



Nestlé Good food, Good life



Nestlé Research & Development

Digital Transformation and Process Modelling Integration for Innovation

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Nestlé at a glance

Providing
safe, quality nutrition
for almost
160 years

2 000 +
Brands
worldwide



Around
270 000
employees

Number
of countries
we sell in
188

340
factories
in 77 countries

CHF 93.0
billion
Group sales
in 2023

Nestlé Research & Development organisation



Fundamental research
Nestlé Research

—
Vers-chez –les-Blancs
EPFL Innovation Park Lausanne
Switzerland



**Category-focused
product development**
**Nestlé Product
Technology Centers**



Systems development
**Nestlé System
Technology Centers**

—
Orbe
Switzerland

Over 4100 employees , working at 23 sites worldwide

Who are we ?



Digital transformation lead
Nestlé Product Technology Centers

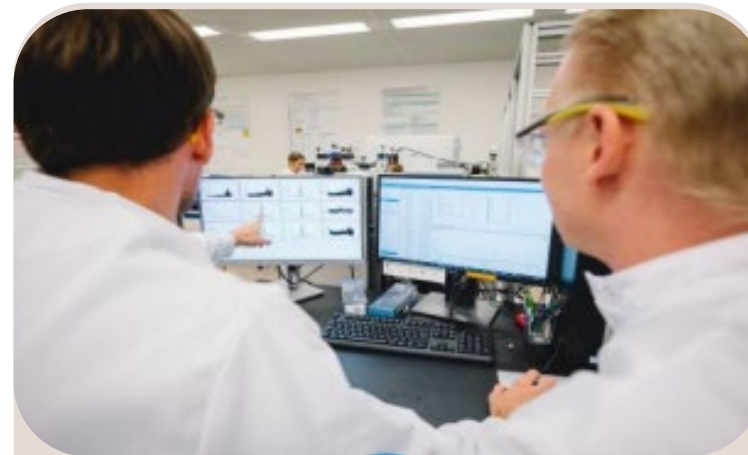


R&D Expert in Process Modelling
Coffee category
Process Optimisation Network leader

What we will cover today



R&D Digital transformation
to support efficient innovation



Process modelling capabilities
to develop proprietary technologies

Our R&D digital strategy prioritized right tools , supported by solid data foundation & people digital upskilling



Tools ► Improve efficiency & effectiveness of our products innovation & renovation



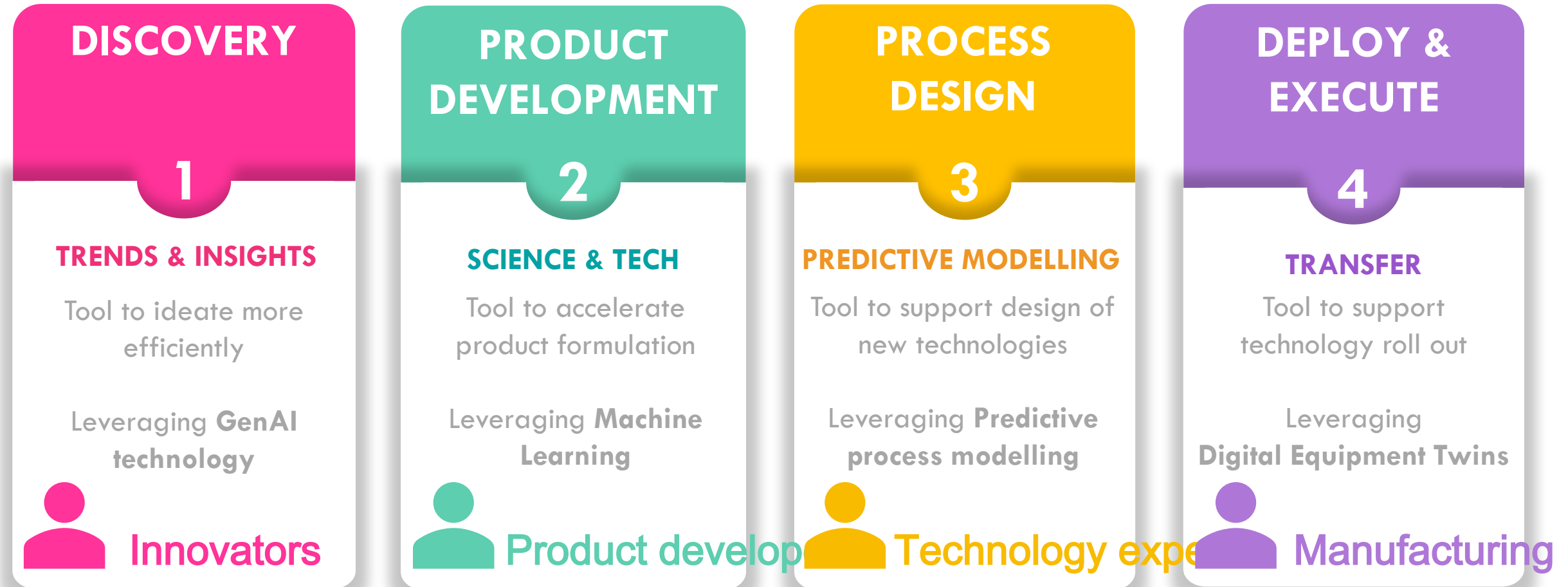
Data ► Set solid foundation with improved data practices & technologies



People ► Accompany change with upskilling adapted to each R&D role

Digital transformation

Product technology centers, empowered by digital capabilities & tools, can accelerate innovation and product development cycle



Amongst digital capabilities , process modelling expertise is used as lever for innovation

DEVELOP

Supporting new product , pack & process development

Example

> Process model to support proprietary Nescafé extraction process development



DEPLOY AND EXECUTE

Support to all Nestlé factories & operations

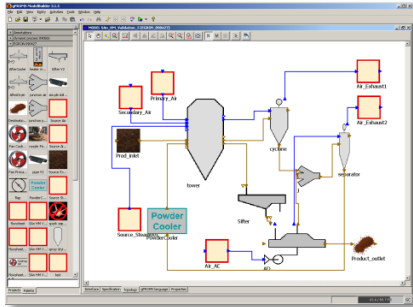
Example

> Process model to support Nesquik box shape & manufacturing process



We exploit a wide variety of modelling techniques to support all product areas

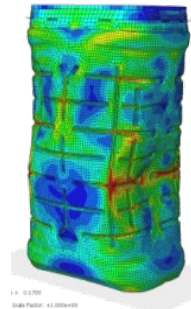
Flow-sheet process modelling



Model unit processes and their interaction in process lines

APM

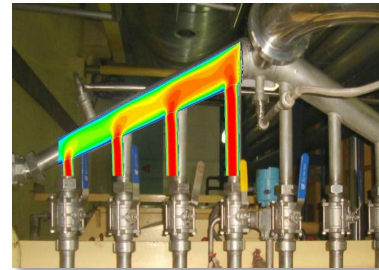
Solid structure modelling



Model structural resistance, deformation & vibration analysis of packaging and process equipment

FEA

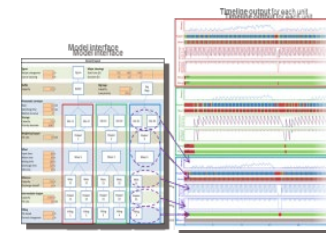
Fluid dynamic modelling



Model turbulent, viscous and multiphase flows of fluids through process equipment

CFD

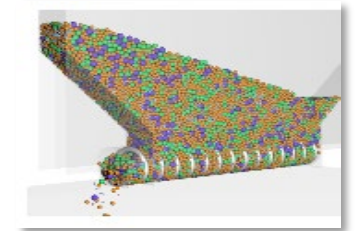
Logistics modelling



Provide tool to guide engineering decisions regarding buffer sizing, line layout and product scheduling

DEvS

Granular flow modelling

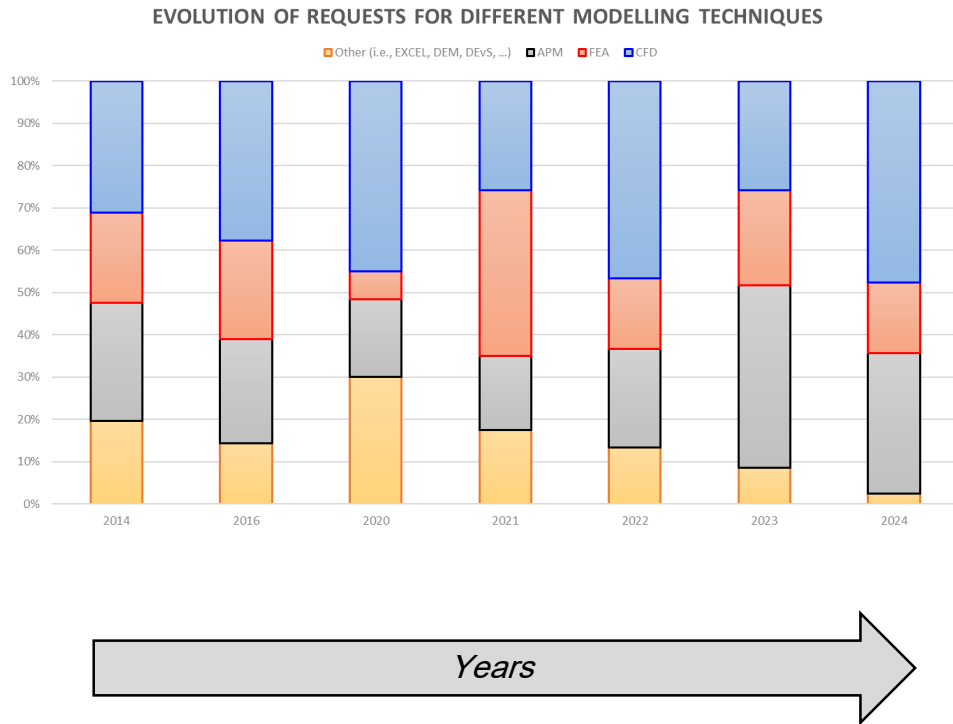


Model granular or powder flows in process & dispensing

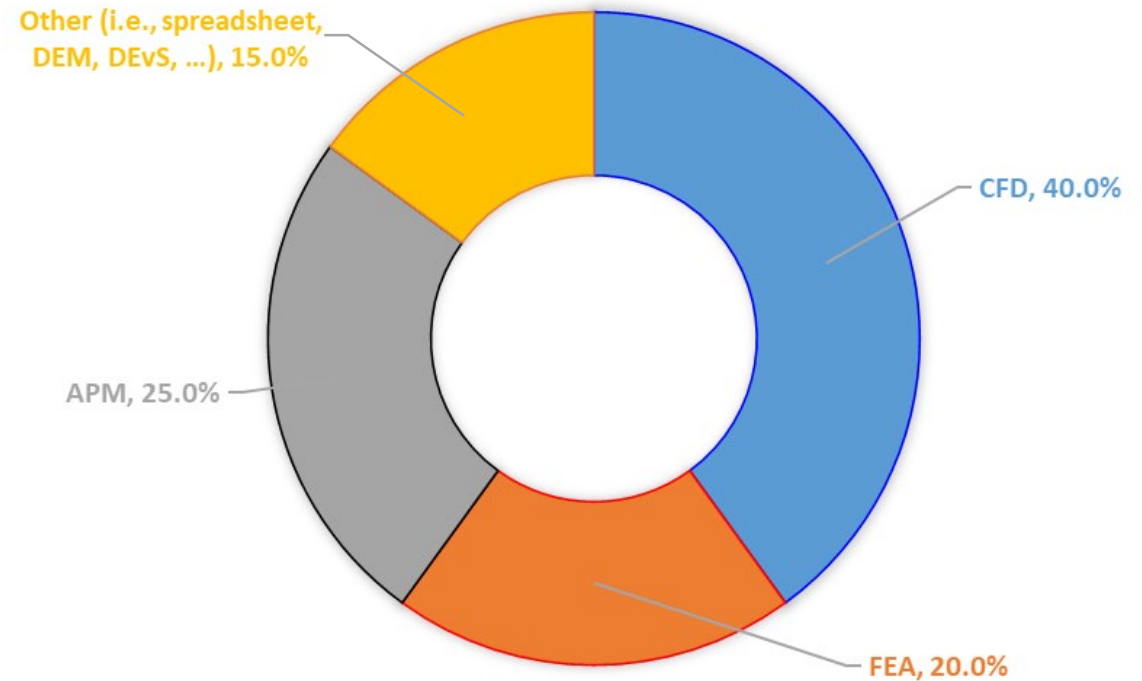
DEM

→ Continuous reviewing and use alternate software / modelling techniques (i.e., meshless CFD methods, Moving Particle Simulation method, surrogate approach, ...)

We use many modelling techniques But mostly : CFD, FEA and APM



AVERAGE USAGE OF DIFFERENT MODELLING TECHNIQUES



We have developed internal digital tools to democratise use of process models to non-experts in R&D & factories



Library of process line modelling tools

Energy Rating tool for factory engineers

Advanced Process Control (APC): APM software ↔ OPC ↔ HMI ↔ factory

Operator Training System (OTS): HMI ↔ OPC ↔ APM software (model of factory)



Web based model sharing platform

Deployment to Nestlé users in both R&D and Operations

Highly interactive apps, promoting digital literacy and efficiency

Accompany change providing specific training (superusers/users)



Rapid prototyping



First time right technology deployment across Nestlé



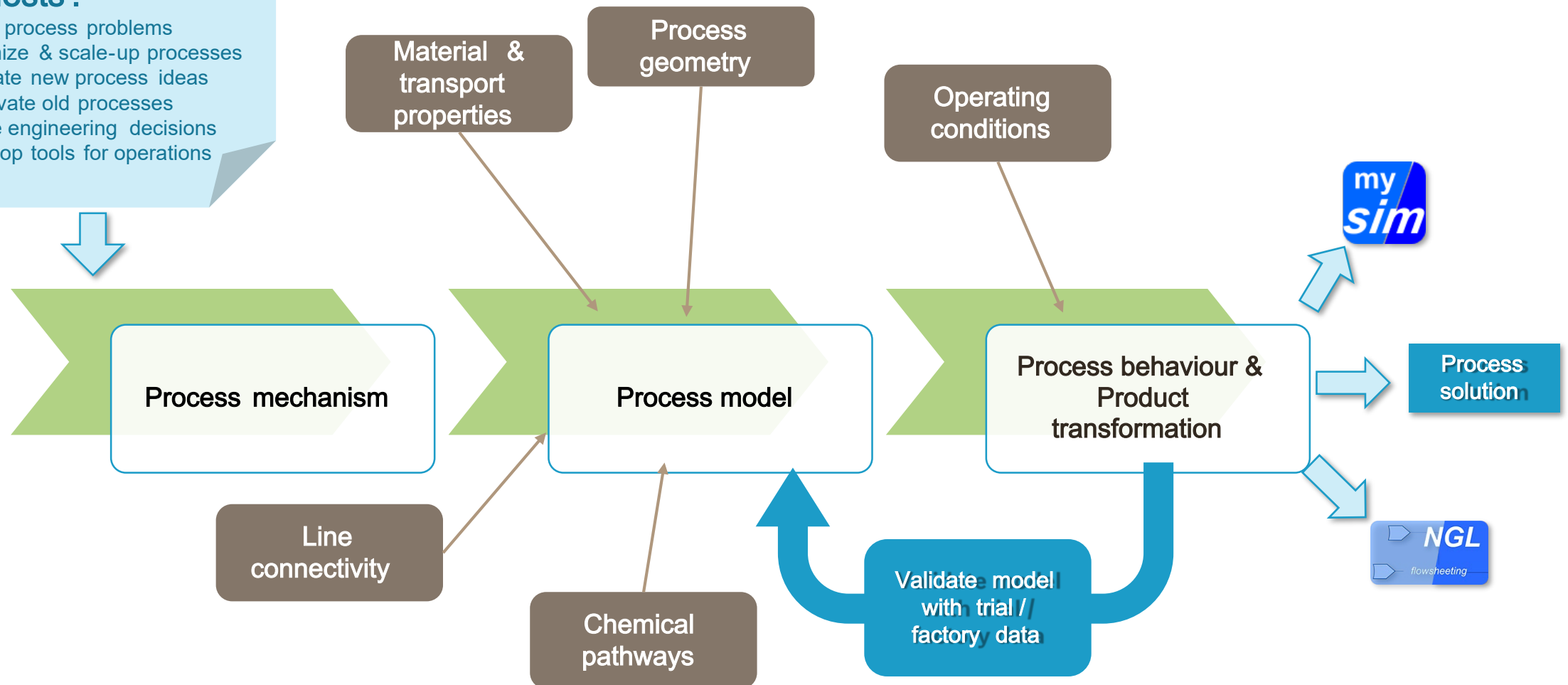
Agile & remote problem solving

Our process modeling workflow ensures our tools are fed with the right data & models

ensures our tools are fed with the right data & models

Requests :

- Solve process problems
- Optimize & scale-up processes
- Validate new process ideas
- Renovate old processes
- Guide engineering decisions
- Develop tools for operations



Extrusion blow molding machine for Nesquik box renovation

Iterative improvement of the current design
The relevance of each modification is tested by simulation and adapted accordingly

Purpose of modelling :

→ Identify technical corrugations and material distribution maximizing box top load capability

Modelling technique :

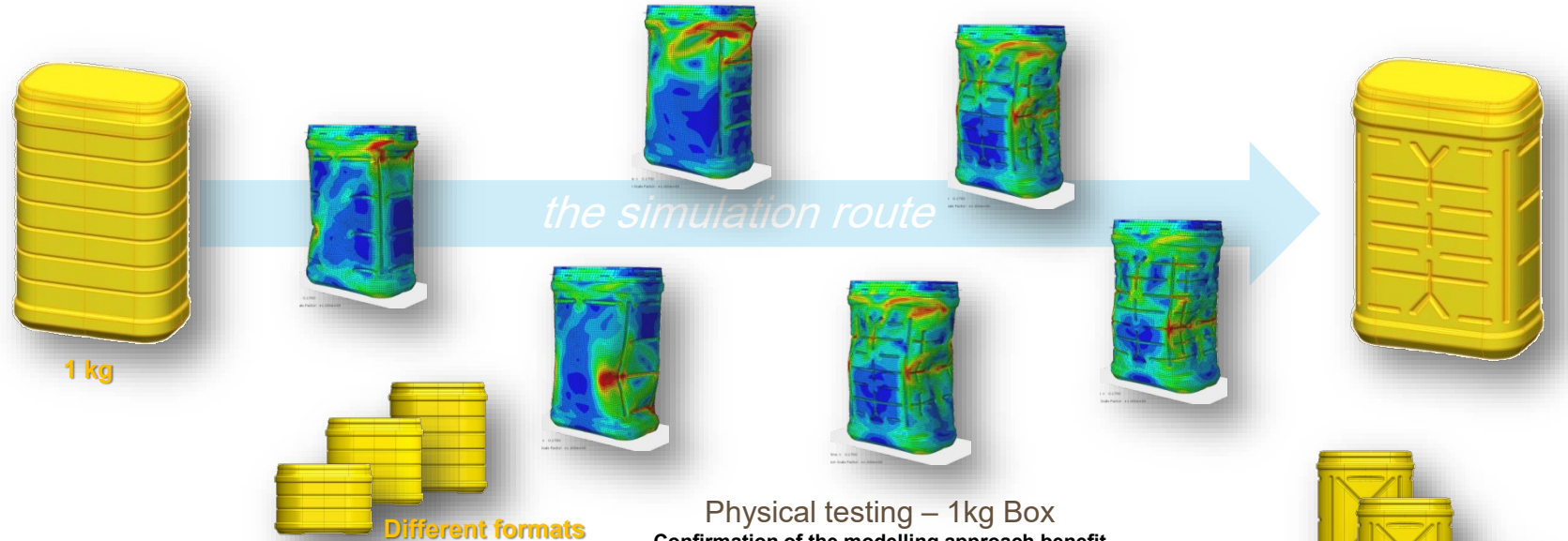
→ Finite Element Analysis

Results :

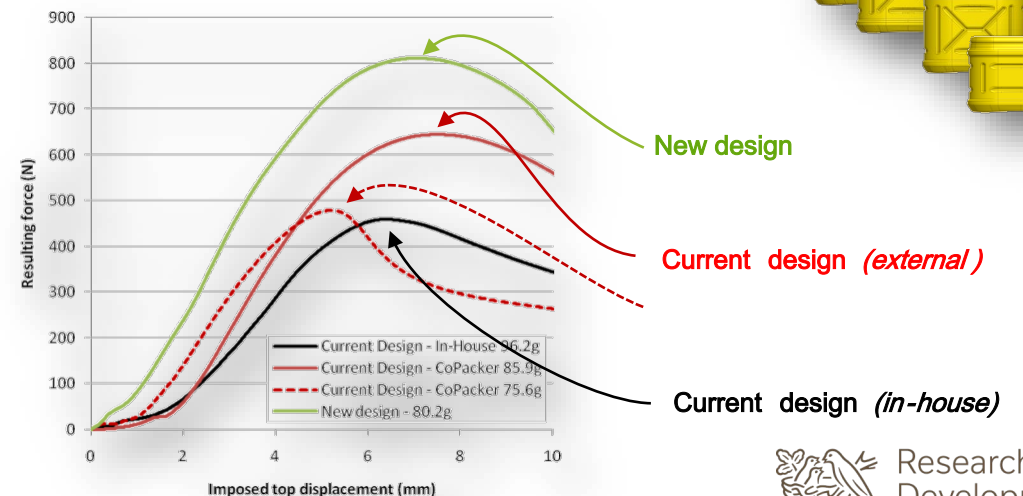
- ❑ 1kg box format : doubling the admissible load with a box design using less material
- ❑ 500g box format : doubling the admissible load with a box design using less material

Benefit :

- ❑ 1kg box format :
 - ✓ Consistent savings on material cost
 - ✓ No more collapsed pallet issues



Physical testing – 1kg Box
Confirmation of the modelling approach benefit



End-to-end Energy Analysis Tool (Digital Twin) to compare PSC factory line performance

Why develop this tool?

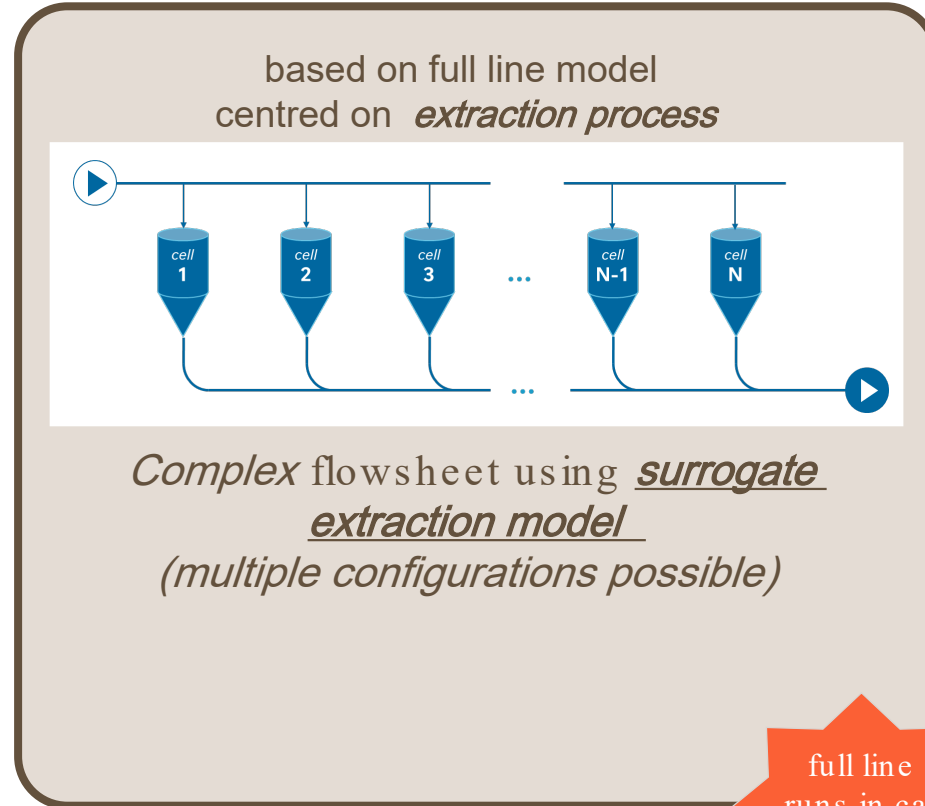
- ➔ Previously cumbersome to assess “theoretical” energy needs
- ➔ Previously single process models were available but not coupled
- ➔ Each line is different, so tool needed to evaluate the consequences

Need for efficient tool

- ➔ To provide overview on each part of PSC process

Manufacturing Master Plan on Zero Carbon in Europe

➔ What is at the base?



full line runs in ca. 1 min

➔ How is it deployed?

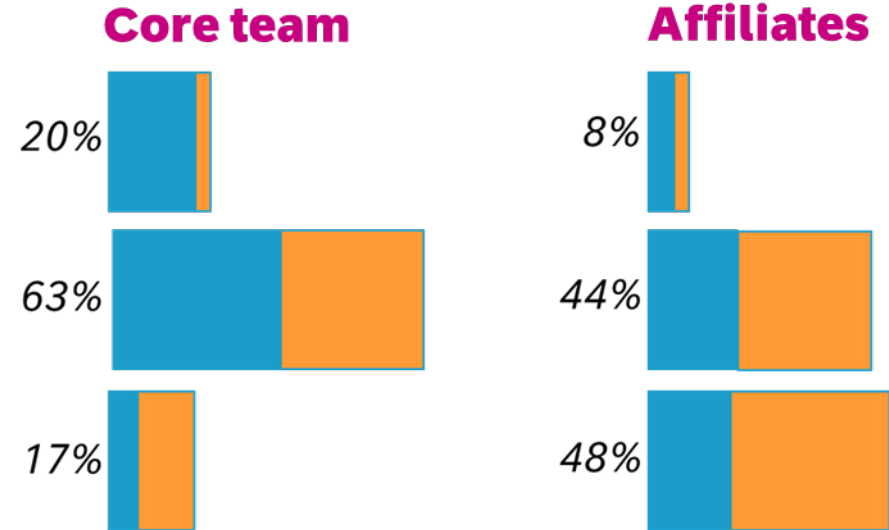
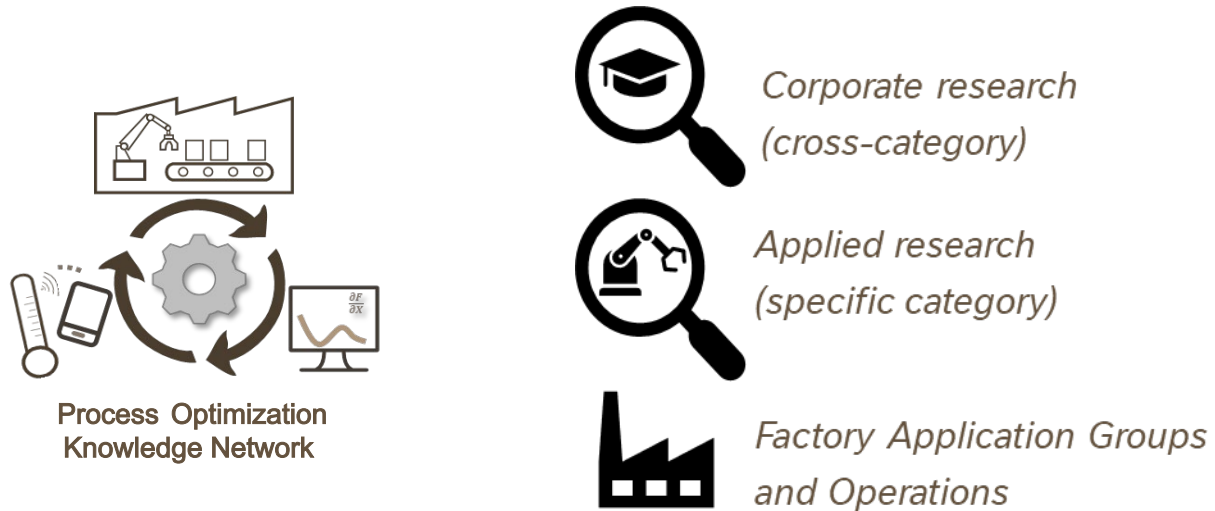
available on intranet *mySIM* platform

Summary of energy requirements

Step	Energy Requirement (MW)
step 1	~2.5
step 2	~1.0
step 3	~4.0
step 4	~1.5
step 5	~1.0
...	...
step 6	~4.0
step 7	~0.5

energy stream visualization

Our process modelling network is a key asset to support our digital transformation strategy to increase success rate and speed of innovation



Process modeling in Nestlé is combining strength of accurate **data-driven** & interpretability of **mechanistic** models to support digital transformation of R&D.

