Understanding Information Challenges for Brownfield Assets and Greenfield Projects

Unstructured Information Exposes Operations and Engineering Companies to Unnecessary Cost, Risk, Delay, and Hazard
# Contents

1. Introduction ................................................................................................................. 1  
   1.1 What is Unstructured Information and Why Is It Such a Challenge? ......................... 1  
   1.2 How Widespread Is the Challenge? ............................................................................ 2  

2. Impacts of Unstructured Information ........................................................................... 3  
   2.1 Acquisitions of Brownfield Assets ........................................................................... 3  
   2.2 Handovers and Turnarounds ................................................................................... 4  
   2.3 Time-critical Access to Plant Information ................................................................ 5  
   2.4 Quality of Project Information ............................................................................... 5  
   2.5 Integrity of Plant/Project Information ...................................................................... 6  

3. The Path Forward........................................................................................................ 7
1. Introduction

Owner operators and engineering, procurement, and construction (EPC) companies in asset-intensive manufacturing industries routinely handle large volumes of unstructured, unintelligent information on a daily basis. This information takes many forms and is often duplicated in various folders and databases throughout the organization.

This unstructured information comes and goes in many different forms and file formats, and is often stored, misclassified, and distributed in a wide variety of systems and locations, typically in an uncoordinated way. This lack of coordination leads to duplication and further re-distribution, which in turn lead to degradation of information quality and integrity, and sometimes, its outright loss.

As a result, the right information is difficult to find when it is most needed. This continues to expose operations and engineering companies to unnecessary cost, risk, delay, and hazard. Many have desired an easy, fast, and cost-effective way to organize this unstructured information and to provide a single point of access so that everyone can quickly find the information they need, when they need it. They have also desired a way to automatically extract intelligence from these unstructured documents, and provide links to all other related documents.

This white paper will highlight the challenges in collating, organizing, and accessing unstructured information, particularly in brownfield plants, offshore facilities, and greenfield construction projects.

1.1 What is Unstructured Information and Why Is It Such a Challenge?

Engineering data and documentation are essential for effective project delivery and safe, efficient operations. Every person involved in designing, constructing, operating, and maintaining a facility needs ready access to trustworthy information to perform their job effectively.

Structured information is well-organized in form and format, conforming to your company's data governance policy. In other words, there is a "place for everything and everything in its place." As such, you can continuously use and reuse that information knowing that it is controlled, managed, and trustworthy – that is the basis of the Intergraph® data-centric SmartPlant® Enterprise approach.

However, the vast majority of facility information is unstructured: it resides in many forms – documents, drawings, models, lists, and sheets – and is stored in a myriad of file locations and databases throughout your organization. It gets copied out of document management systems to local file storage such as a USB memory stick or any other removable storage device to hand to someone; it gets sent via email to suppliers and returns changed, renamed, and relocated; or it gets printed, marked up, and scanned, again with a different name, file format, and location. With such a wide variety of "containers" and versions of software that are used for their editing and viewing, it means that the data inside – the really important stuff – becomes more and more difficult to trust over time. This makes it very difficult to find the data needed to support important day-to-day decisions. You often rely on your own variation of the truth stored locally on your personal computer because it was so hard to find the information you needed the first time around.
1.2 How Widespread Is the Challenge?

In a recent survey conducted by Intergraph and TechValidate™, survey respondents from the process industries revealed some interesting insights into just how widespread the challenge of managing unstructured information is. (“Unstructured Information” was defined as document-centric; unintelligent formats; poorly managed; undisciplined distribution and version control; high degree of duplication; and outdated information.) Using this definition, respondents admitted to a high percentage of unstructured information existing in their organizations.

In the same survey, over half of the respondents admitted to spending 20 percent or more of their time searching for and validating plant information; 7 percent even admitted to spending more than 60 percent of their time looking for data!

And, the inability to locate information isn’t just a matter of wasted time; it directly impacts a company’s ability to operate safely and reliably. In the same survey, 61 percent of respondents expressed a lack of complete confidence in their ability to find information required to support an emergency response.
2. Impacts of Unstructured Information

Here are just a few examples of how unstructured information can affect owner operators and EPCs, and impact the bottom-line to the business.

2.1 Acquisitions of Brownfield Assets

An owner operator is acquiring an existing operating brownfield asset – this could be a plant, platform, FPSO (floating production, storage, and offloading) unit, or other operating unit. To take over and ensure continuing safe operations of the facility, the O/O will need to quickly capture and verify all of the information that is needed to operate the facility even before considering any naming, numbering, or management changes to match its own standards, procedures, and systems.

The owner operator discovers that the asset has been built over many years in a series of projects by different EPCs, each using different standards, so a common facility-wide naming and numbering system has not been established. As each EPC has used different software and formats for the engineering, the owner operator is also not able to use common tools to access and review this information. Gathering the information is difficult because it is scattered and distributed across multiple networks, personal computers, removable storage, or even as physical copies of marked-up prints on plant workers’ desks.

What is the scale of this information distribution and duplication? One owner operator recently acquiring a FPSO requested all of the information from the current owner and its engineering support company. It received 11TB (terabyte) drives full of unstructured information. In this example, the owner inquired as to how many P&IDs covered the asset and were advised by the engineering support company that there were “about 150 masters.” During the capture exercise, more than 7,000 P&IDs were discovered on the drives – clearly, there were many, many duplicate copies. After a quality assurance (QA)/quality control (QC) exercise, the owner determined there were, in fact, some 300 master P&IDs.

As brownfield assets are invariably old, it is unlikely that there will be a native 3D model of the asset available, even though there may be an out-of-date viewable rendition. It is also unlikely that there will be a cost justification as part of the acquisition to reverse-engineer an as-built, data-centric, and 3D digital representation of the plant before the asset is turned over.
2.2 Handovers and Turnarounds

A new plant is coming to the end of the construction and commissioning phase, and is being prepared for start-up and handover, or a brownfield asset is coming online again after a turnaround. During this often frenetic period, documents, drawings, and electronic files are distributed in boxes throughout the temporary construction offices and taken onto the site by craft workers. Whether this information returns to where it came from is questionable. It may also be unknown or unrecorded if the information contains markups as to the as-built state of the plant. As mentioned previously, the information is scattered around the plant on network drives, personal computers, technicians’ folders and desks, or even non-existent.

Although modern 3D design systems are now readily available, many owner operators do not consider an up-to-date 3D model, with every pipe modeled, as a core handover requirement. This is the same with EPCs, where most do not model small bore piping, leaving it instead to be field-run. This presents significant challenges to knowledge capture and the provision of an accurate information record of the as-built state of the plant to any regulatory auditing or insuring agency.

Confirming and matching the as-built state of the plant to the as-exists information record is challenging because most engineering contractors would have disengaged before the plant is operational. This is the same for the engineering applications that would have been used to generate the plant information. Many owner operators struggle to regain the information record that matches the as-built state of the plant, and this continues to be a huge challenge long after the plant is operating, leading to significant recovery costs. Industry analysis suggests the handover costs for a $1 billion CAPEX project are in the order of $10 million to $20 million.
### 2.3 Time-critical Access to Plant Information

A plant shift manager has to deal with the alarm on the plant tripping at 2:00 a.m. It is critical to find the cause of the alarm quickly and determine a potential remedy. However, there could be insufficient plant personnel on-site to quickly gather all of the information necessary to develop a plan of action because it is scattered between many locations.

The plant manager could shut down the plant and wait for resources to arrive, find, and then fix the root cause of the problem before bringing the plant back online in a controlled manner. However, the negative impact on production will result in significant costs, potentially making the plant uncompetitive. Alternatively, the plant manager could keep the plant running but this decision risks the safety of the plant and its personnel.

Having quick access to information that is easy to navigate during problem evaluation is essential for owner operators to support the daily decisions required for plant operations and maintenance. There are usually multiple systems on a plant, with multiple locations for documents and drawings. While it may be ideal to have data-centric tools integrated with an engineering data warehouse, these may not be practical short-term options. What is critical is to provide owner operators with a single point of access to the engineering information – a portal to well-organized and cross-referenced information.

### 2.4 Quality of Project Information

An EPC uses intelligent enterprise engineering software, such as the suite of Intergraph SmartPlant Enterprise solutions and engineering applications. However, the majority of information that it receives from vendors, suppliers, and partners to be turned over to the owner operator is typically in document form. These documents may be in the form of PDFs, images, and scans, or unintelligent drawing files like AutoCAD® or MicroStation, and a wide variety of other formats including Microsoft® Word files and Excel® spreadsheets.

As indicated earlier, the valuable data inside these files are largely invisible unless each and every file is read and evaluated, which invariably means there will be inconsistencies in the naming, numbering, and tagging of information. In one customer example, the company employed three engineers for six months on each and every project, capturing and recording what tags appear on which supplier/vendor documents, and identifying any inconsistencies.

The challenge for the EPC is to quickly gather the information from suppliers/vendors or past projects into an organized information resource so that they can navigate and review the documents and drawings without having to resort to a time-consuming and costly manual loading exercise. Additionally, because suppliers may not always name things correctly, the EPC needs to find these anomalies efficiently. Clearly, the EPC may not be authorized to modify information supplied to them (even if it was in an editable form), but they may be responsible for highlighting the inconsistencies and the planning of future steps to improve its quality. Understanding what is valid will go a long way to ensuring handover is completed satisfactorily.

This requires a system that automatically watches for any new information, reads it, understands the content, is tolerant of poorly named tags, and indexes and links the content automatically.
2.5 Integrity of Plant/Project Information

An EPC is seeking to provide new services to a brownfield owner operator. A plant walkdown would provide the EPC with the necessary information to deliver ongoing engineering services, as well as an information quality remediation program. However, the owner operator may be reluctant to pay for an expensive walkdown that is not perceived to add value to its plant operations. The EPC then faces the challenge of quickly gathering the plant’s “as-exists” information to evaluate its scope and integrity. It is unlikely there will be a native 3D model of the asset available, even though there may be an out-of-date viewable rendition.

It is important an EPC does not spend time on upfront cleansing and loading of information. The data and documentation should be captured and evaluated as-is. However, there may not be a 3D model available, and if the EPC is unable to get access to the plant site, how can it visualize, investigate, and measure the “as-built” plant from its remote office location? How can it link such a visual representation of the plant with the documents and data to understand the operating envelope on the plant? Such knowledge will need to be quickly assimilated and studied to provide accurate project plans and engineering services to the owner operator.
3. The Path Forward

The dirty secret about unstructured information is that this issue has existed as long as there have been computers. Arguably, computers have exacerbated a problem that has been around a lot longer in the paper world. The answer may not be more rigor in your existing document management system, or an extension of your ERP or CMMS. Many companies have such systems already, and still the issue exists.

The real solution is to recognize that legacy information, which is often uncontrolled and unstructured, will always exist in organizations. The ability to react to business situations like those outlined in this white paper and others will be constrained by how well you deal with it.

This white paper is the first in a three-part series. To find out about the latest approaches and technologies that are being applied to the management of unstructured information, please also read:

- **New Approaches to Make Plant and Project Information Rapidly Available**
  This white paper will discuss a variety of new capabilities that are being made available by Intergraph and Leica Geosystems to enhance existing on-plant operation systems.

- **SmartPlant Fusion: Technology and Capabilities**
  This white paper will discuss the technology platform now available from Intergraph to solve the unstructured information challenges of various asset-intensive manufacturing industries.
For more information about Intergraph, visit our website at www.intergraph.com.

© Intergraph Corporation. All rights reserved. Intergraph is part of Hexagon. Intergraph, the Intergraph logo, and SmartPlant are registered trademarks of Intergraph Corporation or its subsidiaries in the United States and in other countries. Other brands and product names are trademarks of their respective owners. Intergraph believes that the information in this publication is accurate as of its publication date. Such information is subject to change without notice. Intergraph is not responsible for inadvertent errors. 4/14 PPM-AU-0178B-ENG