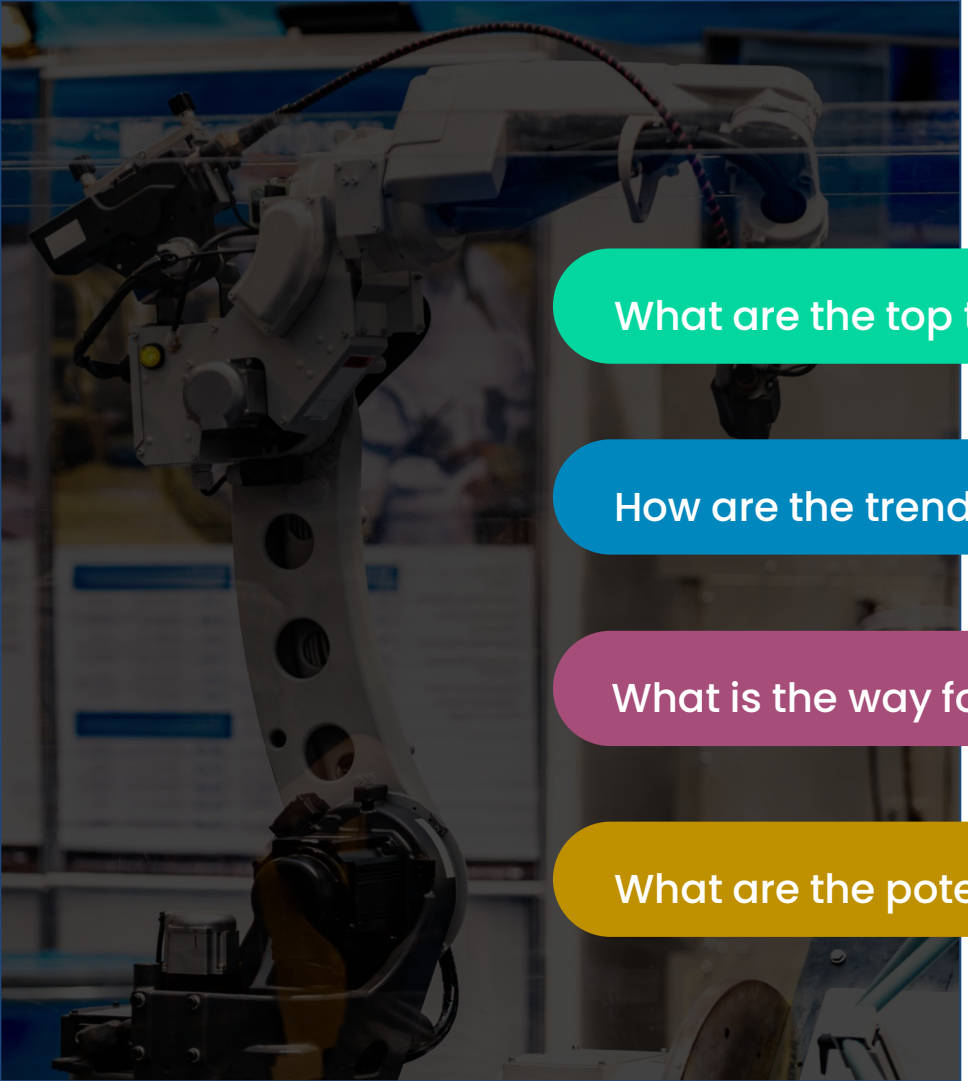
INCISIV

Market Report

Enterprise Recipe Management

IN PARTNERSHIP WITH

SIEMENS



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Trends and Challenges

Changing consumers preferences and a challenging business environment warrant a wholistic reassessment and alignment of strategy and operations.

Changing consumer preferences, challenging macroeconomic conditions and ever-intensifying competition define the new normal for consumer businesses. This operating environment is putting tremendous strain on business operations with shortening product lifecycles, escalating costs and unpredictable demand.

Demand volatility increased by 50% in 2020 and continues to rise as consumers look for healthier, organic products and they shift to brands involved in sustainability initiatives. The challenge is further compounded by unprecedented supply disruption due to the pandemic, shipping lane closures or the war.

Current trends that call for immediate technology advancements:

- Need for new, varied product assortments and enhancements to meet region-specific demands.
- Declining brand loyalty has increased the proliferation of new brands with advanced supply chain capabilities.
- The growth of private label products has forced brands to create new products in shorter time spans.
- Increased costs of raw materials, natural resources and shipping/freight charges call for resilient and flexible supply chains.
- Supply disruptions have forced companies to develop alternate recipes.

Consumer Mindset

40%
Shoppers have changed their brands or purchase behavior.

44%
Shoppers are now purpose-driven when it comes to making purchases.

Rising Production Costs

Up to 120%
Y-o-Y increase in input costs.

20%
Y-o-Y increase in energy costs.

Growth of Private Labels

11.4%
Growth in the private label 'Produce' category.

2.7%
Growth in the private label 'Beverage' category.

Demand Supply

30%
Increase in supply uncertainty.

7X
Increase in demand seasonality.

Getting the strategy right, plus aligning and streamlining the operations for optimized execution are imperative for survival.

Manual Recipe Management

Most CPG organizations maintain physical records of recipes, new food regulations, safety standards and formulation history.

As a result, all the data has to be collected and collated every time a new product is developed. This slows the design process and increases the error rate of production, thereby causing costs to rise considerably.

Time-to-Market

In the formulation and design phase, teams have to collaborate and collect data for formula development. Recipe data is not stored in digital modules.

More than 2/3 of R&D professionals say it takes 6 months to a year and sometimes longer to get a new product out in the market.

Production at New Locations

When shifting plant locations for production, professionals have to recalibrate equipment, ingredients quality and raw material usage.

This information is not stored in a central location for quick scaling up across different plants. Yet, only 36% of supply chain professionals across Europe plan to adopt flexible automation solutions (vs. only 24% across the U.S.).

Productivity Goals

Supply chain costs for CPG organizations rose by ~100% during the pandemic. They were constantly under pressure to revamp their operations.

Digitization of supply chain operations, along with performance intelligence are great ways for CPG organizations to increase revenues by up to 3% through better product availability and superior customer service.

Implications

While most CPG organizations are focused on meeting changing consumer expectations, they still need to streamline and optimize manufacturing operations.

Product Development

Food manufacturers are unable to maintain continuous product development cycles. With new compliance regulations and allergen listings, gathering data and inputs from various departments for designing the formula takes months.

Data Storage and Management

Most CPG organizations have a manual approach to recipe storage. They lack a central digital repository where recipes, guidelines and processes can be saved and altered at any given time.

Operations Management

Executives in the CPG industry face labour and equipment challenges when product demand surges. Line managers have to manually check machine calibrations, and perform multiple product tests to determine favorable conditions for new recipe executions.

Global Production Management

Every organization has a 'Golden Recipe' for their most popular product. However, they fail to maintain the taste and flavor of the product across different regions and plants. Manufacturers neither access plant capacity nor compare recipe bills-of-material (BOMs) to improve operational efficiency.

18%

Loss in productivity per annum due to poor plant layouts and process ergonomics.

47%

CPG executives stated that securing key inputs for products in a timely manner and/or keeping products in stock is a major challenge.

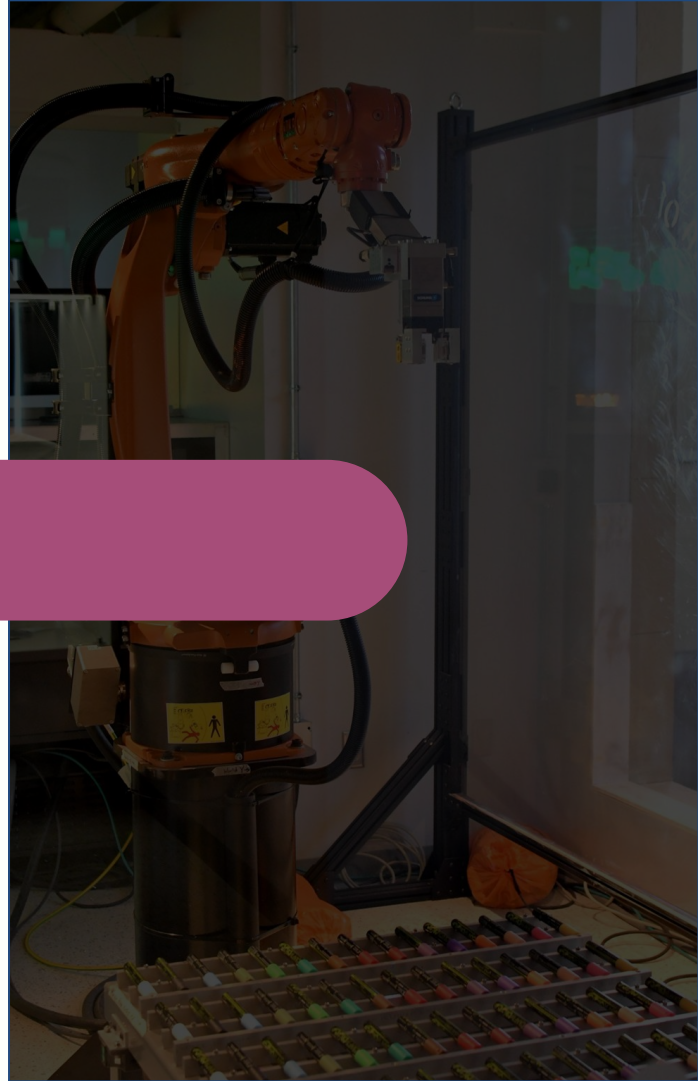
4 out of 5

New product launches have failed in less than 4 years at large CPG organizations.

10X

Overage on budgeted time for recipe customization/localization.

The Way Forward



An Enterprise Recipe Management solution integrates design, lifecycle management, flexible manufacturing and traceability phases of product development to enhance performance and improve profitability.

The Siemens Recipe Transformation solution is a common repository for recipes, product/process specifications and equipment specifications. The solution bridges the gap between product design and optimized equipment usage on the shop floor. It addresses some of the major manufacturing challenges faced by the industry, such as:

- Provides access to the 'Bill of Materials' and allows the creation and storage of the 'Bill of Processes.'
- Uses a module-based approach for recipe formulation, which increases the speed of scaling recipe design and formula execution across plants globally.
- Improves production efficiency through automated batch management and decoupled process executions.

35%

CPG executives consider recipe formulation and customization as one of their top 10 priorities.

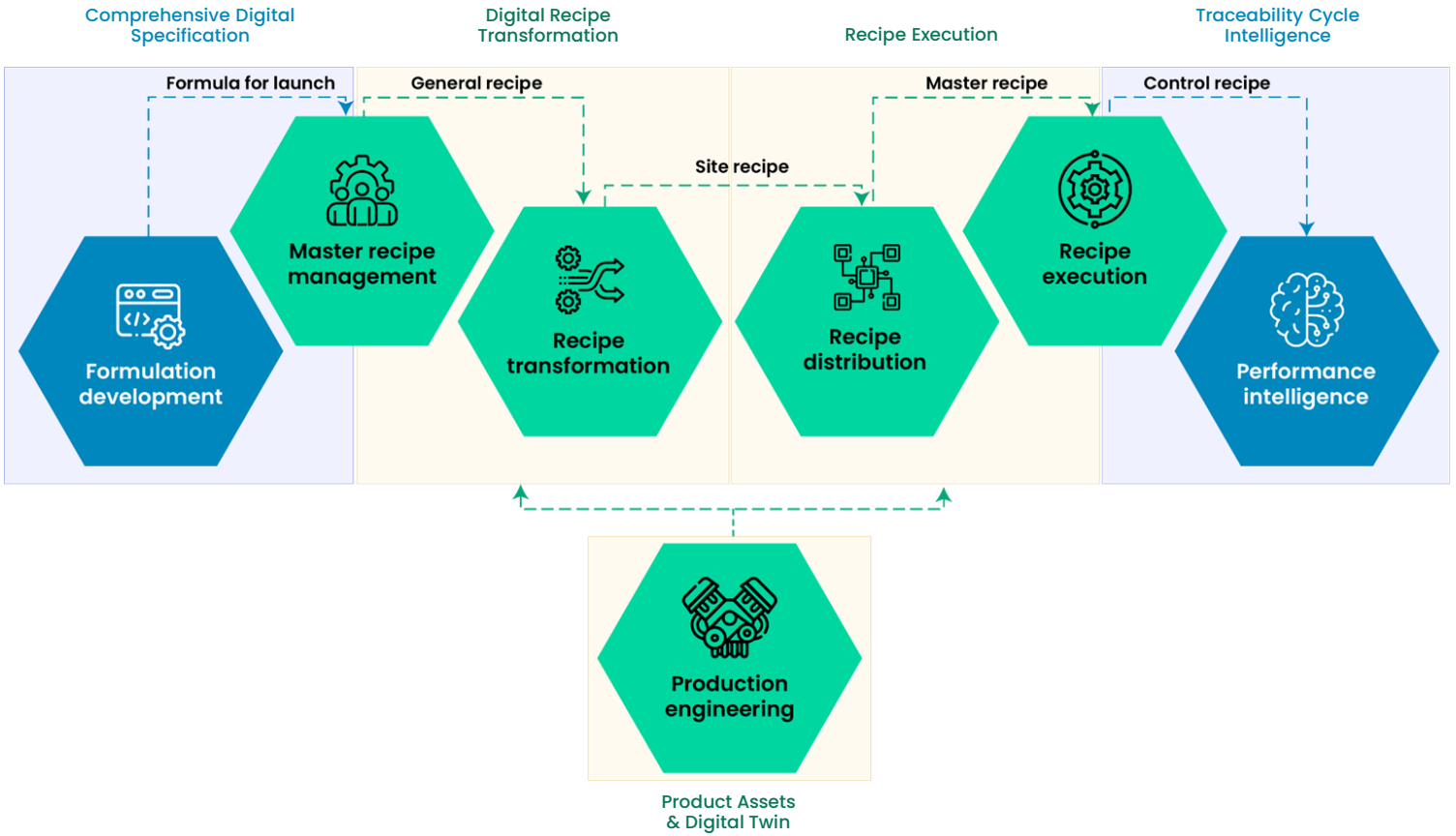
25%

CPG organizations **consider 'Manufacturing Process improvement',** and **'Visibility of Plant Network Performance'** as a top 5 priority.

"Traditionally, two people have to work through approx. 500 pages of documentation to identify and evaluate abnormalities.The Electronic Batch Record Software achieves the same result in one second flat, because only alarms, discrepancies and so on are shown in a systematic manner."

Dr. Kristin Stolpman,
Senior Manager Quality Assurance,
BioNTech AG

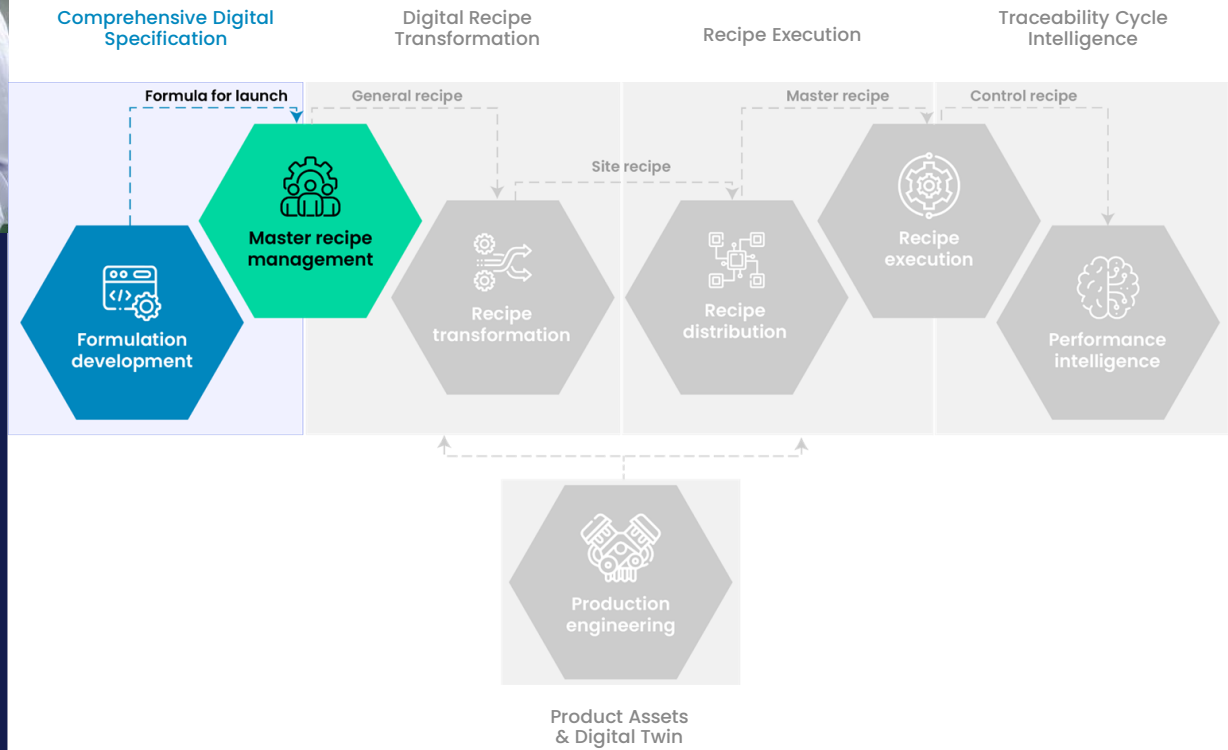
Enterprise Recipe Management Solution: End-to-End Transformation



Comprehensive Digital Specification

Recipe Formulation acts as a digital hub for new product development. It creates a digital link between the recipe design, formula development and product testing phases.

Recipes can be designed, altered and updated using generative design techniques coupled with process automation within seconds.

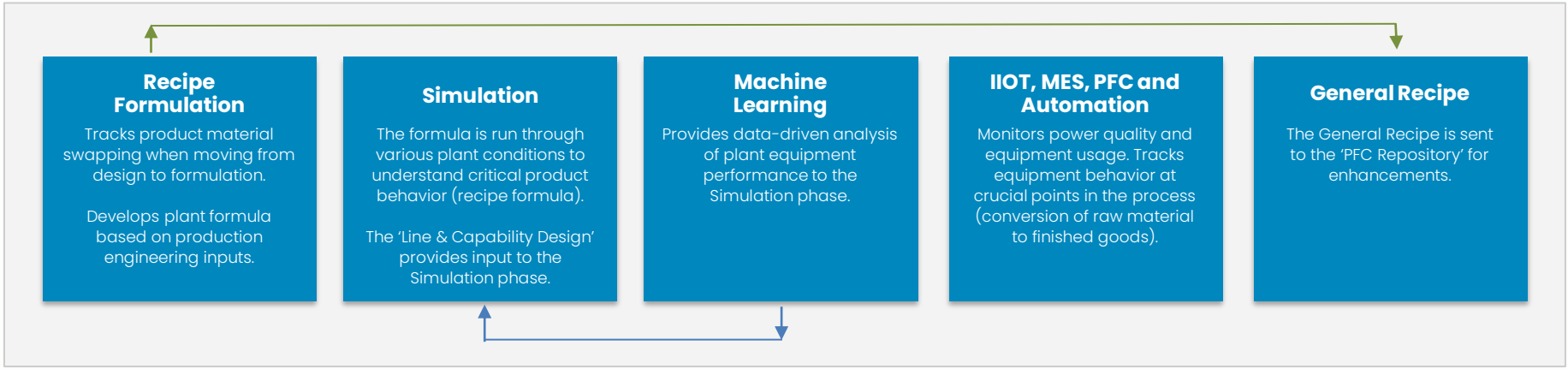


Stages of the Enterprise Recipe Management Solution (1/2)

Comprehensive Digital Specification

The first stage of the solution is designed to smooth the transition between formulation and General Recipe creation

Input: Key operational parameters (E.g. Cold Brew under the Beverage section), the plant location and recipe ingredients to be added.



Output: This stage automatically generates the formula required for production by accessing the production capabilities and raw materials requirements.

Stages of the Enterprise Recipe Management Solution (2/2)

Comprehensive Digital Specification

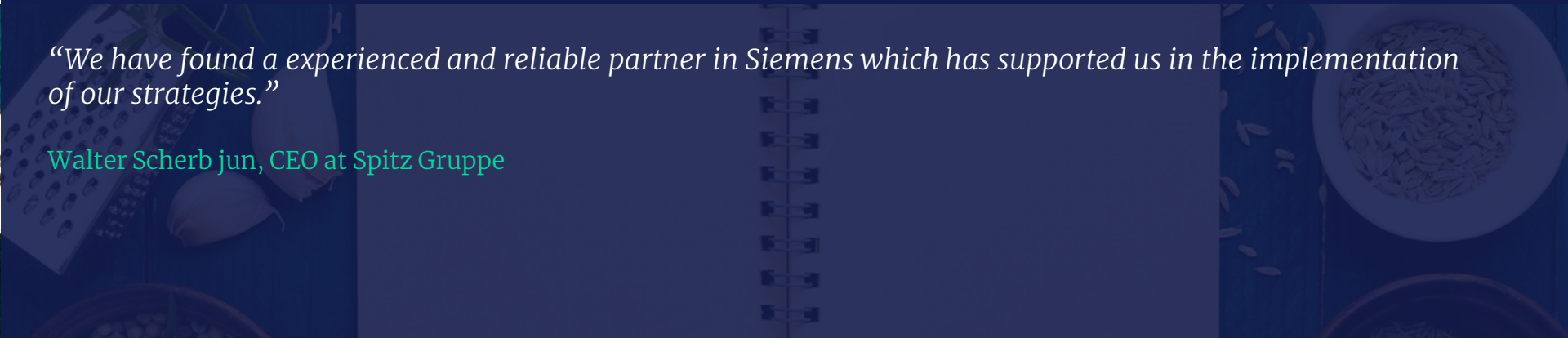
The digital recipe formulation process provides the following advantages.

There are > 2000 manual touchpoints when altering ingredients/raw materials:

- This stage reduces the number of touchpoints needed to swap ingredients and reduces the time taken to scale up the design process.
- Fewer iterations are required to develop the formula.
- Eliminates unnecessary production costs caused by human error.

The process also improves the product quality by:

- Identifying key conditions (temperature, viscosity) required for execution.
- Increasing adaptability by maintaining global product consistency.



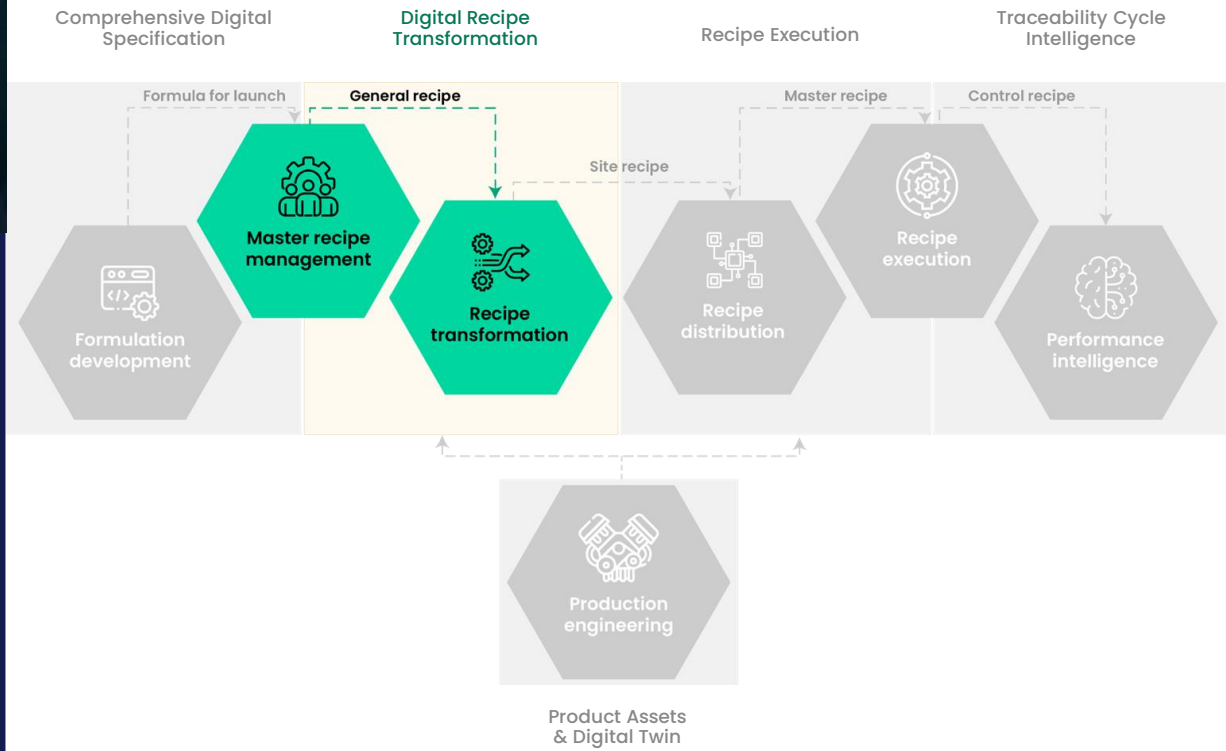
"We have found a experienced and reliable partner in Siemens which has supported us in the implementation of our strategies."

Walter Scherb jun, CEO at Spitz Gruppe

Digital Recipe Transformation

Recipe transformation is a pre-programmed, automatic, self-operating system that accesses plant capacity and individual equipment capabilities, and transforms the recipe into a scalable, executable format.

A module-based approach is used to alter process sequences, compare recipes and change operational parameters based on standard manufacturing capabilities.

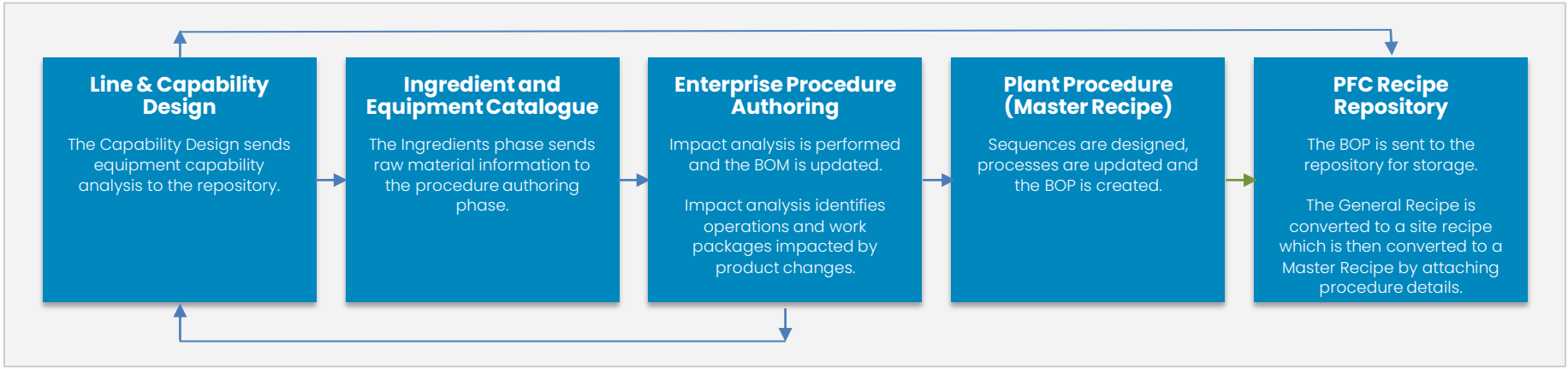


Stages of the Enterprise Recipe Management Solution (1/2)

Digital Recipe Transformation:

During this stage, the General recipe designed and then transformed into a Site and then a Master recipe. Process sequences are created and impact analysis of Process BOM is performed.

Input: BOMs can be compared side-by-side. Users can also select the operating sequence of any formula and move the steps (modules) around to alter process sequences.



Output: BOM analysis accesses the need for additional materials and equipment changes. It also highlights the key differences in the BOMs. A digital 'Bill of Process' is created by adding process sequences to the BOM.

Stages of the Enterprise Recipe Management Solution (2/2)

Digital Recipe Transformation:

The digital transformation process provides the following advantages.

Recipe processes can be altered and production sequences can be changed, which, in turn:

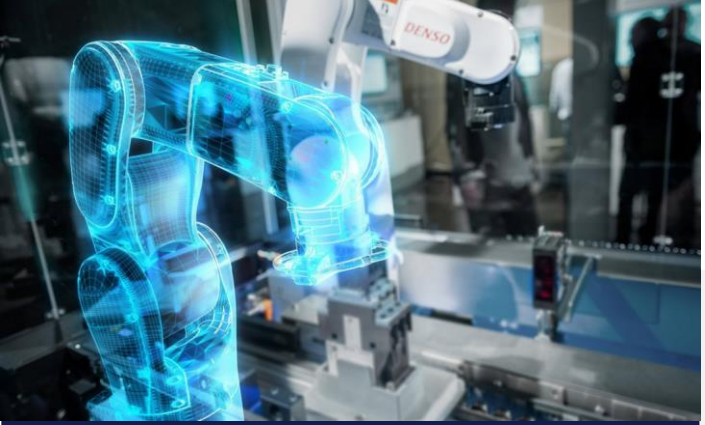
- Improves process efficiency.
- Creates sequences specific to various geographic plant locations.

The product formulation and assembly stream are merged by creating the 'Bill of Process' (BOP):

- The BOP is easily accessible from any global location since it is stored in the repository.
- The BOP generated is a manufacturing blueprint that can be referred to when installing new machinery.

"Technology is very important in the craft brewing and distilling market place,particularly when you don't have enough staff or time which are your most precious resources."

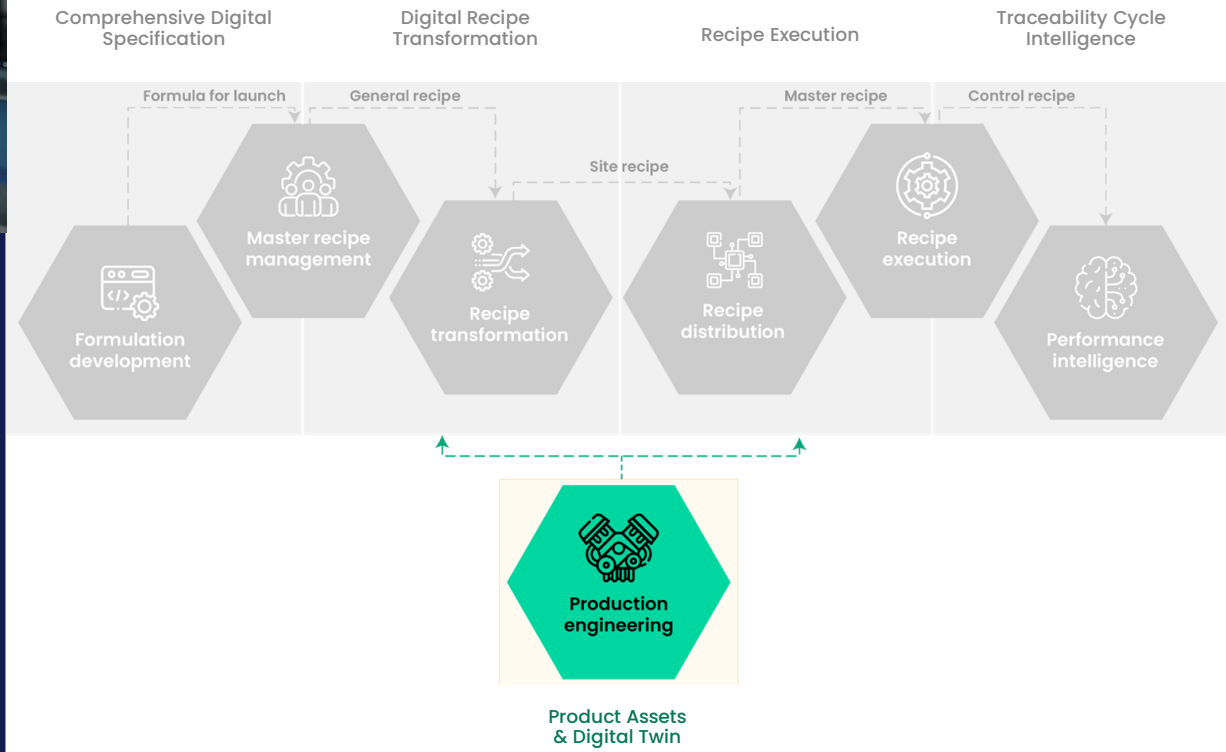
Simon Carr, Brogan's Way founder and co-owner



Production Engineering

Production Engineering is responsible for the ‘Global Equipment Repository.’ It is a global database that feeds information to all the other stages.

This repository contains plant manufacturing capabilities, equipment execution ability, and the best parameters and operational conditions suitable for recipe execution.



Stages of the Enterprise Recipe Management Solution (1/1)

Production Engineering:

Production Engineering acts as a central database that stores all plant-specific information and allows for visual representations of plant locations.

Input: Stored assembly line information, production processes, equipment capability descriptions and the complete plant layout.

Recipe Formulation

Capability Management: The management of equipment skills to access production feasibility for formula development.

Digital Transformation

Recipe Planning: Provides plant-specific capabilities for scaling up recipes across plants based on a set of predefined rules.

Recipe Execution

Plant Lifecycle Management: Information management and visualization of all production changes and equipment performance changes.

Modular Automation: A library of automation and hardware rules that can be used during new equipment installations.

Output : Feeds information to the other stages of the production process, creating a digital thread between the development and execution phases of recipe transformation.

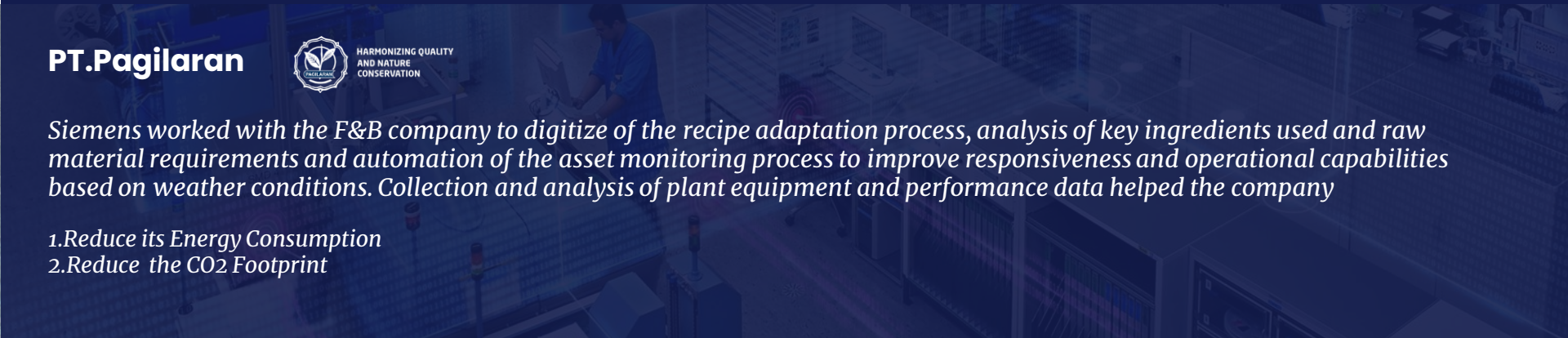
Stages of the Enterprise Recipe Management Solution (1/2)

Production Engineering:

The most important stage of the entire transformation process has several benefits.

Production Engineering is an integral part of the recipe management system.

- It synchronizes equipment skills with process capabilities.
- It digitizes the manufacturing plant-related information.
- Enables constant monitoring of activities on the plant floor.
- Allows Equipment Supplier Management by creating Module Type Packages (MTP), which are standards that make the integration of new equipment easier, improving relationships with suppliers.



PT.Pagilaran

HARMONIZING QUALITY AND NATURE CONSERVATION

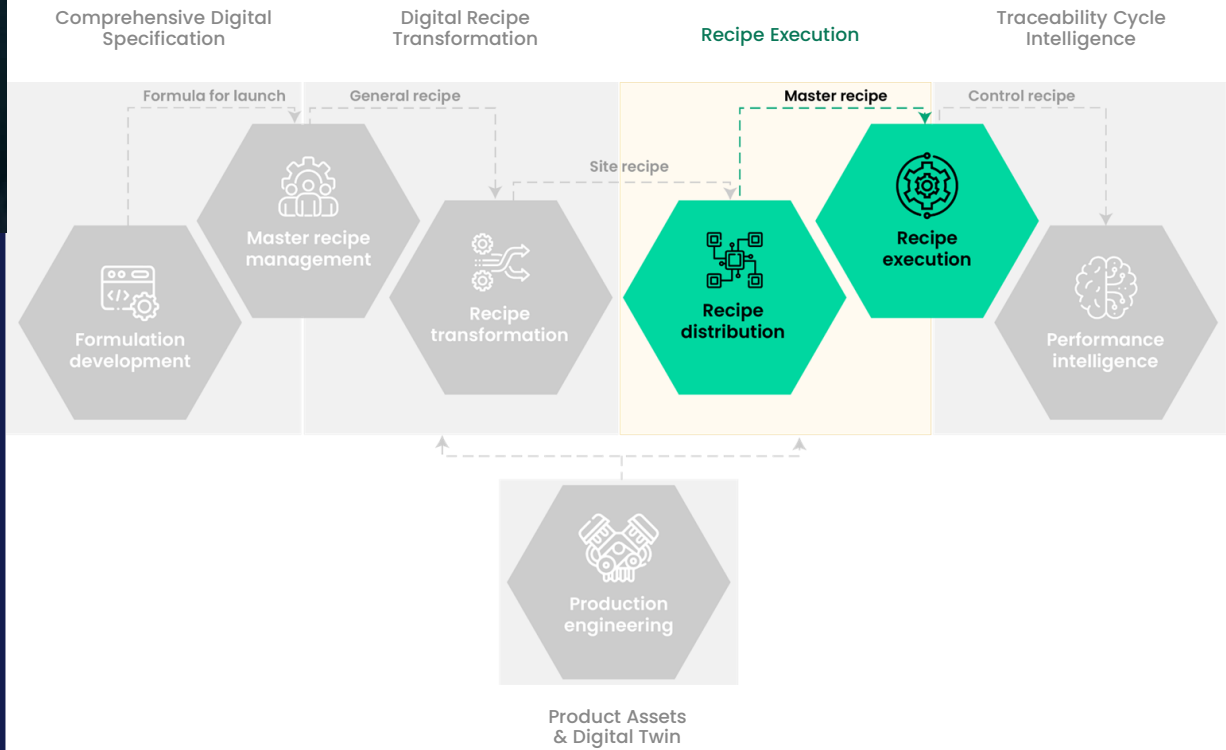
Siemens worked with the F&B company to digitize of the recipe adaptation process, analysis of key ingredients used and raw material requirements and automation of the asset monitoring process to improve responsiveness and operational capabilities based on weather conditions. Collection and analysis of plant equipment and performance data helped the company

1.Reduce its Energy Consumption
2.Reduce the CO_2 Footprint

Recipe Distribution and Execution

In many manufacturing locations, only specific types of equipment are used for production while the rest of them lie idle Recipe distribution regulates batch processes and allocates execution sequences based on equipment performances.

Recipes are transferred directly to the execution system with minimum human intervention. Multiple recipes are executed at the same time via different equipment groups ensuring optimized production operations.

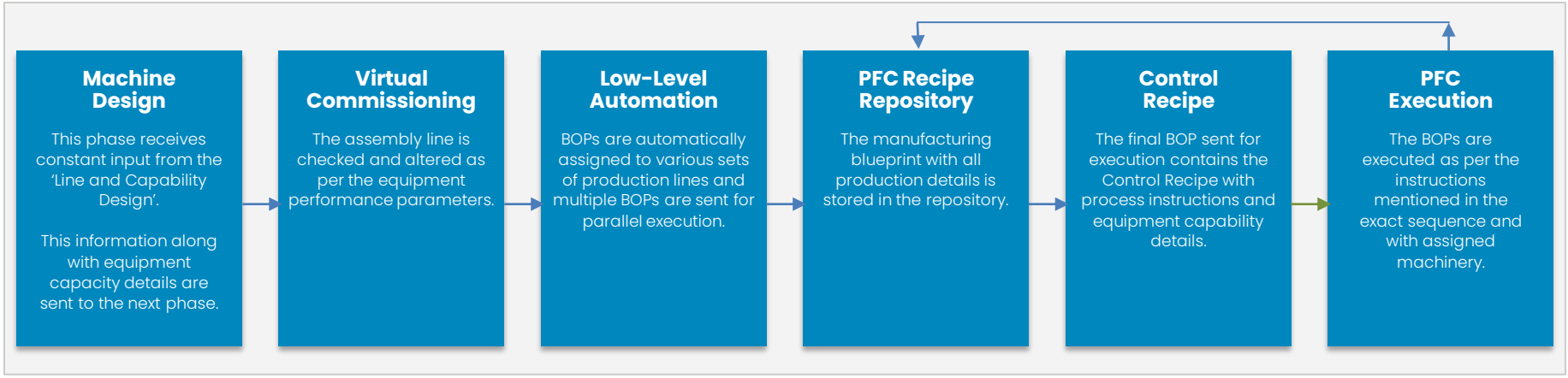


Stages of the Enterprise Recipe Management Solution (1/2)

Recipe Distribution and Execution:

The third stage of the ERM uses asset performance and capacity information to identify the best equipment to be used for recipe execution.

Input: The Master Recipe in the PFC Repository is analysed by the system and each process step is verified.



Output: The system provides equipment capability details like speed, completion time and capacity. These details are used to send BOPs to the respective machinery allowing for multiple recipe executions.

Stages of the Enterprise Recipe Management Solution (2/2)

Recipe Distribution and Execution:

Using an automated process distribution and recipe execution process has the following benefits.

Automation and virtual commissioning

- Allows for real-time production alterations.
- Chooses the best performing equipment for production.
- Allows for decoupled production of recipes.

A completely automated assembly line that can be changed in real-time

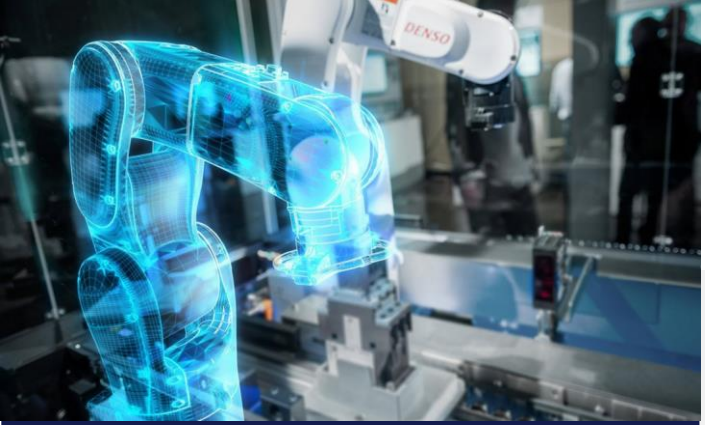
- Reduces errors that occur through human involvement.
- Provides capability information that allows line managers to keep track of equipment performance.

Nestle Juuka, Finland

Nestlé
Good Food, Good Life

Siemens developed an effective Closed Loop Manufacturing monitoring system using IIoT, and Simulations to improve operational KPI's through a data-driven development and iterative process improvement. This helped the brand achieve:

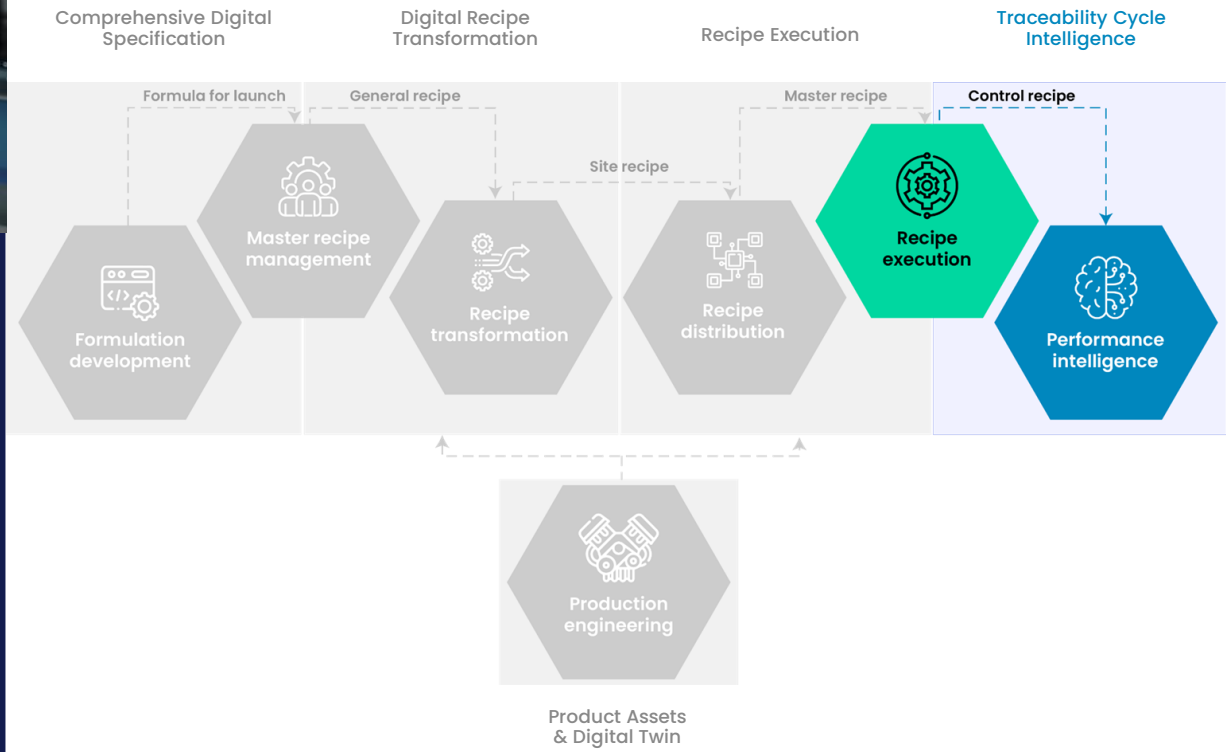
1. 23% decrease in median kettle heating time.
2. Cost Reduction of 35,000 Euros in water and chemical utilization/year.



Performance Intelligence

Performance intelligence uses sensors embedded in plant equipment to gather and analyse equipment performance using Mendix and Low code Applications.

Manufacturing execution systems(MES) that track raw material conversions and power factor controllers (PFC) that analyse power usage for each asset are used to gather data for analysis.



Stages of the Enterprise Recipe Management Solution (1/2)

Performance Intelligence:

The final stage of the ERM solution uses IoT to gather asset performance data in real time combined with data analytics to control and track and trace the process.

Input: Data from the equipment is continuously collected in real time and fed to machine-specific phases throughout the digital transformation process.

IIOT, MES, Edge and Automation

Enabling real-time connectivity and track and trace capability..

Closed-loop Digital Twin

Enables industrial organizations to make informed decisions to optimize products and plant operations.Also feeds data back into the digital twins of product and production, which can then be used for future iterations.

Asset Performance

Use sensor data to establish KPI's that help you determine machine performance quickly, including machine availability, utilization rate, number of deviations from optimal performance range, number of stoppages per unit of production and more.

Energy Optimization

Establish KPIs to control:

- Kilowatt hours used
- Energy inefficiency losses
- Greenhouse gases produced
- Percentage of energy produced in the factory versus energy coming from the grid.

Output: Key decisions about material additions, adequate machine running time and working conditions are monitored.

Stages of the Enterprise Recipe Management Solution (2/2)

Performance Intelligence:

Using IoT to gather asset performance data in real time provides the following benefits.

There are > 2000 manual touchpoints when altering ingredients/raw materials:

- Identifying performance issues and rectifying bottlenecks.
- Optimizing the process by utilizing machinery to its fullest potential.
- Reducing maintenance costs by predicting future failures.
- Preventing complete execution downtime.
- Ensuring environmentally-friendly operations through emission, energy and water consumption checks.

"With Simatic Energy Manager, we have a good starting point for defining savings targets and proving the cost effectiveness of efficiency measures in the wter and energy sector"

Theresa Fieischberger,Environment Manager, Coca-Cola HBC Austria

Business Outcomes

The complexity of running a consumer goods manufacturing plant has increased. A poor production management system only adds to production costs and slows development cycles.

The enterprise recipe management solution positively impacts production factors by achieving:

100%
Optimized manufacturing process.

1 second
Recipe scaling time.

20%
Increase in manufacturing efficiency.

100%
Digital recipes to speed up adoption.

Digitization of recipe operations is the key enabler for organizations to gain competitive advantages in the highly volatile CPG marketplace.

The CPG industry is managing higher product variations, creating new product assortments and launching new products more frequently than before. The Siemens solution not only brings flexibility, agility and visibility to the manufacturing processes, but it also enables:

Digital Bill of Material (BOM)

The solution creates a digital blueprint of processes, recipe formulas, manufacturing instructions and equipment specifications. It eliminates the usage of paper-based bills, allowing for secure storage and quick recovery of BOM documents.

Automated Batch Management

An automated management process ensures the best utilization of assets for recipe production and improves product quality across different plant locations.

Sustainable Production

Continuous equipment monitoring helps improve key parameters like carbon emission, energy consumption per asset and water consumption at the plant. By eliminating the “Trial & Error” testing process, waste generation is greatly reduced.

Production Efficiency

The ERM solution allows organizations to maintain product consistency across regions. A central repository allows global access to BOMs and BOPs, making the process faster, efficient and error-free.

INCISIV

ABOUT INCISIV

Incisiv is a peer-to-peer executive network and industry insights firm for consumer industry executives navigating digital disruption.

Incisiv offers curated executive learning, digital maturity benchmarks and prescriptive transformation insights to clients across the consumer and technology industry spectrum.

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