

qontrol MAPS FOR FOUNDRIES

# HOW BREYDEN MOVED FROM EXPERIENCE- BASED PLANNING TO **AI-DRIVEN** CHARGE OPTIMIZATION

CUSTOMER CASE STUDY

**Breyden GmbH**

## **FROM STATIC RECIPES TO LIVE DECISIONS**

Charge planning moved beyond fixed recipes to reflect actual stock, operational constraints, and daily production priorities.

## **MAKING THE YARD VISIBLE**

Digital scrap yard transparency turned material availability into a real planning input.

## **FOUR WEEKS TO OPERATIONAL VALUE**

A fast rollout created lower costs, better transparency, and more stable daily planning.



## FOREWORD

In an era of volatile raw material prices and increasingly complex supply chains, the traditional methods of foundry management are reaching their limits. For many years, the industry treated charge planning as a static, technical calculation — a “recipe” to be followed. Today, that approach is no longer enough to maintain a competitive edge.

The Breyden project represents a fundamental shift in how a modern foundry operates. It is not merely a story of software implementation or the digitization of existing manual tasks. Instead, it is a blueprint for transforming operational data into strategic decision intelligence.

The core philosophy of this project was simple yet ambitious: to close the gap between the theoretical world of planning and the physical reality of the scrap yard. By integrating metallurgical logic with real-time inventory and a continuous feedback loop, Breyden has moved beyond simple cost-cutting. They have built an architecture where every melt is an informed economic decision, and every operational constraint is an opportunity for optimization.

This document outlines the journey from a fragmented, experience-based planning model to a synchronized, self-learning production environment. It serves as a testament to what is possible when a foundry stops viewing digital transformation as a technical burden and starts seeing it as the foundation for long-term cost leadership and operational stability.

**The future of the foundry is no longer about calculating more; it is about deciding better.**

**Dr. Stefan Griesser**

Head of Sales at qoncept technology GmbH

## PIONEERING TECHNOLOGIES

### MAKING INTELLIGENT PRODUCTION A REALITY

Software and engineering solutions that increase process efficiency, optimize raw material use, and increase operator safety in steelmaking.

#### GLOBAL FOOTPRINT

15+

Software Projects

5

Countries Software

50+

Equipment Projects

17

Countries Equipment

40+

Consulting Projects

9

Countries Consulting

#### PRODUCT PORTFOLIO

##### SOFTWARE & HARDWARE

###### qontrol MAPS

Raw material management & charge optimization

###### qontrol steelmaking

Level 2 automation & digital twins

###### qontrol MES

Manufacturing execution system

###### qontrol LMS

Ladle management system

###### qonsole

Operator terminals & camera systems

##### EQUIPMENT & DEVICES

###### qouplerG

Automatic gas coupling system

###### qouplerM

Patented multi-media coupler

###### qouplerD

Automatic slide gate coupling, globally unique

###### Bins & Silos

Complete industrial silo systems

###### Engineering Services

Custom mechanical design & revamps

##### CONSULTING & STUDIES

###### Metallurgical Process Consulting

Measurable improvements in melt shop operations

###### Digitalization & Software Strategy

Feasibility studies and transformation roadmaps

#### COMPANY HISTORY

2018



##### FOUNDATION

Founded in Leoben, Austria, by metallurgists with strong industrial backgrounds.

2019



##### ARCHITECTURE AND ENTITY

Establishment of the software architecture creates the scalable foundation for modular qontrol integration. qoncept engineering GmbH is founded as a dedicated entity for hardware integration and field operations.

2020



##### FIRST PRODUCTIZED SYSTEMS

The Scrap Tracking System marks the transition to a productized operational software system in live steel production. qouplerM reaches market readiness and enters the patent process as the first productized hardware system.

2022



##### INTEGRATION AND PATENTS

qontrol evolves into a plant-wide Level 2/3 production control system. Patent granted for qouplerD, expanding the portfolio into automated slide gate actuation.

2024



##### SCALE AND INTERNATIONAL EXPANSION

The qontrol platform expands with dedicated modules for heat optimization, ladle tracking, and scrap yard management. qoncept Americas Inc. is established to serve North American customers.

TODAY



##### 100+ PROJECTS WORLDWIDE

Active operations across Europe, the Americas, and Asia.

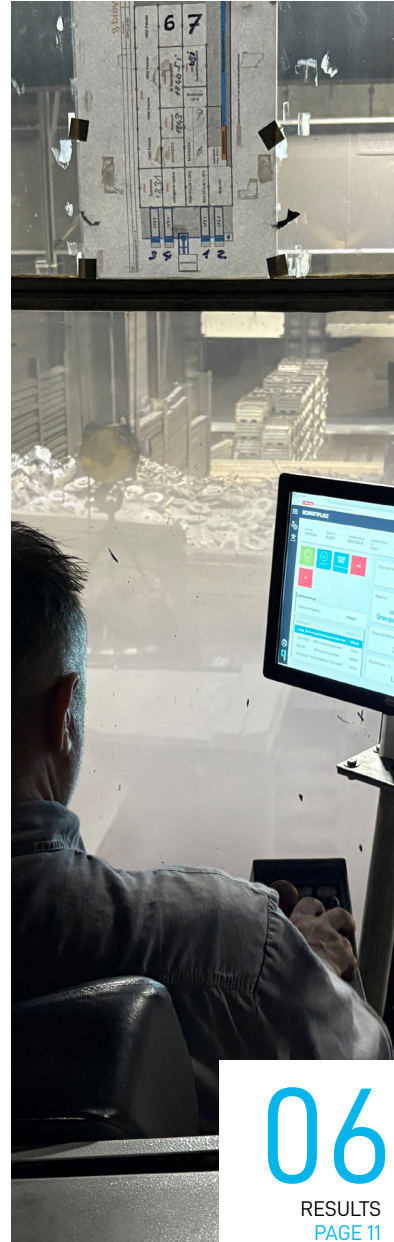
# CONTENTS



**01**  
CUSTOMER  
CONTEXT  
PAGE 5



**02**  
INITIAL  
PROBLEM  
PAGE 6



**06**  
RESULTS  
PAGE 11

**01 CUSTOMER CONTEXT**.....5

Why charge planning had become a central economic decision in Breyden's dynamic foundry environment.

**02 INITIAL PROBLEM**.....6

Static recipes, manual coordination, and limited yard transparency prevented economically optimal charge decisions.

**03 DECISION BASIS**.....7

A feasibility-based business case, executable results, and a system built around real plant constraints.

**04 SOLUTION APPROACH**.....9

control MAPS connected optimization, metallurgy, and live yard data in one operational system.

**05 IMPLEMENTATION**.....10

A four-week rollout established the data backbone, yard transparency, and execution workflow.

**06 RESULTS**.....11

Lower production costs, higher transparency, better planning stability, and improved use of return materials.

**07 LEARNINGS AND OUTLOOK**.....13

The project showed that better decisions require live data, closed loops, and self-learning logic.



# 01 CUSTOMER CONTEXT

Breyden GmbH operates in a foundry environment in which economic performance is strongly influenced before the melt even begins. The selection of purchased materials, internal return materials, alloy additions and immediately available stock determines not only the cost of the next heat, but also process stability, energy demand, purchasing flexibility and delivery reliability. In such an environment, charge planning is not an isolated technical task. It is one of the central economic decisions of the entire operation.

At Breyden, this challenge had become more visible because the external environment was no longer stable enough for traditional planning logic. Raw material prices changed frequently, availability on the market did not remain constant, customer requirements required flexible production decisions, and energy cost could no longer be treated as a negligible background variable. Under these conditions, a foundry can continue to produce with conventional methods, but it becomes increasingly difficult to produce at the economic optimum.

The key point is that Breyden did not have a metallurgy problem in the narrow sense. The company had a decision-quality problem in a dynamic operating environment. Operators and planners were able to run production, but the organization lacked a digitally connected system that could turn all relevant inputs (materials, prices, inventories, restrictions and production priorities) into one coherent and immediately executable charge decision. That gap between operational reality and planning logic is what made the project strategically important.

This customer context matters because it explains why the project was not positioned as the rollout of a calculation tool. From the beginning, the objective was broader: create a system that reflects the reality of the plant, improves daily raw-material decisions and makes the foundry more controllable, more transparent and more economically responsive. In Breyden's case, the project therefore sat at the intersection of production, scrapyard logistics, purchasing, controlling and digital execution rather than inside only one technical department.

At Breyden, charge planning became a strategic task because prices, availability, and material flows could no longer be managed with static logic.



## 02 INITIAL PROBLEM

Before the implementation of qontrol MAPS, Breyden's charge planning followed the pattern that is still common in many foundries. The plant relied on predefined recipes, manual stock-level checks, experience-based adjustments and a planning logic that was practical but structurally static. This did not mean that the process was disorganized. It meant that a highly dynamic system was still being managed with methods designed for a more stable reality.

The first weakness of this setup was the gap between planning and the real material situation. Stock values, incoming deliveries, storage locations, internal return flows and actual availability were not yet part of one live, synchronized decision environment. That meant the planning side could not always work with a fully reliable, real-time picture of what was truly available and immediately usable. In daily operations, such gaps are usually bridged by experience, phone calls, local workarounds and conservative decisions. Production continues, but planning quality remains below what would be possible with better data integration.

The second weakness was the role of the scrap yard. In the previous state, the yard was primarily a physical storage and handling area, not a strategic data source. Material movements, re-allocations, withdrawals and actual charging events were not all embedded in a closed digital loop that directly supported optimization. In practice, that made the scrap yard a logistical blind spot. Material was present, but its precise decision value for the next heat was not always visible at the moment it mattered most. This is one of the reasons why static planning persists in many foundries: the yard is managed physically, while optimization is attempted conceptually somewhere else.

A third problem was that charge planning remained too narrow in scope. Reaching the target chemistry is obviously essential, but in real foundry operations that alone is not enough. A feasible and economical charge also depends on current stock, material

reservations, yard capacity, lot-specific availability, the role of internal return materials, metallurgical and energy relevant effects, as well as practical execution constraints such as handling sequence and charging instructions. Without a decision system that considers all these dimensions together, the result may be chemically acceptable while still being economically weaker than it could be.

Finally, Breyden faced the broader strategic problem that static planning hides opportunity. When a foundry works with recipes and manual coordination, it often underestimates how much value can be created through better use of the same materials, better visibility of the yard, faster recognition of shortages or surpluses, and a closer link between purchasing and actual production needs. The plant does not necessarily feel inefficient, because production continues. But it leaves money, transparency and responsiveness on the table every day.

Breyden did not primarily have a metallurgy problem. It had a decision-quality problem in a dynamic and constrained operating environment. Static recipes, manual coordination and limited scrap-yard transparency were no longer sufficient to reach the economic optimum.



## 03 DECISION BASIS

The project at Breyden started from a different question than a conventional software rollout. The key question was not, "How can we digitize the existing recipe process?" It was, "What information must be connected so that the foundry can make the best possible charge decision under current operating conditions?" That change in perspective became the real decision basis for the project.

From that point onward, charge planning was no longer treated as a narrow calculation around target chemistry. It was reframed as an integrated decision problem. The correct result would not be the most familiar recipe, nor the mathematically cheapest theoretical blend, but the lowest-cost executable solution that satisfied production, quality and operational requirements at that moment. To reach such a solution, the project had to combine production orders, inventory, purchasing information, internal circular materials, practical restrictions and process constraints in one logic.

This also meant that data quality and operational relevance had to be elevated to the same level as algorithm quality. A highly sophisticated optimization model is of limited value if it works with an incomplete picture of the yard or if its output still has to be manually translated into actionable instructions. Breyden therefore did not need a system that simply calculated more. It needed a

system that improved the decision basis itself: better visibility into the actual state of materials, better connection between planning and execution, and better translation of constraints into executable results.

Another important element of the decision basis was the requirement that the solution remain practical in daily use. The project was never intended to replace operator knowledge with abstract software logic. The goal was to create a system that uses live data, optimization and metallurgical intelligence to support better decisions while remaining close to the real workflow of planners, crane operators, purchasing staff and production management. In that sense, the decision basis was both technical and organizational: improve the quality of the charge decision, but do so in a way that strengthens actual plant execution rather than creating a parallel world on screen.

This is also where the feedback-oriented element of the solution became relevant. The system was intended to become better over time by learning from actual use, actual execution and actual production response. In the context of Breyden, this should be understood as continuous improvement of decision quality through a closed operational loop. The business value lies in making the next decision better informed than the previous one.

After evaluating different solutions on the market, Breyden chose the one that offered the greatest potential for cost savings combined with the highest level of practical usability and operator acceptance.



Finally, an upfront feasibility study was conducted in which Breyden's operational data was loaded into the software environment. Based on this data set, multiple optimization calculations were performed to compare the existing charging logic with an optimized, constraint-based planning approach. The purpose of this step was to quantify the real cost optimization potential under Breyden's actual production conditions rather than relying on generic assumptions or broad benchmarking values.

The results of this feasibility study formed an important part of the decision basis for the project. They showed where economic

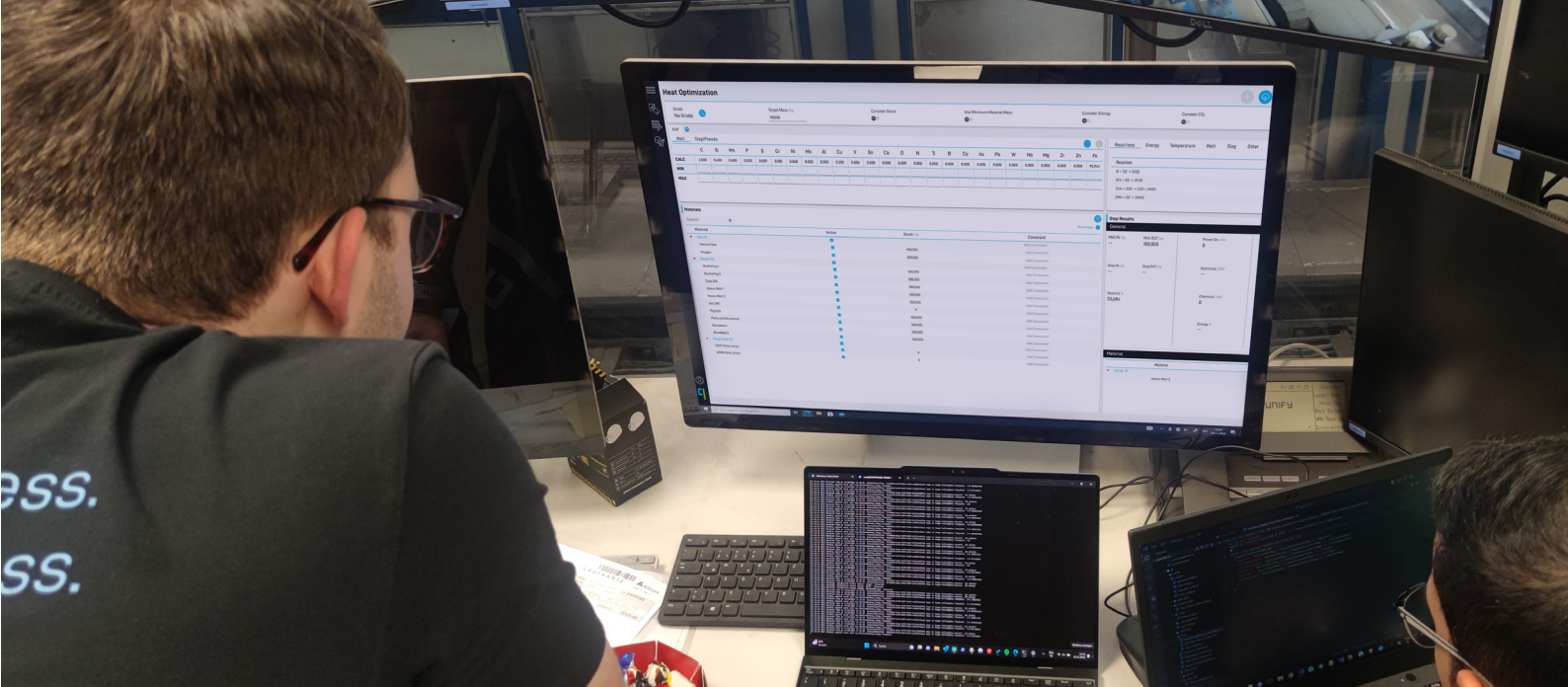
improvements could realistically be expected and made it possible to derive a structured forecast of the business impact. This forecast translated the technical optimization potential into an economic perspective that could be understood by decision-makers. In this way, the project was not just justified as a software initiative, but as an investment case with measurable cost reduction potential and a clearly communicated operational upside.



**Michael Hermann**  
Meltshop Foreman



Since the implementation of qontrol MAPS and the active support of the qoncept team, we have succeeded in raising our raw material management to a new level in terms of both price and quality in a very short time. In addition, the automated process control will improve the accuracy of our operations and make our daily work much easier.



## 04 SOLUTION APPROACH

qontrol MAPS was implemented at Breyden as a connected decision system rather than as a standalone charge calculator. Its role was to transform a fragmented and partially static planning environment into one integrated framework in which the best executable charge could be determined from current conditions. The heart of the solution was the coupling of three elements: advanced optimization, metallurgical process logic and live operational data.

The optimization component searches through possible material combinations under multiple simultaneous restrictions. This is important because a foundry charge is never governed by one variable only. Material cost, stock availability, lot restrictions, return-material flows, reservations, practical handling conditions and production priorities all interact at the same time. A useful system must therefore handle more than a recipe library or a narrow least-cost blend; it must identify a feasible result inside a constrained real-world system.

The metallurgical component ensures that optimization remains grounded in process reality. A charge that looks cheap on paper has no value if it is not technically sound in the melt. qontrol MAPS therefore evaluates candidate solutions not just against cost, but also against the metallurgical and process requirements that define whether the charge can actually be run. In Breyden's context, this was essential because the project had to produce decisions that were not merely elegant, but genuinely operable in daily production.

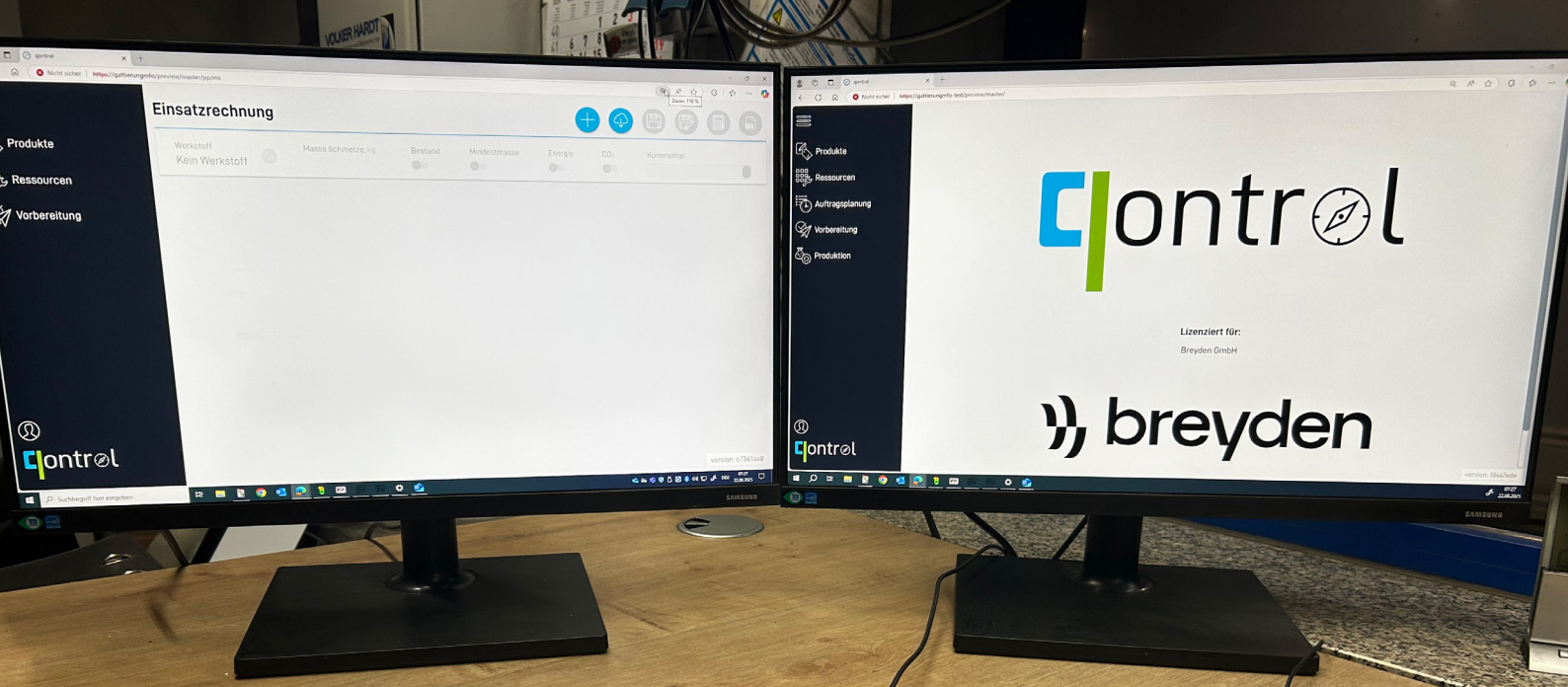
The third element, and in practical terms one of the most important, was the live integration of the scrap yard and internal material flow. This is what turned the project from "optimization software" into a broader operational transformation. Deliveries, storage positions,

movements, withdrawals, reservations and actual loading events were digitally captured so that the yard became a real-time decision layer. Internal circular materials were handled as first-class planning inputs rather than as an informal side stream. This changed the role of the yard fundamentally: from logistical black box to strategic source of optimization-relevant information.

Within this broader solution, the feedback-oriented and partly self-learning nature of the system became an important differentiator. Value is created through a continuous improvement loop: planned charges, actual charging data, production feedback and operational experience help refine future decisions. Over time, the system supports better estimation of how materials behave in this specific plant context, reduces unnecessary uncertainty and enables more confident planning with fewer conservative buffers.

Another major strength of the solution was executability. qontrol MAPS was not intended to provide a theoretical optimum that operators still needed to reinterpret manually. The target was an immediately usable result. This is where the project clearly differentiated itself from many generic optimization narratives in the market. At Breyden, the real value was not only that the system could optimize. It was that it could optimize against actual stock, actual restrictions and actual execution logic, then translate the result into instructions that the plant could use directly.

As a whole, the solution approach can therefore be described as a shift from static planning to operationally grounded decision intelligence. It connects economics, metallurgy, scrap-yard transparency and execution into one system. That is why the project was strategically significant: it changed how the foundry decides, not just how it calculates.



## 05 IMPLEMENTATION

The implementation at Breyden was not a one-time installation event. It was a structured transition from fragmented planning logic to a digitally connected operating model. The first step was to establish a reliable data backbone. Orders, inventories, relevant price information, process parameters and practical restrictions had to be brought into a single environment that the planning system could use consistently. This did not mean replacing all existing systems. It meant connecting the existing digital landscape in a way that made real-time planning possible.

The second step was operational embedding. A planning result is only valuable when it arrives at the right place in the right form. At Breyden, this meant translating optimization output into practical instructions for crane operators, planners, control-room personnel and purchasing. The user layer had to follow the workflow of the plant, not the internal logic of the software. That requirement is more important than it appears: many technically strong industrial systems fail because they make good calculations but poor operational handovers. In this project, implementation success depended on keeping the path from decision to execution short and clear.

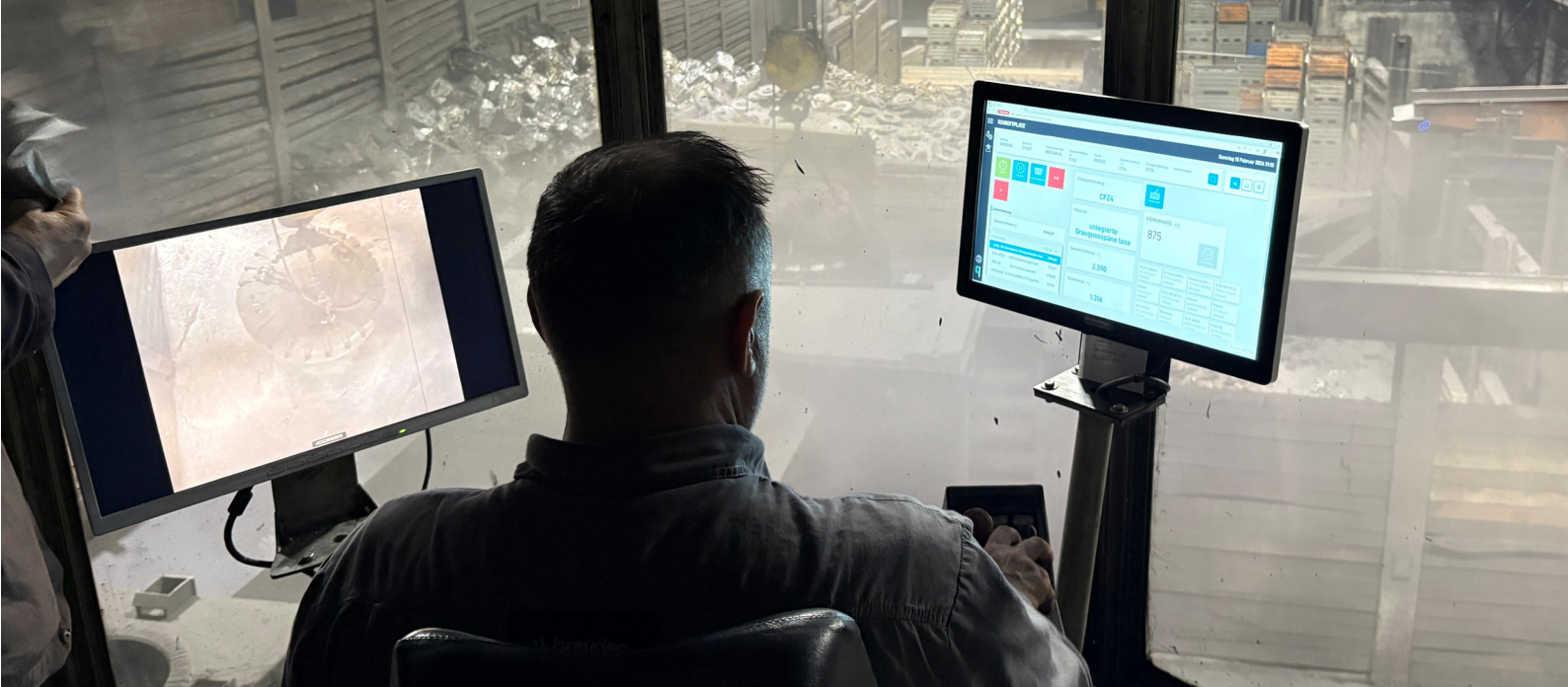
The third step was the digitalization of the scrap yard and associated material movements. This was a decisive implementation element because the entire optimization concept depended on working with a truthful and current picture of what was actually available. Deliveries were digitally recorded, storage locations became visible, movements and withdrawals were tracked, and actual charging events were fed back into the system. The result was that the optimization no longer worked with nominal or delayed stock values alone, but with the state of the yard as it really existed.

A further implementation advantage was the modularity of the architecture. Breyden did not have to wait for one large and disruptive big-bang rollout before seeing value. The project could be staged, integrated into existing workflows and expanded over time.

This mattered both for technical reasons and for organizational acceptance. In foundry environments, systems that respect the maturity of the operation and can be introduced incrementally usually deliver stronger long-term adoption than systems that require all-or-nothing change from day one.

What makes the Breyden implementation instructive is therefore not only the technical rollout itself, but the sequencing. First create a trustworthy data basis. Then turn the yard into a live source of truth. Then connect planning and execution. That sequence is what made the project credible operationally rather than remaining a conceptual optimization exercise.

**4 Weeks**  
from project decision to  
software readiness and reduced  
production cost!



## 06 RESULTS

The first visible result at Breyden was economic. Once charge planning was connected to the metallurgically intelligent optimization logic, material decisions became more deliberate and less conservative. This immediately reduced production costs without requiring compromises in quality or throughput.

The second result was greater process transparency. Before the project, parts of the material flow and stock reality were handled through manual or fragmented logic. After implementation, the organization had a much clearer view of what was in the yard, where it was located, what had been reserved, what had actually been loaded and how planning differed from execution. That transparency mattered not only for production, but also for purchasing, controlling and management. The foundry became easier to steer because its material system became more visible.

The third result was improved operational stability. A planning process that works against actual stock, actual restrictions

and practical execution logic naturally reduces last-minute improvisation. Shortages and bottlenecks become easier to detect early. Deviations between plan and real execution can be analyzed rather than simply absorbed. This does not eliminate operational complexity, but it changes the organization's relationship to complexity: instead of reacting manually to every surprise, the plant increasingly works with a system that anticipates and structures the next decision.

A fourth result was better use of internal return materials. In many foundries, these streams are economically significant but operationally under-managed. At Breyden, integrating them into the same planning and data environment as purchased materials improved their practical value. They could be considered systematically, not opportunistically. This strengthened both cost efficiency and raw-material transparency.

By working against actual stock and practical constraints, the system replaces last-minute improvisation with a structured process that anticipates bottlenecks before they happen.

A fifth result, and one that is strategically important for long-term differentiation, was the improvement of decision quality through feedback. Because planning, execution and production response were digitally linked, the system could support more informed future decisions with less dependence on static assumptions alone. In the Breyden case, this should be read as a plant-specific continuous-improvement effect. The system became more useful because the foundry stopped treating planning as a one-way calculation and started treating it as a loop.

Finally, the project created a platform for future expansion. Once a foundry has real-time yard transparency, connected planning logic and a feedback-oriented execution loop, it is possible to move beyond isolated heat optimization and begin thinking in broader campaigns, delivery horizons and plant-wide economic windows. That forward path is important because it shows that the Breyden project was not merely a local productivity improvement. It created the architecture for a more strategic production model (see **Figure 1**).



**Figure 1:** Strategic Results of Process Optimization



## 07 LEARNINGS AND OUTLOOK

One of the clearest learnings from the Breyden project is that foundry optimization is not primarily a mathematics or melt chemistry challenge. It is a decision-quality challenge. Optimization matters, metallurgical intelligence matters, and system architecture matters, but none of these create value in isolation. They create value only when they are connected to the actual material system, the actual workflow of the plant, and the actual execution process on the shop floor.

A second learning is that the scrap yard cannot remain a semi-manual black box if meaningful optimization is the objective. As long as the yard is managed physically while planning is performed conceptually somewhere else, the organization will continue to operate with blind spots. The Breyden case shows that digitalizing the yard is not just an inventory improvement. It is one of the foundations of charge quality and therefore of cost leadership.

A third learning is about how to position the feedback-oriented, partly self-learning nature of the system. Once planning, execution, and production data are connected, the foundry can continuously improve the basis of future decisions. That is a meaningful differentiator because it reduces uncertainty where conventional static master-data logic would otherwise remain frozen.

A fourth learning is that usability is not secondary. Even the most advanced decision system will fail if the result reaches operators, planners, and purchasing teams in a form that is difficult to interpret or awkward to execute. One reason the Breyden case is valuable as a reference is that it demonstrates how operational clarity and digital execution support can be combined with technical sophistication rather than traded off against it.

The outlook extends beyond real-time inventory transparency and real-time price integration. The software already provides the capability to determine the effective chemical analysis of each

scrap grade autonomously and on a continuous self-learning basis, even though this functionality was not part of the implementation scope in the Breyden project. Instead of assuming that a scrap grade has one fixed chemistry stored in static master data, the system continuously derives and updates the actual chemical behavior of the material from production, charging and execution data.

This is particularly relevant because scrap quality is not constant. The chemical composition of a given scrap type can change over time due to supplier changes, lot-to-lot variation, market shifts or changing source material. The software captures these shifts continuously and updates the planning basis accordingly. In this way, the system does not merely digitalize inventory and price information in real time, but also transforms chemical scrap characterization from a static assumption into a dynamic, data-driven and self-learning element of the optimization logic. As a result, another major block of static master data is eliminated and replaced by a continuously improving representation of actual material reality.

For that reason, the Breyden project should not be understood as a finished digital state reached once and for all at go-live. Its real significance lies in establishing a more mature operating model: one in which the foundry makes better, faster, and more economically grounded decisions because it has a more truthful, more dynamic, and more actionable understanding of its own production reality.



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