentley's robust MicroStation platform – the market leader for plant creation – to provide intrinsic interoperability across DGN- and DWG-based interfaces and applications already familiar to almost all infrastructure professionals, especially those in plant operations. By way of the MicroStation platform, OpenPlant users are assured of information modeling continuity, including proactive support of emerging data types such as 3D PDF and laser point clouds.

OpenPlant Modeler V8i, the first commercially available 3D plant modeling software based on ISO15926, is more versatile and productive than any existing '3D piping' application available in the market today.

The "OpenPlant Services" packaging enables breakthroughs in ease of use and affordability, as MicroStation installations and licensing are not required, together with role-based subscription licensing. OpenPlant is intrinsically based on the open ISO 15926 data schema, assuring universal accessibility for dispersed project teams using disparate systems across the project lifecycle.

**Concurrent file- and component-based workflows:** OpenPlant fully leverages ProjectWise collaboration services, which are mission critical to managing distributed enterprise workflows across a wide range of disciplines and project types. Designed for today's real-world project environments encompassing individual practitioners, globally distributed engineering, procurement and construction (EPC) contractors, and small- and large-scale modularization of plant projects, OpenPlant succinctly meets and addresses the resulting challenges for design, engineering, and handover throughout the project lifecycle.

**Comprehensive applications and services:** OpenPlant supports applications for every infrastructure discipline with software and information modeling services that enable the integration of civil, geotechnical, electrical, instrumentation, equipment, structural, piping, and environmental engineering and construction.

### Standards-based interoperability to meet the demands of today's projects

Bentley OpenPlant applications provide an integrated set of tools based on internationally recognized industry standards and formats (ISO 15926, XML, DGN, DWG, and PDF). These enable engineering contractors and plant owners to create and maintain the digital information about a plant across its lifecycle. Core to Bentley's approach is a data management and interoperability backbone based on ProjectWise and the OpenPlant (ISO 15926) schema handling both files and data.

OpenPlant Modeler V8i, the first commercially available 3D plant modeling software based on ISO 15926, is more versatile and productive than any existing '3D piping' application on the market today. Crucially, OpenPlant Modeler V8i supports project workflows for engineering, tracking, and management at the component – 'data-centric' – design level, while concurrently accepting and producing conventional, 'file-based design' work packages.

OpenPlant ModelServer V8i provides for the management of components on a ProjectWise server for distributed team collaboration. In addition, OpenPlant ModelServer V8i can automatically migrate PDS models, as well as associated piping catalogs and specifications, to ISO 15926. As a result, PDS data can be readily shared across other OpenPlant applications.

OpenPlant Isometrics Manager V8i extracts isometric information in a neutral format so it can be easily maintained, modified, and tracked outside of design systems. This new tool provides management control capabilities for pipe models and isometrics from not only OpenPlant, but also PDS.

OpenPlant ModelServer V8i can automatically migrate PDS models, as well as associated piping catalogs and specifications, to ISO 15926.

OpenPlant allows management of information at a component level so that engineering processes and project timescales can be compressed. Engineering contractors can therefore consolidate information across multiple engineering functions in real time, improving overall quality and reducing rework.

## Bentley OpenPlant is a managed environment for plant information

What does OpenPlant mean to an engineering contractor or a plant owner-operator at a business, project, and facility level?

For the engineering contractor:

- OpenPlant allows information to be managed at a component level so that engineering processes and project timescales can be compressed. Engineering contractors can, therefore, consolidate information across multiple engineering functions in real time, improving overall quality and reducing rework.
- OpenPlant gives management immediate access to progress and performance metrics to manage project milestones better.
- OpenPlant provides a repeatable environment for managing handover requirements to meet widely varying owner-operator requirements.

For the plant owner-operator:

- OpenPlant helps reduce unscheduled plant shutdowns.

According to AEA, over half of unscheduled plant shutdowns are caused by the selection of the wrong equipment due to lack of information. BASF estimates that plants experience several unscheduled shutdowns a year, many due to poor data.

OpenPlant keeps plant information up to date, accurate, and available to those who require it – including the maintenance manager, who needs the latest drawings and manuals; the procurement manager, who needs the latest spec sheets; or the plant engineer, who needs the latest drawings, spec sheets, and running history.

- OpenPlant helps reduce the surplus material ordered by every project.

Even the best projects order as much as 5 percent surplus material, and it's not unusual to find a surplus of 20 percent. In any case, surplus material is usually scrapped, which wastes money and adversely affects overall operating margins.

OpenPlant provides a central, managed backbone that integrates all engineering disciplines and project systems. So from the ERP-based purchasing system to the project management system scheduling the construction, everyone involved in the procurement process can see what is required, what has been purchased, what is on site, and when deliveries are scheduled. OpenPlant provides a central project database from which all material information across all engineering functions can be extracted. It also centrally manages construction drawings, as well as the design models from which the drawings were extracted.

In addition, OpenPlant can rationalize materials across the project – giving project managers accurate, complete information to make better procurement decisions. For example, OpenPlant's contract management interface manages key information across multiple contractors' deliverables during construction.

OpenPlant is based on the internationally recognized data standard ISO 15926. This is specifically designed to manage information in a neutral format supporting the complete plant lifecycle.

- OpenPlant automatically populates operations and maintenance systems, reducing handover costs.

OpenPlant offers a wide range of tools for connecting to and managing information from EPC systems. These include sophisticated design systems such as Intergraph's PDS and SmartPlant and AVEVA's PDMS using Bentley's PDx Dynamic Review and supported third-party application interfaces. The range also includes Knowledge Manager for extracting key tags and line list information from DWG and DGN files, as well as Bentley's ProjectWise and MicroStation platforms, which can handle multiple formats.

The OpenPlant backbone handles files and components, enabling owner-operator maintenance management and operations systems to be automatically populated by component data through a process of 'continuous data handover.' Likewise, document management systems can be populated by relevant documents and drawings. Bentley offers interfaces to connect with SAP, Maximo, Documentum, and FileNET.

- Owner-operators can select engineering contractors based on their expertise, rather than on the CAx system they use.

OpenPlant will connect to and manage information in any format from any system. OpenPlant ensures information is complete, consistent, and correct, and supports workflows that track and manage change across multiple contractors.

OpenPlant has built-in support for industry standards and formats (e.g., ISO 15926, DWG, DGN, and PDF), as well as for widely used engineering contractor tools such as PDS, SmartPlant P&ID, SmartPlant Instrumentation (INtools), SmartPlant Electrical, and PDMS.

- Owner-operators can easily assess the impact of new environmental regulations and satisfy regulatory requirements.

OpenPlant tracks the full audit history of plant data – documents and components – across all stages of the lifecycle. It can also manage proposed changes and determine their impact.

- Engineering information lasts as long as the physical plant.

OpenPlant is based on the internationally recognized data standard ISO 15926. This is specifically designed to manage information in a neutral format supporting the complete plant lifecycle. OpenPlant also has proven capabilities for the management and reuse of legacy information in DGN, DWG, and other formats.

### Support for all disciplines across the plant lifecycle

OpenPlant ModelServer and all OpenPlant applications not only connect silos of information, but also provide critical functions on top of these connections. These include:

OpenPlant creates a nexus of information, and includes powerful search and query options to retrieve and display information through the plant's history ...

**Connection:** Enabling plant systems on the business side and those on the operations side to connect and exchange information, both at the file and component level.

**Management:** Allowing users to:

- Assess the impact of proposed changes,
- Manage the distribution of change,
- Keep all engineering data up to date,
- Use data at both the file and component level.

**Query:** Creating a nexus of information, including powerful search and query options to retrieve and display information through the plant's history and in context, using standard office tools such as Adobe PDF Reader, Internet browsers, and Microsoft Office.

**Visualization:** Providing powerful interactive visualization capabilities, including:

- 2D schematics, diagrams, and spreadsheets,
- 3D models,
- 4D animation (adding the time dimension),
- 5D (adding a dimension of cost, resources, or state of completion).

In addition, all these visualizations can be made available to the project through Adobe's PDF format.

**Design and analysis:** As a leading provider of computer-aided engineering design and analysis tools for process plant design and construction, Bentley understands the true nature of plant engineering information. Based on the two leading CAD packages, MicroStation and AutoCAD, these tools work with the OpenPlant environment to create, analyze, and maintain maturing engineering information throughout the asset's lifecycle:

- Front-end engineering and design (FEED), including interfaces to major simulation vendors, equipment sizing, costing, and automatic creation of PFDs and P&IDs;
- Functional plant design, including process design cases, piping and instrumentation diagrams, electrical/wiring diagrams, datasheets, and instrument hook-ups;
- Physical plant design, including piping, equipment, electrical raceway, civil, structural, structural detailing, reinforced concrete design and detailing, HVAC/ducting, hangers, and supports;
- Engineering analysis, including pipe and structural stress analysis, nozzle/vessel connection, steady state flow and pulsation analysis, building performance analysis, environmental impact assessment and risk-based inspection planning.

## **4. Protecting PDS Data Investments Using ProjectWise PDx Dynamic Review**

### **Choices empower innovation and creativity**

The ability to exchange existing or legacy data among CAD systems provides users with more choices when it comes to maintaining or extending operating margins on current and future projects. In the same way, data exchange helps reduce risk of a schedule overrun during engineering data handover into plant operations.

When combined with other Bentley OpenPlant applications, ProjectWise PDx Dynamic Review utilizes and fully exploits legacy 3D CAD data in a format that is readily accepted by a growing family of compatible CAD applications.

### **ProjectWise PDx Dynamic Review – live connection to PDS projects**

PDx Dynamic Review connects to a PDS project and accesses all design information within the project without requiring PDS software or licenses. Unlike the traditional DGN/DRV file route, PDx Dynamic Review opens up the entire PDS project database and provides read access to anyone using MicroStation V8i or Bentley Navigator V8i, or open applications that can read an ISO 15926 data model. Users can see the breakdown structure of the PDS model in a hierarchy browser, select and zoom to individual objects, and display all PDS property information for any object in a property dialog using the same display order used in PDS.

### **Translation of PDS data into ISO 15926 format**

PDx Dynamic Review saves PDS data into the ISO 15926 format, thus allowing a PDS project to be accessed and reused in an open format with other ISO 15926-compliant applications, such as Bentley's OpenPlant PowerPID. Once in this open format, users can collaborate on a heterogeneous project.

PDx Dynamic Review also enables legacy PDS data to be saved into the ISO 15926 format, extending the life of the data beyond the life of the PDS application. The information can be accessed and managed across the lifecycle of the infrastructure using tools such as eB Data Quality Manager (formerly ProjectWise Lifecycle Server). This provides a deliverable of all PDS data, from the project phase to operations, in a format that can be taken into operations and maintenance systems.

### **Integrating PDx Dynamic Review with ProjectWise**

Integrating PDx Dynamic Review with ProjectWise enables PDS users to add value to current PDS workflows by automating the review process and distributing and tracking PDS content across the project. This is provided by PDx Dynamic Review Service working with ProjectWise Integration Server.

PDx Dynamic Review creates native MicroStation design files (DGN format) or i-models. The application does not require a PDS license to access the original PDS source data.

## Under the hood...

PDx Dynamic Review operates on native PDS project design files. It can be run from any workstation since only the PDS files are required. The resulting 3D model conforms to the OpenPlant ISO 15926-based public domain schema. The object class definition returned from the process is defined in a mapping file, which uses the RDBMS table referenced by the geometric objects as the primary identifier. The resulting plant model has the full hierarchical engineering structure of the original process plant design.

PDx Dynamic Review creates native MicroStation design files (DGN format) or i-models. The application does not require a PDS license to access the original PDS source data. As a result, PDx Dynamic Review re-establishes control of the evolving digital information asset and enables work-sharing and collaboration among companies with different CAD systems exchanging data with other plant design systems. The ability to exchange data between disparate applications into a neutral model, without loss of information, also allows users to capitalize on existing resource investments. It also removes dependencies on closed, proprietary plant design systems by removing migration dependencies from legacy products such as PDS.

## 5. PDS Data Handover

### PDS data in a standard, open format

Advances in the MicroStation V8i tag format provide a fundamental data storage and handover environment that exploits the portability of MicroStation design files. This is especially useful for owner-operators who do not want the burdens of investing in, training on, and maintaining a complex 3D design system that impose work-process changes requiring specialized CAD expertise. PDS model intelligence can now be delivered by EPCs in MicroStation V8i format, allowing owner-operators to review and utilize 3D models to support plant operations.

Using MicroStation V8i tag functionality, EPCs can retain full PDS model and data intelligence to an agreed tag data format within a V8i file. This eliminates the need to maintain the PDS model. It also provides a simple yet cost-effective handover option. MicroStation's DGN file format gives owners a wider range of options to extend the value of their PDS investment based on:

- Viewing and querying plant data held in DGN or DWG files using Bentley View – a free, easy-to-use viewer;
- Viewing and querying plant data held in DGN or DWG files using Bentley Navigator – a powerful, easy-to-use 4D and 5D visualization and simulation application;
- Extending tag data held in a DGN file to include materials management information or business system data from SAP. This approach also affords a logical migration path as part of an integrated data warehouse implementation strategy, since data can remain in the DGN file until the warehouse strategy is fully implemented;

eB Data Quality Manager is designed to also capture and store a full change history of PDS data for the entire lifecycle of the asset ...

- Using simple isometric sketch tools to capture as-built changes in MicroStation DGN files.

And, of course, with PDx Dynamic Review Service, PDS models can be saved in the ISO 15926 format, extending the life of the data to match the life of the plant itself.

## Data warehouse ensures PDS data fidelity

In capital projects, owner-operators are increasingly using data warehousing technology to capture and manage data from engineering and technical information sources (such as models and documents) as part of handover from their contractors. This information is extracted from a multitude of different engineering design, analysis and related systems.

Owner-operators and a growing number of EPCs use data repositories and data warehouses to capture and manage the fidelity (consistency, completeness, and correctness) of information handed over within the extended enterprise – contractors, subcontractors, vendors, and suppliers – which is then used to populate downstream operations systems. This integration has been shown to save significant time, effort, and money during handover. Data warehouses are further used to manage subsequent engineering changes during operations.

In a survey of PDS users, 80 percent of respondents said that having better change management – such as revision control, audit trail, and design history – within the PDS environment would make them more competitive.

At the core of Bentley's approach to supporting handover into operations are:

- ProjectWise, a repository of engineering content data that improves the quality, visibility, and reliability of data coming in from multiple systems and data sources,
- eB Data Quality Manager, a full-feature engineering data warehouse and repository.

Both combine and use the OpenPlant schema to capture PDS project data associated with a physical asset to populate eB Data Quality Manager.

While PDS design tools focus on design and engineering, eB Data Quality Manager is designed to also capture and store a full change history of PDS data for the entire lifecycle of the asset. eB Data Quality Manager provides the perfect complement to the PDS design system, with full change control, management, and reporting combined with change impact analysis.

## A scalable approach to data handover

As the cornerstone to a managed, data handover environment, eB Data Quality Manager has a powerful data consolidation engine that takes data from a variety of sources, including PDS, and ensures that data are stored only once – so data are consistent, correct, and complete. Data are stored in an open, neutral format. Storage, presentation, and business rules are independent of the source that created the data. These are requirements for lifecycle data management, in which data and assets must be viable over decades.

Users confirm that it takes one-third as long to become productive using Bentley software, compared with competitors' products.

PDS design tools do not focus on data interoperability, but on data creation within the confines of the PDS design environment. eB Data Quality Manager for PDS users is extensible, in that it is designed to publish and retrieve information across a variety of sources, including systems for procurement, document management, and maintenance.

## 6. Value Proposition of Bentley's OpenPlant

The process industry seeks to capitalize on the productivity benefits of data-centricity – such as the ability to collaborate across time zones, multiple office locations, and geography – and the power to manage change to a new level of granularity. The tools and technologies provided by Bentley's OpenPlant applications enable and accelerate fundamental change in work process and associated workflows, lowering overall cost of ownership based on:

- Lower seat cost: Subscription-based licensing means the cost to deploy the required functionality for each OpenPlant design seat is typically one-third that of our competitors.
- Reduced deployment time: The time required to install the software with associated project requirements and have the software up and running in production is typically less than half that of competitive products.
- Reduced operational costs: Rather than requiring one information system (IS) staff member for every five design seats, a single IS staff member typically supports 20-30 seats of Bentley software, significantly reducing the ongoing support costs over the lifetime of the project.

There are several unique advantages Bentley can provide to PDS users today with its "Smart Plan" including:

- Coexistence with Intergraph applications, enabling users to retain their investments;
  - Retain a MicroStation-stable infrastructure;
  - Access to alternative proven tools to offset risk;
  - A more open and robust managed environment;
  - The ability to effectively manage both existing tools and new alternative tools;
  - The ability to minimize project risk and maximize business value.
- Bentley's subscription-based licensing offers a low-cost, low-risk approach to attaining the advantages;
  - Bentley partners with users as they work through their transition strategy.

## Global user resource pool

Another important advantage, which must be considered a priority when evaluating a PDS transition strategy, is that Bentley's plant design applications have the largest trained and globally available user base of any plant design vendor.

- **Product support:** Bentley supports and is committed to applications that work in MicroStation and AutoCAD environments. Because these are the de facto standards, a large number of designers are already trained in these products. High availability of operators allows quicker staffing of fast-track projects.
- **Time to productivity:** Another factor is time to full productivity – how long it takes a designer to learn and use the new software in a production environment. Ease of use and rapid training are critical. Users confirm that it takes one-third as long to become productive using Bentley software, compared with competitors' products.
- **Scalability:** Significant benefits come from being able to use the same software on large or small projects.

## About OpenPlant

Bentley's OpenPlant software for plant creation is based on ISO 15926, an open data model. The OpenPlant offerings are the only commercially available products to share and meet the primary goal of the iRING user community ([www.iringug.org](http://www.iringug.org)) – that is, to enable real-time, seamless sharing and interoperability of data and information across different organizations and systems using an internationally recognized standard.

## About Bentley Systems, Incorporated

Bentley is the global leader dedicated to providing architects, engineers, geospatial professionals, constructors, and owner-operators with comprehensive software solutions for sustaining infrastructure. Bentley's mission is to empower its users to leverage information modeling through integrated projects for high-performing intelligent infrastructure. Its solutions encompass the MicroStation platform for infrastructure design and modeling, the ProjectWise platform for infrastructure project team collaboration and work sharing, and the AssetWise platform for infrastructure asset operations – all supporting a broad portfolio of interoperable applications and complemented by worldwide professional services. Founded in 1984, Bentley has grown to nearly 3,000 colleagues in more than 45 countries and \$500 million in annual revenues. Since 2001, the company has invested more than \$1 billion in research, development, and acquisitions.

Additional information about Bentley is available at [www.bentley.com](http://www.bentley.com) and in Bentley's annual report. For Bentley news as it happens, subscribe to an RSS feed of Bentley press releases and news alerts. To view a searchable collection of innovative infrastructure projects from the annual Be Inspired Awards, access Bentley's Year in Infrastructure publications. To access a professional networking site that enables members of the infrastructure community to connect, communicate, and learn from each other, visit Be Communities.

To download the Bentley Infrastructure 500 Top Owners ranking, a unique global compendium of the top public- and private-sector owners of infrastructure based on the value of their cumulative infrastructure investments, visit [www.bentley.com/500](http://www.bentley.com/500).

© 2012 Bentley Systems, Incorporated. Bentley, the "B" Bentley logo, MicroStation, MicroStation/J, ModelServer, SELECTserver, ProjectWise, and SELECT, are either registered or unregistered trademarks or service marks of Bentley Systems, Incorporated or one of its direct or indirect wholly owned subsidiaries. Other brands and product names are trademarks of their respective owners. DAA038840-1/0002 01/12