



The Solution Buyers' Guide
Pipeline Corrosion &
Integrity Management

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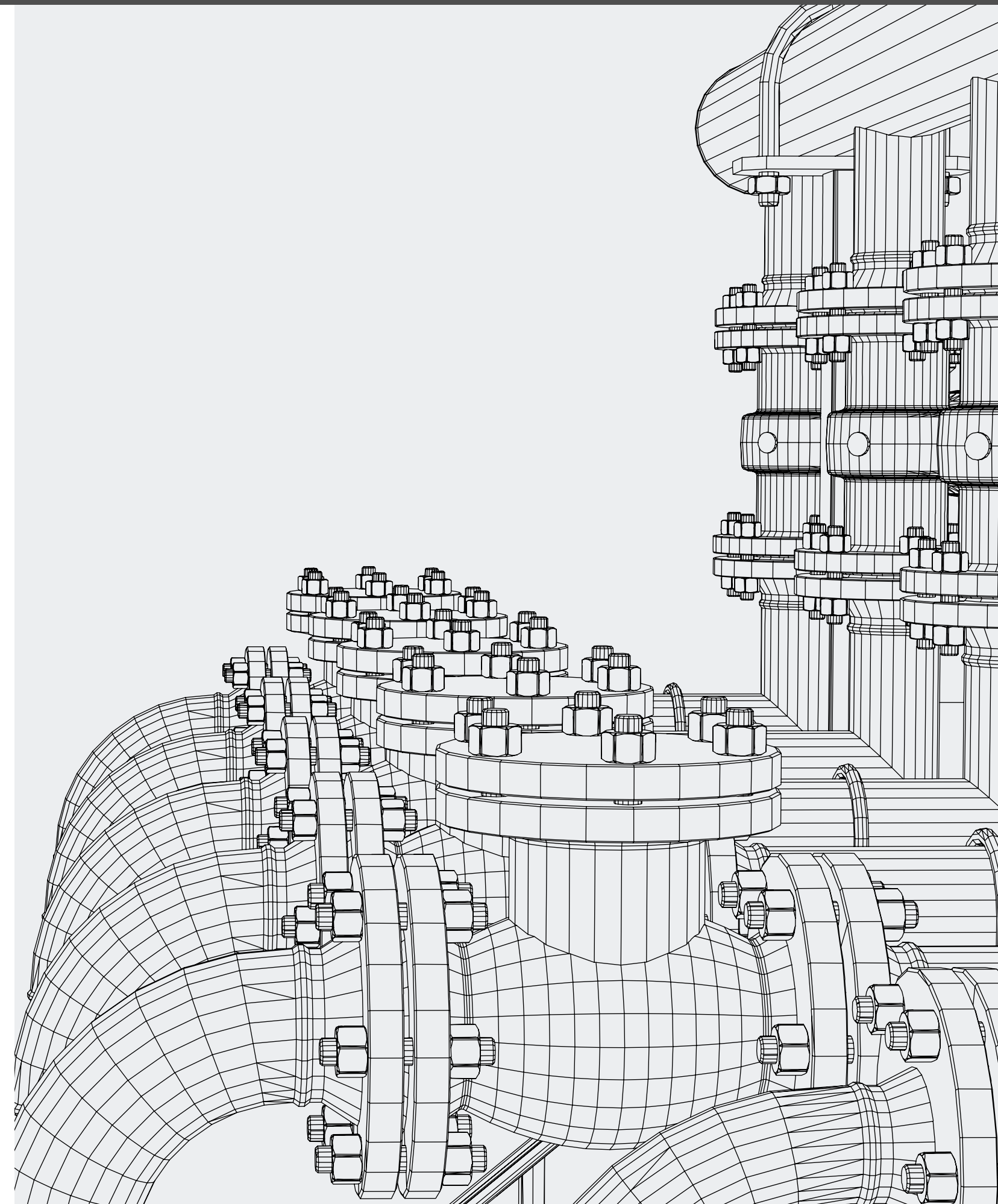
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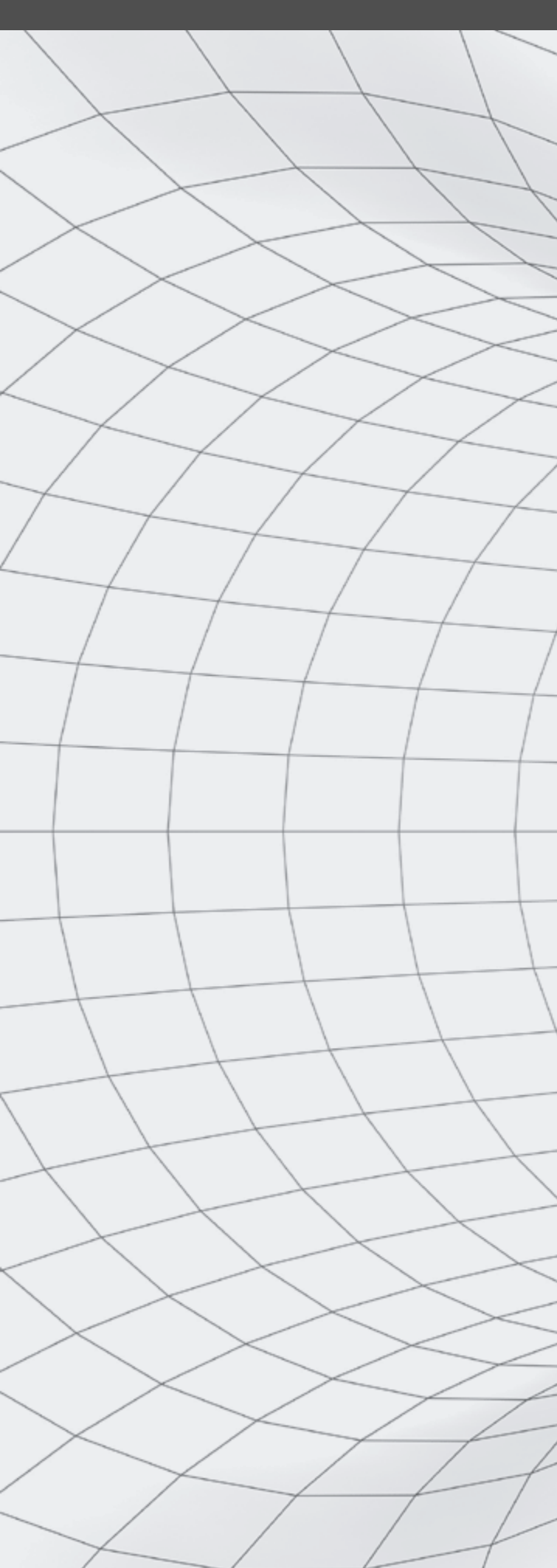
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How to Use This Guide

Who needs software solutions for corrosion in oil and gas pipelines? If you are the senior manager or leading engineer responsible for software purchase decisions for your company, it might be you. Perhaps you are accountable for midstream pipeline design and construction, or operational concerns such as integrity management and safety. Alternatively, you are an independent expert, such as a cathodic protection consultant. The guide assumes that you have a practical understanding of corrosion in midstream pipeline assets, and the objective is to explain the characteristics of an ideal solution.

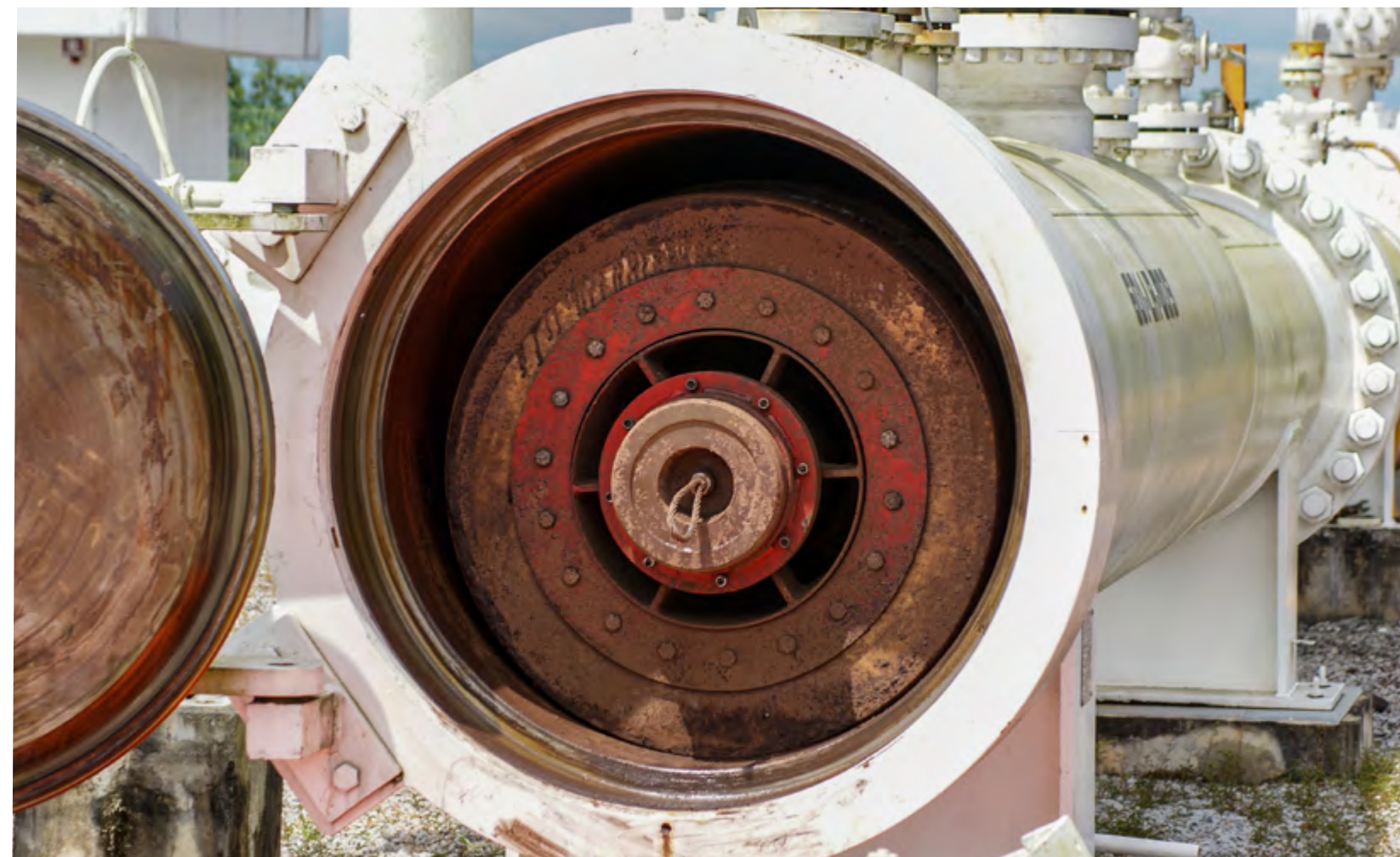
The Corrosion Solution Buyers' Guide builds on the collective knowledge and experience of the Technical Toolboxes team. For more than two decades, we have been developing and delivering solutions for the midstream oil and gas pipeline sector. The research for the corrosion solutions buyers' guide draws on our direct knowledge of the industry, combined with the input of partners from across the industry. In this guide, we explain the dimensions in the decision to purchase a corrosion or integrity management solution.

Dedicated Data Systems for Digital Transformation

Let us begin by stating outright that the best in class solution is a dedicated solution. Engineers who deal with corrosion, its mitigation, and integrity management use a wide range of approaches to find the answers they need. The methods they use are not all created equal. Legacy solutions range from paper records to spreadsheets and PDFs to in-house solutions built on general-purpose database software. Solutions that trap data and engineering knowledge within the silos of teams, departments, and unstructured repositories are the norm.

Digital innovation has brought dramatic improvements in efficiency and accuracy. Whether it resides onsite or in the Cloud, the best software is designed for corrosion engineers by corrosion engineers, from the ground up. The answer is to implement a dedicated solution designed explicitly for the midstream pipeline industry. The question that remains is, how do you identify the features that make a dedicated solution best-in-class? The objective of this guide is to arm you with the answer to that question.

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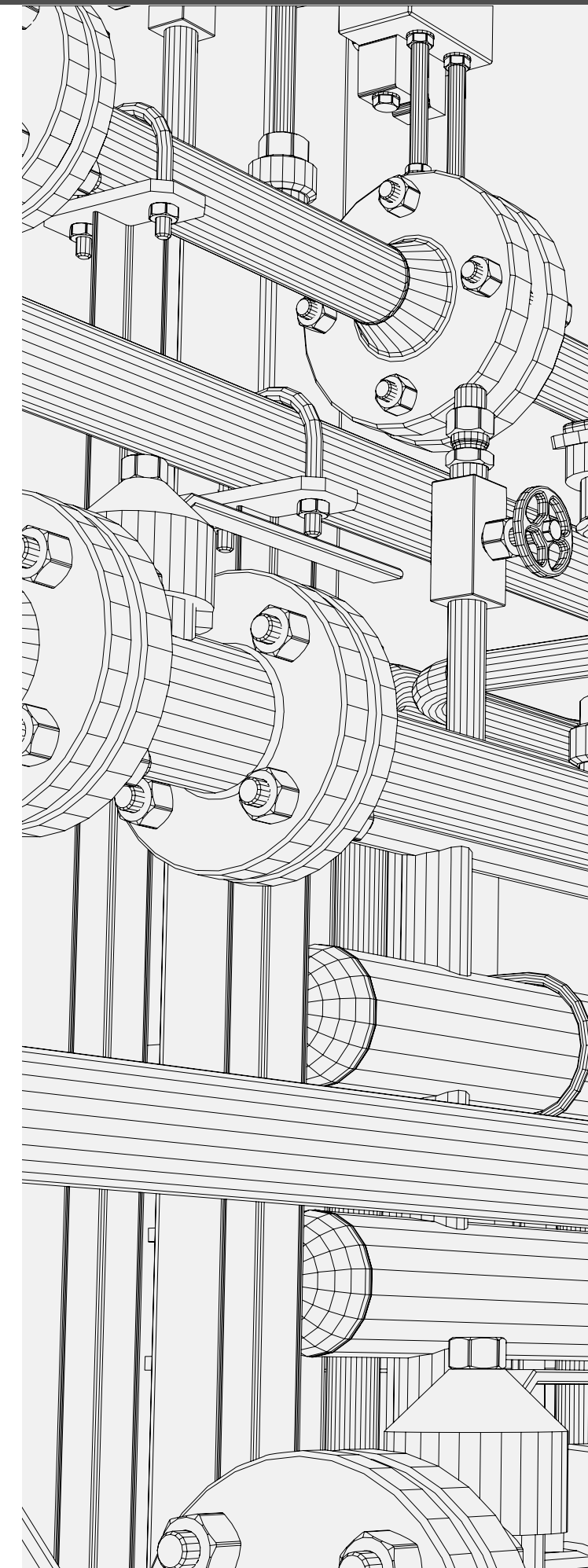


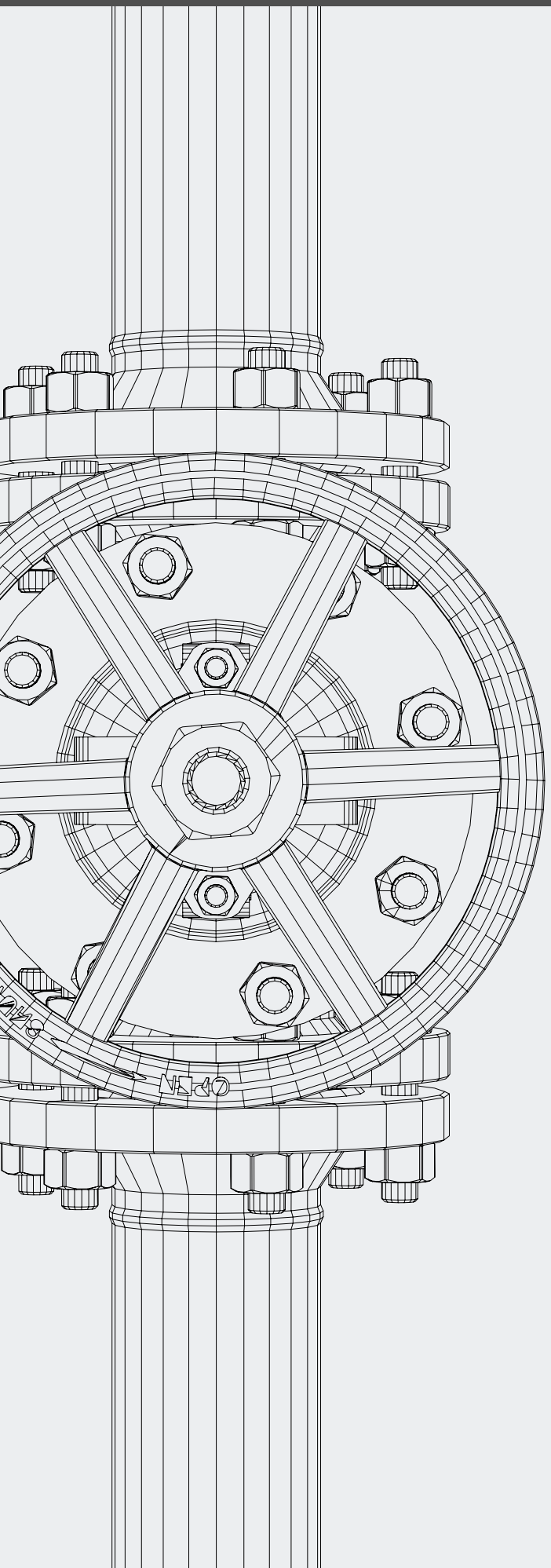
Threat Vector Dimensions

Corrosion in pipelines is a technical concern, a matter of applying engineering knowledge to achieve measurable objectives. However, in addition to the qualitative and quantitative technical factors, you have to consider the threat vectors that relate to business operations, such as productivity, government oversight, and workforce competence. These factors form the five unique dimensions along which both opportunities and threat vectors emerge.

The dimensions to consider:

1. The pipeline life cycle stage
2. Operational budgeting constraints
3. Data availability and accuracy
4. The regulatory environment
5. Knowledge management





1. The Pipeline Lifecycle Stage

In the pipeline lifecycle, corrosion is a consideration at every point along the way. In practical terms, engineers have two main modes of operation.

The modes of the lifecycle:

- **Before corrosion** - In the Design and Construction stages, the environmental conditions determine the preparation for pipeline operations in the future. Soil composition and geology influence the choice of coatings and cathodic protection requirements. Welding practices and other construction activities must be designed to reduce corrosion risk later in the life of the pipe.
- **After corrosion** - In the Operations and Integrity Management stages, engineers must address corrosion that may have accumulated already. In both cases, engineers benefit from a solution that goes beyond the minimum calculation.

The role your company plays within the midstream sector determines what software will benefit your engineers the most. When you add a new pipeline to a right-of-way corridor, you need to know the soil composition, the local geography, crossing pipelines, and potential encroachment issues. Power lines require careful consideration, so in your design, you are more likely to use tools that address cathodic protection and the impact of AC mitigation for nearby power lines. Your data comes from site surveys and geological records, among others.

In later stages, your data will come from the field, from measurements, smart pig runs, and, more recently, from remote sensors that listen to your key assets day and night. The ability to gather data without excavating pipes for inspection was a revolution. Now you need the most efficient way to qualify and store that data so that analysis results are available to all of your users until you choose to remove it. Engineers and field staff need to understand remaining strength, remaining life, and prioritize mitigation efforts accordingly.

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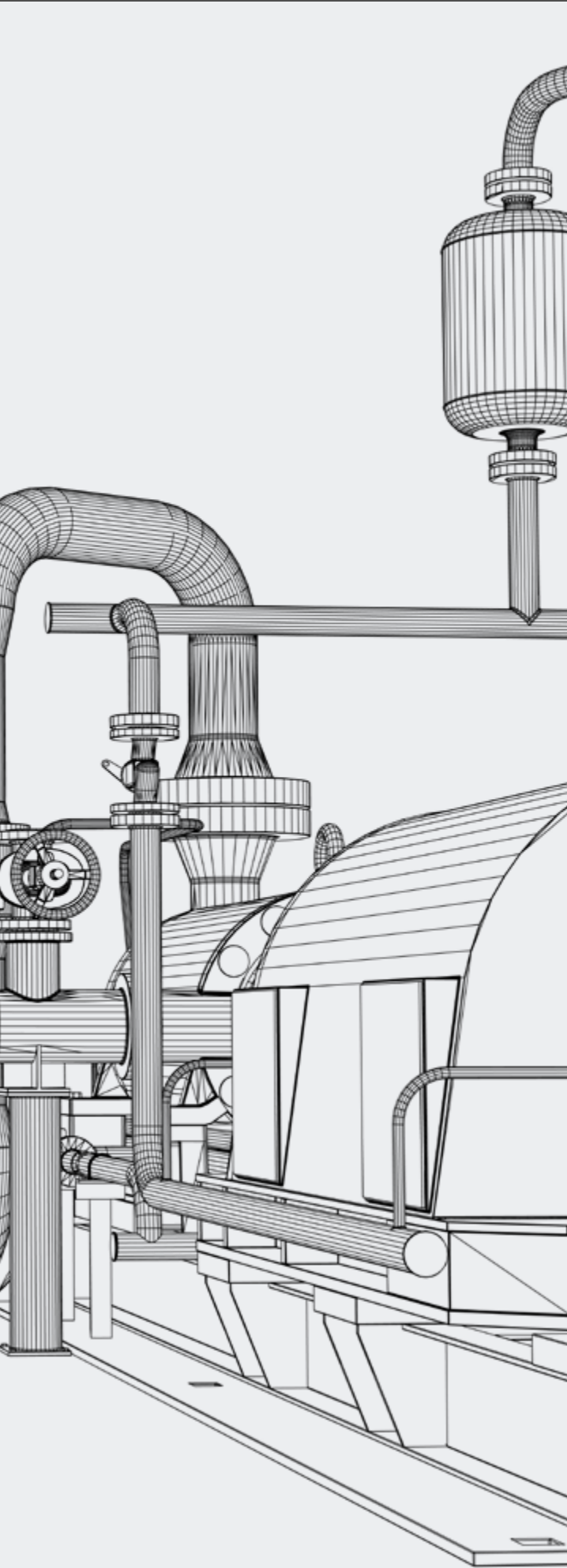
2. Operational Budgeting

Freeing your engineering teams to perform high-value tasks helps to minimize your costs in the dimension of your operational budget. Collectively, your engineers are the most valuable knowledge resource of your business. You benefit most when you deploy them in a manner that maximizes their productivity. Legacy systems demand time and attention from your valuable engineers. If you are not currently using a dedicated solution for corrosion calculations and analysis, you are likely to be losing data and duplicating work. To perform calculations, engineers have to spend time chasing down paper files or PDFs. They depend on spreadsheets that may contain unreliable data or calculation errors.

In contrast, a dedicated corrosion solution saves time and cost brings by making data, notably results of analyses performed, available to all of the engineers in your organization that need it. Best-in-class solutions leverage automation to produce unprecedented operational efficiency. They capture and qualify key asset data, and then store it in one central repository. This type of integration prevents mismatched calculations that lead to conflicting results for different teams. Additionally, access to data and analysis results via a central database saves the time and cost of engineers duplicating work already completed by other teams.

A typical example is a pipeline engineering team that previously required six engineers can now manage the same workload with one person. Engineers spend much less time chasing files and double-checking spreadsheets. It means that you can redeploy these valuable knowledge workers to discover and develop new opportunities for your business, thereby making the most of your limited operational budget.



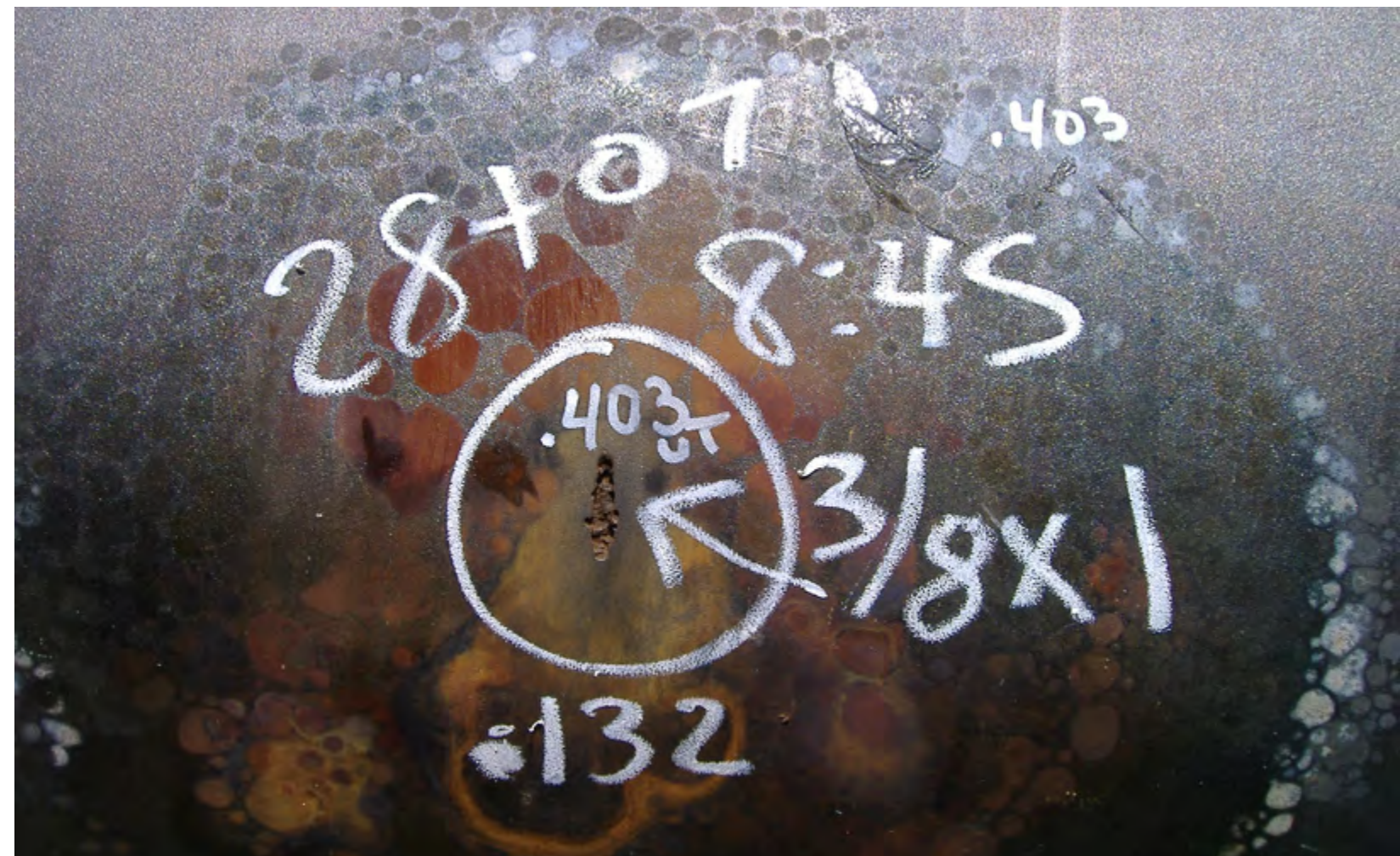


3. Data Availability and Accuracy

The third dimension is the operational and design risk to data availability and accuracy. Uncertainty and variances in pipeline designs, as well as measuring the integrity of pipelines in operation and their environments. Changing materials and improved metallurgy have increased the strength of steels used in pipeline construction. Tougher steels with better weldability at the expense of increased sensitivity to corrosion. The result is lighter pipes with thinner walls, which have a correspondingly lower tolerance to corrosion. The challenge for engineers is responding with the right combinations of preventative maintenance efforts and design considerations, such as Cathodic Protection and Insulated Coatings.

How well you understand the environment you are designing for determines how successfully you can mitigate future corrosion. How well you know your remaining pipe wall thickness impacts how you operate. Your engineers need data and the ability to arrive at the correct course of action. Legacy solutions provide accurate point data for integrity management. However, it is extended lengths of corrosion on your pipeline that determine your operating pressures and downtime. The need in this dimension is for accurate and consistent calculations with a high degree of trust. A clearer picture of situations in the field facilitates a better decision-making process. It results in fewer digs and the ability to transport more product to your customers.

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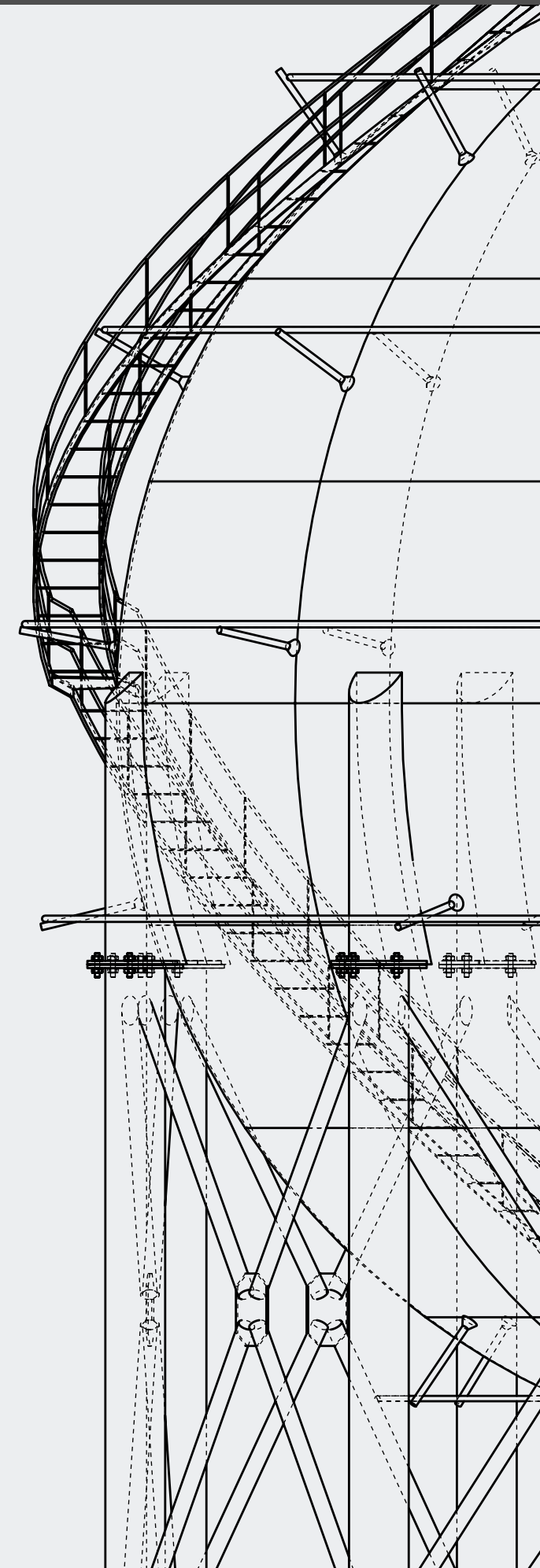


“Understanding the latest rules and regulations, then applying them to designs and pipes in operation is vital to your business process.”

4. Regulatory Environment

Standards and regulations play a defining role in the midstream pipeline business. Understanding the latest rules and regulations, then applying them to designs and pipes in operation is vital to your business process. Failed audits and citations can result in fines and expensive change orders as well as lost time and productivity. Pipeline engineers need solutions that take regulations, industry standards, and company SOPs into account in all calculations and reporting.

A solution that has comprehensive, searchable documentation about corrosion standards and regulations ensures that you remain compliant and avoid costly fieldwork or fines, one that works for all parties, for the companies, regulators, and the engineers that rely on its output. In case some damage or another event should occur, it accelerates the investigation if you can track down the causes and investigators can receive reports immediately, rather than waiting for months while companies try to locate data stored in disconnected and outdated formats.



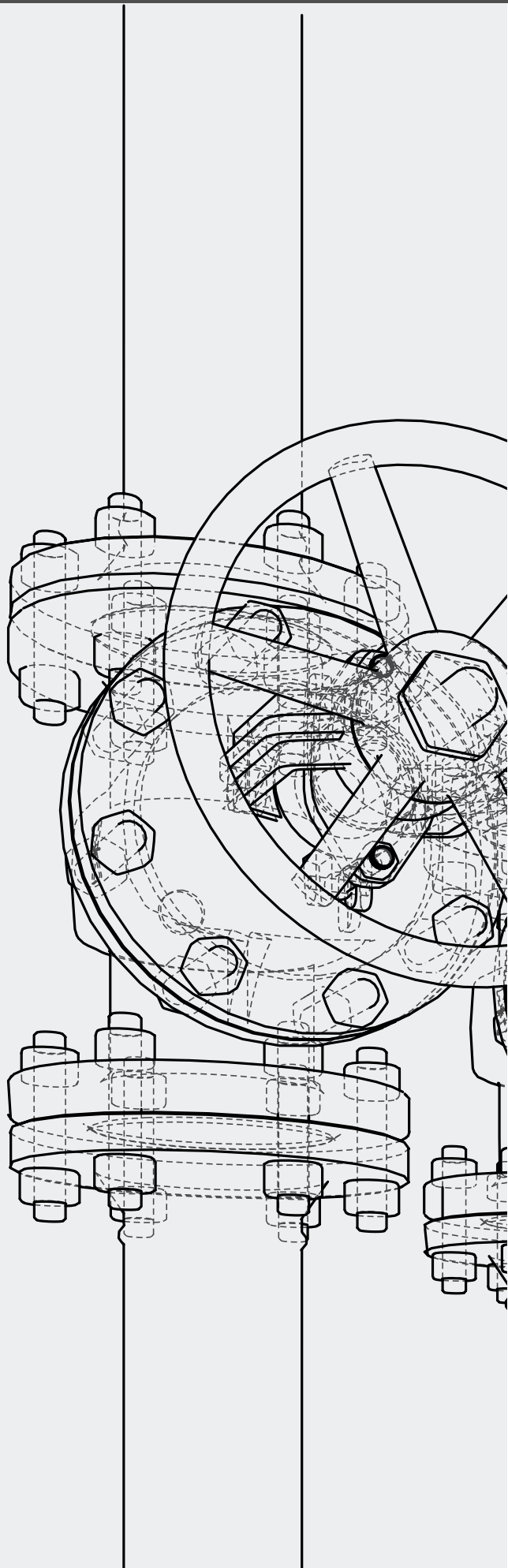
5. Knowledge Management

Knowledge transfer limitations constrain the effectiveness of how you deploy your tools. Even the most elegant solution diminishes, if it leaves a gap between its capability and the way that users exploit it. It is not so much competence itself as it is the ability to apply the full power of the tools. It means simplifying the user interface, improving the experience, or providing the training and support resources to foster learning.

Change management is a modern challenge faced by any organization that has the potential to benefit from data integration and automation. However, in the real world, change initiatives fail frequently. Implementing a new solution is more likely to succeed if you can train users quickly to a level of competence that enables them to experience and appreciate the benefits inherent in the new system. Ideally, users should be able to operate the solution after just a few training sessions. That means engineers should be competent after days of training, rather than weeks or months.

In the real world, engineers may work on integrity for a limited time. If the expertise and experience of your solution are stored in the heads of your engineers, it goes out the door when they move on to other positions. Their replacements face a struggle to get to understand the status of assets they are responsible for, where their predecessors left off, etc. Every time you train replacements, you need the time lost in the learning curve to be as little as possible. How well your engineers know the capabilities of the tools they have at their disposal determines their ability to make the largest potential productivity gains. An ideal solution will enable the new engineer to understand the analyses previously performed, including the assumptions used and instills trust that the correct data and calculations were applied to a given asset, or challenge.

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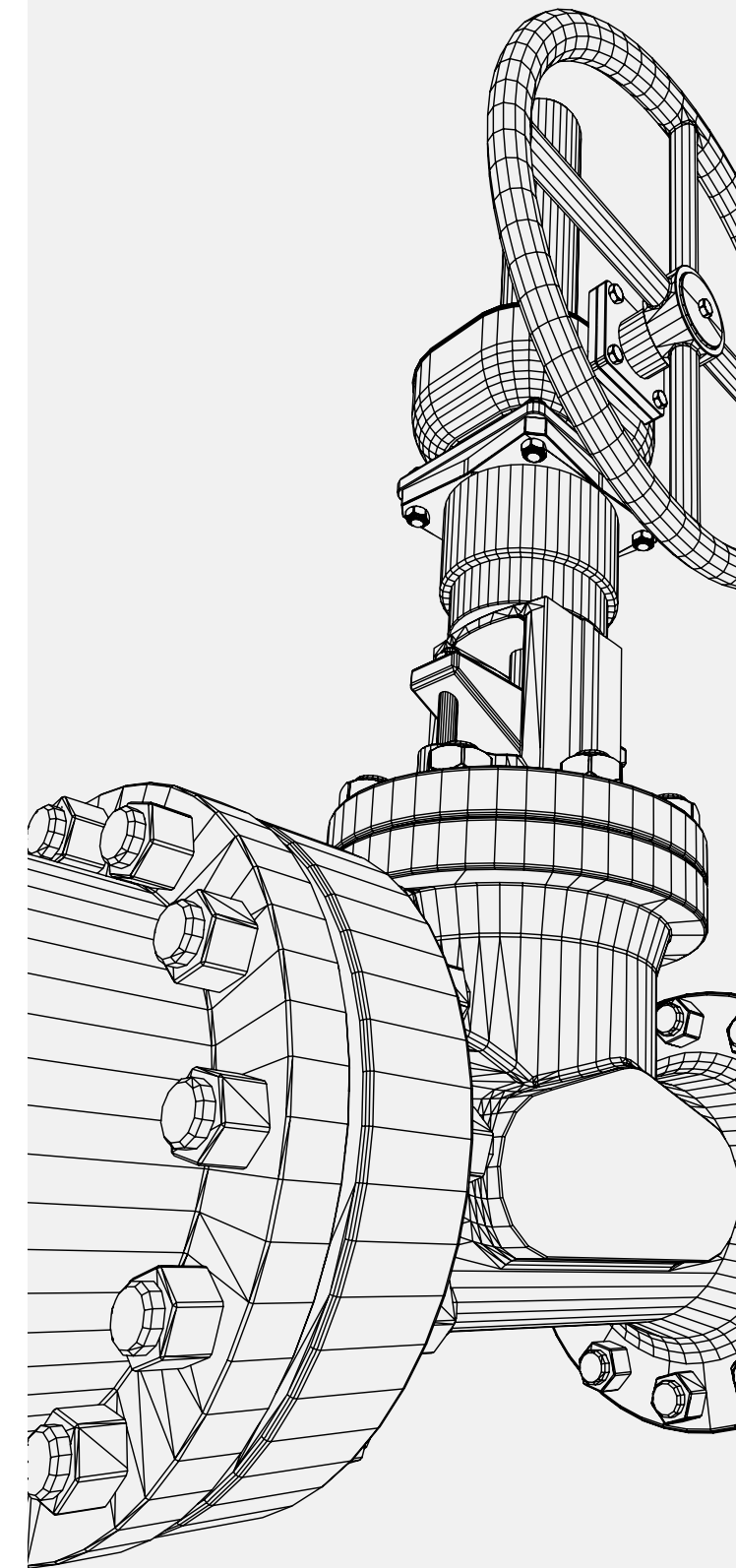


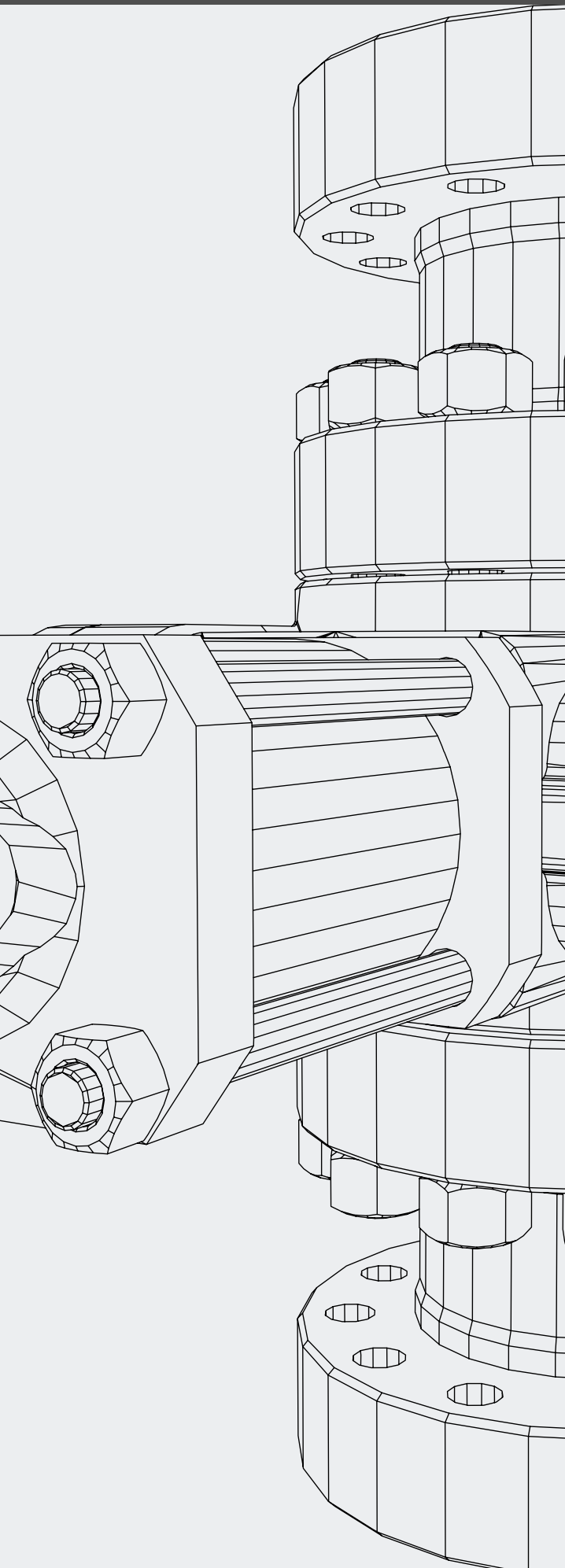
Multi-Dimensional Solutions from Technical Toolboxes

Technical Toolboxes has been an established provider of corrosion, risk, and integrity management solutions for more than two decades. We know what the challenges are that pipeline engineers face in managing corrosion. Our solutions for corrosion address the issues that matter to engineers, companies, and regulators. We aid in knowledge transfer within and outside the company.

The goal of Technical Toolboxes is to share our knowledge and that of other experts in the industry. We achieve this through software and training events, and through ongoing support for our customers. As such, we provide a broad array of tools that pipeline engineers use in the battle against corrosion in mid-stream pipelines, compression and pumping facilities, as well as storage tanks. Our mitigation solutions help power line operators too. We have worked with partners and leaders within the industry to bring to market the tools that address the challenges and threat vectors that corrosion engineers face every day.

In the operations and integrity stages you manage risk with higher confidence. Technical Toolboxes gives you the engineering tools to work within more accurate tolerances to maximize the value and benefits of your chosen materials. Increasing the availability and accuracy of your data extends the operational term of the pipeline lifecycle for your assets. It also minimizes the engineering costs associated with analyzing and reporting remaining strength and wall thickness data. It reduces risks and eases the burden of regulations compliance.





1. AC Mitigation Tools

Concerns about AC interference arise at all stages of the pipeline lifecycle. While there is a broad range of pipeline coatings available to insulate steel pipes, AC mitigation is still a fundamental concern. Engineers calculate the fields and potential and design cathodic protection based on the environment. Technical Toolboxes offers two excellent tools for AC mitigation. PRCI AC Mitigation Toolbox and our top-tier product, the AC Mitigation PowerTool.

“Technical Toolboxes offers two excellent tools for AC mitigation.”

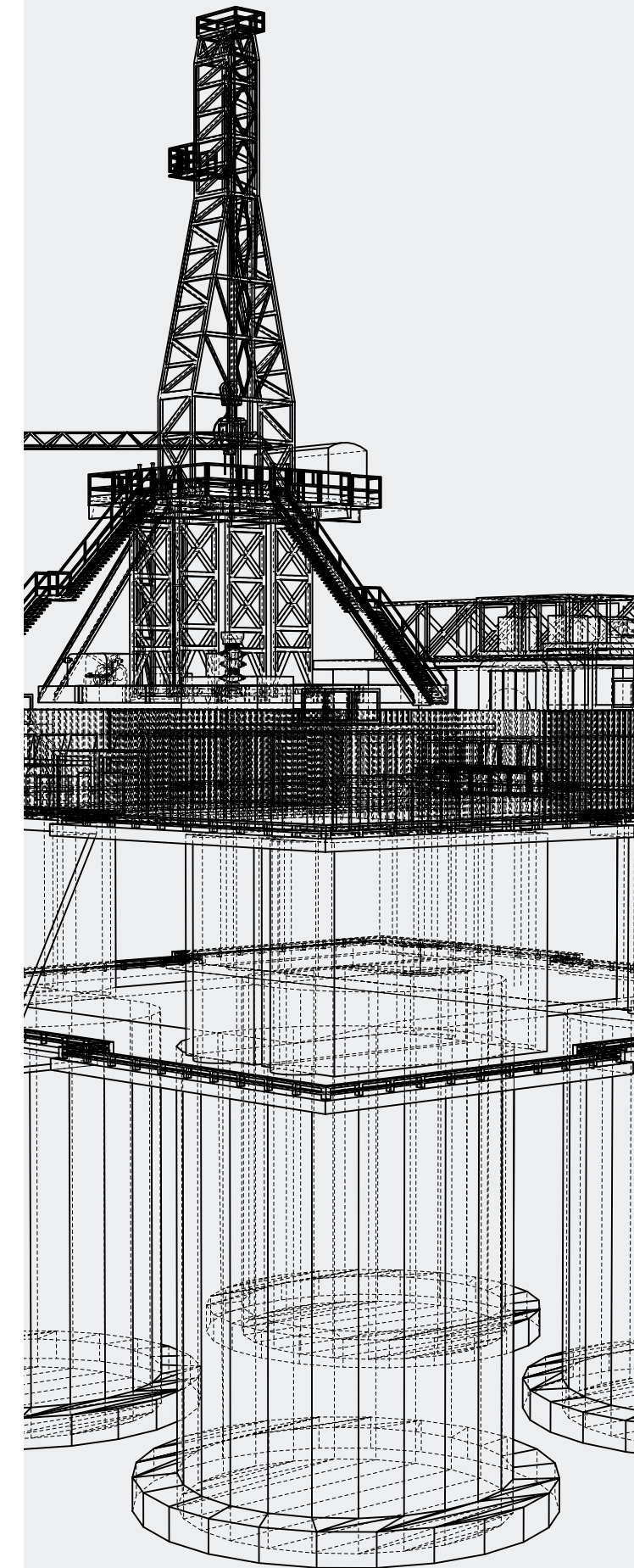


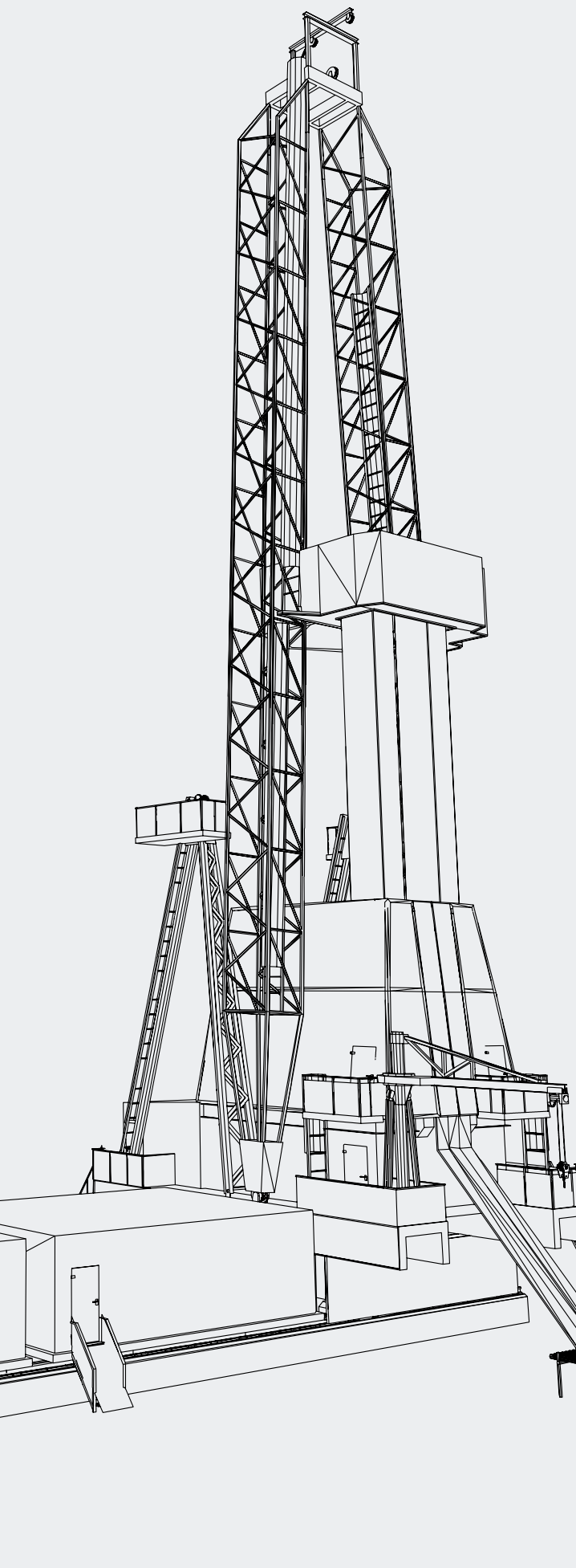
“RSTRENG® from PRCI turns data into risk analyses.”

2. RSTRENG® Tools

For engineers in the field, responsible for regulatory compliance, risk, mitigation, and integrity, there is no more valuable tool than data. How you capture, qualify, and maintain your data matters. RSTRENG® from PRCI turns data into risk analyses. It tells you where corrosion is happening, not just a single point but along extended lengths of pipe. It is called by name in 49 CFR parts 192 and 195 as an acceptable practice for compliance.

Technical Toolboxes offers two levels of sophistication in RSTRENG calculation tools. We are authorized agents of PRCI to provide the industry-leading product, PRCI RSTRENG® and RSTRENG+, which includes workflow automation capabilities that complement the base PRCI product.





3. Pipeline Toolbox

Pipeline Toolbox contains more than 230 applications for pipeline engineers, including modules for Corrosion, External Direct Assessment, Cathodic Protection, and other compliments to the PRCI RSTRENG® and AC mitigation calculations. Integrity and corrosion are just a fraction of the capabilities of the Pipeline Toolbox. This powerful set of pipeline tools is an all-around pipeline engineering solution that addresses all stages of the pipeline lifecycle, as well as costs, operational risk, and regulations. Pipeline Toolbox advances project schedules, lowers risk, and improves profitability via efficient and complete calculations, as well as identifying pipeline operations and integrity savings. It assists 49 CFR parts 192 and 195 compliance and how to implement industry standards.

“Pipeline Toolbox contains more than 230 applications for pipeline engineers, including modules for Corrosion...”

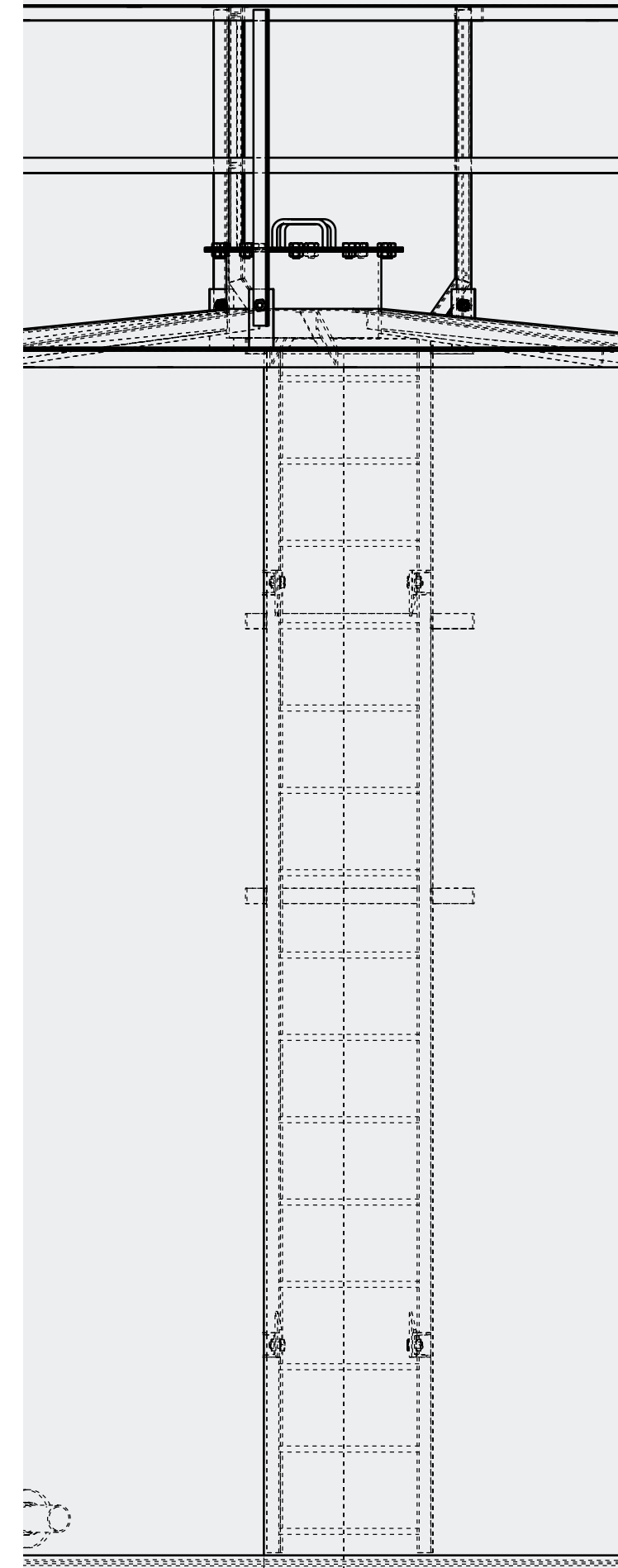


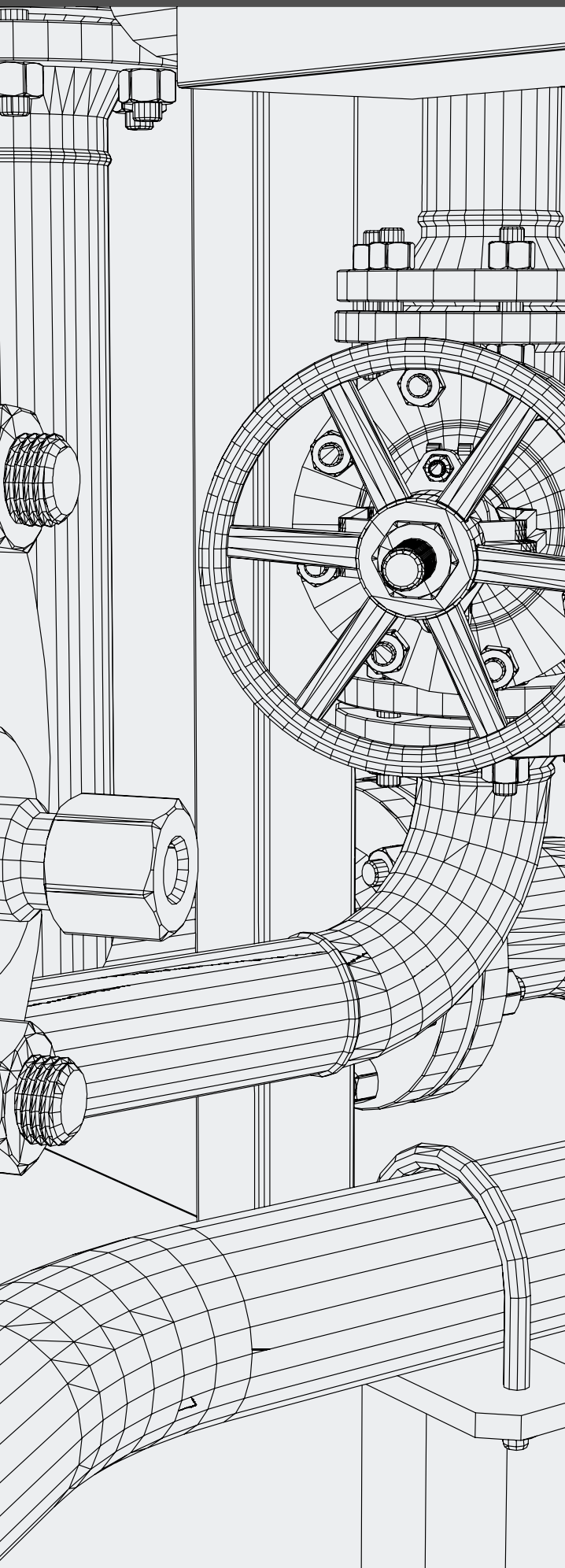
“HUB^{PL} is an integrative platform that brings together the data and computational powers of many tools in customizable workflow canvases.”

4. Pipeline HUB

The Pipeline HUB (HUB^{PL}) is an innovative new platform from Technical Toolboxes. HUB^{PL} is an integrative platform that brings together the data and computational powers of many tools in customizable workflow canvases. With it, you can combine functionalities of Pipeline Toolbox, PRCI RSTRENG®, and PRCI AC Mitigation Toolbox in one canvas for unmatched workflow efficiency.

The HUB^{PL} facilitates added mapping capabilities. You can combine GIS data to display corrosion geographically and link cases to pipes, assets, and maps along the path of the pipeline on a canvas. The platform streamlines your engineering resources, leveraging existing pipeline data sets. It connects our library of engineering standards and tools to your data across the pipeline lifecycle. With it, you gain unprecedented efficiency gains and additional use cases of legacy standard tools.



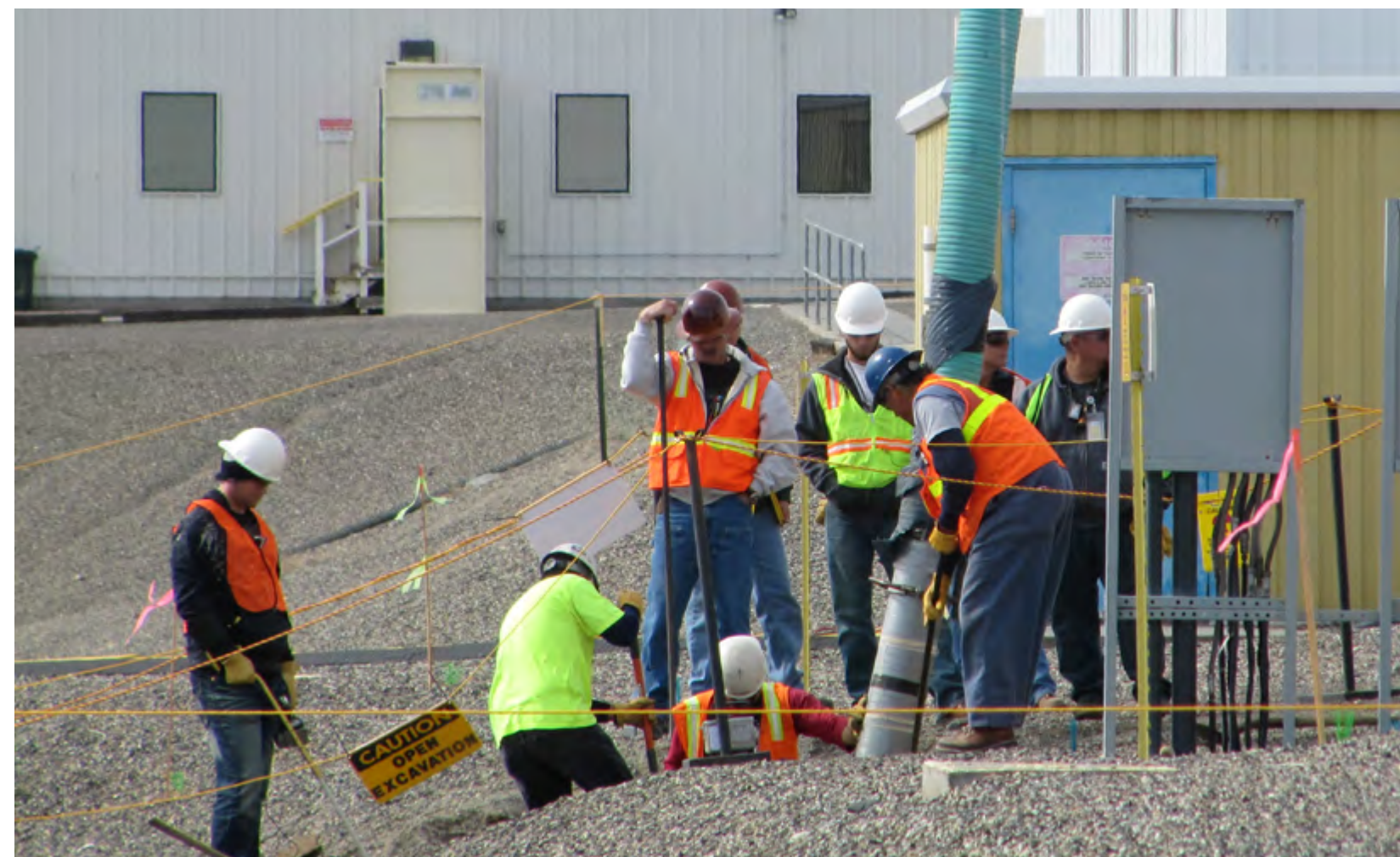


5. Training for Full Software Utilization

Technical Toolboxes is an organization that does more than sell products; we are pipeline engineers and teachers too. We provide the training resources so that your engineers have the competence to maximize the value of your investment.

Download the software for a free trial. Attend technical and/or application training on that subject, and, when you know that it works first-hand, commit to the solution. Technical Toolboxes has both in-house experts and partnerships with outside experts. All of our products come with technical support you can call anytime.

“Technical Toolboxes is an organization that does more than sell products; we are pipeline engineers and teachers too.”



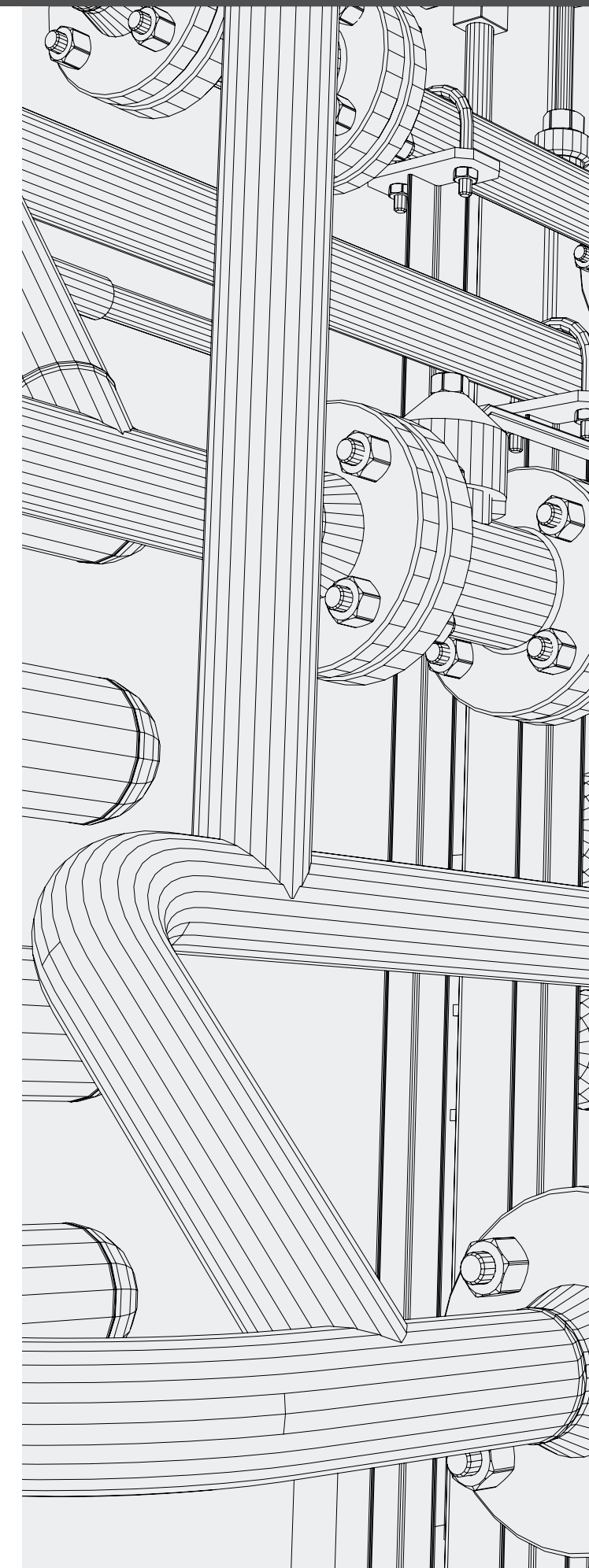
“Best in class solutions set the standards for compliance while delivering high-quality results and unmatched productivity.”

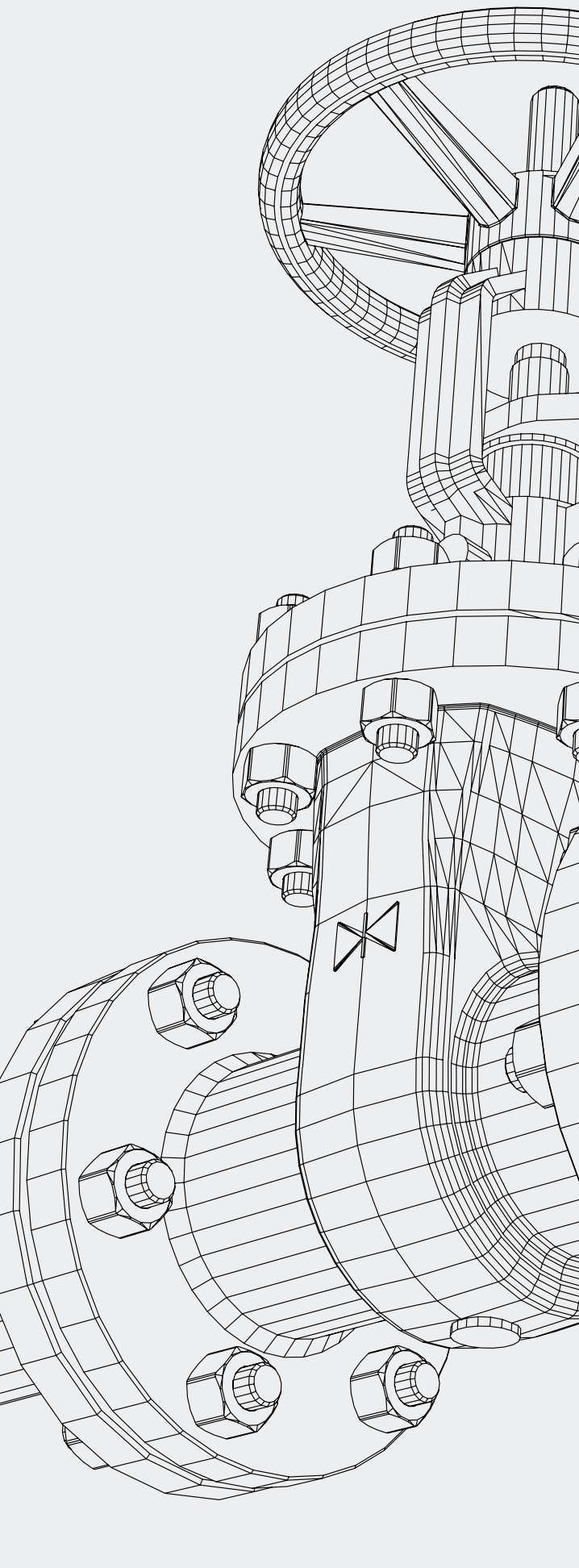
Conclusions

Dedicated solutions for pipeline corrosion calculations, analyses, and reporting offer many advantages to the integrity and corrosion engineers that use them. They deliver qualitative and quantitative results that in-house programs and Excel spreadsheet-derived solutions fail to achieve. Best in class solutions set the standards for compliance while delivering high-quality results and unmatched productivity. Engineers achieve consistent results, align SOP practices, and leverage key asset data efficiently. Asset data is readily available, no more hunting for files or uncontrolled spreadsheet versions. Consistent data availability and automated loading to relevant input fields also minimizes losses due to fat-finger data entry errors and uncontrolled spreadsheets. Finally, the data used in, and derived from, analyses performed remains as part of the company as individual staff members come and go. Therefore, new personnel have the benefit of competence and confidence in the analyses and reports they create and in analysis results inherited from predecessors.

Threat Vectors in Summary

- The pipeline life cycle stage
- Operational budgeting constraints
- Data availability and accuracy
- The regulatory environment
- Knowledge management





Technical Toolboxes for Mitigation and Integrity Management

Corrosion solutions are one of our core competencies. We design our products and training services to combine to address the five threat vectors.

Technical Toolboxes offers best-in-class solutions for AC mitigation and integrity management. We address the challenges that pipeline engineers face across the pipeline life cycle stages. We deliver unprecedented gains that reduce costs and improve productivity to work within operational budgeting constraints. In terms of operational results, we help engineers achieve improved quality in calculations and reporting, which reduces errors and increases trust with superior data availability and accuracy.

Additionally, corrosion solutions from Technical Toolboxes help you master the regulatory environment. With it you increase your adherence to government rules, industry standards, and SOP practices. Finally, Technical Toolboxes is a knowledge transfer company for the pipeline industry. Along with the software products, we deliver the knowledge management support that enables you to retain knowledge within your organization. Your engineers can skill-up quickly and achieve the best return on investment for your organization.

The corrosion solutions from Technical Toolboxes deliver affordable cloud-based applications. Whether your business focus is pipeline design and construction or operations and integrity management, you raise your standards, maximize quality, and boost productivity with Technical Toolboxes.





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PRCI Products:
PRCI AC Mitigation Toolbox
PRCI HDD-TB
PRCI OBS
PRCI RSTRENG
PRCI Thermal Analysis

Technical Toolboxes Products:
Pipeline HUB (HUB^{PL})
AC Mitigation PowerTool
API Inspectors Toolbox
Crossings Workflow
ECDA & Remaining Life
Encroachment Manager
HDD PowerTool
Hydrotest PowerTool
Investigative Dig PowerTool
Pipeline Toolbox
Report Builder
RSTRENG+

About Technical Toolboxes

Technical Toolboxes is a leading provider of integrated and cloud-based pipeline software, online resources, and technical training for pipeline engineering professionals around the world. The integrated software products developed by Technical Toolboxes provide engineering software productivity tools for standardization, and we deliver oil and gas industry training courses covering a breadth of topics with industry-recognized instructors.