Decarbonizing Cement by Advanced Analytics in Holcim's Plant of Tomorrow Program

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conneqt

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Decarbonization, Head of Industrial IT

SeeQ®

HOLCIM

HOLCIM
GLOBAL LEADER IN INNOVATIVE AND SUSTAINABLE BUILDING SOLUTIONS

BUILDING MATERIALS

- AGGREGATES
- CEMENT
- READY-MIX CONCRETE
- CONSTRUCTION MATERIALS

SOLUTIONS & PRODUCTS

- ROOFING
- INSULATION
- TILE ADHESIVES
- FACADE

HOLCIM
GLOBAL LEADER IN INNOVATIVE AND SUSTAINABLE BUILDING SOLUTIONS

~60K
Employees

2030 & 2050
1.5 degree aligned net-zero targets, validated by SBTi

300
Patents in green construction

100+ Start ups
in our open innovation ecosystem

29 B CHF
Net Sales

21%
reduction in our CO_2 per net sales by 21%

40+
University collaborations

#1
R&D organization in our industry

5
worldwide R&D hubs

DECARBONIZING BUILDING

GREEN OPERATIONS
Decarbonizing Holcim

BUILDING BETTER WITH LESS
Decarbonizing construction

CIRCULAR CONSTRUCTION
Building new from old

MAKING BUILDINGS SUSTAINABLE
Decarbonizing cities

NET ZERO FUTURE HOLCIM APPROACH

Rigorous and science-driven

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

Transparent

Industry's first Climate Report in 2022; second report in 2023

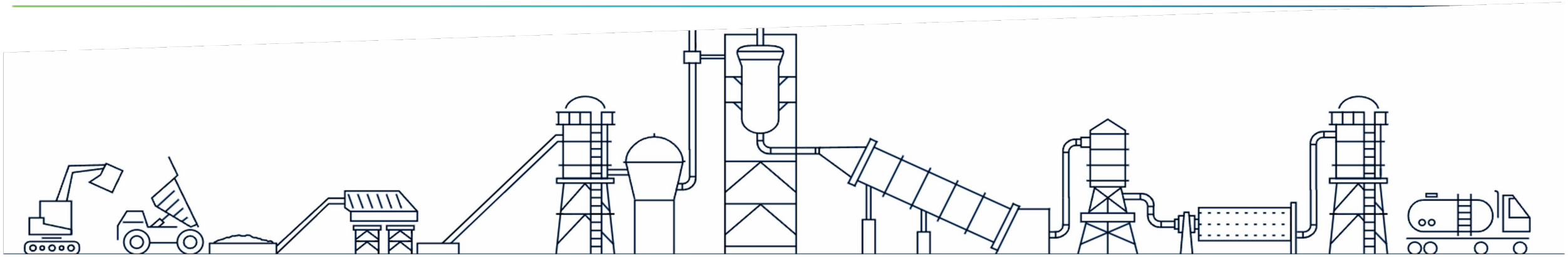
Globally recognized

FT FINANCIAL TIMES statista CLIMATE LEADERS 2022

Giving **shareholders** a say on our **climate strategy**

96%
approved in 2023

CEMENT MANUFACTURING 101
FROM QUARRY TO LORRY



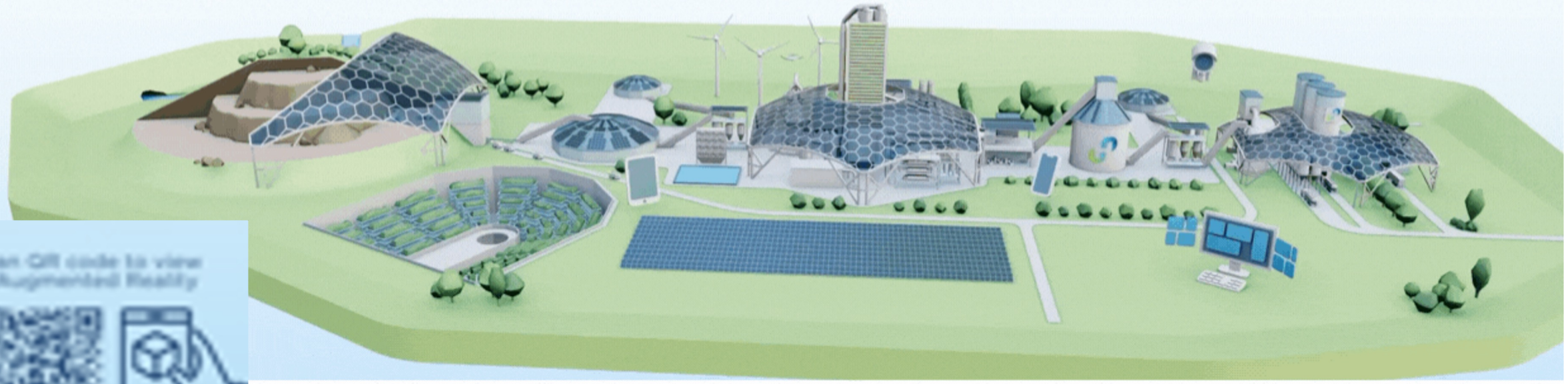
Quarry and Raw Materials			Clinker Production					Cement Grinding and Distribution		
Quarry	**Crusher**	**Transport**	**Mixing bed**	**Raw mill**	**Preheater**	**Kiln**	**Cooler**	**Clinker Silo**	**Cement Mill**	**Logistic**
Limestone and other raw material are extracted using drilling and blasting techniques	The quarried material is reduced in size in crushers by compression or impact	The crushed raw material is transported to the plant, mainly using conveyors or trucks	The limestone, clay and other raw materials are mixed and homogenized	The homogenized raw materials are milled and dried in a mill into a raw meal	The raw meal is preheated before entry into the kiln	At flame temperature up to 2000°C and materials temperatures up to 1450°C the raw materials are transformed into clinker minerals	The molten clinker is rapidly cooled	Cooled clinker is stored in preparation for grinding	Clinker is ground with gypsum and other cementitious materials to form the final cement	Cement is transported in bags or as a bulk powder by trucks, rail, ships

NEXT GENERATION TECHNOLOGIES
INDUSTRY 4.0 LARGEST DEPLOYMENT IN THE SECTOR

GREEN OPERATIONS

Our Plants of Tomorrow program is deploying automated and data-driven solutions to make our operations more sustainable, from robotics to predictive maintenance.

THE PLANTS OF TOMORROW



Scan QR code to view in Augmented Reality

SIMPLICITY AUTOMATION SELF SERVICE

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HOLCIM'S PLANTS OF TOMORROW

EXECUTIVE SUMMARY: 40+ PRODUCTS, 2000+ DEPLOYMENTS IN 130+ PLANTS

1. **PLANTS OF TOMORROW** is our global program to develop, deploy and operate end-to-end Industry 4.0 solutions across our operations, from quarry to lorry

2. Through this program **WE HELP FOSTER A NEW CULTURE OF INNOVATION** by empowering our people to own the digital transformation of their plants

3. **OUR ROADMAP OF TECHNOLOGIES** offers any plant opportunities to use Industry 4.0 to get to the next level in operational performance

4. **WE ARE DEVELOPING, REPLICATING AND SCALING TECHNOLOGIES,** alongside our industry partners, with 40+ products to date, and a new products pipeline in development

5. **WE'RE DELIVERING TO AMBITIOUS TARGETS AS PART OF STRATEGY 2025,** targeting over CHF 100M annual savings by 2025 while reducing carbon emissions

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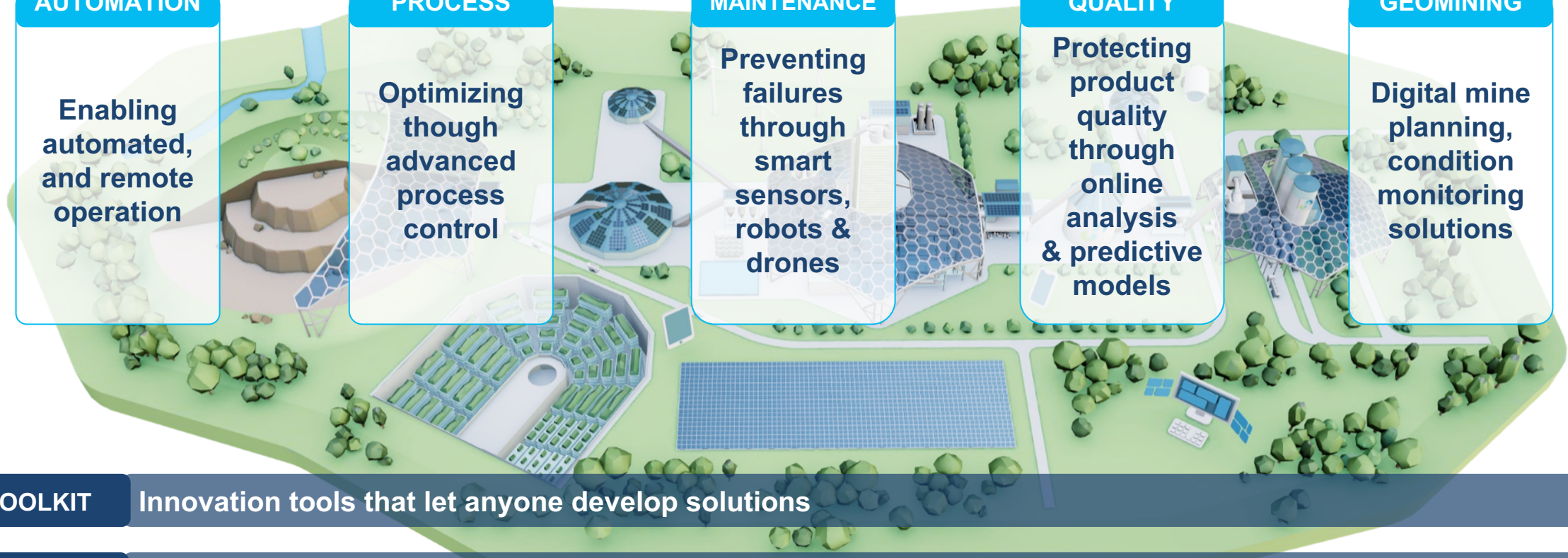
PLANTS OF TOMORROW: WHERE WE IMPACT HOLCIM

WE DEVELOP AND OPERATE DIGITAL TECHNOLOGIES FROM QUARRY TO LORRY

OUR PLANTS OF TOMORROW PRODUCTS ARE GROUPED INTO 7 PORTFOLIO GROUPS



AUTOMATION

Enabling automated, and remote operation

PROCESS

Optimizing though advanced process control

MAINTENANCE

Preventing failures through smart sensors, robots & drones

QUALITY

Protecting product quality through online analysis & predictive models

GEOMINING

Digital mine planning, condition monitoring solutions

TOOLKIT Innovation tools that let anyone develop solutions

PLATFORM The systems to collect data from anywhere in our operations, at any time

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PLANTS OF TOMORROW: ANALYTIX | SEEQ
JOURNEY SINCE 2020

Journey:

2020: various vendors contacted and evaluated their fit to Plants of Tomorrow

2020/21: 6 months pilot in two cement plants in Switzerland and Italy; custom API developed to integrate Holcim MES systems

2021: 3 months of industrialization and testing scalability with 2 more two cement plants; fully developed and productive API

2022/23: 18 plants in total onboarded and using Seeq daily, 3 more plants ongoing

2024: 23 plants in total onboarded and using Seeq daily, 10 more plants ongoing, additional 8 planned for 2nd half of the year

PLANTS OF TOMORROW: ANALYTIX | SEEQ
SELECTED CASES #1

PROCESS

Optimizing though advanced process control

Energy savings due to fast and frequent reaction on cem performance changes

Improve Cooler stack emissions by using Seeq's analytics tools in a simple way for operational parameters monitoring and analysis to drive the decisions and meet EP optimum operation

Reduce CO2 emissions

Increasing of kiln and cement mill average output

Thermal Process Optimization : TSR +1%, PRI +0.5%

QUALITY

Protecting product quality through online analysis & predictive models

Cement quality improvements, reduce the clinker factor

Improvement of the cement strength uniformity; clinker reactivity improvement; decreasing of clinker LSF Standard Deviation

Increase clinker quality, avoiding the nonconforming clinker production; reduce the off-spec clinker

Self-service analytics is a key enabler in Holcim's Plant of Tomorrow program, enabling plant engineers to both improve process performance and simultaneously upskill in analytics
Here are the highlights of some of the >100 use cases this effort delivered in optimizing emissions, energy usage, materials quality, productivity, maintenance cost, and more.

PLANTS OF TOMORROW: ANALYTIX | SEEQ
SELECTED CASES #2

MAINTENANCE

Preventing failures through smart sensors, robots & drones

Main Fan Performance Monitoring
Reduction of transportation from the emergency to Clinker patios and feeding the tolve, reducing carriage costs.
Monitor the performance of the AF feeding line and assess the functioning of the AI-control loop
Diagnostics of downtime causes and eliminating them
Enable online equipment diagnosis – enables performance of faster and more frequent equipment condition analysis
Kiln Performance Statistics and search of representative performance data as basis for a CAPEX project

AUTOMATION

Enabling automated, and remote operation

Time saving for the process team to analyze the huge amount of data using Seeq
Opportunity savings by gaining better efficiency
Set analyzed limits and a standardized methodology to operate the kilns
Identification of outlier or peak data – shows probable weak points or bias in the data.

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PLANTS OF TOMORROW: ANALYTIX | SEEQ
STATISTICS

STATISTICS

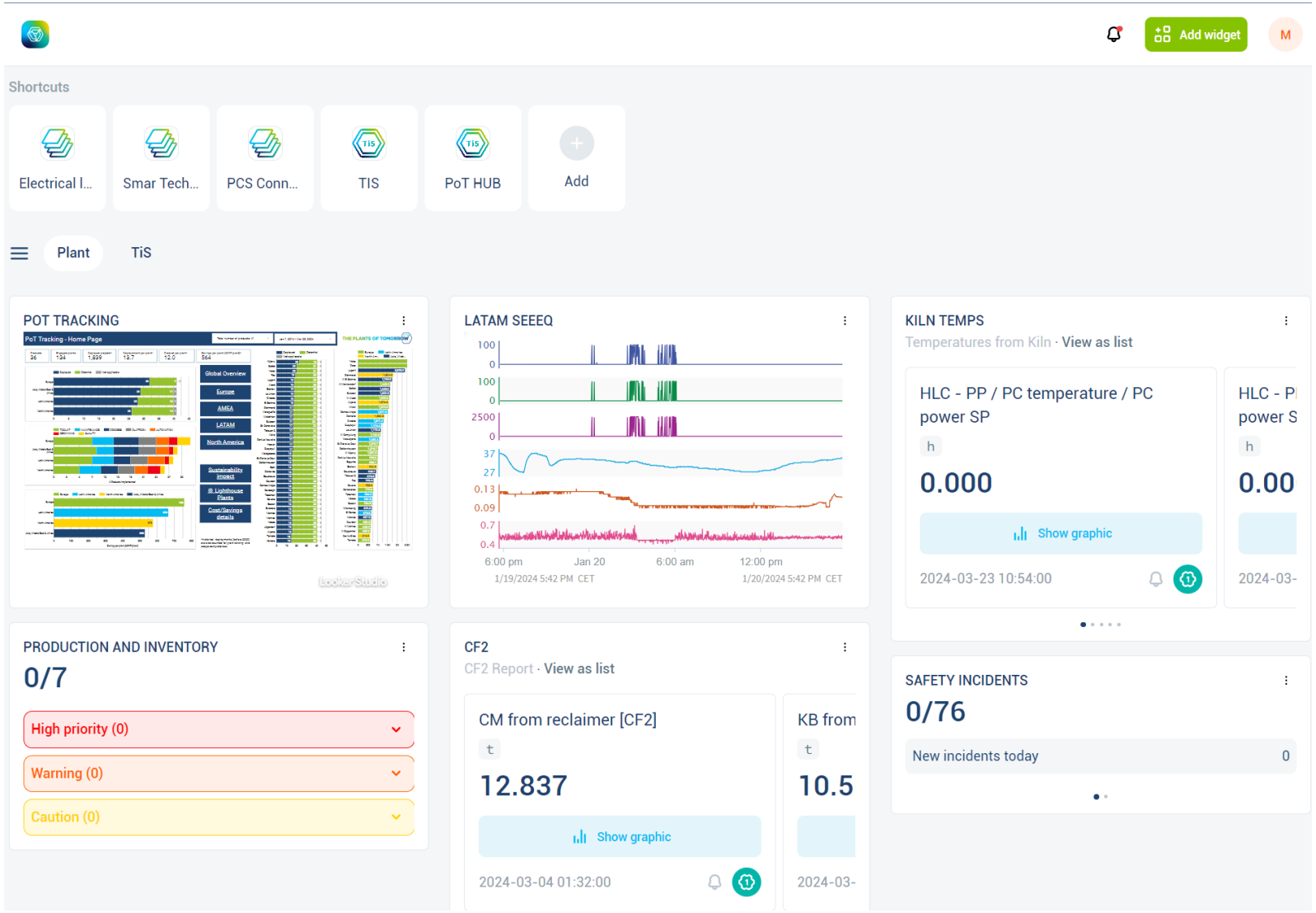
300+ GB of data analyzed monthly

33 data sources (plants)

14+ million signals connected

100+ users

PLANTS OF TOMORROW: ANALYTIX | SEEQ
INTEGRATION



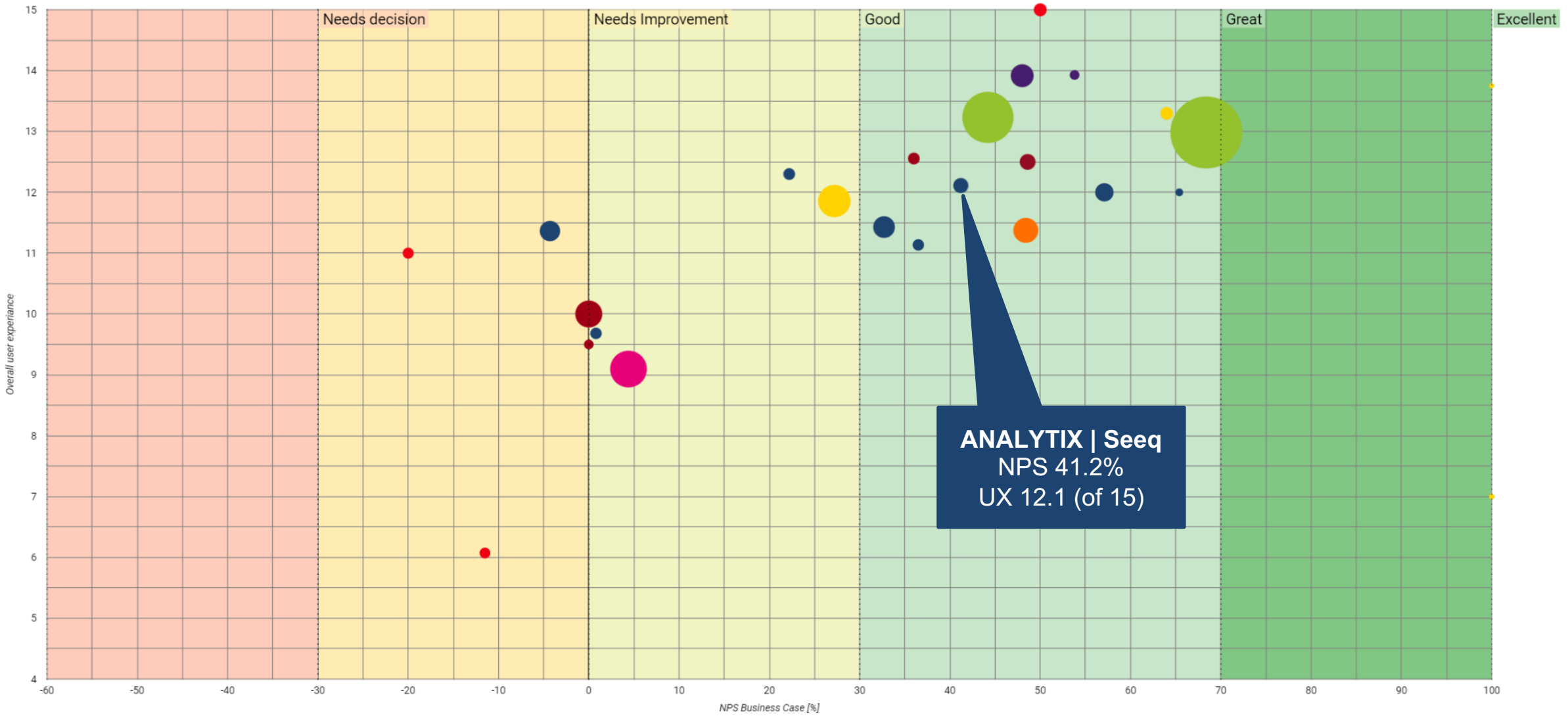
Integrated in plant daily work and processes

Integrated with plant single source of truth

Integrated with Google SSO

Integrated in Portal - a plant super app

PLANTS OF TOMORROW: ANALYTIX | SEEQ
BuSINESS ACCEPTANCE AND USER EXPERIENCE



Best Practices Sharing

- **Organizational alignment: right people in right roles, with adequate time allocation**
  - Invest in and upskill people, and be ready to adjust organization and operating model on the way
  - Invest in people upskilling on all levels
- **Business driven Technology**
  - Start with the problems that matter most to the business and have the clear business case and ROI
- **Things don’t have to be technically perfect from Day 1, but the added value must be clear**
  - Time value of money – capture value while models mature and build credibility
- **Large efforts that create value in few years don’t always play out this way**
  - Start with what you have, with plants/people ready to explore, “play”, and experiment
  - Combine “low hanging fruits” projects with strategic, technology enabling platforms
- **Build partners ecosystem**
  - Decide what you want/can own & build and what you should get from partners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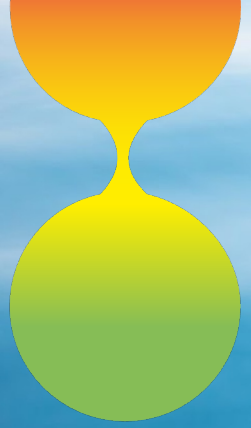
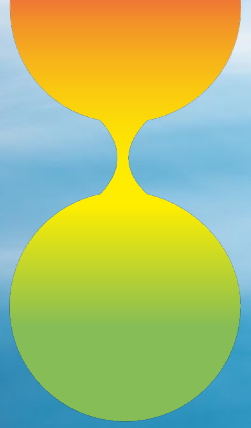


Q&A



Thank You