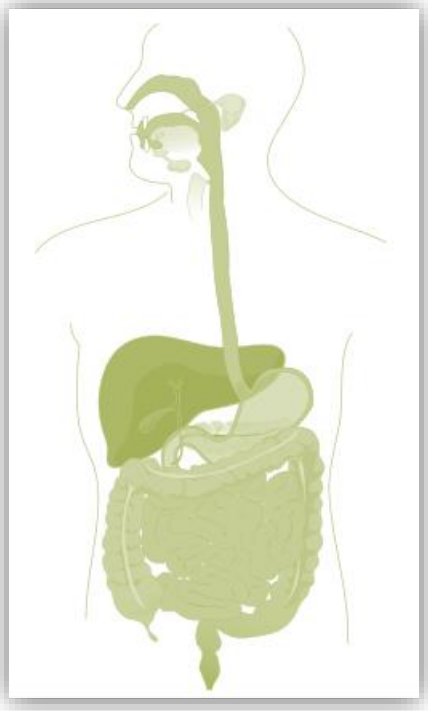
YOUR FOOD RESEARCHERS

Food process & GI tract modelling



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Together to the next level

NIZO food research

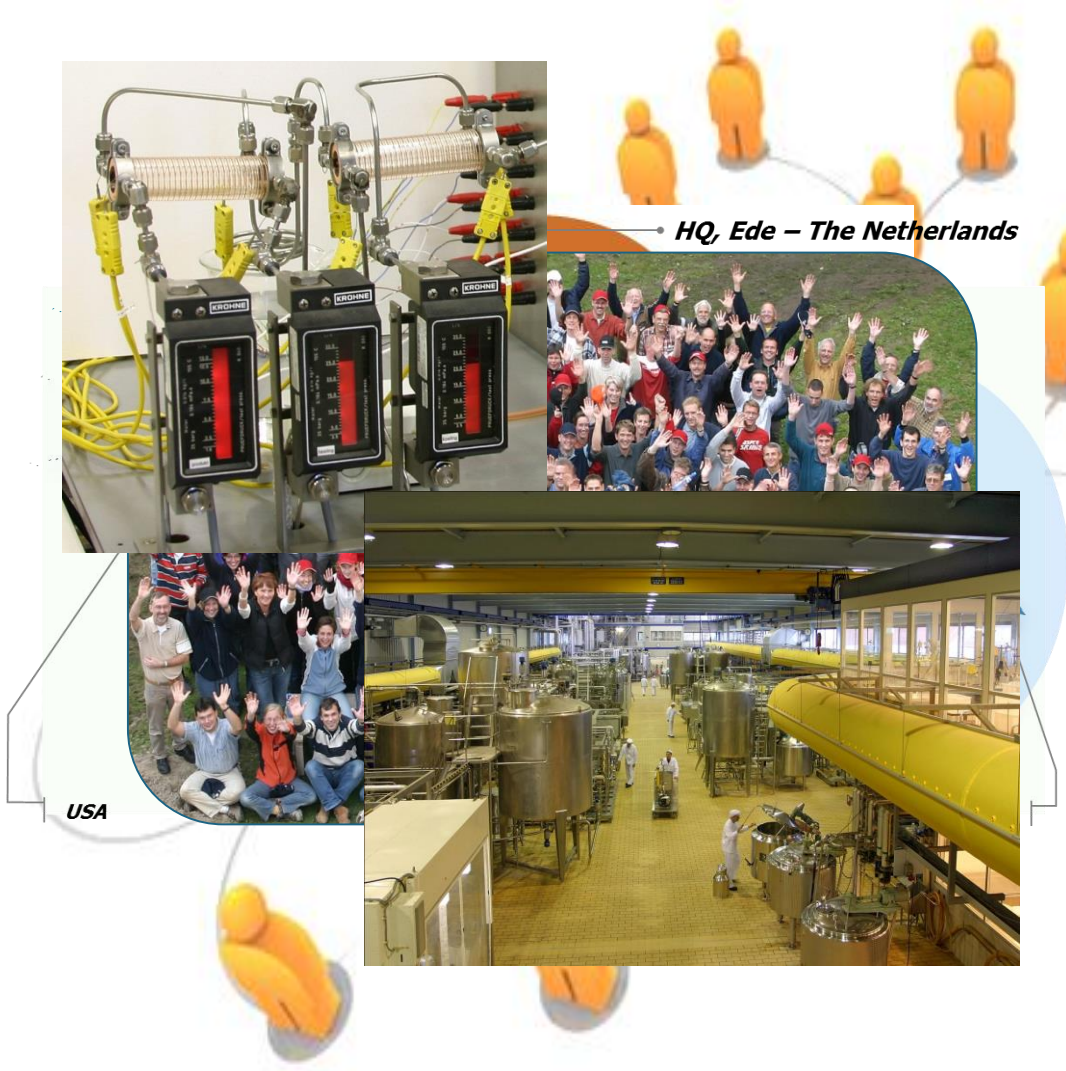
Why
- Good food needs good science

How
- Science hub for projects in a global food network

What
- Flavor, Texture, Health, Processing & Safety
- From lab to pilot plant

Where
- HQ in the Dutch Food Valley
- Sales offices in USA, France & Japan

Who
- 180 professionals

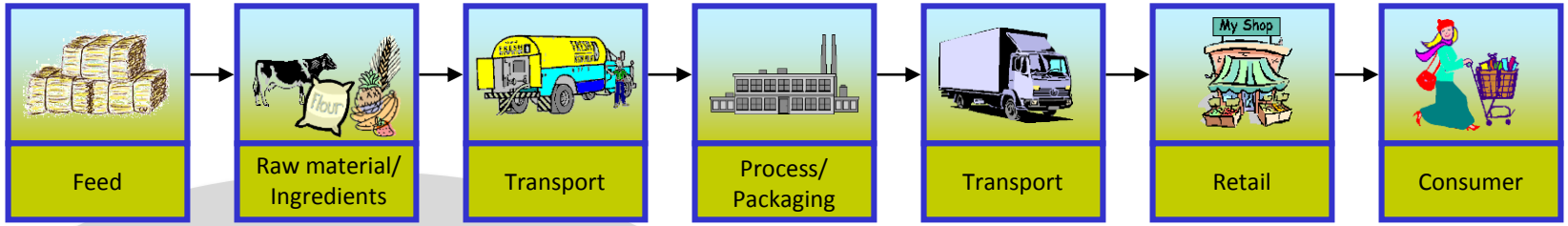


Modelling @ NIZO general overview

Farm management modelling

Process & product property models

Sensory models



Bio-informatics (metabolic pathway modelling, random forest…)

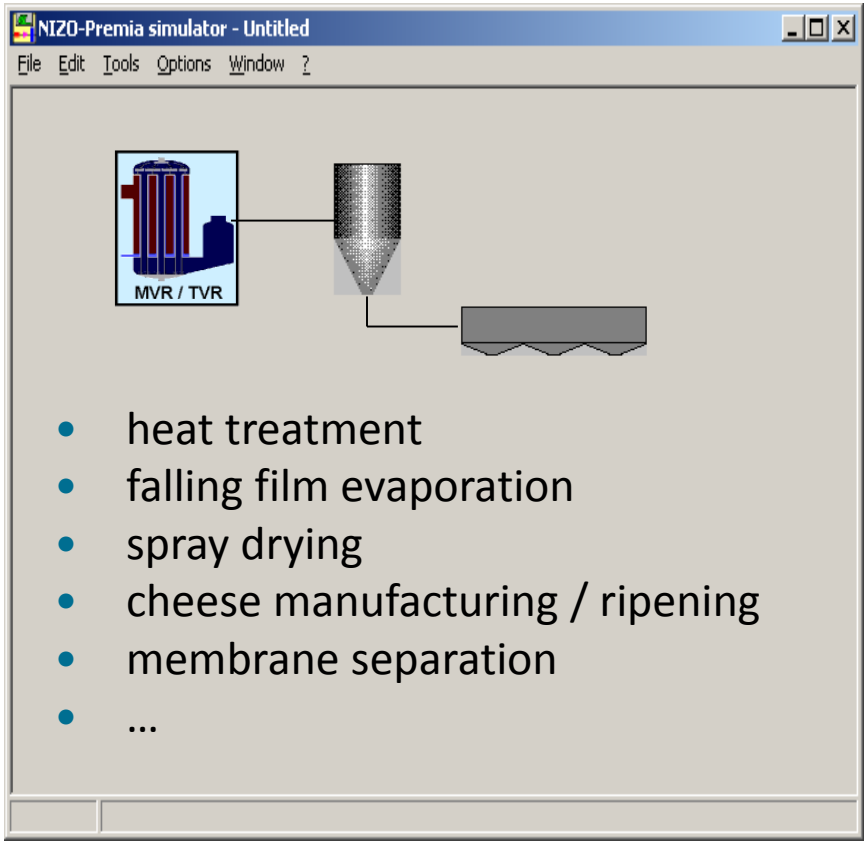
Product quality & shelf life models

GI tract modelling

QMRA (Quantitative Microbial Risk Analysis)

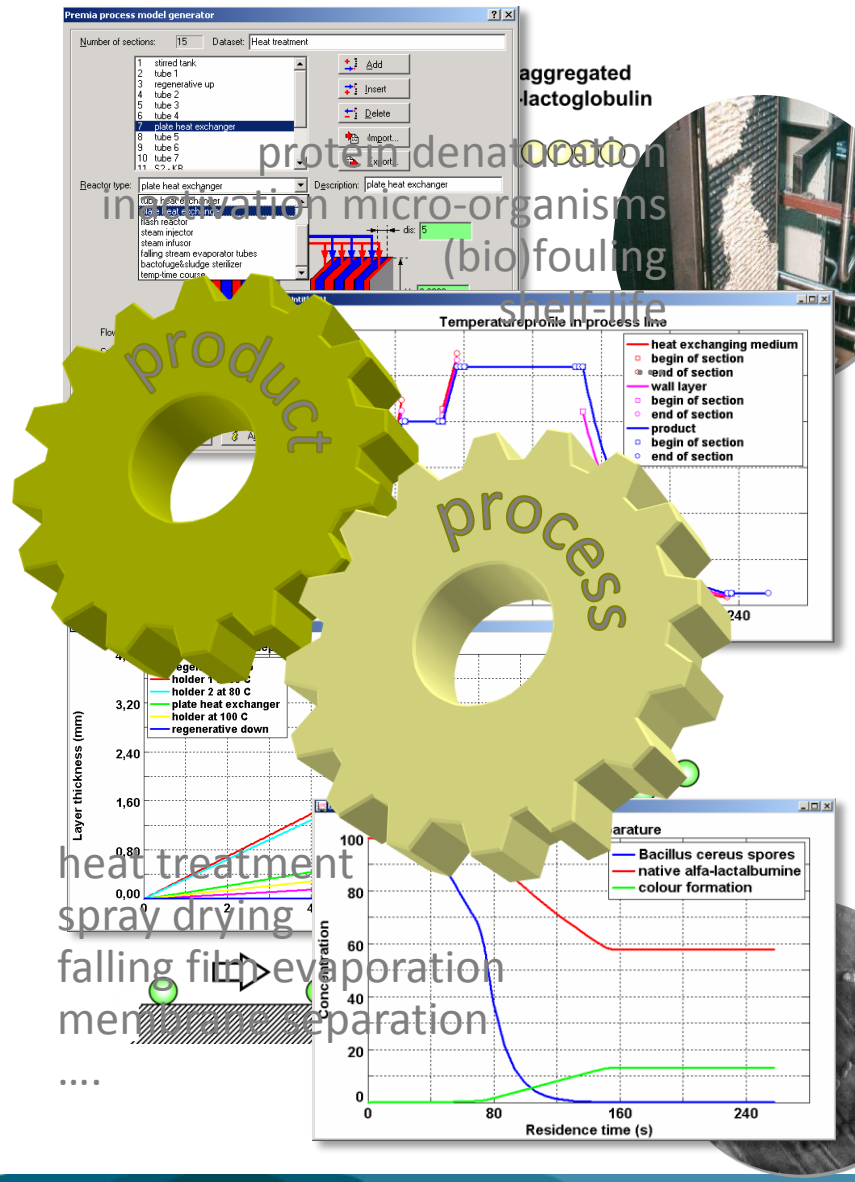
NIZO Premia

- PREMIA: PREdictive Models for Industrial Applications
- A user-friendly tool for modelling process-product combinations
  - practical user interfaces for each model
  - models can be linked and combined
- Designed for use in practice
  - built in graphical tools, optimisation tools, calibration etc.



Modelling strategy

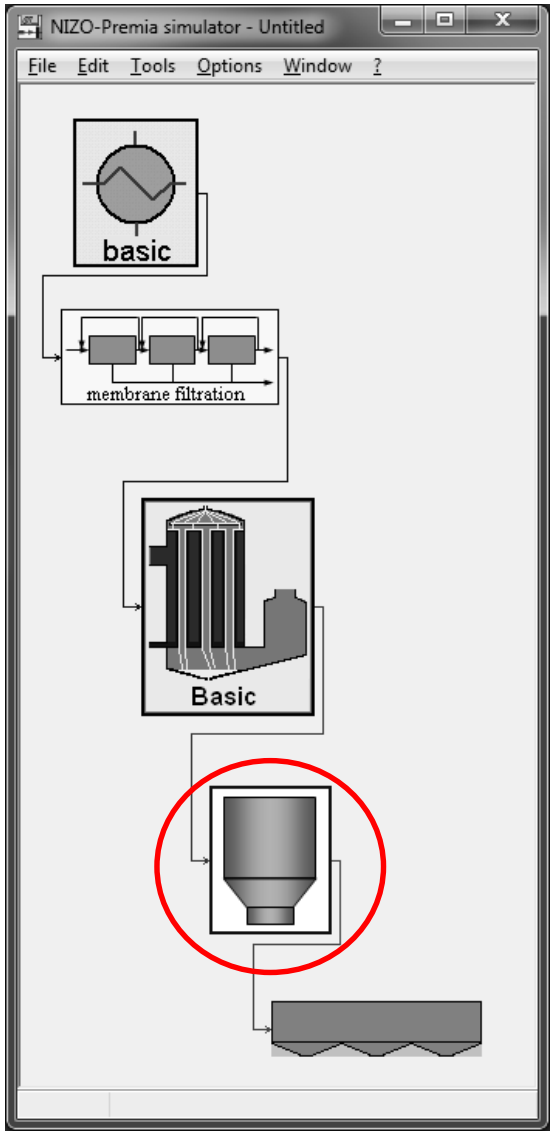
- Understanding **process-product interactions** is key
- E.g. heat treatment
  - High T to guarantee food safety
  - Low T to minimize fouling and optimize product quality
- Modeling is quantifying process-product interactions



Spray Drying

Market need for:

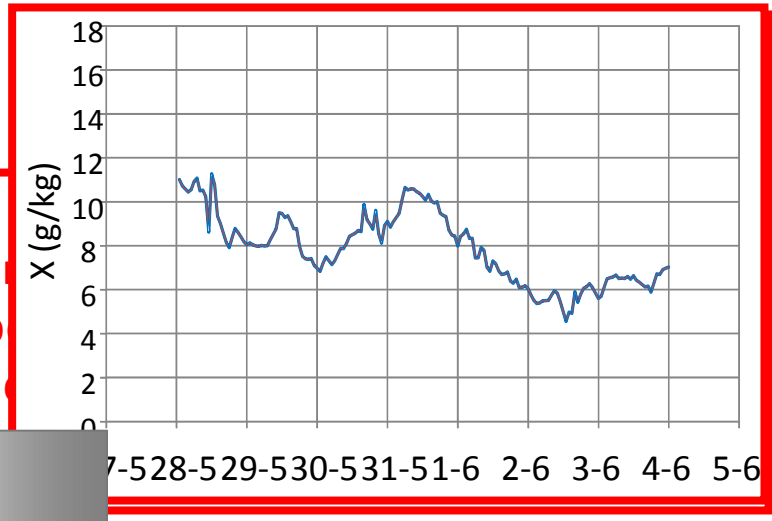
- Capacity ↑
- Energy ↓
- Powder quality ↑



Spray drying

Feed:
- Flow rate F
- Temperature T_F
- Composition

Inlet air:
- Flow
- Temp
- Humi



Outlet air
- Temperature T_{out}
- Moisture content X_{out}

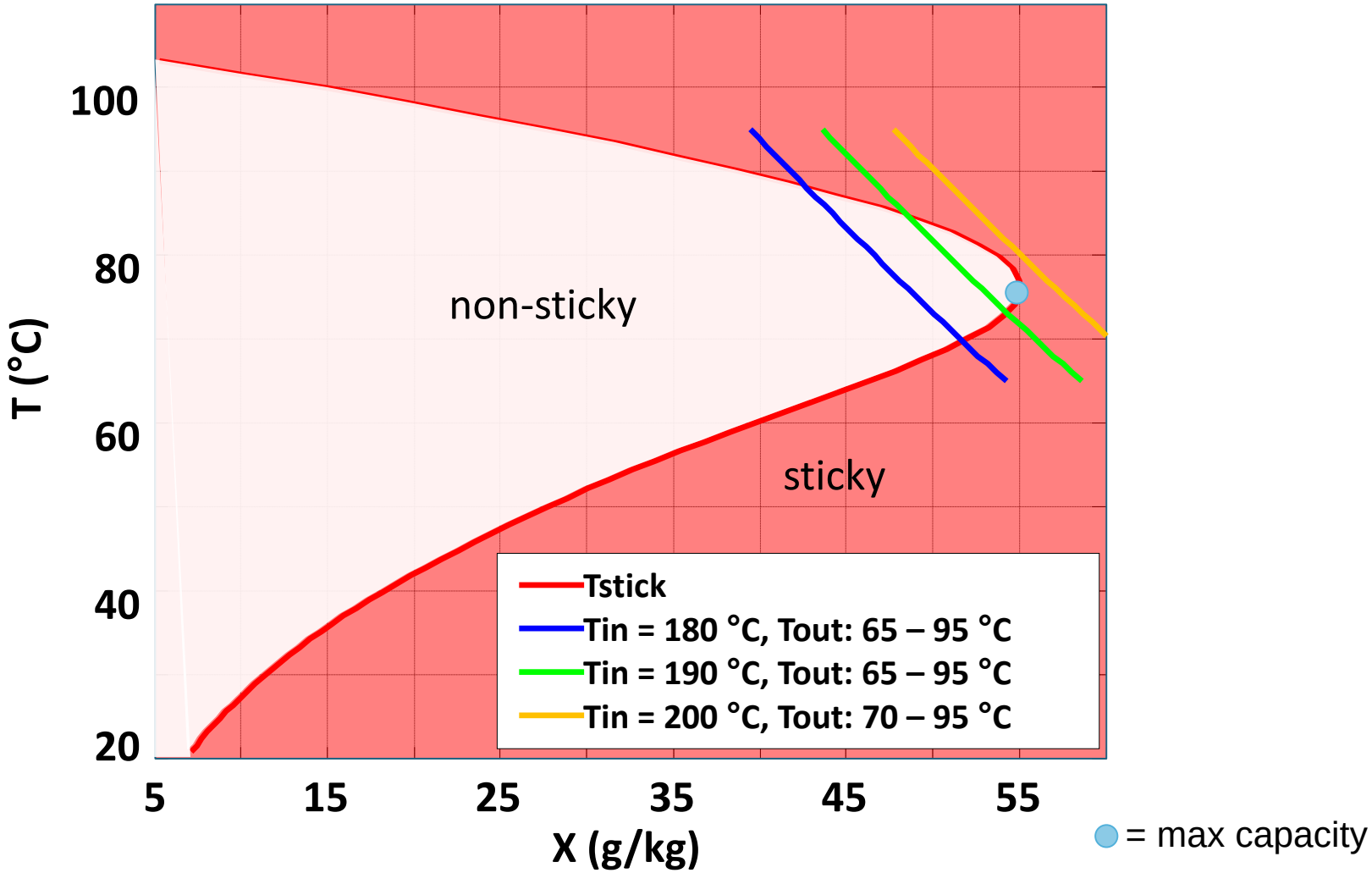
Particles hitting the wall:
- $T \cong T_{out}$
- M_p outer layer ≅ equil. moisture cont. $M_{p,eq}$
- Sticky point

  $= f(T_{out}, M_{p,eq})$

  $\equiv f(T_{out}, X_{out})$

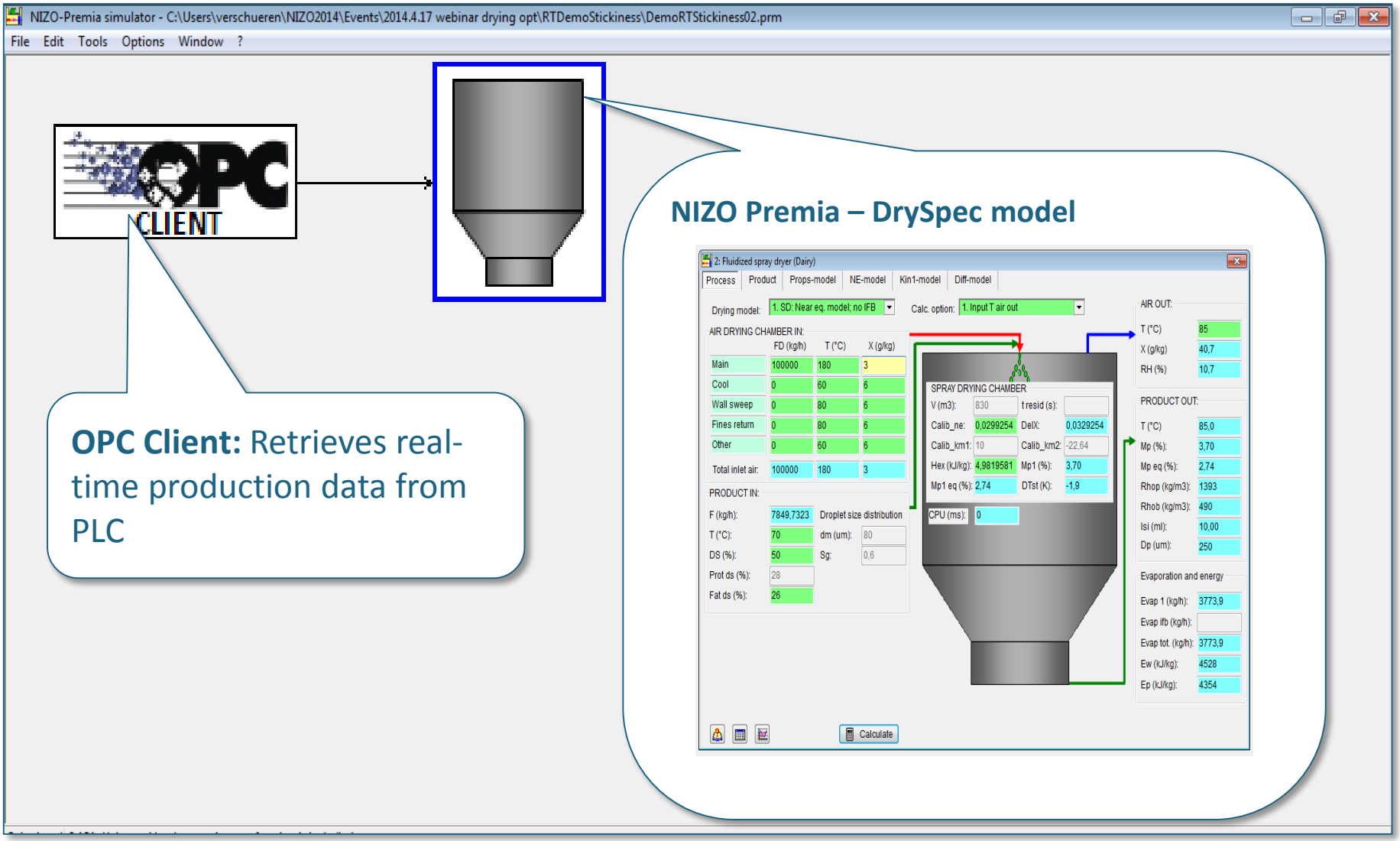
Powder out:
- Moisture content M_p
- Temperature T_p
- Powder functionality

Stickiness curve – maximizing capacity



Case:

Optimizing capacity at varying ambient air humidity



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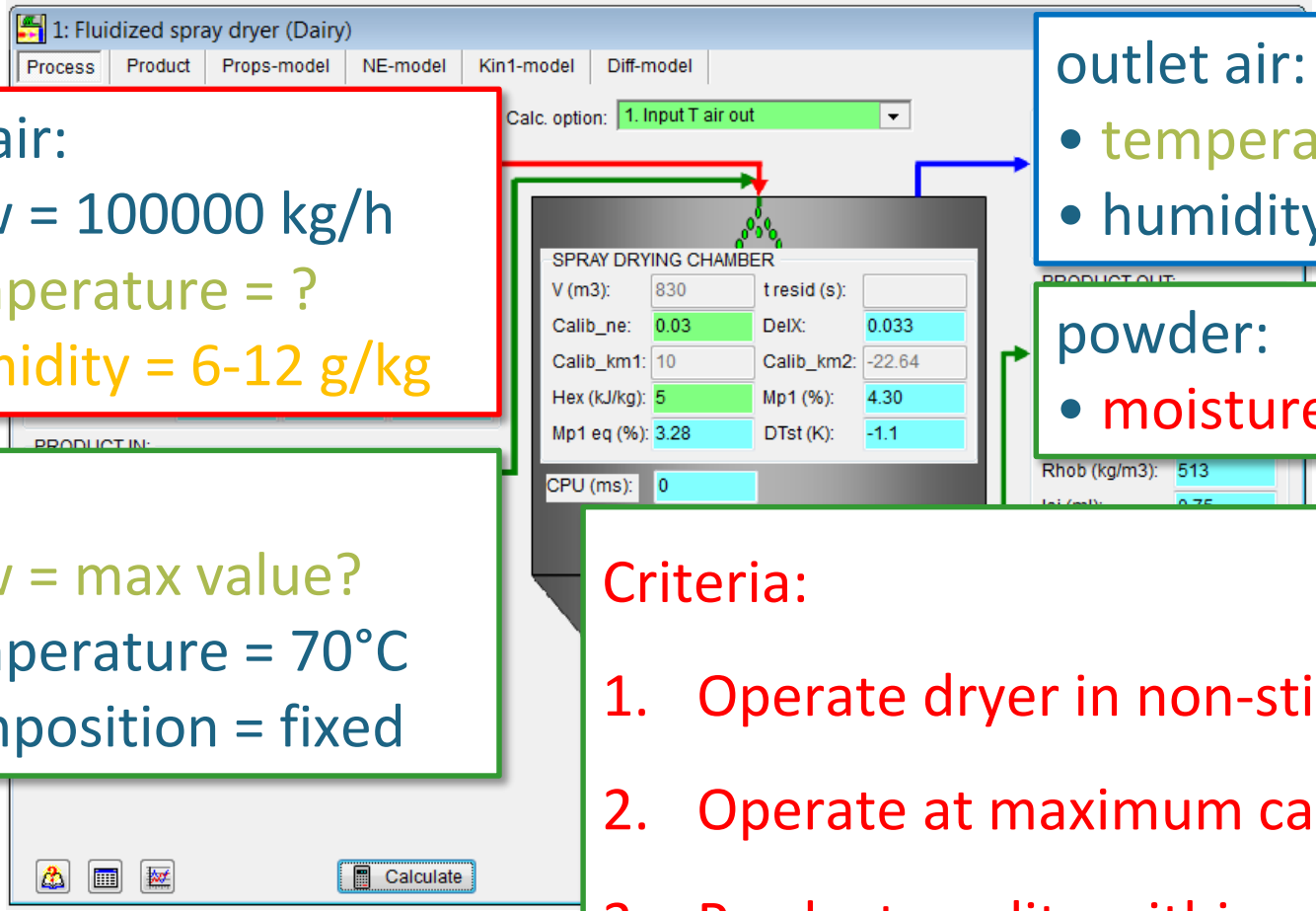


inlet air:
- flow = 100000 kg/h
- temperature = ?
- humidity = 6-12 g/kg

outlet air:
- temperature = ?
- humidity = ?

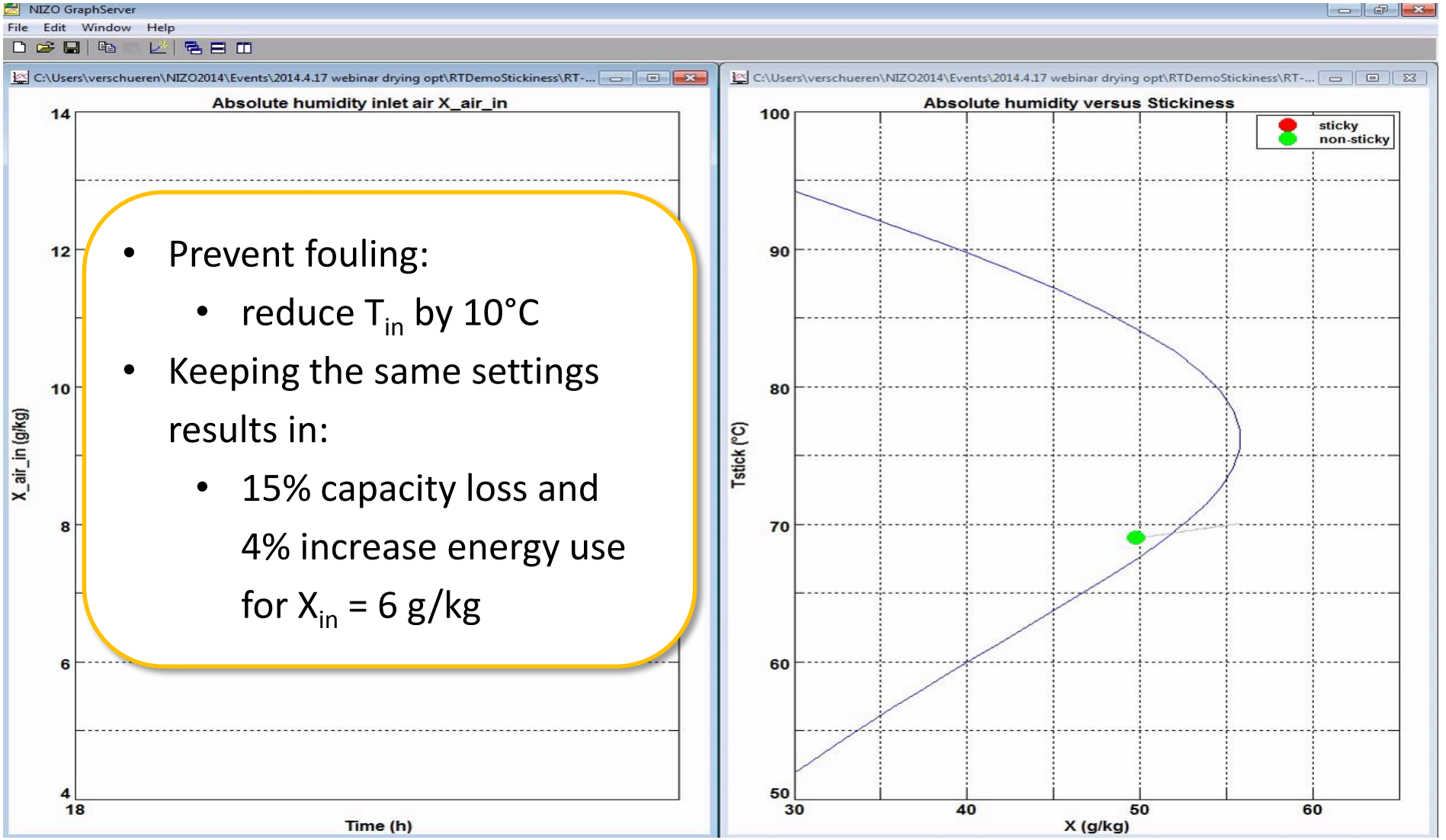
powder:
- moisture: 3,5%

feed:
- flow = max value?
- temperature = 70°C
- composition = fixed

Criteria:

1. Operate dryer in non-sticky zone
2. Operate at maximum capacity
3. Product quality within spec

Case: Optimizing capacity at varying ambient air humidity, while keeping powder moisture M_p at 3.5%



- Prevent fouling:
  - reduce T_{in} by 10°C
- Keeping the same settings results in:
  - 15% capacity loss and 4% increase energy use for X_{in} = 6 g/kg

PSE/NIZO Collaboration

- Make Premia available in gPROMS
  - Combine Premia's process /product expertise with strengths of the gPROMS platform

- Together with industry and universities
  - Speed up development by combining resources and sharing information
  - Prevent 'wheel reinventions' on precompetitive topics
  - Further enhance practical use of predictive models