



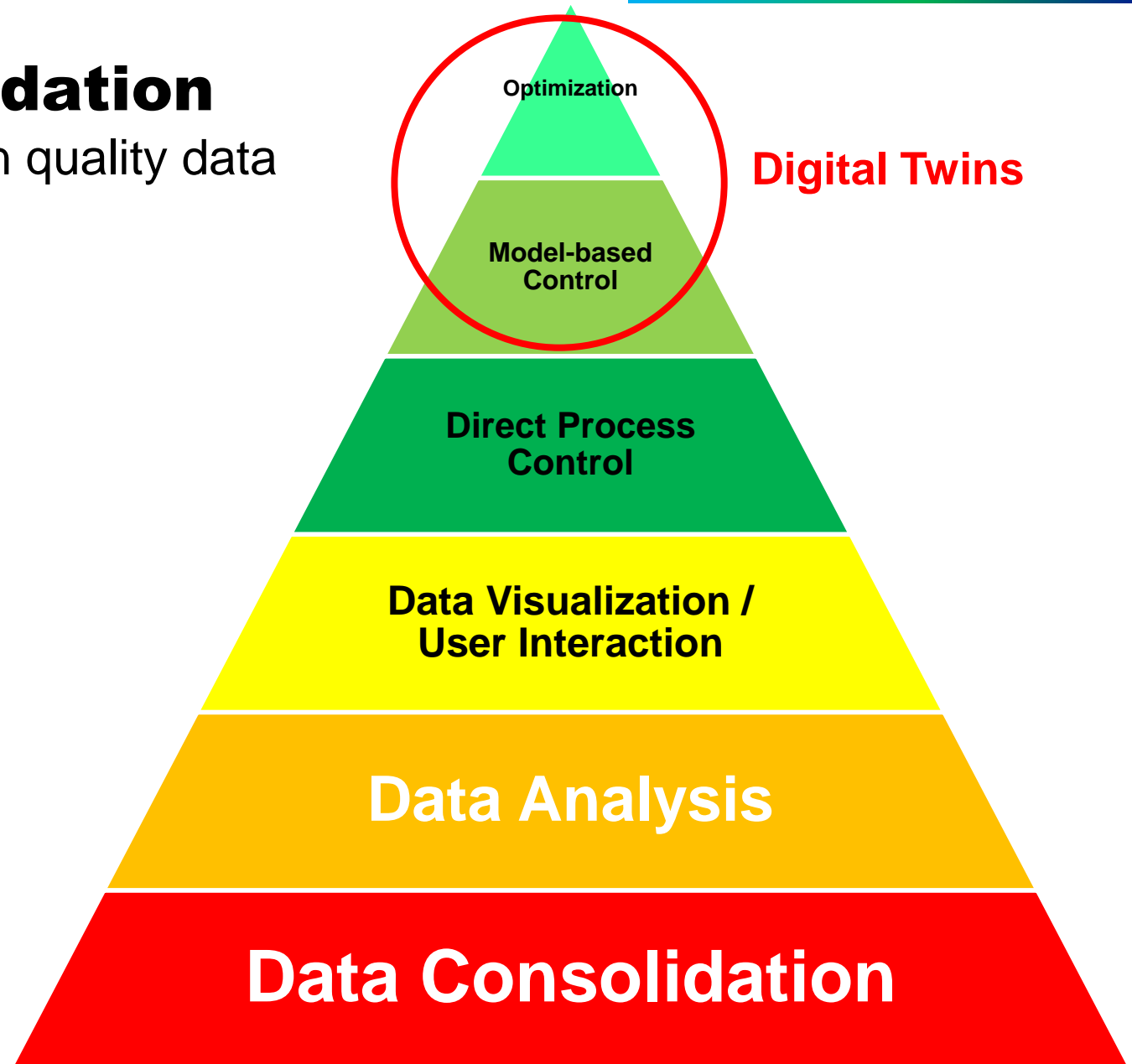
Digital Innovation

Innovative Data Tools and Solutions

General Overview | Digital Twin Workshop - SWAN Forum 2019 | Miami FL, USA

Smart on Solid Data Foundation

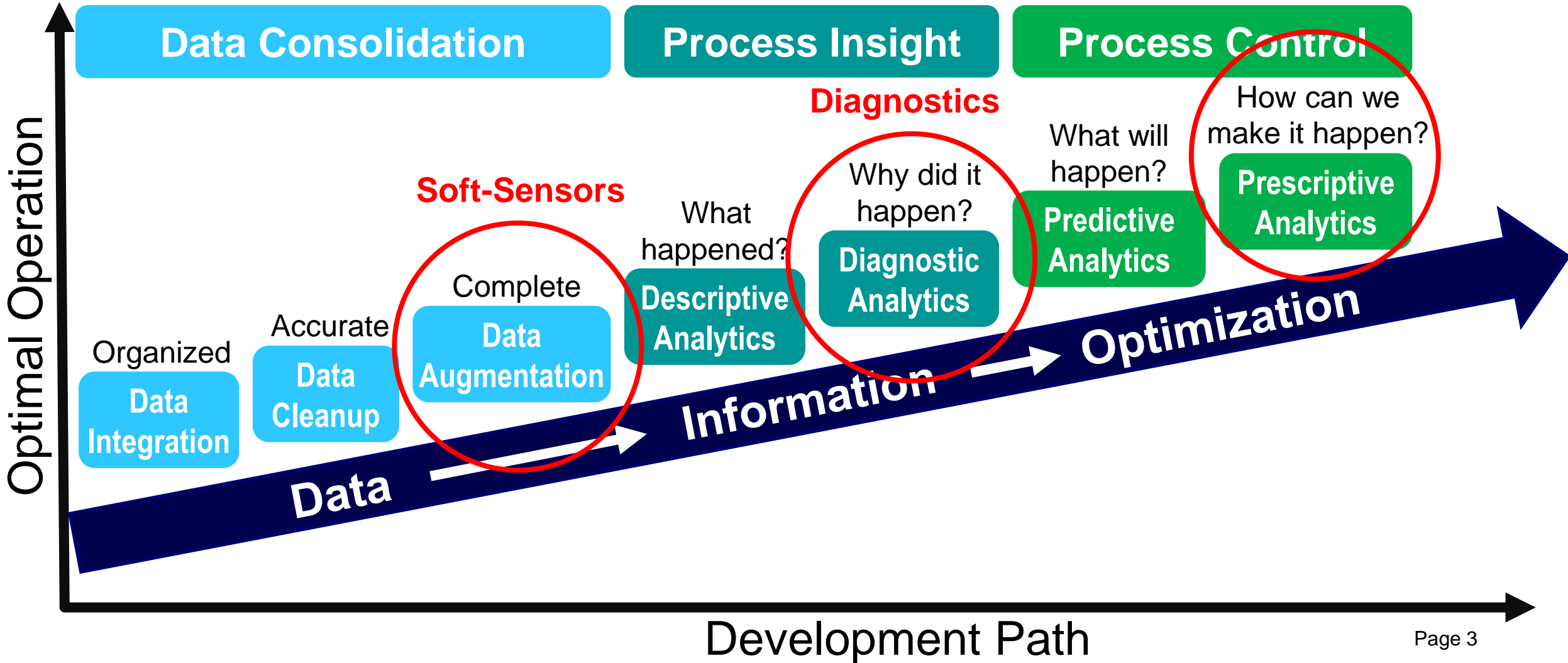
Increased value and resilience based on quality data



Digital Tools – From Sensors to Design and Optimization

A complete path to added value

Digital Twins

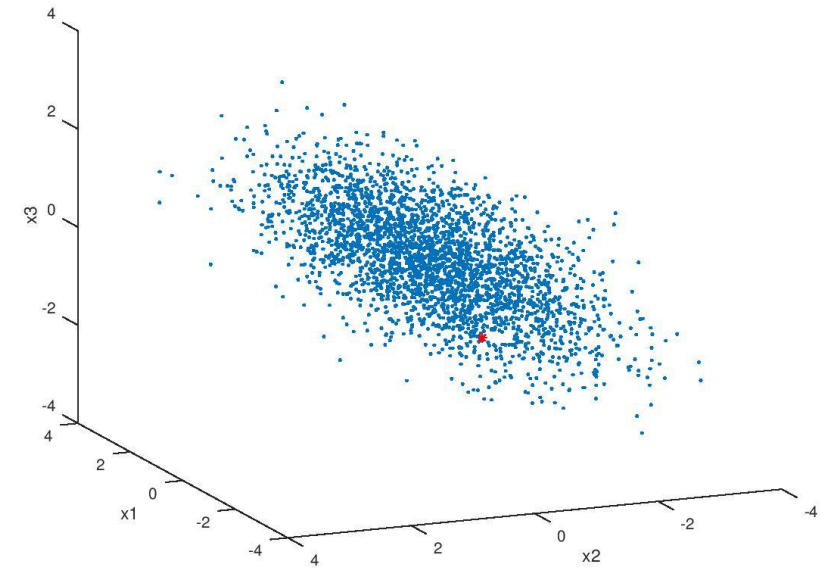


Data Augmentation and Clean-up

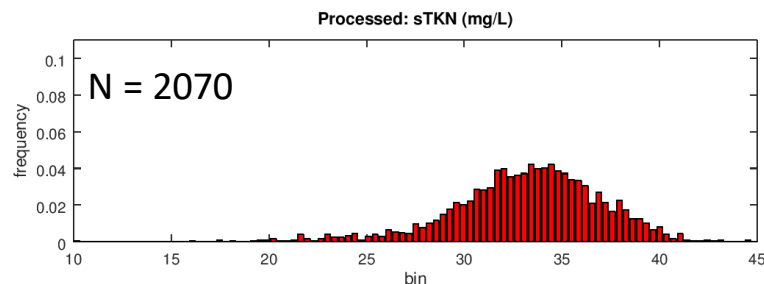
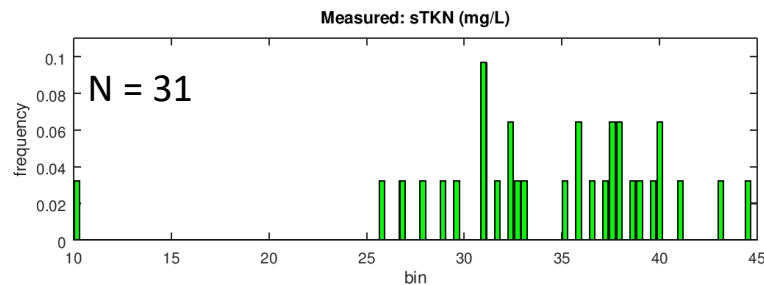
Accurate and complete

Methods that reconcile and augment data sets to provide high quality and high-resolution data.

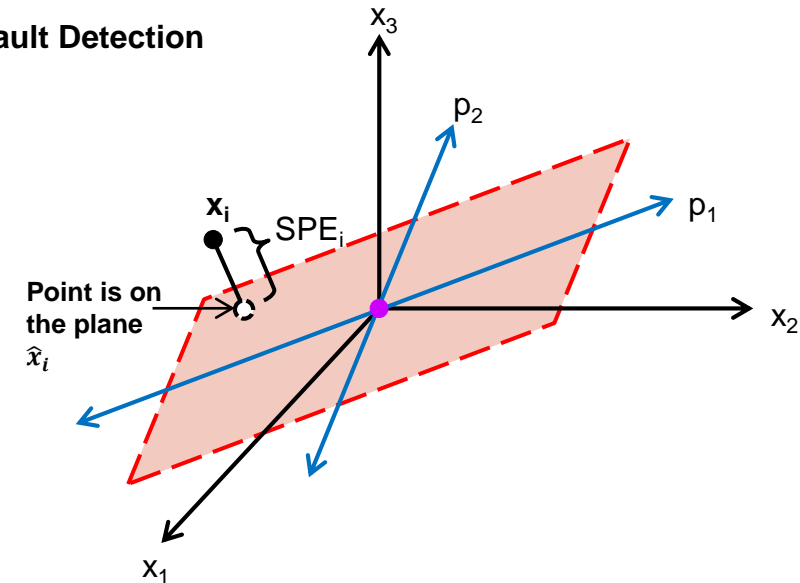
- Fill gaps by applying multi-variate models instead of averaging or linear univariate interpolation
- Fault detection
- Differentiate sensor and process faults



Data Augmentation



Fault Detection



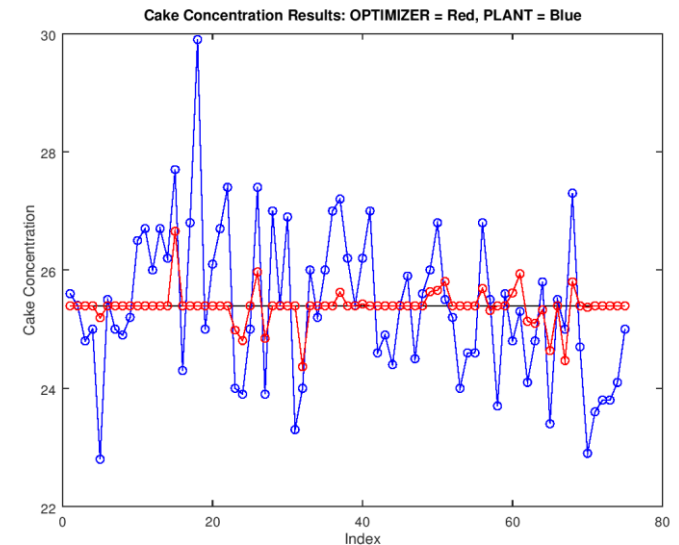
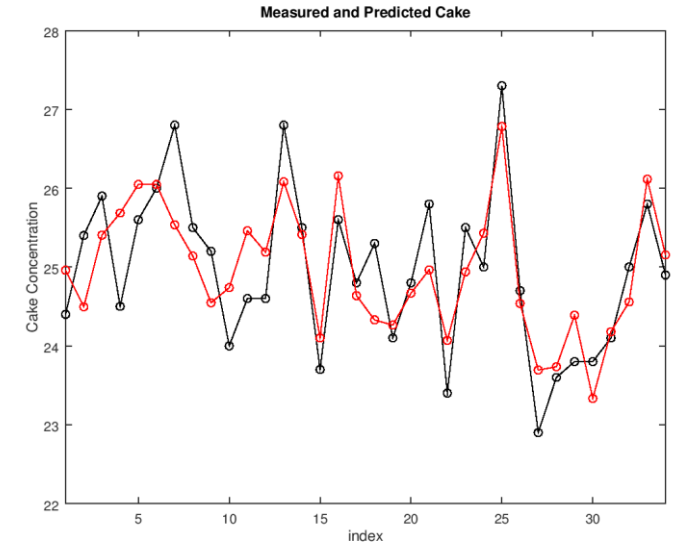
Smart Solutions

Intelligent control and optimization systems based on quality data

1. Status visualization for operators
2. Tools for maintenance and controller tuning
3. Robust in real-world operation

Applications

- **Classic control solutions (PID cascades)**
- **Model-based control/optimization**



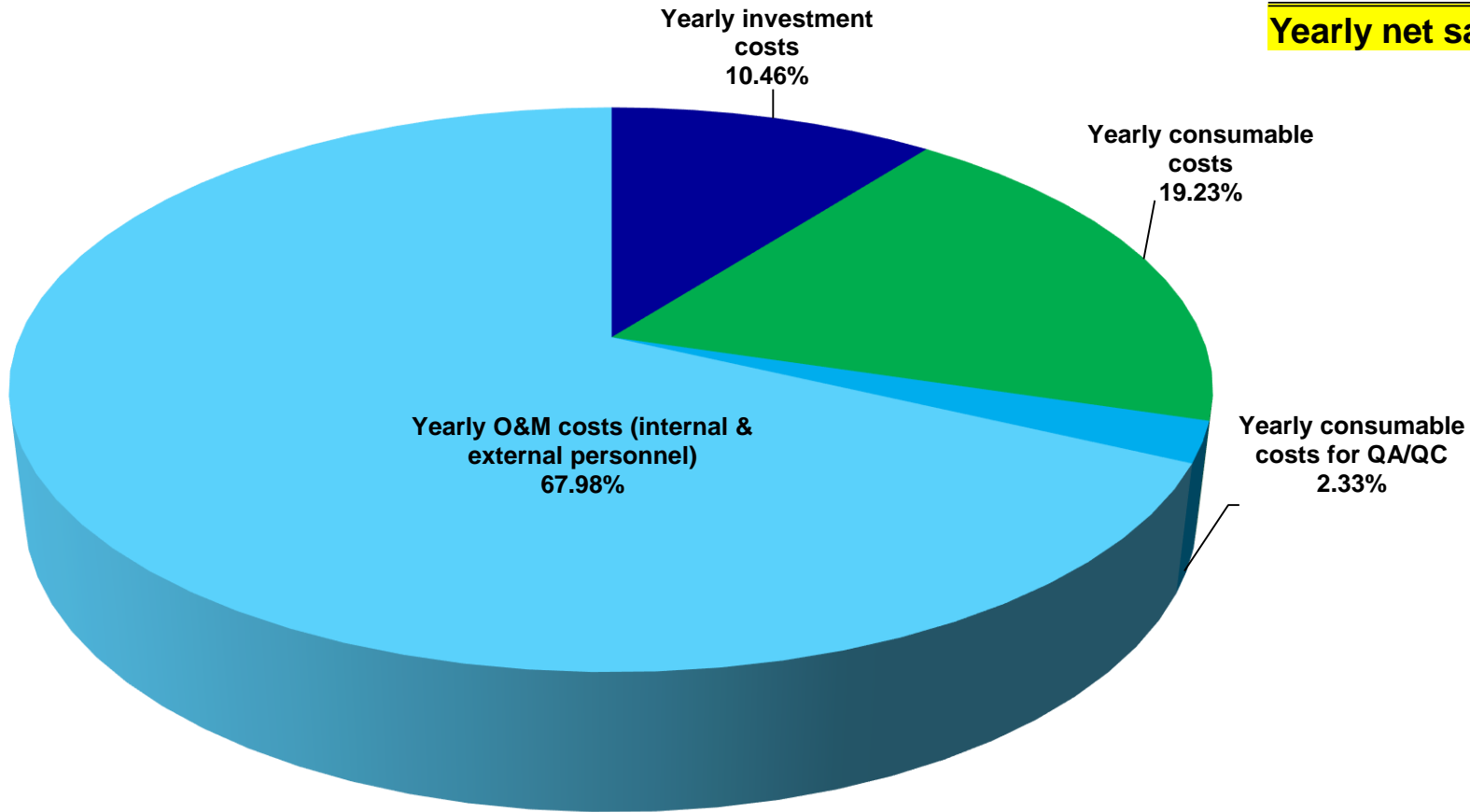
Optimizer stays on target more often than current dosing practice

Polymer reduction: 22%

Cost of Ownership

Careful with number of sensors

Annual Sensor Costs



Population Equivalent
Energy savings

100,000 PE
15%
0.1 \$/kWh

Annual Benefit

Saving potential
Energy savings

\$/yr	21,000
\$/yr	21,000

Yearly net saving potential (only energy) \$/yr -23,716

Model types

Mechanistic vs. data-driven models

Mechanistic Models

- Based on huge amount of dedicated experiments
- Mature and reliable
- Predictive
- Insights into process (microbiological level)
- Very sensitive to poor input data
- Require initialization
- No diagnostics (expert required)

Data-Driven Models

- Data tells story
- Robust against sensor faults
- Support differentiation between sensor and process fault
- No initialization
- Can include self-diagnosis
- Can include process diagnostics (identify variables with highest impact)
- High dependency to training data sets

The Best of Two Worlds: Hybrid Models

Thank you.

Leiv Rieger | rieger@inCTRL.ca

Canada

inCTRL Solutions Inc.
7 Innovation Dr. | Suite 107
Dundas, Ontario | L9H 7H9
Canada

USA

inCTRL Solutions Corp.
900 Chapel Street | 10th Floor
New Haven, CT | 06510
USA

Contact

Web: www.inctrl.ca
Mail: info@inctrl.ca

inCTRL 
SOLUTIONS