

Hydrometallurgical battery recycling at industrial scale

What really matters for reliable, high-recovery and future-proof operations

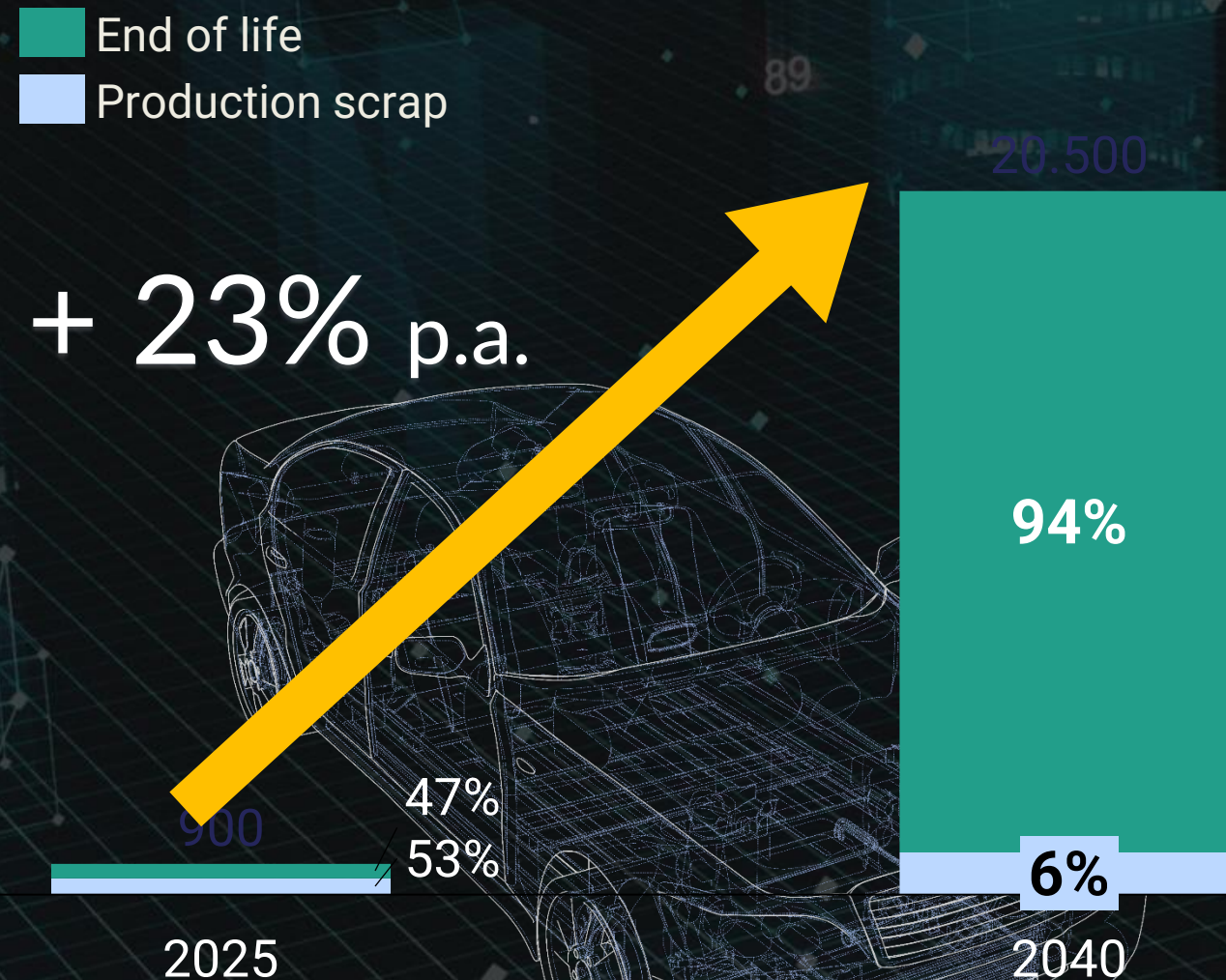


Presented by Dr. Michel Siemon

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Market & regulatory context

The volumes are coming.
The regulation is already here.

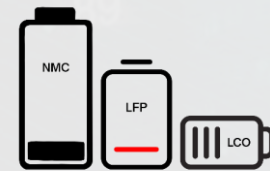


Source: McKinsey Battery Insights, 2023 Q1; Reference: Global total, kiloton (Numbers are rounded)

- 1 1 TWh global battery demand — constantly growing since 2024
- 2 EU Battery Regulation: binding recycled content targets from 2031
- 3 End-of-life volumes will hit in scale from 2030: operators need to be ready now!

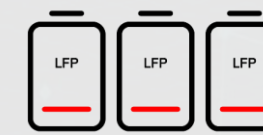
The challenges that matter

Four issues that don't show up in a lab, but define whether a plant succeeds.



FEEDSTOCK VARIABILITY

Chemistry shifts week to week,
the process must keep up



THE LFP REALITY

LFP share is growing & your process
must handle the mix, not fight it.



SULPHATE MANAGEMENT

By-products require a strategy,
not an afterthought



START-UP COMPLEXITY

Flowsheet interactions emerge
during operation

Hydrometallurgy: beyond the narrative

Today's hydromet performance challenges common industry assumptions.

“Hydromet inevitably leads to high OPEX”

Reagent consumption is widely viewed as a major cost driver.



Process-driven OPEX

OPEX is shaped by process maturity, optimized reagent use and controlled separation.

“Hydromet generates excessive waste”

Large residual streams are frequently linked to hydromet routes.



Designed to minimize waste

Selective process design turns residual streams into manageable outputs.

“By-product volumes are high & difficult to reuse”

Secondary streams are often perceived as challenging residual materials.



Value-generating outputs

Secondary streams are converted into saleable products with defined quality targets.

The solution for successful operations

We provide the technology and know-how to run world-class battery recycling plants. You take it from there.



Discharging & Dismantling



Shredding & Beneficiation



Hydrometallurgy

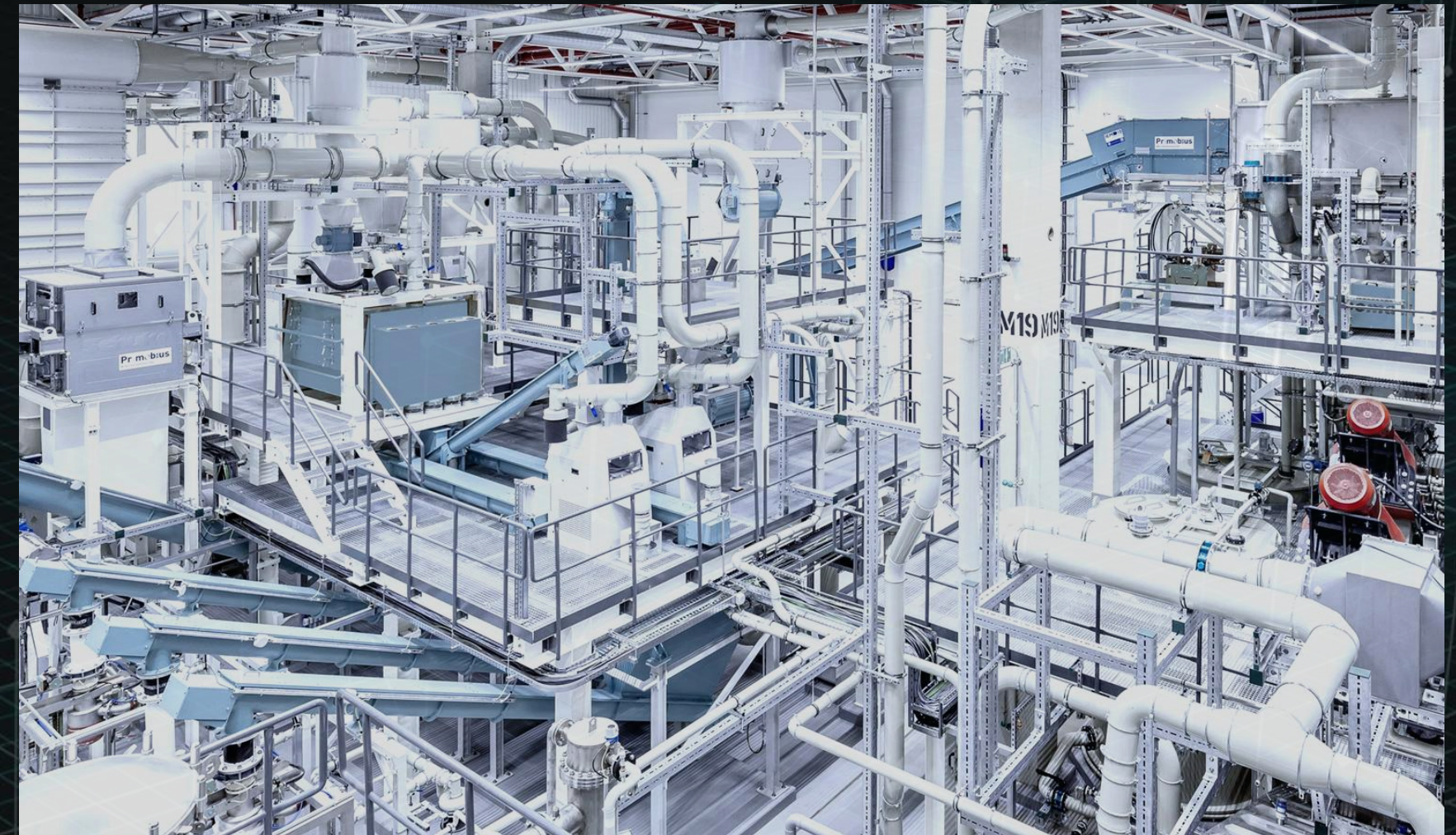


Lifecycle services

From concept to implementation

As a trusted technology partner, we are building a large-scale battery recycling plant for Mercedes-Benz

- **Integrated plant** including shredding and beneficiation as well as hydrometallurgical plant
- **Fully fed with Mercedes Benz batteries**
- Serves as **own supply** for Mercedes' battery value chain
- **Joint technology development** focuses on process optimization and continuous improvement in recovery, quality, sustainability and cost efficiency



Hydrometallurgy: where robustness is built

Benefits of efficient hydromet plants in numbers.
Not targets, but operating parameters.

98%

RECOVERY
RATE

100%

REAGENT
RECYCLING LOOP

100%

SODIUM-FREE
CIRCUIT

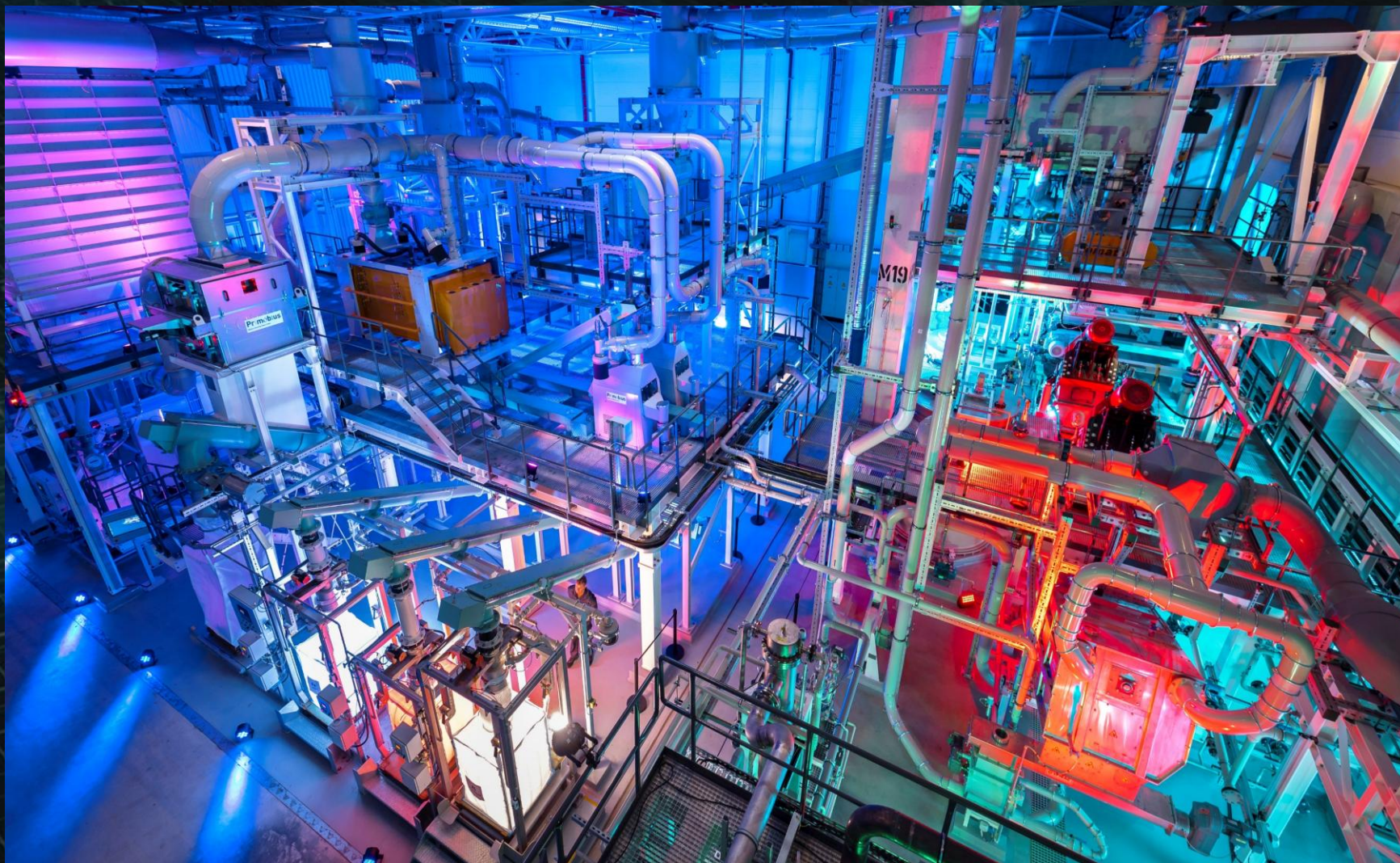
close to 0%

WASTEWATER
(ZERO LIQUID DISCHARGE)



Key takeaways for your recycling success

Industrial scale battery recycling is not just a bigger lab.
It is a different discipline.



- 1 Choose a partner offering reliable process design right from the start, built-in flexibility, and operational experience
- 2 Invest early in getting the fundamentals right: integrated design, process robustness, and an uncompromising focus on product quality.
- 3 Let us connect. Because that is exactly, what Primobius was built for.

Thank you

Let's shape a better tomorrow together!



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