



# Delivering Operational Value Through Physics Informed Digitalization

How Orise Enabled BASF Antwerp to Turn Simulation into Everyday Operational Insight

## EXECUTIVE SUMMARY

At BASF Antwerp, managing complex pressurized utility networks across more than 50 plants requires deep operational insight, fast decision making and absolute reliability. As the site continued to expand over time, its brackish water and steam grids became increasingly difficult to monitor and stabilize using traditional instrumentation alone.

Together with BASF Antwerp and Siemens Simcenter, Orise played a central role in transforming advanced simulation models into an operational, real-time decision system.

By designing, automating, and operationalizing an Executable Digital Twin, Orise enabled BASF to move beyond reacting to issues and instead toward understanding root causes, predicting outcomes and optimizing operations continuously.

**The result? A stabilized grid, reduced environmental impact, faster troubleshooting, and a scalable foundation for site-wide digitalization.**



# THE CHALLENGE

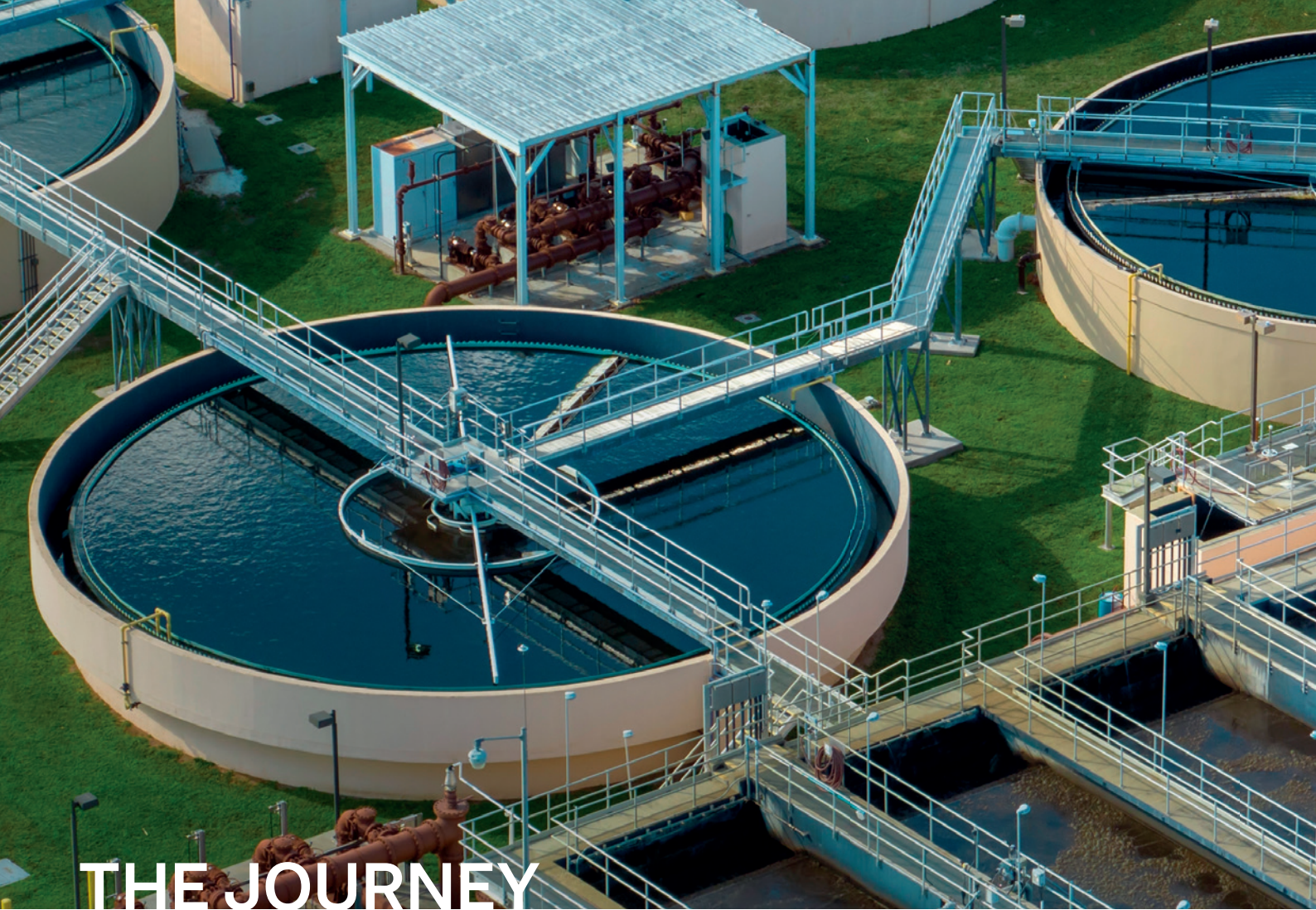
## Navigating Operational Complexity in the Dark

Imagine operating one of the world's most complex industrial utility infrastructures. BASF Antwerp's brackish water grid, primarily used for cooling, spans a massive site. It weaves through underground and elevated pipes to serve dozens of producers and consumers with constantly fluctuating loads.

Over years of incremental expansions, true visibility began to fade and obtaining clear, actionable insight became increasingly difficult:

- Flow distribution and residence times were hard to predict
- Untreated or partially blocked pipe sections were difficult to detect
- Grid disturbances could be observed, but not easily explained
- Adding sensors or instrumentation was impractical and cost prohibitive

While engineering teams had long used simulation for design and verification, **operations lacked a practical way to leverage physics-based insights in real time.** Bridging this gap required more than software. It required an approach that connected engineering accuracy with operational simplicity.



# THE JOURNEY

## Turning Simulation Into Daily Operations

Orise took on a critical mission: make advanced physics based modeling usable, reliable, and genuinely valuable for day-to-day operations.

We knew that simply handing over another complex engineering tool would not work. Instead, acting as the integrator connecting engineering, operations, IT, and cybersecurity, we focused on removing the hurdles that typically prevent digital twins from delivering real business value:

- Connecting live plant data securely and reliably
- Designing a robust data infrastructure and automation logic
- Managing failure scenarios without compromising operations
- Defining model update frequencies, redundancies, and plausibility checks
- Translating engineering complexity into operator-friendly workflows

Orise deliberately designed an operational system tailored specifically to how BASF operators actually work—resilient, straightforward, and focused entirely on decision support.



## THE SOLUTION

### Bringing an Executable Digital Twin to Life



Using Siemens Simcenter Flomaster, BASF engineering teams developed accurate thermohydraulic models of the cooling water and steam networks. Orise then elevated these models into a dynamic Executable Digital Twin, integrated directly with live operational data.

This closed-loop system continuously:

- Updates model boundary conditions based on real plant signals
- Calculates flow, pressure, temperature, and residence times virtually
- Provides operators with precise insight into what's happening and why

By hosting the solution in BASF's on premise environment, Orise ensured full control over data, cybersecurity, and availability. Now, operators have precise insight into exactly what is happening across the grid and why.

# The Impact: Real Visibility, Confident Decisions

With the Executable Digital Twin in place, BASF Antwerp experienced a massive shift in operational transparency. They achieved tangible outcomes, including:



## Key outcomes included:

- **Clear visibility** into flow distribution across the entire grid
- **Identification** of untreated or low flow pipe sections **without physical tracing**
- Better control of biocide dosing, significantly **reducing environmental impact**
- **Faster and more reliable** root cause analysis during grid upsets
- **Predictive insight** into the operational impact of changes and maintenance

What previously required manual investigation and guesswork can now be analyzed systematically and proactively.

**Most importantly, operators can now understand the causes behind the consequences, empowering them to make informed, confident decisions.**



# THE FUTURE

## A New Way of Work

**Our work went beyond just implementing technology; it fundamentally changed how teams collaborate.**

Historically, engineering and operations worked in parallel silos. Through thoughtful system design and automation, Orise linked them into a single, continuous operational loop. Orise enabled:

- Engineering accuracy to inform daily operations
- Operations feedback to improve and validate models
- A shared, trusted source of insight across teams

This shift unlocked value far beyond the initial use case. What began as a solution for cooling water optimization naturally expanded into steam networks and laid the groundwork for future assets such as new cooling towers. BASF Antwerp now has a repeatable, scalable framework that delivers continuous ROI.



# SCALABLE IMPACT AND FUTURE READINESS

The digital twin developed with Orise has proven to deliver greater business impact without increasing operational effort.

By embedding it into an automated, repeatable workflow, BASF Antwerp can scale the approach across additional utility grids and future expansions.

This creates a multiplier effect:

- One modeling approach
  - One operational framework
  - Continuous ROI through reuse and expansion
- As BASF Antwerp continues its digitalization journey, the Executable Digital Twin and the way Orise enabled it has become a foundation for physics-informed, future-proof operations.

## Unlock Your Full Potential with Orise

Orise transforms advanced industrial simulations into reliable, operational decision systems — turning digital potential into measurable business value.

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