American Society of Sugar Beet Technologists

Feb 27th 2025

Longbeach, CA

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Applexion footprint

>150 EMPLOYEES **>10% to R&D**

Newark, DE - USA
Process Development (IBRL, University of Illinois), Pilot, Sales office

Lyon – FR – Headquarter
Process Development, Pilot, Engineering, Sales office

Shanghai - CH
Process Development, Pilot, Engineering, Sales office

São Paulo - BR
Process Development, Sales office, Local services

Bangkok - TH
Sales office, Local services, Process Development

Tunis - TU
Sales office, Local services,

Bangalore - IN
Sales office, Local services

Annual Supply :

30 to 35 equipment installed

5 to 10 pilot units **6 to 8** revampings

16 patent families

76 patents

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Differentiating purification technologies

Applexion
MEMBRANE FILTRATION

Applexion
CHROMATOGRAPHY

Applexion
ION EXCHANGE

\+ A complete range of products and services for upstream & downstream operations

Catalysis, Enzymes
Electrodialysis, Active Carbon, Filtration
Evaporation, Crystallization, Drying

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beyond purification

Our services throughout the lifetime of your equipment

Smart process solutions towards our customers' everyday industrial excellence

PROCESS & EQUIPMENT SUPPLY

- R&D
- Pilot
- System & Process line

DIGITAL & PERFORMANCE MANAGEMENT

- Digital services
- Consumables
- Spare parts

RE-ENGINEERING & REVAMPING SERVICES

- Non-stop operations
- Utilities savings (water, chemicals, energy)
- Columns & systems modernization

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Applexion offer

PROCESS & EQUIPMENT SUPPLY

- R&D
- Pilot
- System
- Process line

DIGITAL & PERFORMANCE MANAGEMENT

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RE-ENGINEERING & REVAMPING SERVICES

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The COVID-19 giant mess

After-Math in the industry

- Where have the operators gone?
- Where has the expertise gone ?
- Is my process unit running well ?
- Is my process unit running at its best ?
- Am I getting the most out of it ?

PERFORM 4.0: what is it about?

Improve performances with a digital solution

A proven proprietary Applexion R&D simulation software successfully turned into an industrial tool

Applexion separation fine tuning expertise service available on this easy-to-use web platform

A guidance solution to optimize purification process parameters

An efficient «do better» tool without any physical change to the unit

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PERFORM 4.0: a learning digital twin

How does the digital twin work ?

- **Machine learning** software
- The **more you use it**, the **more accurate** it becomes !
- The tool is quickly **fully adapted** to your separation unit

Objectives:

- Achieve targets **quickly**
- **Immediately react** to an operational change by proposing new parameters

PERFORM 4.0: why using it?

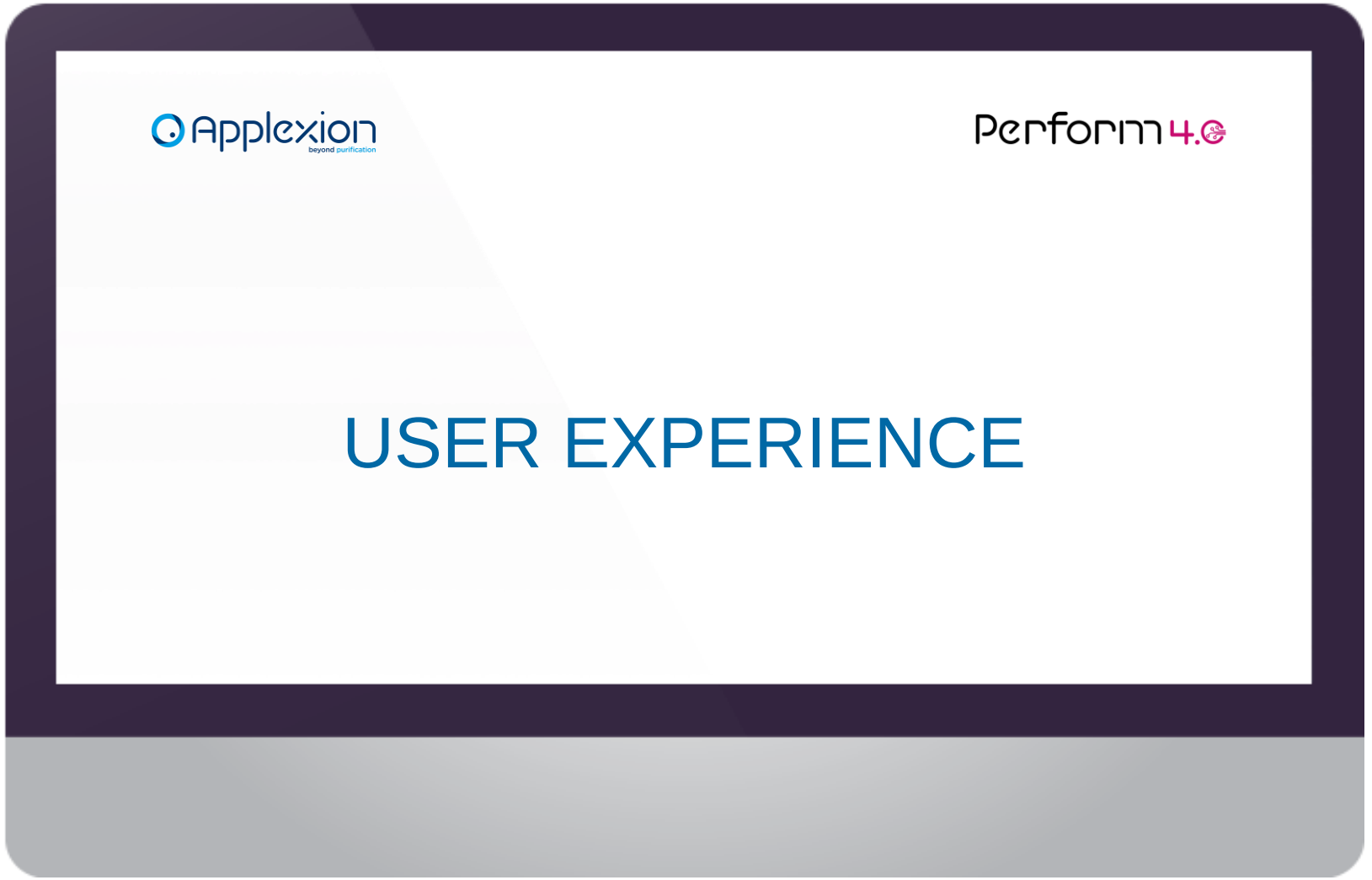
Improve performances with a digital solution

Developed to be your on-line "**Process Coach**" in purification process fine-tuning, whatever is your level of expertise

By your side to :

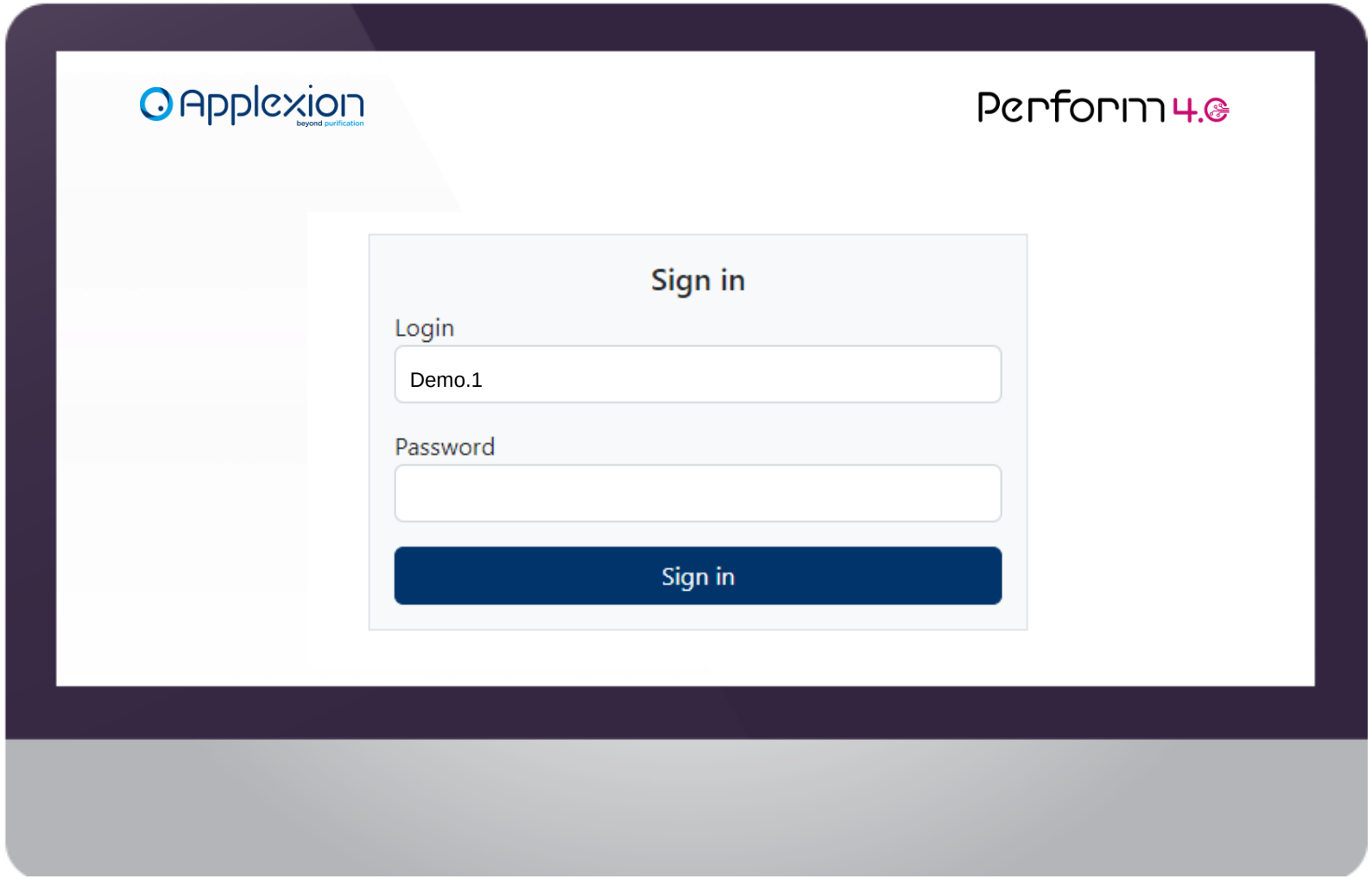
- Reach targeted separation performances (purity, recovery, impurity level …)
- Derisk the setting choice and reduce set-up times by bringing more precision
- Get the most out of your equipment (optimize water consumption, feed injection ...)
- Assist teams by developing expertise, support them in decisions and standardize adjustment strategies

PERFORM 4.0: an easy-to-use platform



PERFORM 4.0: user experience

1 Login on the web platform



*Demo version

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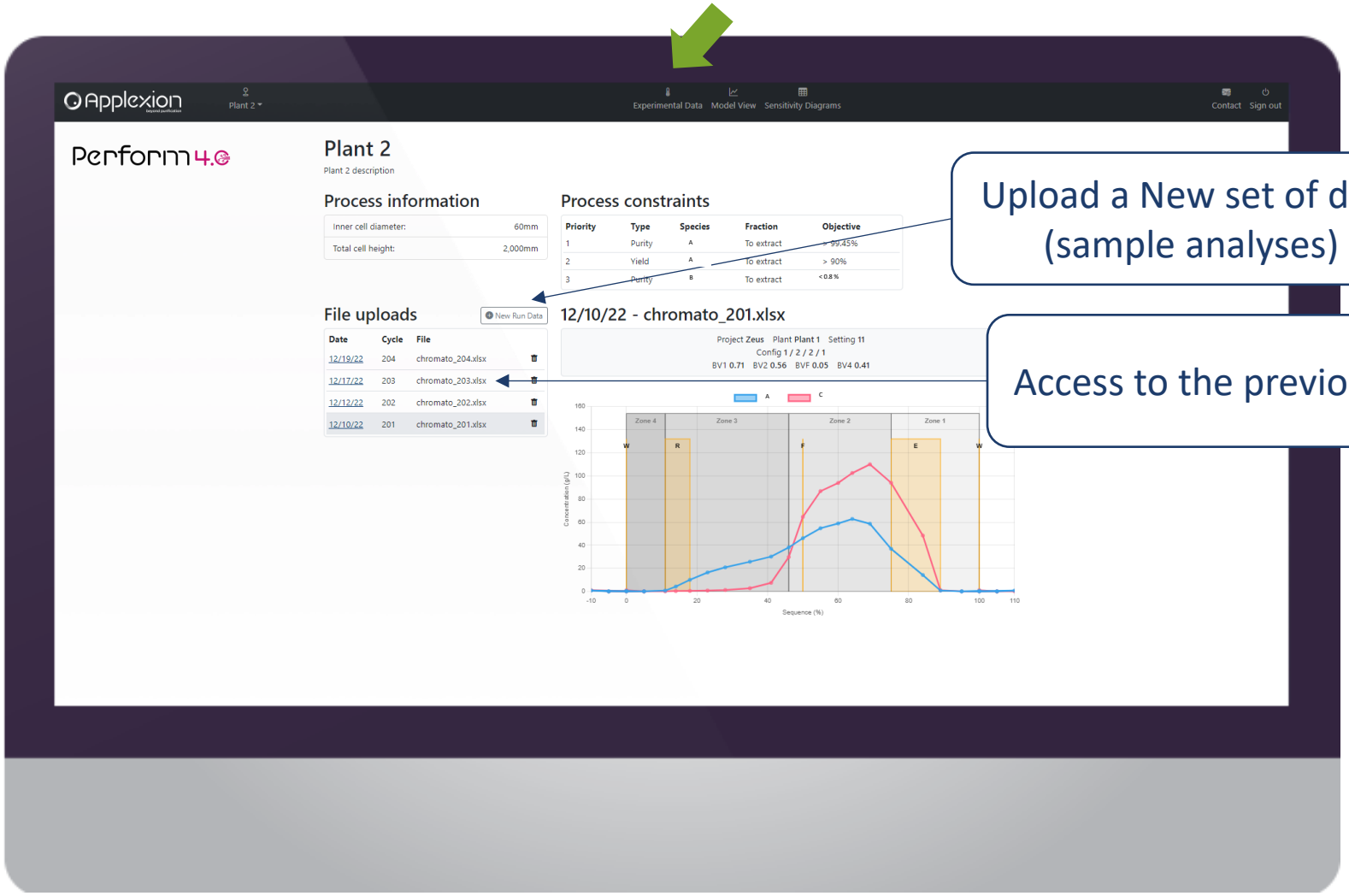
PERFORM 4.0: user experience

2 Upload your separation conditions and analyses



Upload a New set of data (sample analyses)

Access to the previous uploaded files

*Demo version

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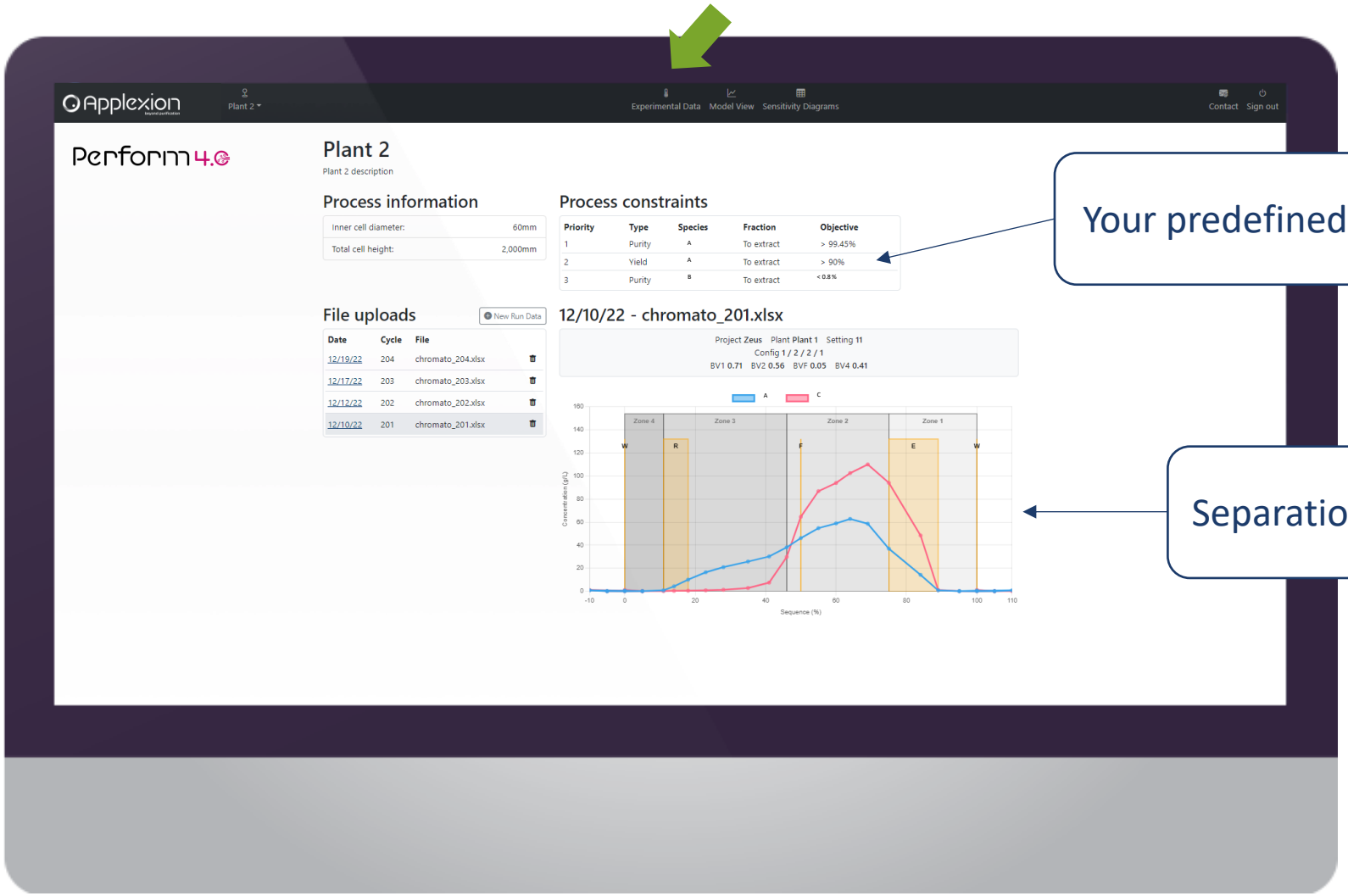
PERFORM 4.0: user experience

2 Upload your separation conditions and analyses



Your predefined process targets

Separation profile display

**Demo version*

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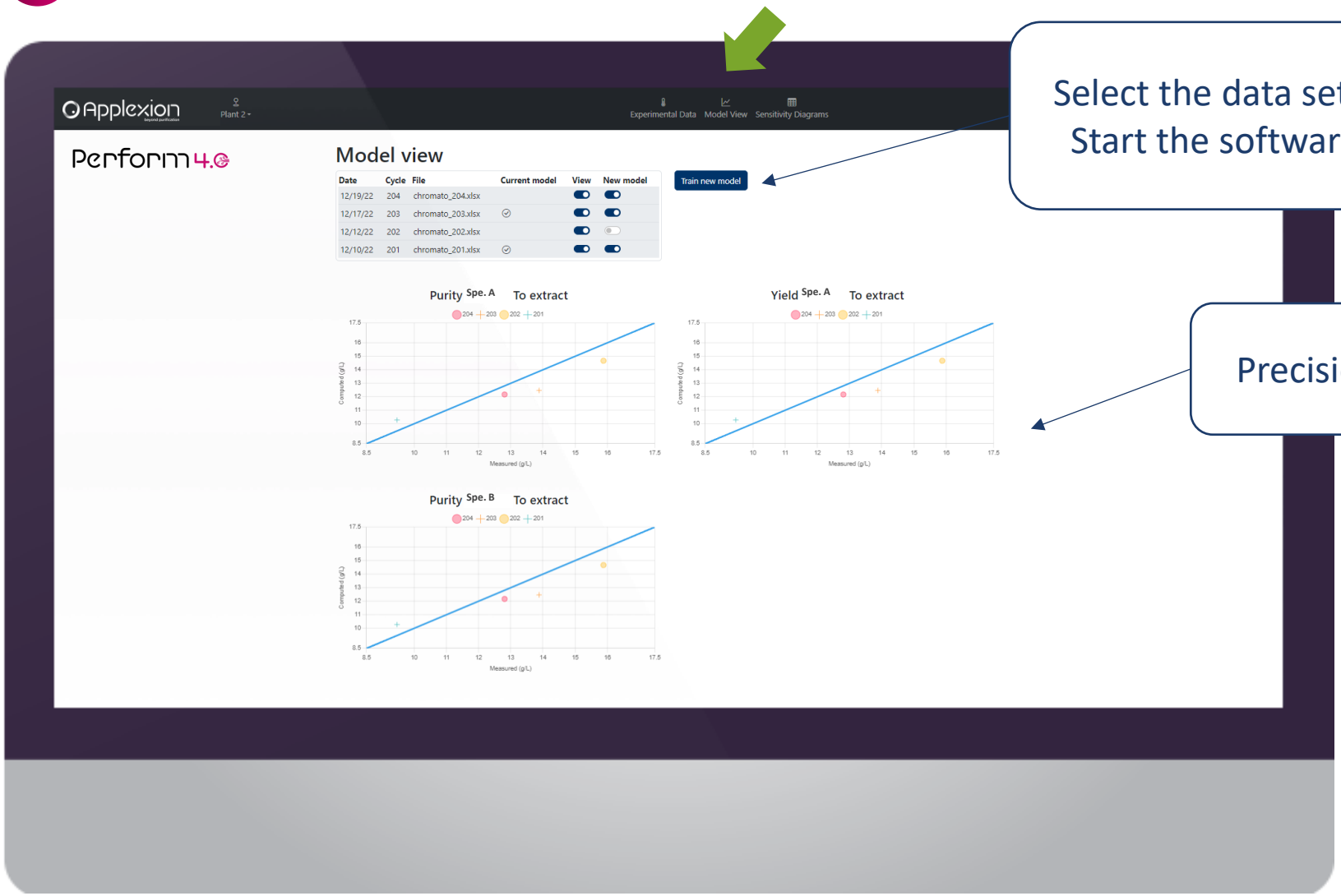
PERFORM 4.0: user experience

3 Check model calculation



Select the data sets to consider,
Start the software calculation

Precision diagrams views

*Demo version

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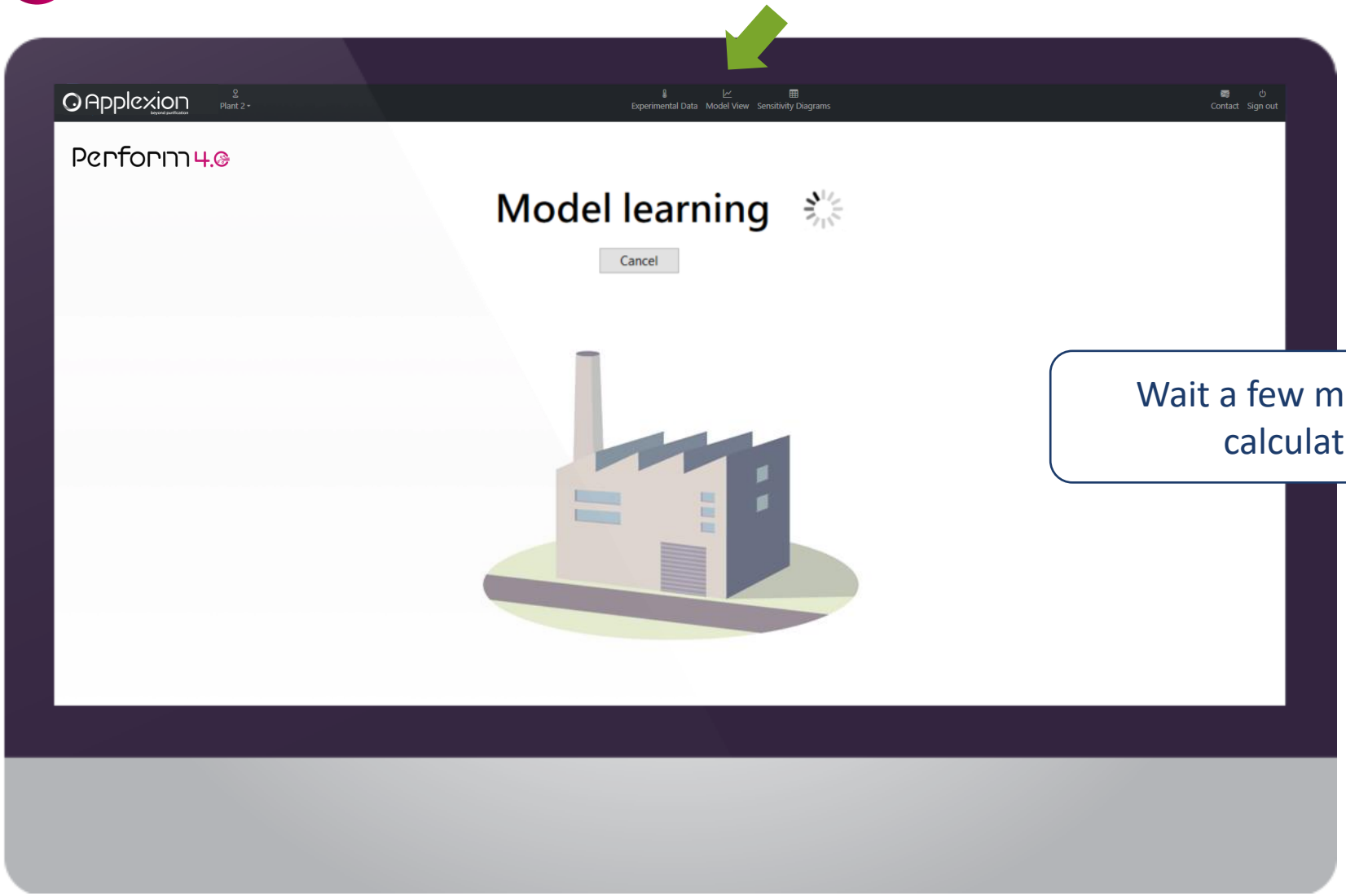
PERFORM 4.0: user experience

3 Check model calculation



Wait a few minutes for calculations

*Demo version

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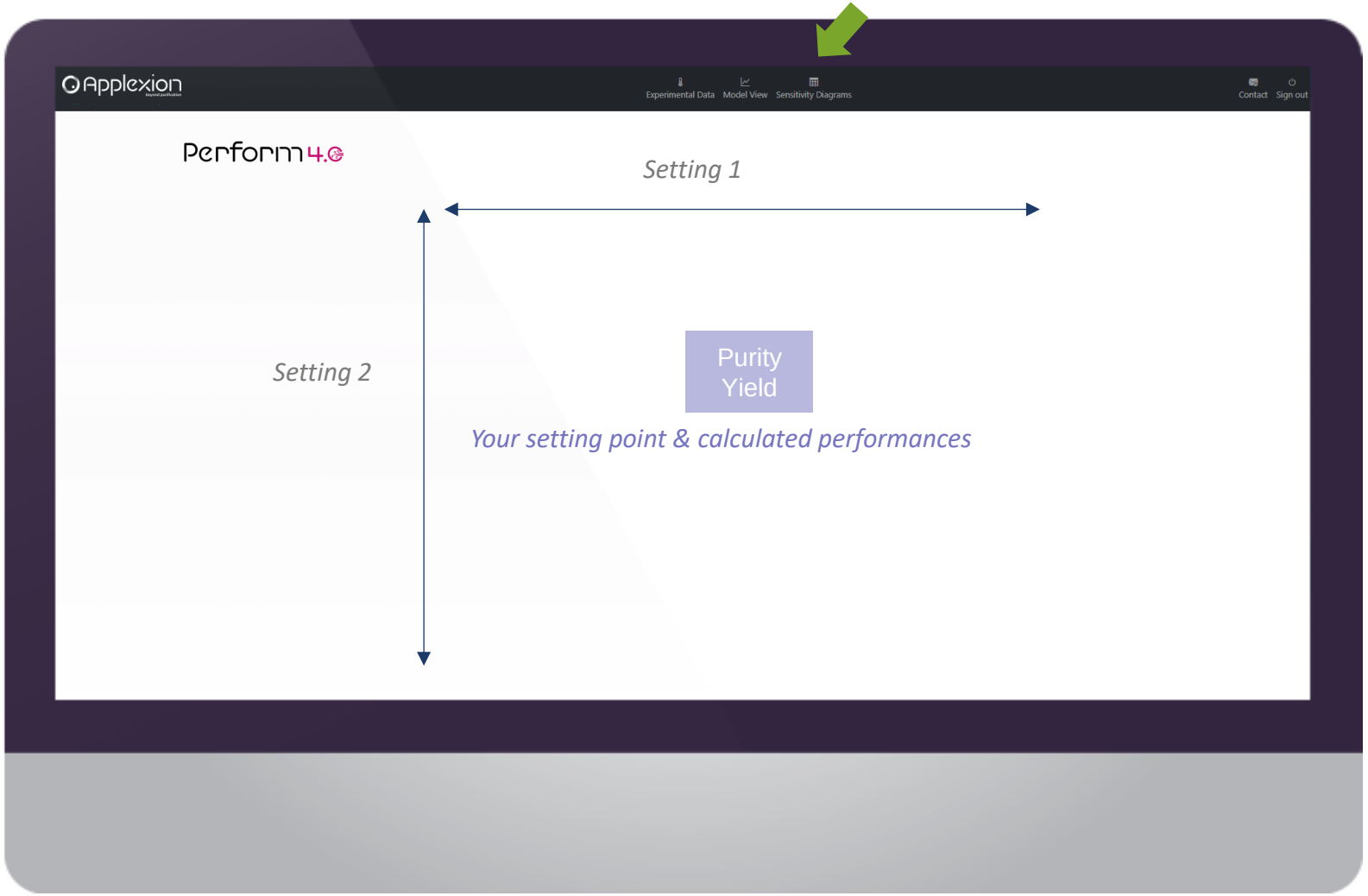
PERFORM 4.0: user experience

4 Get recommendations



*Demo version

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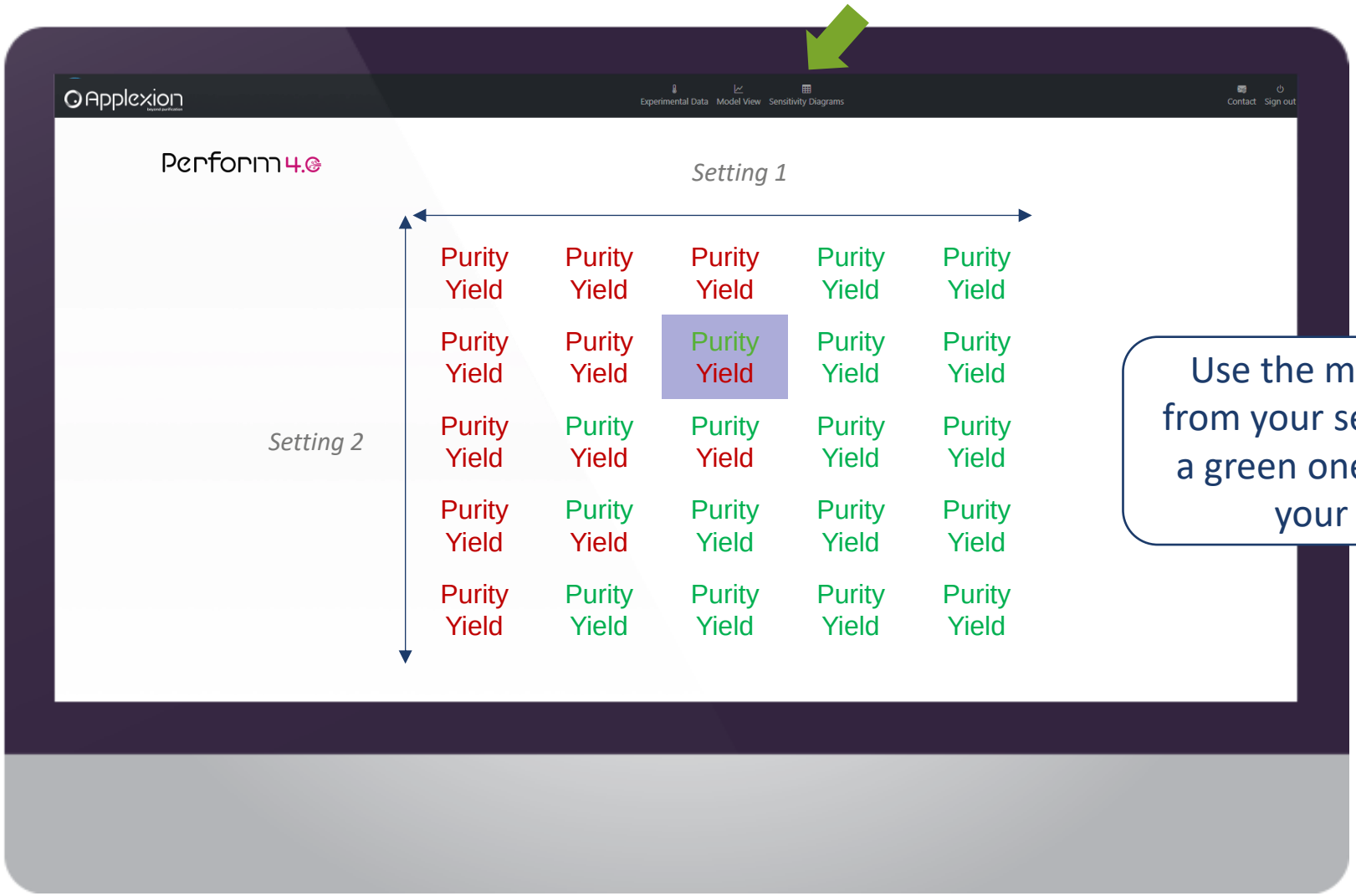
PERFORM 4.0: user experience

4 Get recommendations



Use the maps to move from your setting point to a green one, in line with your targets

*Demo version

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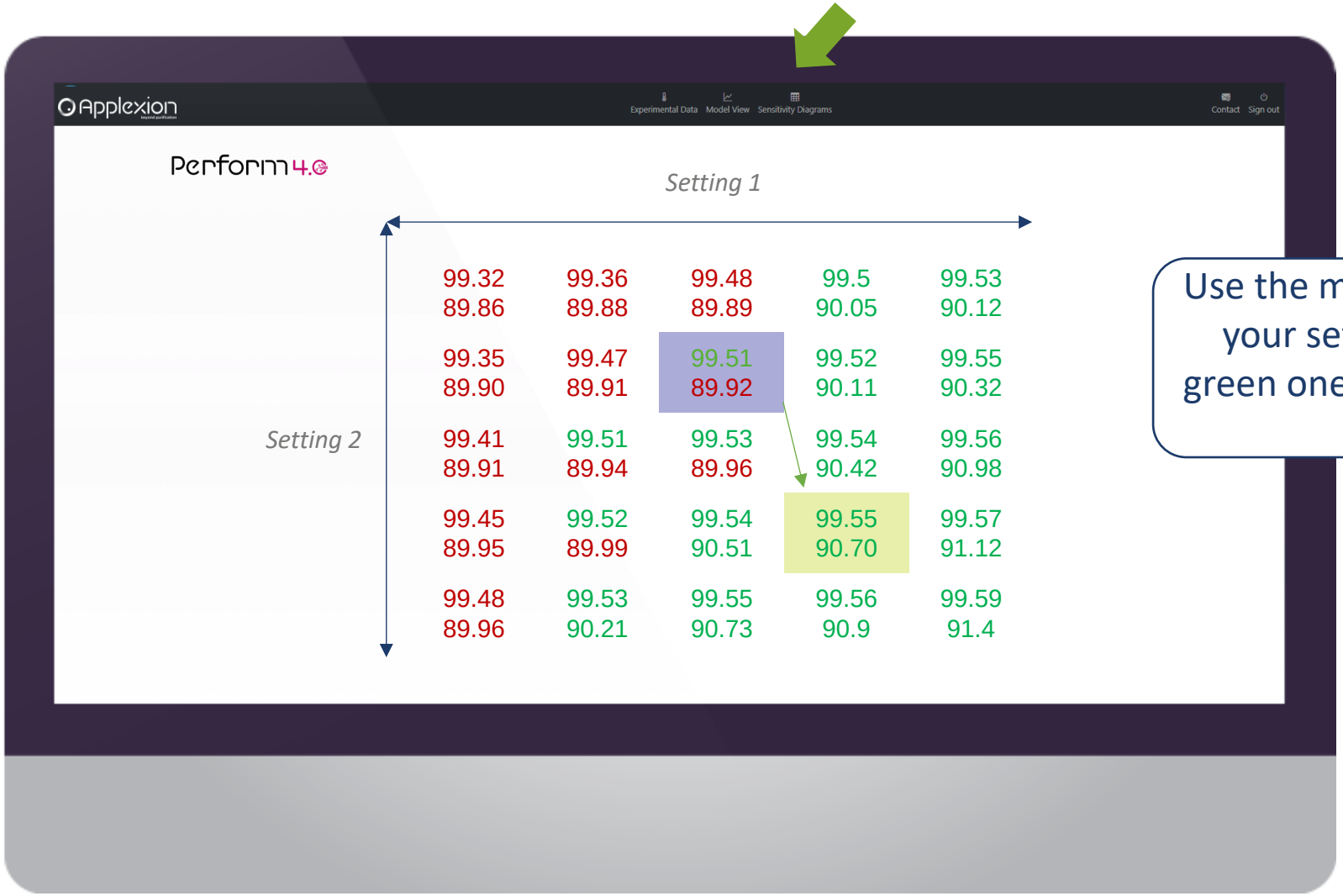
PERFORM 4.0: user experience

5 Efficiently choose your new settings



Use the map to move from your setting point to a green one in line with your targets

*Demo version

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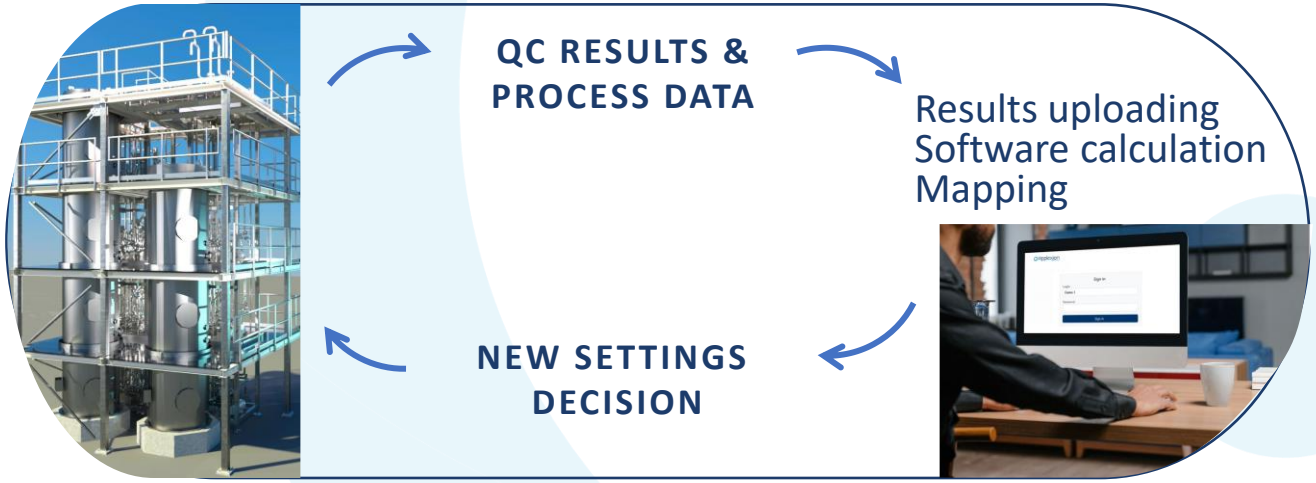
PERFORM 4.0: how do you use it?

Improving technologies with digital solution

Preliminary stage: define your separation and performance targets with Applexion

PERFORM 4.0 process:

1. Login on the web platform
2. Upload your separation conditions and analyses
3. Check model calculation
4. Get recommendation map
5. Efficiently choose your new settings
6. Modify the settings on your supervision



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PERFORM 4.0: case study chromatography

Process optimization using PERFORM 4.0

Applexion™SC
6 cells
Sugars separation

Objective: increase recovery

Decrease of the performance observed onsite prior to PERFORM 4.0 use

Setting	1	…	4	5
Purity	>98%	…	>98%	>98%
Recovery	80%	…	88%	**91%**

Performance before using PERFORM 4.0

➔ Only **5 shots !**

Optimization:

- Increase of final product capacity
- No change in water consumption
- Decrease Energy consumptions (evaporation ↓)

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PERFORM 4.0: case study chromatography

Process optimization using Run 4.0 & Perform 4.0

Applexion™SC
4 cells
Sugars separation

Starting point	t0	Before implementation of the digital services
Checkpoint	+ 1 year	After the implementation of the digital services

- ↑ Sugar recovery
- ↑ Dry matter in extract
- ↑ Feed injection quantity
- ↑ Injection speed

	Capacity In (tDS Feed/year In)	Sugar production (tDS/year)	Water to be evaporated	CO_2 emissions /ton sugar produced	Operating Margin
Starting point	-	-	-	-	<10%
Checkpoint	+25%	+80%	-48%	-50%	16%

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Applexion

RUN & PERFORM

RUN 4.0: main dashboard

General view

Main process unit information

Process unit status overview

Production monitoring

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RUN 4.0: main dashboard

Process recommendations

Every Shift, a specific action plan

Run 4.0

APPLEXION SC MONITORING
SEPARATION TYPE
PURITY TARGET : 90%
RECOVERY TARGET : 85%
RESIN :
APPLEXION SC SEQUENTIAL
BED VOLUME : 10L

CURRENT CONFIGURATION

TOTAL CELLS
6
ASC6C190D1, CYCLE COUNTER
51

BACK TO MAIN MENU

RECOMMENDATIONS LIST ON PREVIOUS SHIFT

Start	End	CONTRIBUTION RATE	RECOMMENDATION	SYMPTOM
2024-02-06 06:00	2024-02-06 14:00	44.80	Adapt boosters coefficients S2, on concerned zone, then on previous and next zone	Outlet pressure too high, 64 times, on cells [1, 2, 3, 4, 5, 6], in periods [1, 2, 3, 4, 5, 6], in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00			Inlet pressure too high, 21 times, on cells [1, 2, 3, 4, 5, 6], in periods [1, 3, 4, 6], in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00			Outlet pressure too low, 13 times, on cells [1, 2, 4, 5, 6], in periods [2, 3, 4, 5], in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00	44.80	Adapt boosters coefficients S1, on concerned cell first, then on previous and next cell	Outlet pressure too high, 64 times, on cells [1, 2, 3, 4, 5, 6], in periods [1, 2, 3, 4, 5, 6], in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00			Inlet pressure too high, 21 times, on cells [1, 2, 3, 4, 5, 6], in periods [1, 3, 4, 6], in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00			Outlet pressure too low, 13 times, on cells [1, 2, 4, 5, 6], in periods [2, 3, 4, 5], in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00	9.960	Check pressure distribution between cells	Outlet pressure too high, 64 times, on cells [1, 2, 3, 4, 5, 6], in periods [1, 2, 3, 4, 5, 6], in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00			Inlet pressure too high, 21 times, on cells [1, 2, 3, 4, 5, 6], in periods [1, 3, 4, 6], in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00			Outlet pressure too low, 13 times, on cells [1, 2, 4, 5, 6], in periods [2, 3, 4, 5], in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00	0.4300	Make sure unit was stable with last analysis, and make new BV settings after taking a profile with Perform 4.0	Too low purity of total targeted species in raffinate, 2 times, in cycles [48, 49].
2024-02-06 06:00	2024-02-06 14:00	0.0200	Check feed quality (dry substance concentration, suspended solids, temperature)	Too low purity of total targeted species in raffinate, 2 times, in cycles [48, 49].

Priority goes to

Action to be taken

Reason for the action

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Digital tools

THANK YOU

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PERFORM 4.0: implementation steps

Working with Applexion

	Applexion scope	You
Remote installation		
• Remote preparation	✓	separation information sharing
• Development of the digital twin	✓	may require feed & resin samples
• Configuration of the calculation platform	✓	-
• Online Trainings	✓	Participation

Ready to start using the software

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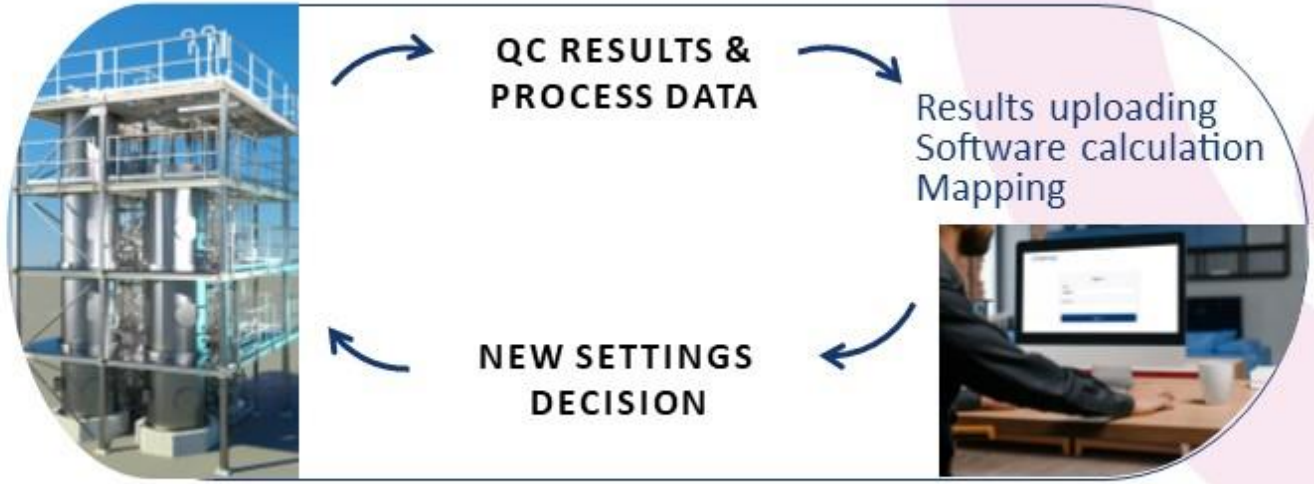
Digital guidance solution to optimize purification process parameters

Available on a web platform

Perform 4.0

Enjoy shorter time to reach your performance objectives.
Get the most out of your equipment.

- Optimal product quality
- Easy to use
- Reliability of settings
- Time saving
- Operational excellence
- Gain in adjustment precision



Based on a unique and reliable Applexion proprietary Machine learning software and your performance initial targets

1. Enter your production parameters and separation analyses
2. Get recommendation to efficiently choose your new settings

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Daily digital solution to better operate the purification process

Available on a web platform

RUN 4.0

Get a quick and helpful view of the mechanical state of your process.
Provide process monitoring, alerts, identification & recommendations.

Process under supervision | Easy to use | Readability

Structured information | Peace of mind | Easier problem solving

FEEDBACK OF SENSORS DATA, CALCULATIONS & ALGORITHMS

Monitoring
Alerts
Identification
Recommendations

AWARED ACTIONS ON THE INDUSTRIAL EQUIPMENT

Focus on mechanics & hydraulics of industrial equipment

1. Monitor your purification system
2. Be alerted when deviation occurs
3. Get recommendations to identify & solve the issue

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