TECHNICAL TOOLBOXES

The PRCI On-Bottom Stability Software

Return on Investment Guide

Table of Contents

Who Needs This ROI Guide?

The latest release of the PRCI On-Bottom Stability Software Tool (OBS) extends the organization's leadership in subsea pipeline engineering analysis. The OBS tool provides calculations that simplify the analysis of wave action and hydrodynamic forces. It supports the comprehensive design and complex modeling of specific pipeline assets and the specified environmental conditions under which they operate.

If your business engages with pipeline engineers responsible for sea bottom pipeline design and integrity in any capacity, the OBS Return on Investment Guide from Technical Toolboxes is for you. The guide shows how the software reduces risk by many millions of dollars. It is a must for any organization or engineering professional involved in moving liquid or gas products underwater.

- Companies owning subsea flowlines and risers

- Contractors who manage subsea flowlines and risers

- Consulting firms that design and analyze subsea flowlines and risers

- Companies tasked with overseeing contractors that perform OBS calculations

"[This guide] is a must for any organization or engineering professional involved in moving liquid or gas products underwater."

Impacting ROI

To create this guide, industry experts were surveyed by PRCI and by Technical Toolboxes, and the results of those surveys were combined into this ebook.The questionnaire enquired about the financial aspects of their experiences with subsea pipeline design. The answers that came in were informative and insightful, exposing the depth and breadth of the risks and costs that pipeline engineers face in designing for on-bottom stability. The guide also draws upon a recent report in Oil World Magazine, which provided information about the economics and end-of-life costs of offshore platform closures.[1]

Engineers that design and manage integrity for sea-bottom pipelines shoulder immense responsibilities. As contractors and consultants, the costs of redoing sub-optimal designs work add up quickly, in increments of thousands of dollars of lost time and revenue, while expenses continue to accrue. On the seabed, the costs of errors spiral upward, amplified by the industry's capital-intensive nature.
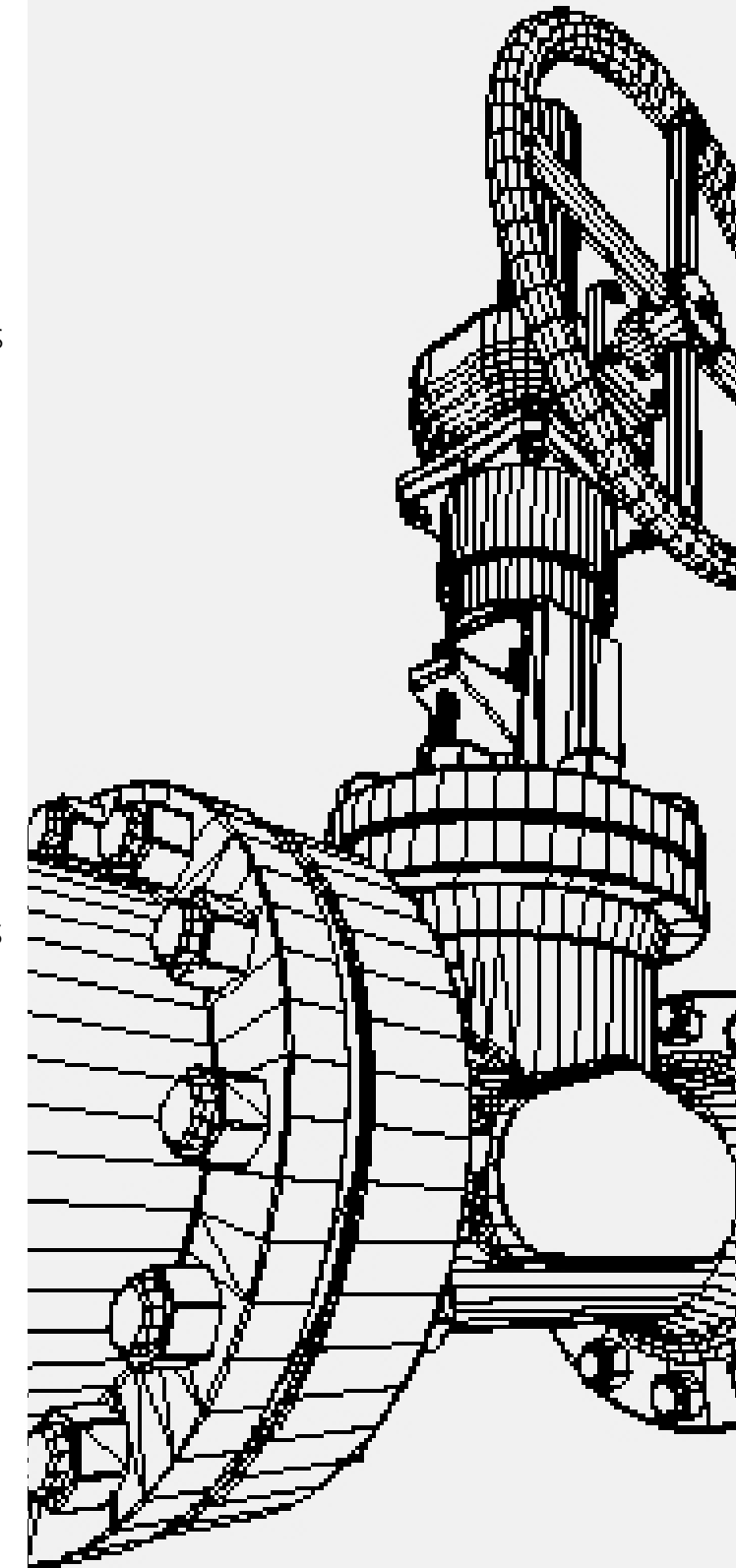
1. Peter Millard, Laura Hurst, and David Wethe, "Underperforming Offshore Wells Rack up over $100 Billion in Abandonment Liabilities Worldwide," World Oil - Upstream News, June 05, 2020.
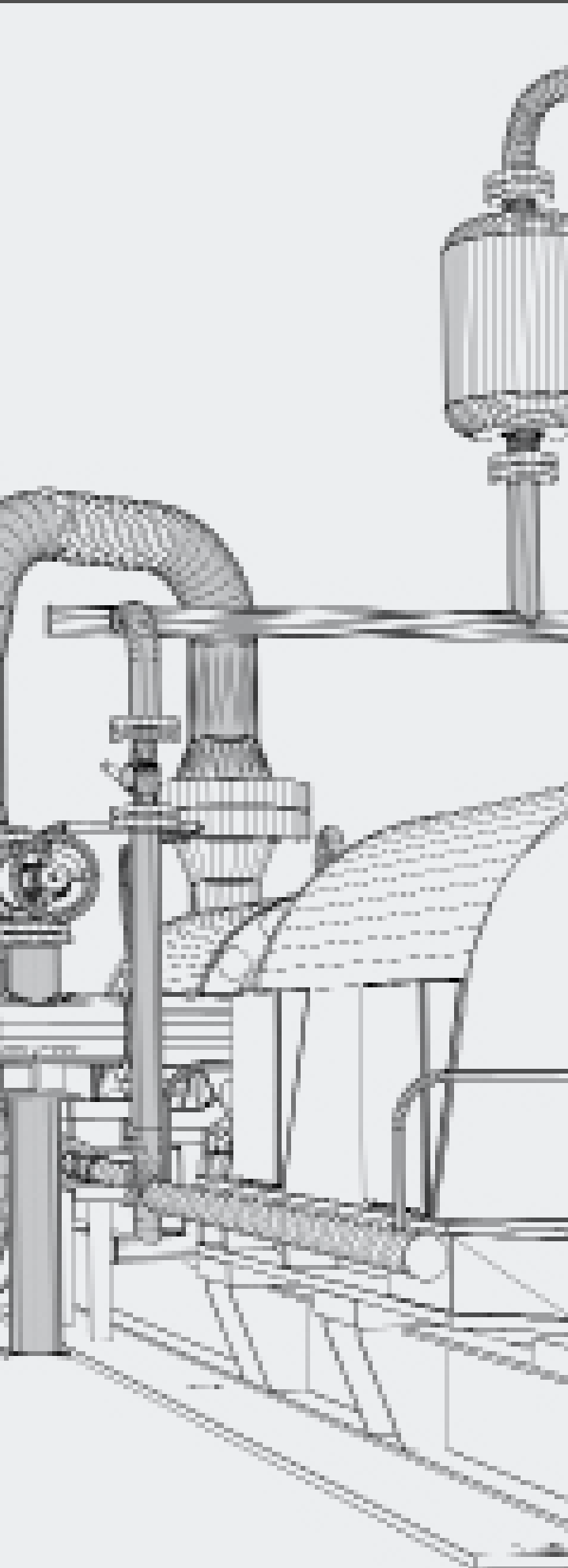
The Capital Expenditure (CapEx) frequently amounts to hundreds of millions, if not billions of dollars. Once the platform is in operation and flowlines in place on the seafloor, there is no going back to fix it or mitigate risks. If you get it wrong, it dramatically reduces the platform's productive life, as a result of potential nine-figure increases in CapEx and Operational Expenditure (OpEx). Therefore, not only does the asset generate revenue from operations for fewer years, but it also incurs significant additional expenses for operation, combining for a huge impact on ROI.

The tools that you use as an OBS engineer amplify your choices in practice. The result is that your choice of software for calculation and analysis can have a disproportionate impact on the performance of platforms at sea and asset value on the balance sheet. This guide explains the scope of financial returns. It breaks down the numbers of how your OBS software choice directly impacts your company's return on investment, regardless of how large your corporation may be.

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Engineering Firm ROI

Results of the industry SME survey showed that the PRCI OBS software cut the time they spent performing preliminary segment design in half compared to spreadsheet-based approaches. The time savings in doing a robust analysis correctly the first time, from the perspective of consultant time per project, is an expenditure of between $500-$3,375 for each person involved in addressing the error or question.

The time savings in not having to repeat a flawed analysis can save as much as $40–$70,000 per project, from a consultant or contractor's perspective. From the asset owner's perspective, the risks have much more significant implications.
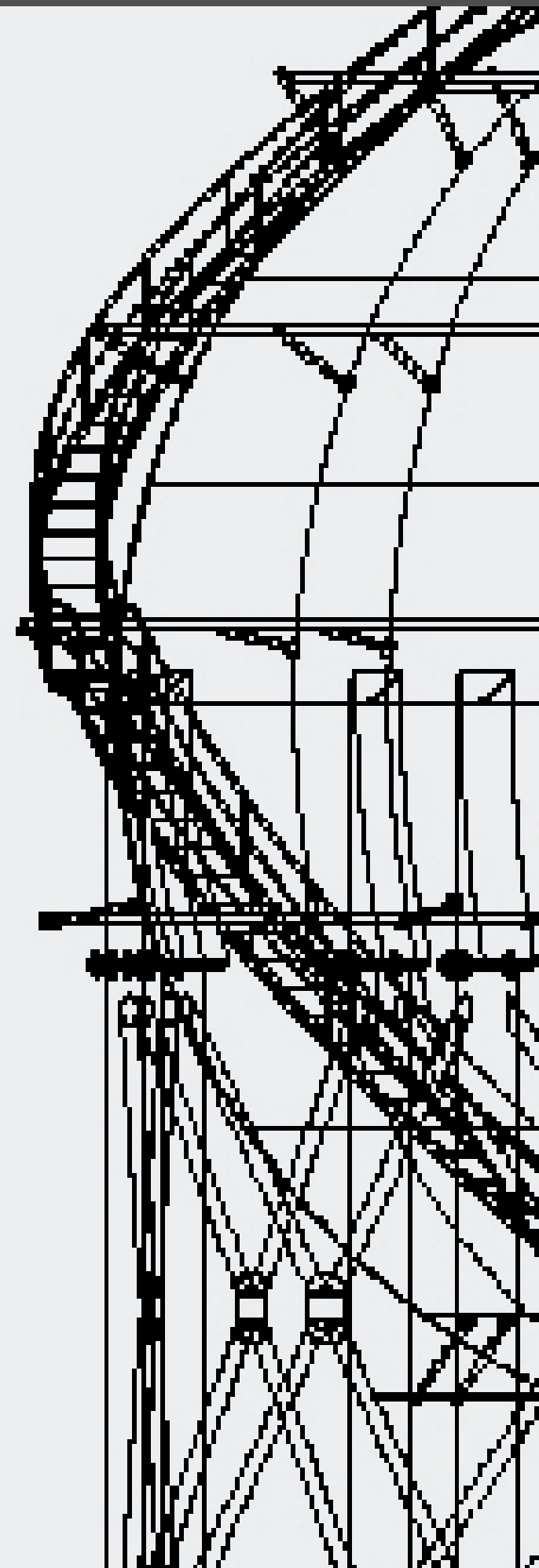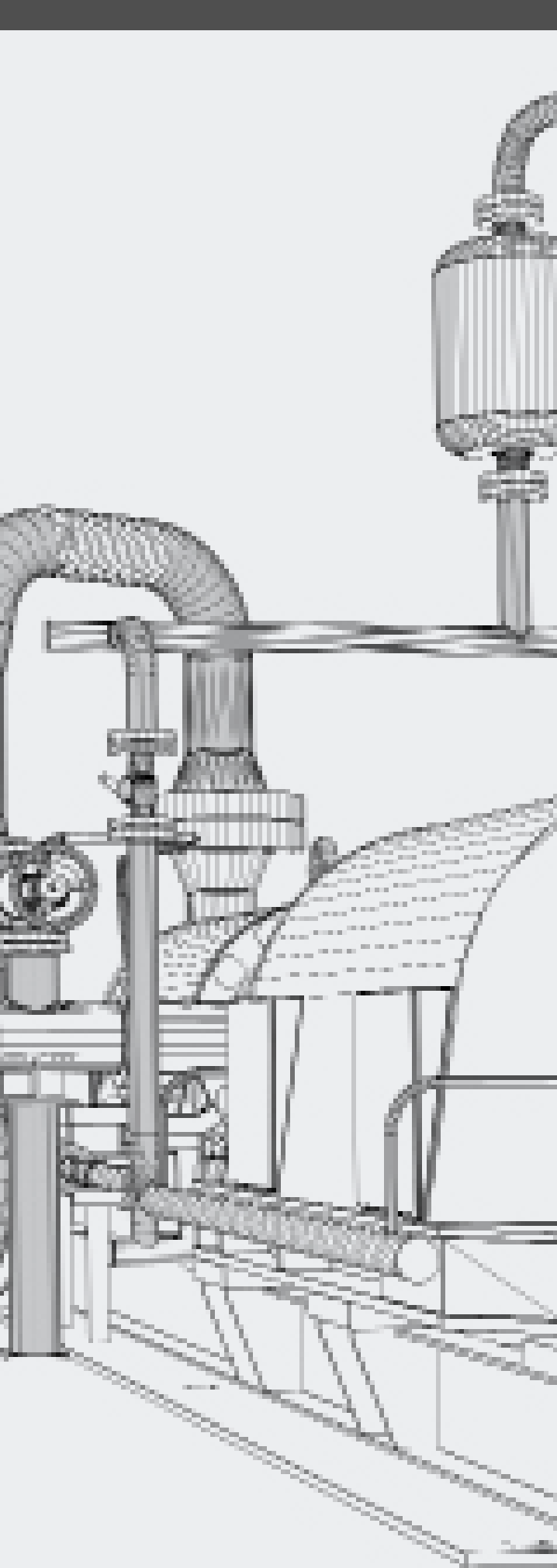
Capital and Operational Overages

Below, you will find some of the findings from the surveys of Subject-Matter Experts that illustrate the impact of initial design on ROI of an offshore project:

Initial Installation Project Costs		
Category	Min	Max
Initial Design	$2 MM	$10 MM
Initial Construction	$50 MM	$500 MM

Over-Spend Due to Design Flaw		
Category	Min	Max
One-time Remediation CapEx	$10 MM	$200 MM
Recurring OpEx	$1MM/yr	$50 MM/yr
Reduction in Design Life	1 yr	10 yrs

Over-Spend, Engineering Re-Design Time		
Category	Min	Max
Re-Design Time	1 month	3 months
Re-Design Team	2 people	5 people
Billable (or equiv) Rate	$150/hr	$450/hr
Redesign Cost	$38,400	$288,000

The impact on the offshore project's ROI is staggering, with potential 10 years of productive life lost and $50 MM/yr in additional OpEx costs, due to activities such as chemical injection, heating, pigging, among others.

The ROI for an investment in PRCI's OBS software to mitigate project risks is also staggering, with the annual license cost being far less than the potential engineering cost for a single re-design effort.

"OpEx overages come from activities such as chemical injection, heating, pigging to clean pipes, or for In-line Inspections, among others…"

Abandonment Costs

"Because CapEx and OpEx overages can be so high for a sub-optimal design, oil companies face the decision of closing the well early."

Because CapEx and OpEx overages can be so high for a sub-optimal design, oil companies face the decision of closing the well early. Loss of productivity is a real-world concern that results in the decision to end production for a platform years before the end of its planned life cycle.

When the revenue of a well fails to justify the OpEx, owners begin considering their options. Deep-water well closures require $10 million to shut down each well. The UK forecasts spending more than $26 billion by 2030 to close out North Sea oil fields. Shallow water wells may be much less but not inconsiderable at around $500,000 per closure.
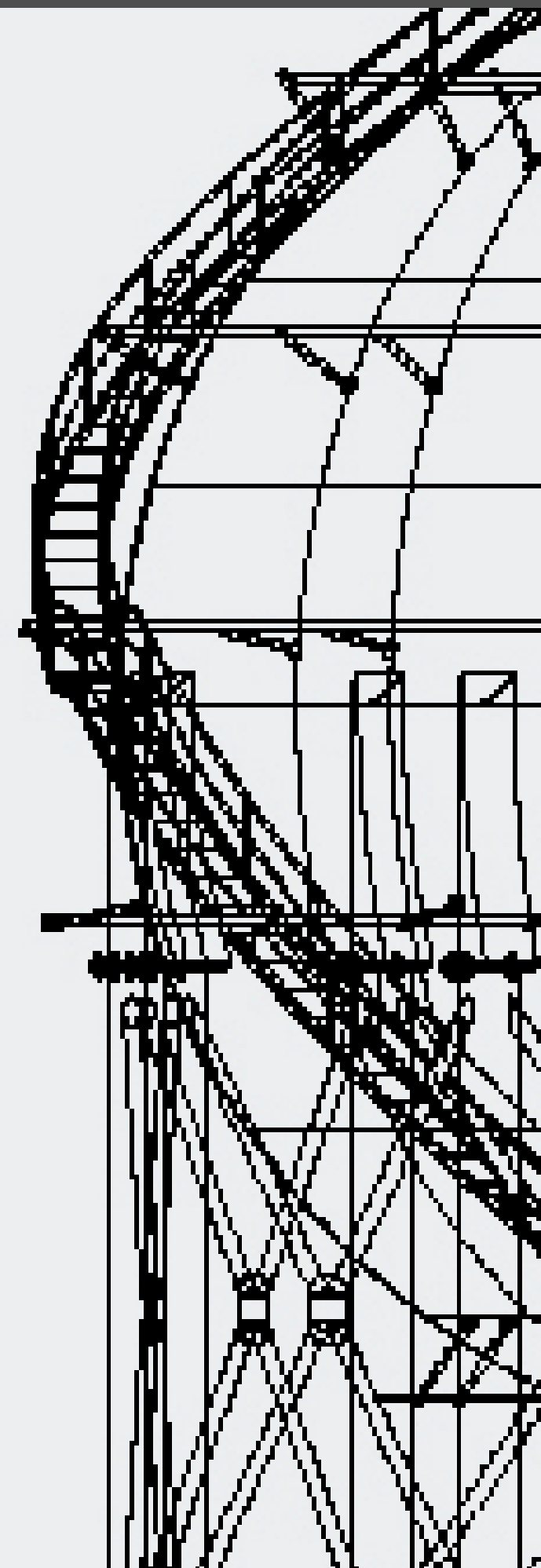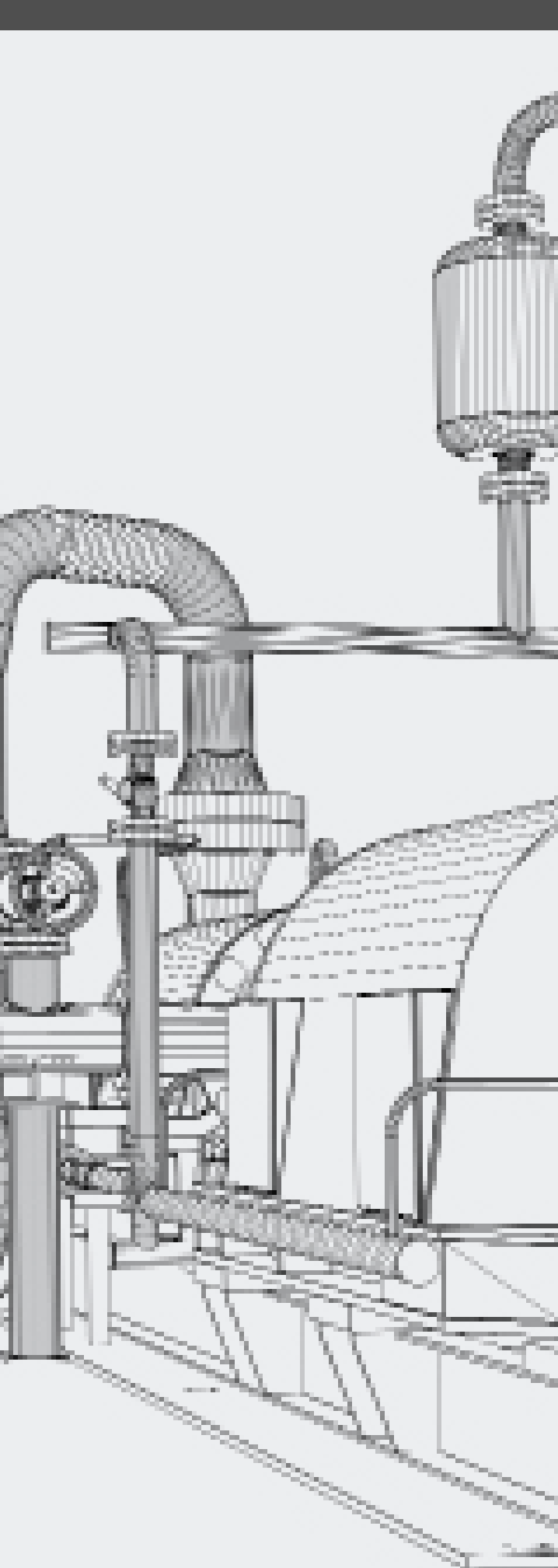
Petrobras Closures and Implications

As an example of the point at which oil wells become uneconomic, Petrobras has recently written off sixty-two shallow-water platform wells. At the stated production rate of 23,000 barrels a day, it alludes to a company calculation that around (23,000/62) 370 barrels per day is an unsustainable rate, which is about half that of other Petrobras assets.[1]

The calculations indicate a range of 500,000 to 1,000,000 barrels of reserves lost per well due to the closures. Reserves directly impact stock prices, and, as of mid-2020, an oil price of $50 per barrel is a reasonable assumption for calculations, which produces a loss equivalent to $150 million barrels oil, or more, for t he decommissioned Petrobras wells.

- In numbers: 500K bbl x $50/bbl x 62 wells = **$155,000,000** (un-discounted)

1. Millard, Hurst, and Wethe, "Underperforming Offshore Wells Rack up over $100 Billion in Abandonment Liabilities Worldwide,"

"As an example of the point at which oil wells become uneconomic, Petrobras has recently written off sixty-two shallow-water platform wells."

Overview of Upgraded OBS Workflows

PRCI OBS Software Tool provides on-bottom stability analysis for pipeline engineers on three levels. Each level serves a different purpose, from simplified analysis to intensive design modeling. The latest release, v.4, maintains the previous version's overall layout and workflow, so existing users can quickly and easily familiarize themselves with the new features.

OBS v.4 gives engineers a much-improved tool with which to perform calculations. In the words of one consultant design engineer and project manager: "OBS has long been the standard tool, but without maintenance in well over a decade lost that. However, with the advances in 4.0 and beyond, it has reclaimed its place in the industry and is leaping ahead. Ongoing technical advancement and maintenance is required to keep it leading the industry in solving challenging and interactive/iterative problems."
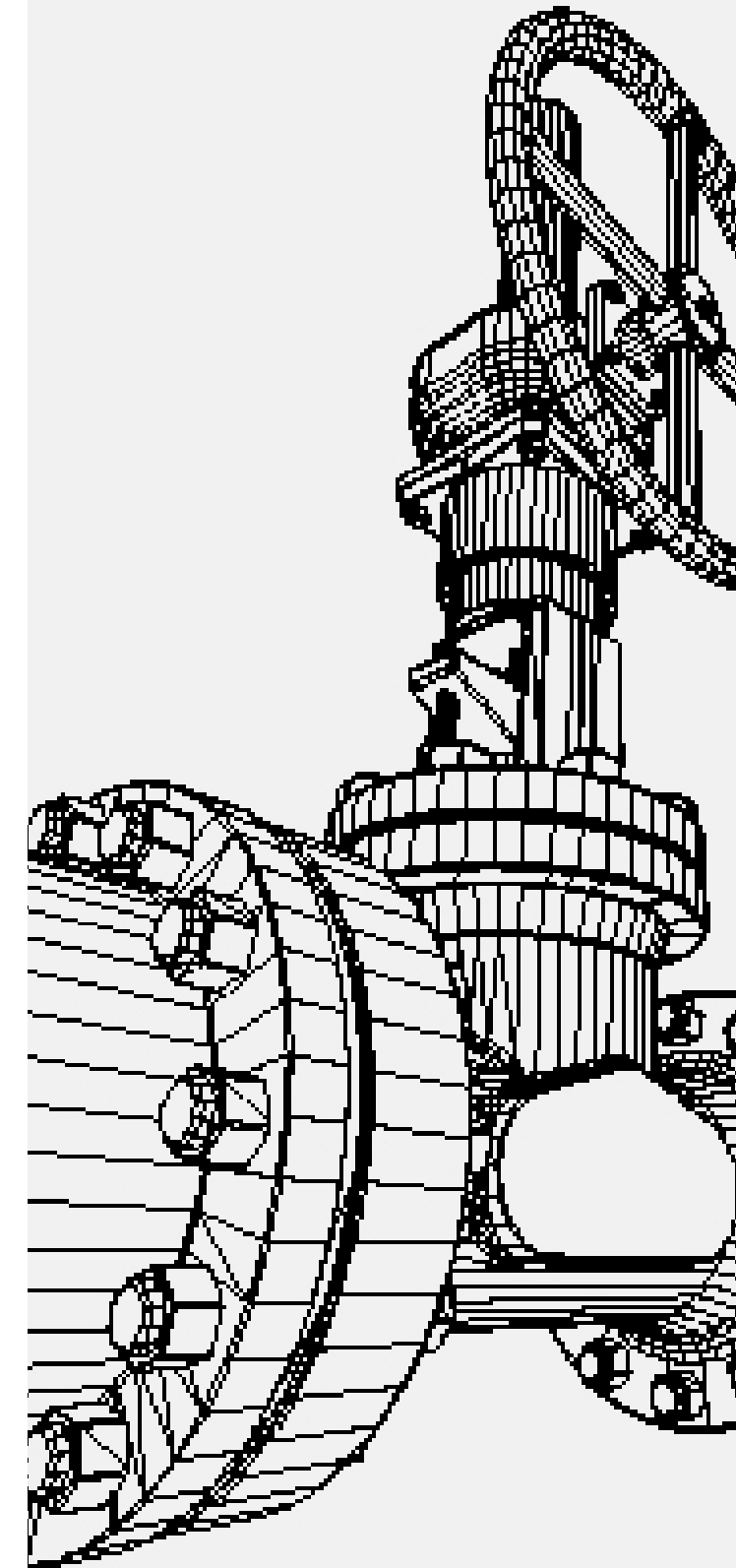
The new additions include:

- Database structural enhancements for storing and accessing project models

- Increased flexibility with more user-defined parameters

- Plotting features

- Absolute lateral static stability code check module in line with DNV-RP-F109 (2011)

Level One — Fast calculations for static stability of un-trenched pipes. It models displacement under the load caused by waves and current and includes other considerations such as cohesive and non-cohesive soils. Version 4 adds simplified analysis with options for logarithmic boundary layer formation and marine growth specification. The software provides an absolute stability check that conforms with the methodology defined in the DNV-RP-F109 version 2011.

"The software provides an absolute stability check that conforms with the methodology defined in the DNV-RP-F109 version 2011. "

"The new capabilities of v.4 include multiple wave seeds peer-run and further plotting and reporting capabilities."

Level Two — Comprehensive on-bottom pipeline design with calculations for clay and sand soils. It includes parametric-run functionality for pipe wall thickness and water depth. The latest release resolves a bug that produced an excessive prediction of embedment when water currents are the dominant force.

Level Two new additions:

- JONSWAP spectrum
- Verley and Lund for clay soils
- Verley and Sotberg for sand soils
- Parametric-run functionality for pipe wall thickness and water depth

Level Three — Complex modeling with finite element analysis. It consists of a user interface at the top level for data input, program control, and output to view and plot results. The random wave generation module computes the environmental forces and surface waves. It produces a velocity-time series for each point that it passes to the hydrodynamic forces module. The new capabilities of v.4 include multiple wave seeds peer-run and further plotting and reporting capabilities.
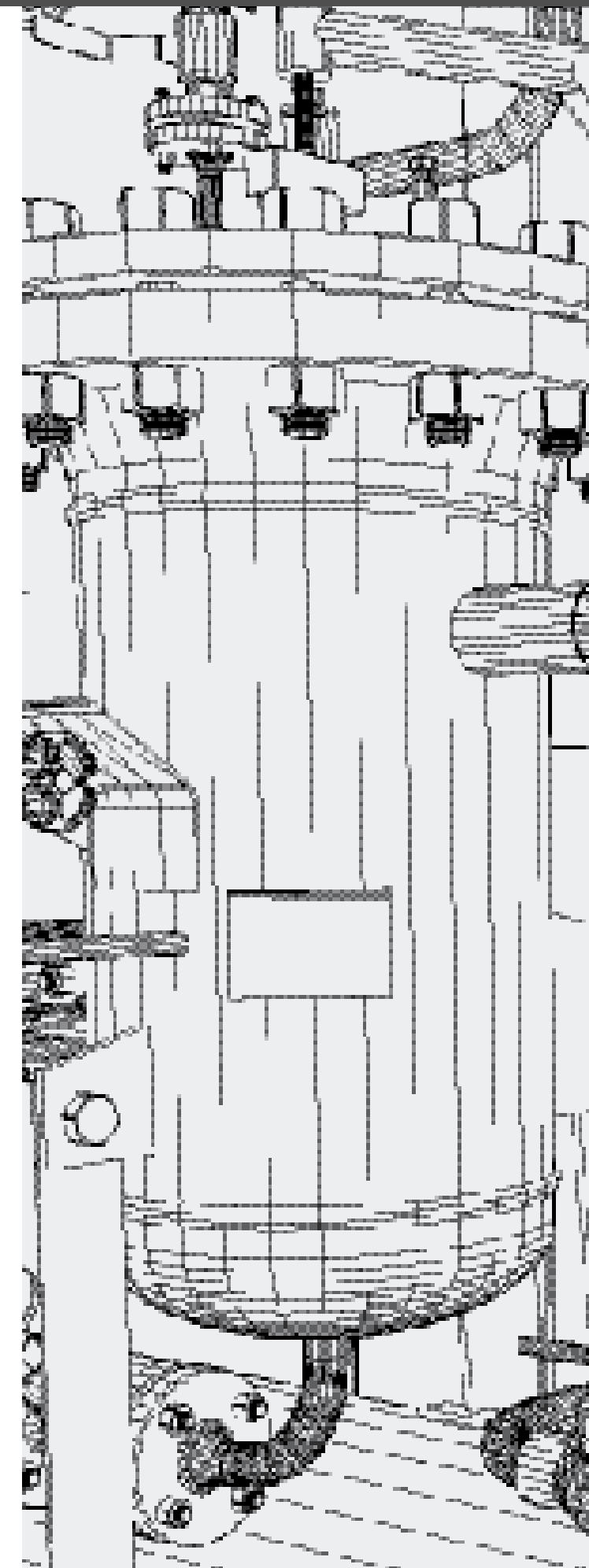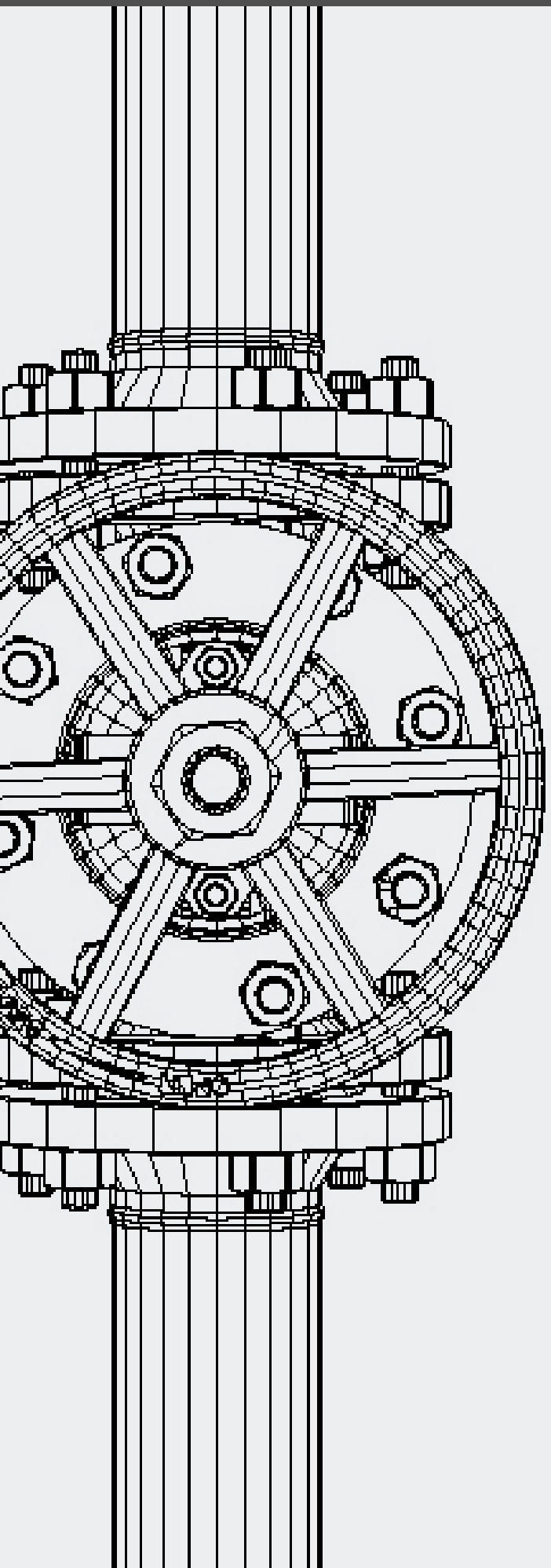
Conclusions

For the $70k investment to purchase OBS v.4, the list of advantages and benefits is long and remarkable:

- Eliminate the risk of losing as much as $280K per project

- Reduce the risk of a $100 million CapEx overspend to correct a design flaw

- Reduce the risk of incurring $50 million per year in OpEx cost to mitigate the defects

- Reduce the risk of losing more than 1 million BOE in reserves per well

- Reduces the risk of losing $150 million in revenue (un-discounted)

The Petrobras closure took place against a backdrop of a volatile petroleum market and uncertain regulatory conditions. Offshore competes with innovations that reduce onshore production costs, the emergence of alternative energy, and Net-zero sustainability initiatives. All of these factors make control more critical than ever before. CapEx and OpEx costs are sensitive to the initial subsea pipeline analysis and design.

The latest PRCI OBS Software Tool, OBS v.4, and the Pipeline HUB provide fast, efficient, and consistent OBS modeling. The results are valuable engineering time and resources saved, which deliver higher profitability and the capability to pursue more revenue-producing opportunities, whether in OBS or other engineering aspects.

"Offshore competes with innovations that reduce onshore production costs, the emergence of alternative energy, and Net-zero sustainability initiatives"

Click here to learn more about Technical Toolboxes

Next Steps

See OBS v.4 in action as an upgrade or a new solution as part of the Pipeline HUB. The HUB^{PL} transforms how engineers gather and manage data and provides a game-changing solution for engineering calculations.

· Upgrade Your Existing OBS License

· Start a Free Software Trial

· Book a Live Demo

CONTACT TECHNICAL TOOLBOXES TODAY!

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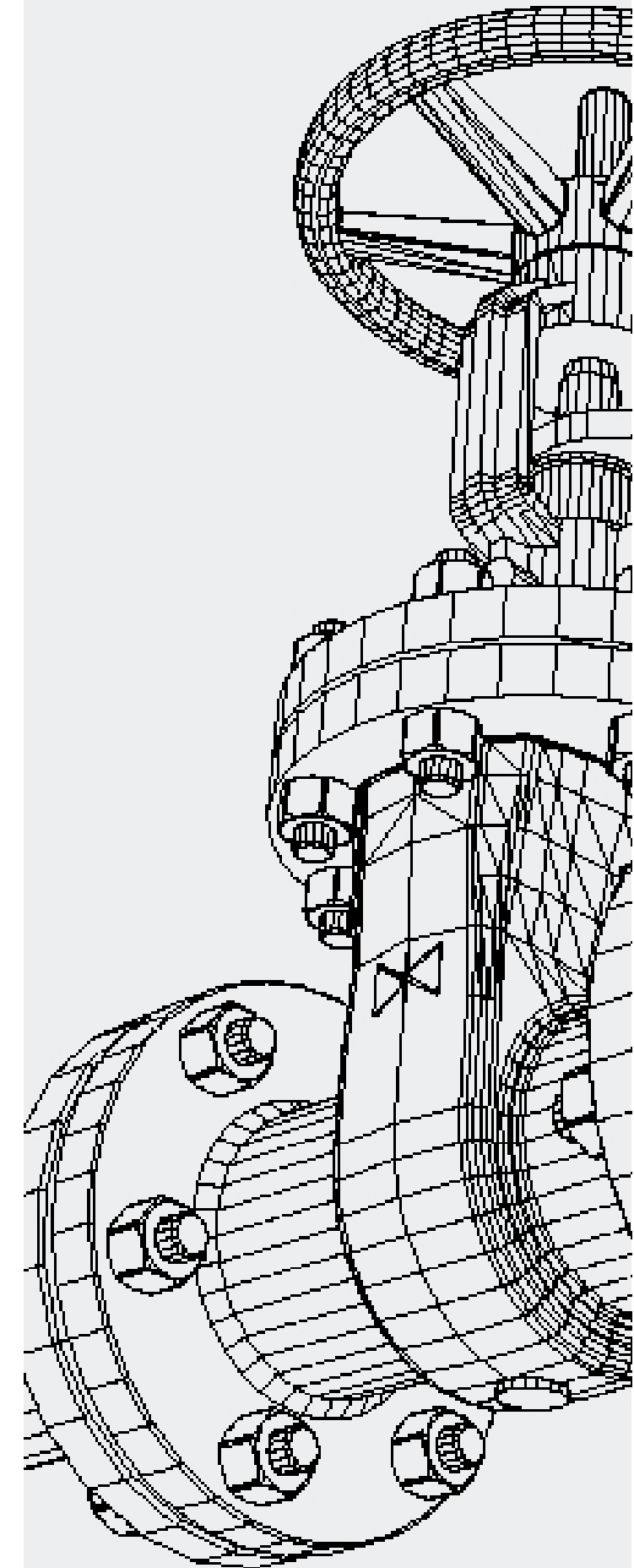
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Technical Toolboxes is a leading provider of integrated desktop and cloud-based pipeline software, online resources, and technical training for pipeline engineering professionals around the world. The integrated software products developed by Technical 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.