September 9th, 2014

Lyon

*smart*INST® introduction

*smart*INST®

high skilled & complementary know-how

Christophe GRAFFIN
CEO
Former Senior VP SONEPAR INTERNATIONAL (#1 WW Electric Material distributor).

SAS company founded in Sept.2009
8 years of R&D
Spin off from CNRS and ENS Lyon
A Team of Engineers, Scientists, technicians and business developers

Pr. Jean-François PINTON
Scientific Advisor
Director of the Institute of Physics of the CNRS

Lucas BERTRAND
Sales & Business Development Manager

Nicolas TISSOT
Industrial Manager
MS engineering

Dr Yoann GASTEUIL
Ph.D., CTO and R&D Manager
Engineer ENS + Co-inventor of the original project patent

ENS DE LYON

CREALYS INCUBATEUR

NOVACITE

cnrs

A well known industry issue:
monitoring a mixing process

- **Some examples of Industrial mixing:**

Chemistry

Food

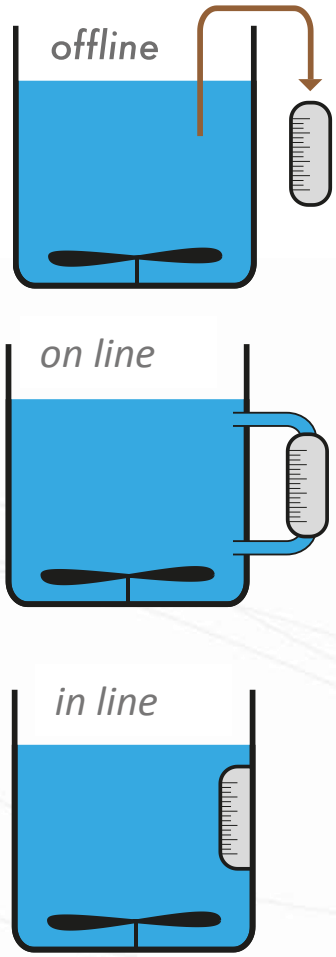
Pharma/Bio-tech

Water treatment

- **For all those industries, 4 constant objectives:**
  - **Product Quality**
  - **Productivity Gains**
  - **Traceability**
  - **Reliability**

Mixing product monitoring:

Common approaches



- Could be as complex as needed
- no real-time (*a posteriori* control)
- representativity issues
- highly process dependent position
- manual operation

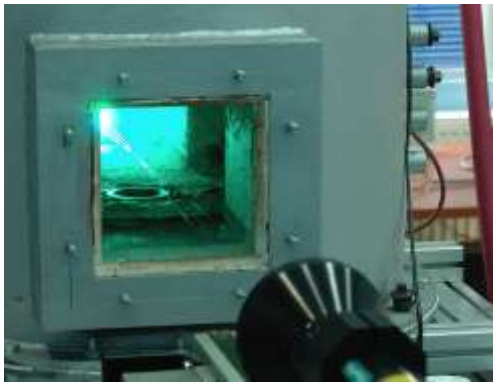
- no real-time (most of the time)
- representativity issues

- continuous
- real-time
- representativity issues
- scale up issues (position)

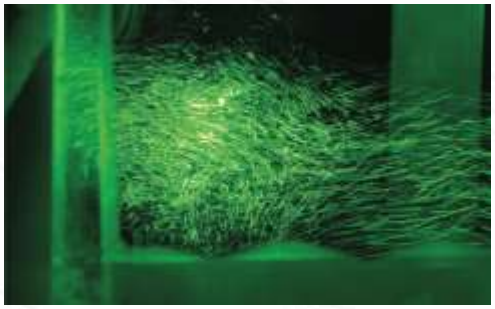
Mixer characterization:

Experimental techniques

Laser Doppler Velocimetry (LDV)



Particle *Imaging* Velocimetry (PIV)
Particle *Tracking* Velocimetry (PTV)



Pressure tubes
Hot-film-anemometry

Measures:

- Velocity
- Acceleration
- Quantities derived thereof

A NEED FOR:

- **Direct access**
- **Transparent fluid**
- **Strongly localized measurement**
- ***No* simultaneous measurement of chemical properties**
- **Addition of tracer particles**

Additional constraints:

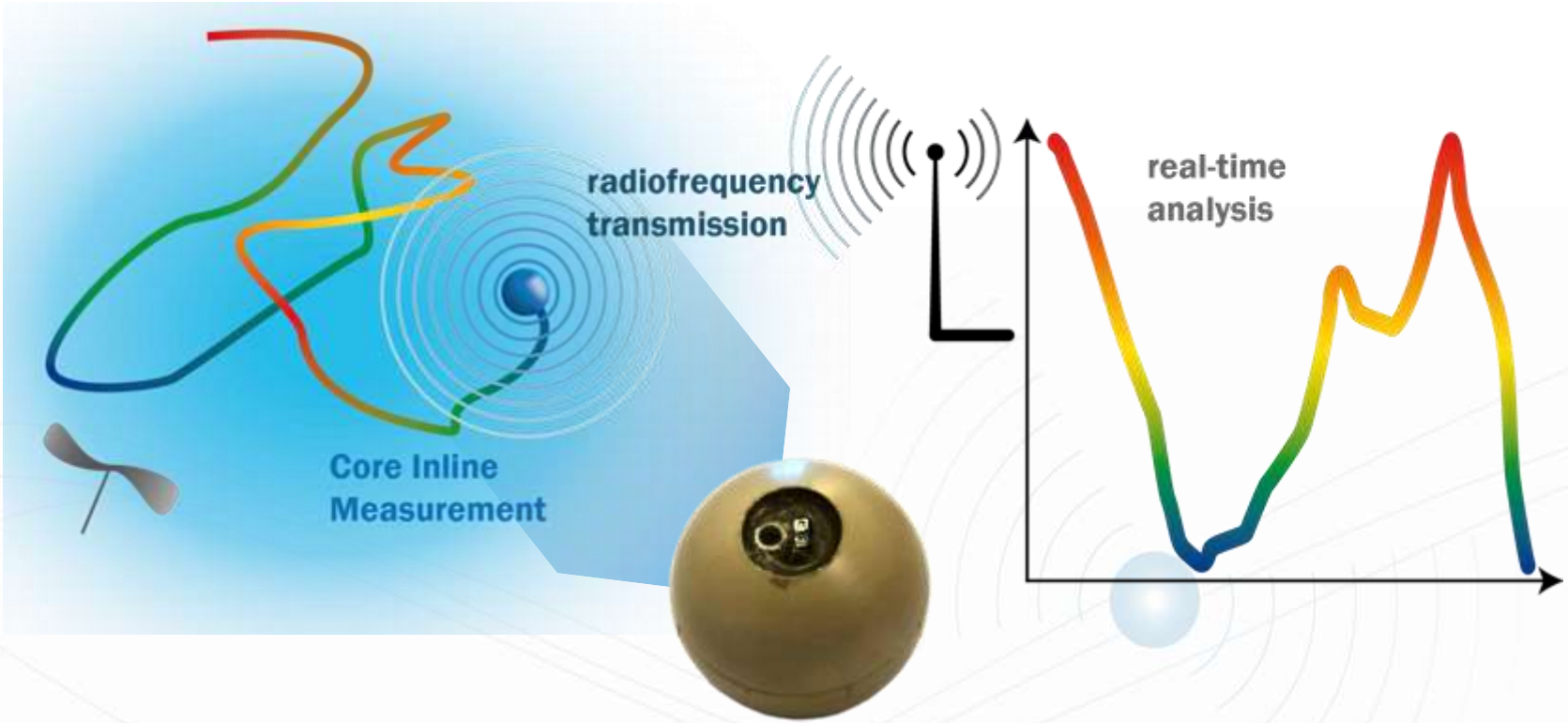
- Light, Material, Cooling, Power Req.

*smart*INST® Our Products

*smart*INST® novel approach:

Core Inline Measurement

A new instrument to increase process intelligence

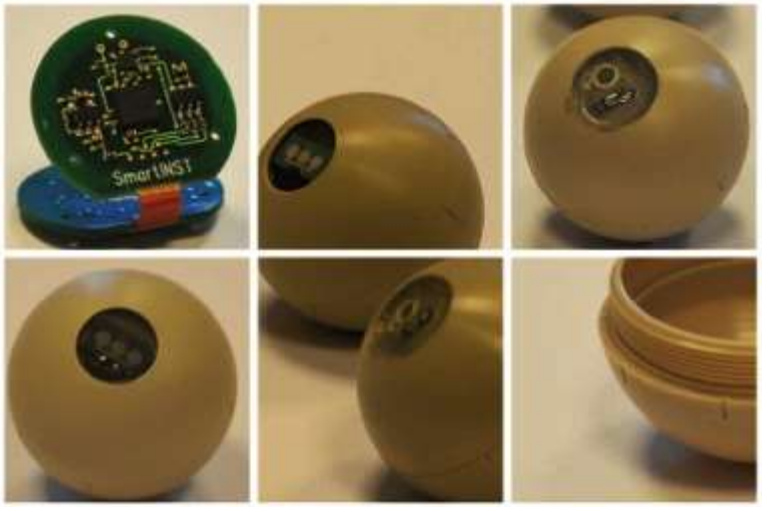


The 1st wireless technology to
measure, understand, monitor, optimize & control industrial mixing

*smart*INST®

measurement system

*smart*PART®



Instrumented Particles :

- Wireless autonomous sensors
- Signal and information transmission
- Power Management

In situ real-time analysis (critical parameter)

- **simple to use**
  - no need to modify existing equipment
  - easy to implement
  - re-extractable instrumented particles
  - explores the whole fluid
  - no need for optical windows
  - for dynamic and real time measurement
- **100% safe in use**
  - robust & shock resistant (Peek)
  - sterilizable
- **long autonomy**
  - from 60 to 400 hours continuous

*smart*INST®

combined measures

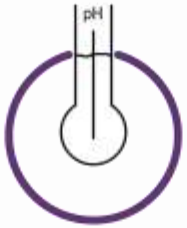
a wide combinable sensor range...

to characterize products:

temperature

turbidity

pH



conductivity

to monitor processes:

hydrodynamics

thermodynamics (p,T)

... freely advected within the process

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large market opportunities

- **Our current customers are:**

Chemicals

Pharmacy/Bio-tech

Cosmetics

Food industry

- **We are members of :**

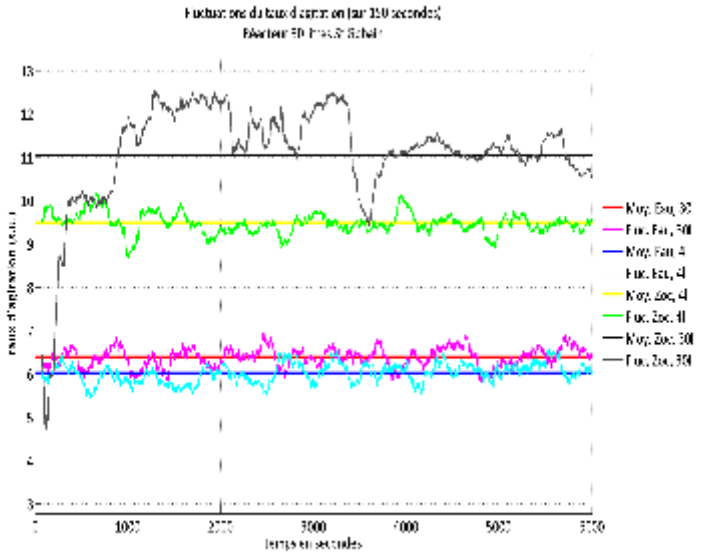
LYONBIOPOLE

AXELERA
catalyseur de croissance durable

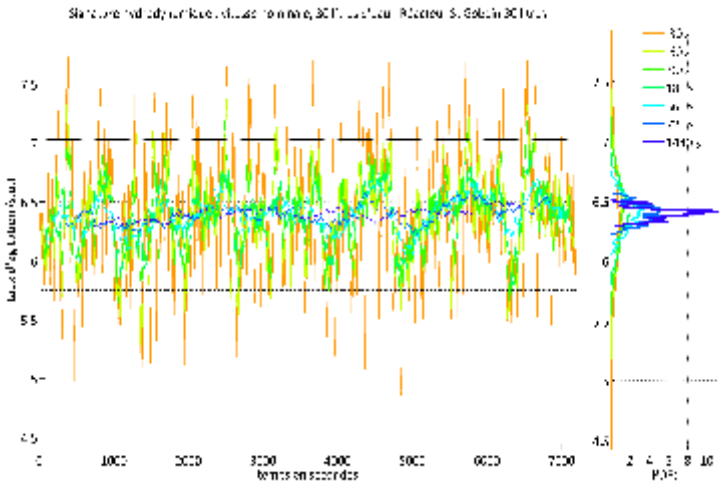
*smart*INST® The outputs

Hydrodynamics

Mixing analysis



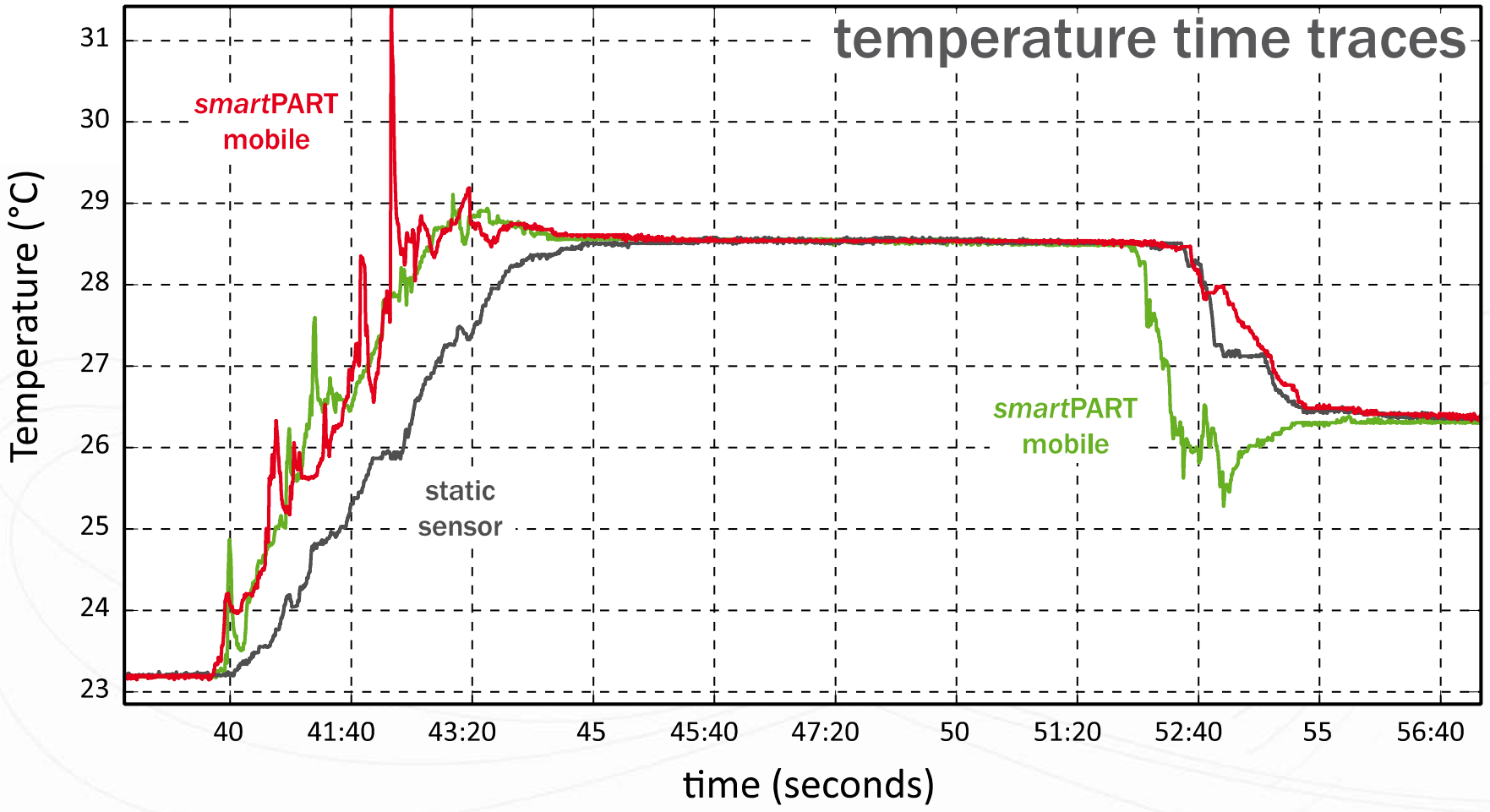
mixing rate per configuration



dead area
overshared area
signature for scaleup

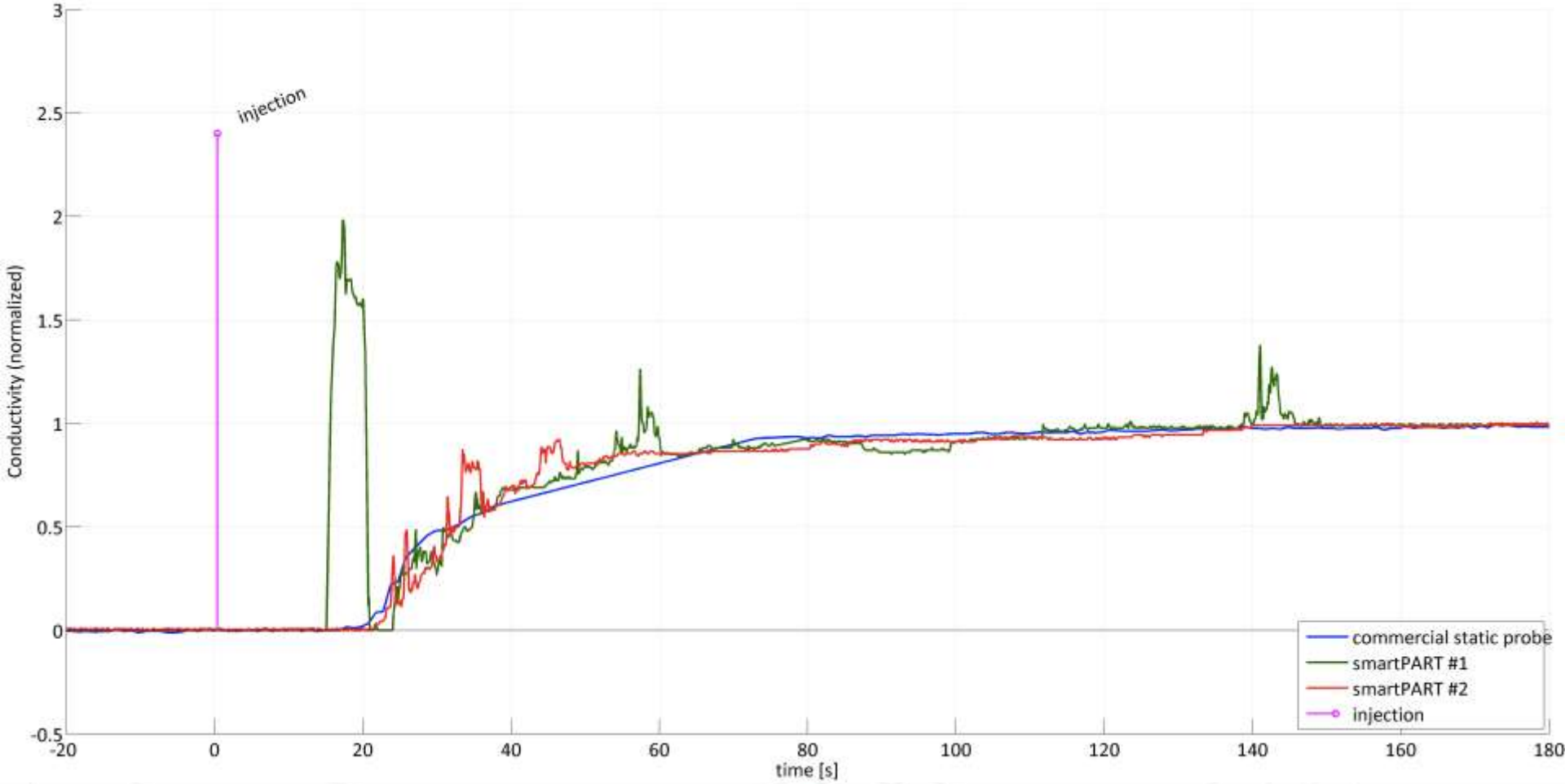
Hydrodynamics

Homogeneity (mixing Temperature example)



Product characteristics

Conductivity example

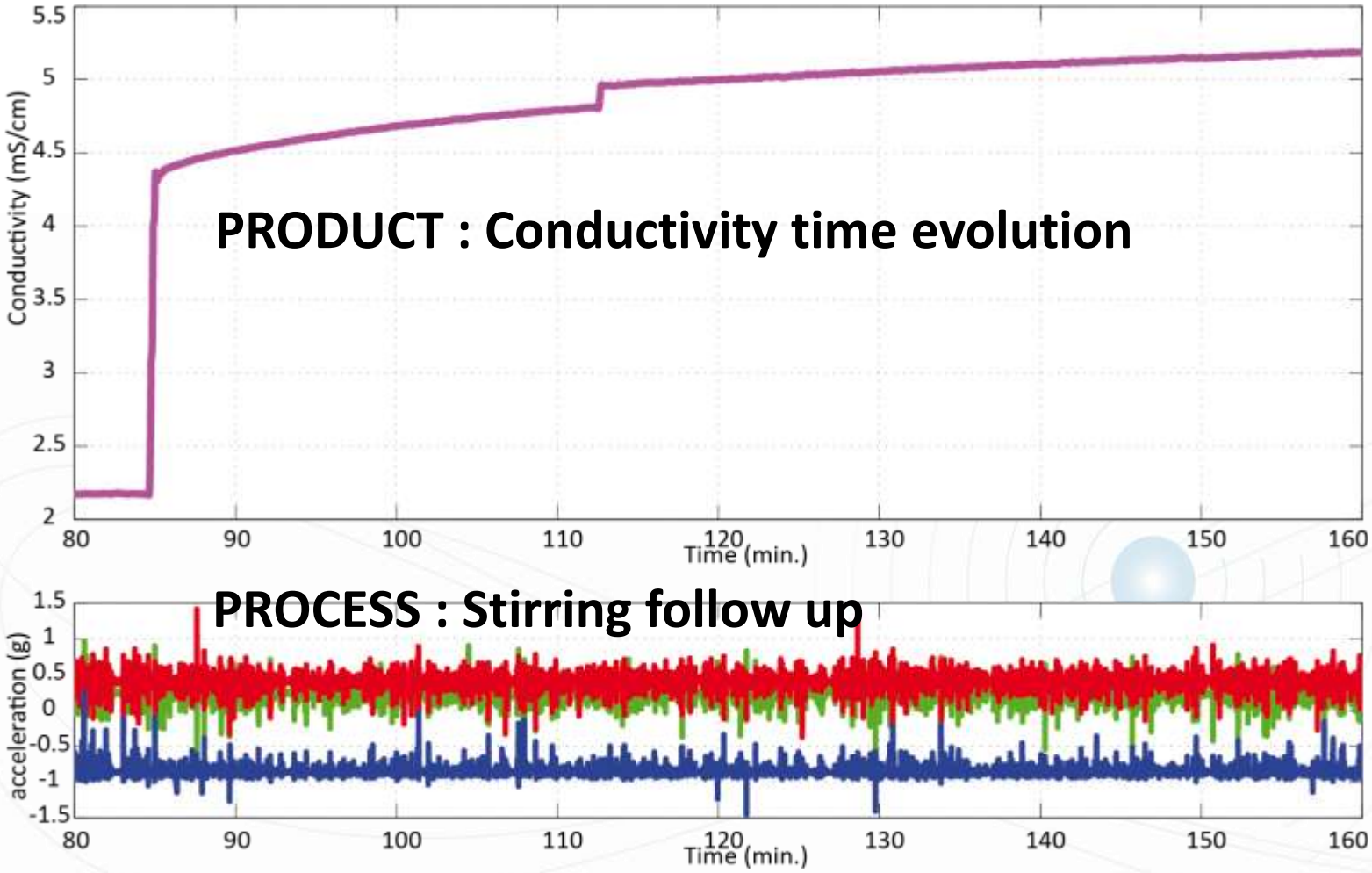


shorter answer time : visible over shoot and non homogenious area

Process Survey : PAT compliant

PATVAX- Fui Vaccine production example

Inline measurements for bio (vaccine) process: 2009-2013



*smart*INST® user benefits

User Benefits

Economic Impacts / Process Optimization

- Time savings
  - Minimizes development lead time
  - Optimizes mixing time
  - Provides a better understanding of process dynamics
  - Simplifies scale-up issues
- Productivity efficiency
  - Allows inline controls
  - Adjusts cycle time to tailored efficiency
  - Provides monitoring (limits / target values)
- Lower wastes
  - Scale-down process check

Improve production process & productivity

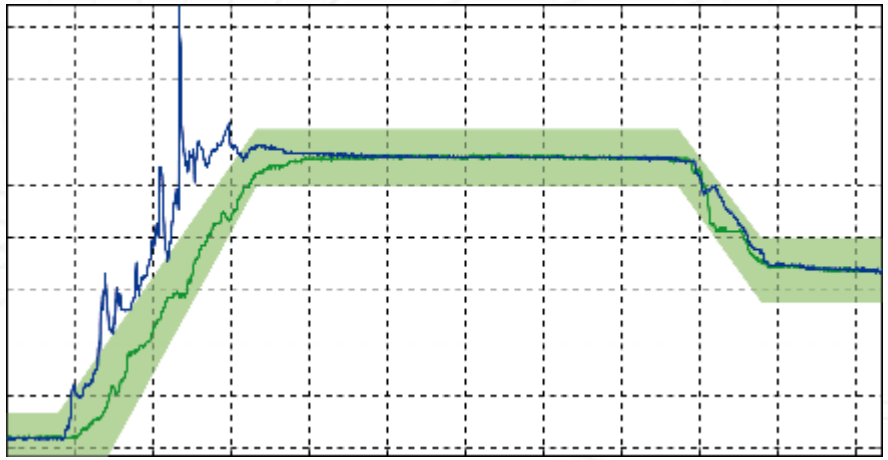
User Benefits

A Tool for Quality Insurance: PAT compliant

- Quality insurance :
  - Traceability of monitored characteristics changes
  - Optimization of process mixing timing depending on the target value required.
  - Definition of targeted optimal process signature
- Set up of control alerts for process monitoring
  - Impeller variation detection during the mixing process
  - Process procedures impact quantification on final product
  - Homogeneity control via continuous monitoring of smartPART

➢ **Example**: Conductivity/Reflectance evolution during vaccine production

➢ **Example**: grafting of different valences in a vaccine production, at various speed and mixing times



*smart*INST® Conclusion

*smart*INST® in short

- **A company based on a technical breakthrough**
  - Adapted to Pharmaceutical and Biotech industries (PAT compliant)
- **A strong capacity for innovation and awarded in 2013:**

- **A reliable technology with high benefits:**
  - Better representativeness, real time analysis, in the heart of the mixing process
  - Validate mixing homogeneity and its evolution overtime.
  - Understanding impact of process on product.
  - Optimization of industrial systems
  - Traceability and quality control management
- **Scientific expertise:**
  - Development of specific embedded measures
  - Analysis and Data interpretation
- **International recognition from leading scientific publications**

New Journal of Physics
The open access journal for physics

Physical Review Letters
moving physics forward

Techniques de l'Ingénieur

Review of Scientific Instruments

SPECTRA ANALYSE

*smart*INST®

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