

Spectroscopy: Igniting Innovation

Spectroscopy technologies for the future

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April 6, 2020



Safe Harbor

This presentation contains forward-looking statements (including, without limitation, information and future guidance on the company's goals, priorities, innovation plans, new product introductions, and continued strengths and expected growth of the markets the company sells into) that involve risks and uncertainties that could cause results of Agilent to differ materially from management's current expectations. The words "anticipate," "plan," "estimate," "expect," "intend," "will," "should" "forecast" "project" and similar expressions, as they relate to the company, are intended to identify forward-looking statements.

In addition, other risks that the company faces in running its operations include the ability to execute successfully through business cycles; the ability to successfully adapt its cost structures to continuing changes in business conditions; ongoing competitive, pricing and gross margin pressures; the risk that our strategic and cost-cutting initiatives will impair our ability to develop products and remain competitive and to operate effectively; the impact of geopolitical uncertainties on our markets and our ability to conduct business; the impact of currency exchange rates on our financial results; the ability to improve asset performance to adapt to changes in demand; the ability to successfully introduce new products at the right time, price and mix, and other risks detailed in the company's filings with the Securities and Exchange Commission, including our quarterly report on Form 10-Q for the quarter ended January 31, 2020. The company assumes no obligation to update the information in this presentation.

Applying more than 50 years of insight and innovation

70+ years

1939

Hewlett-Packard (HP) formed, focused on developing test and measurement products.

1992

Yokogawa Analytical Systems founded as a joint venture between HP and Yokogawa Electric Corp.

1999

Agilent Technologies formed. HP test and measurement (and related divisions) spin-off.

2006

Yokogawa Analytical Systems becomes wholly owned Agilent Technologies subsidiary: ICP-MS.

- Agilent 8452 Diode Array UV/Vis used almost exclusively in pharmaceutical.

2010

Agilent acquires **Varian**: AAS, ICP-OES, UV/Vis/NIR, Fluorescence and FTIR.

- Acceleration of innovative products such as the MP-AES, ICP-OES and ICP-MS QQQ in atomic spectroscopy.

2011

Acquisition **A2 Technologies**: routine, handheld and mobile FTIR spectrometers.

2017

Acquisition **Cobalt**: raman spectroscopy for pharma, detection and airport security.

2018

Introduction two major products in molecular spectroscopy, the Cary 3500 UV-Vis and 8700 LDIR

2019

Introduction of the 5800/5900 ICP-OES, smart system for higher productivity and low cost of ownership

2020

Agilent launches Vaya...

Agilent Spectroscopy: a truly unique portfolio

Atomic Spectroscopy



AAS



MP-AES



ICP-OES



ICP-MS SQ



ICP-MS QQQ

Molecular Spectroscopy



UV-Vis



UV-Vis-NIR



Fluorescence



FTIR (bench)



IR Imaging



Mobile FTIR



Spatially
Offset
Raman
(SORS)



Transmission
Raman (TRS)

Global Trends in Pharma and BioPharma

- Investments continue to grow for New Biological Entities (NBE's)
- New regulatory requirements necessitate new method development and QC testing
- Increasing productivity requirements are driving the need for faster analysis and integrated informatics and method
- Move from Batch to Continuous Manufacturing
- Compliance (hardware and software) remains a key requirement for Pharma and BioPharma

Primary Market Drivers:

- Time to Market
- Productivity & Automation
- Data Integrity & Compliance, Quality by Design
- Efficiency and Cost Saving

The spectroscopy laboratory of the future...



As the role of the **spectroscopy operator broadens**, it will be critical for the instruments they use on a daily basis to be as simple to use, as possible (user-friendly interfaces / 'plug and play' approach)



New platforms and technologies (using quantum cascade lasers [QCLs] and Xenon flash lamps), which will expand applications ranges

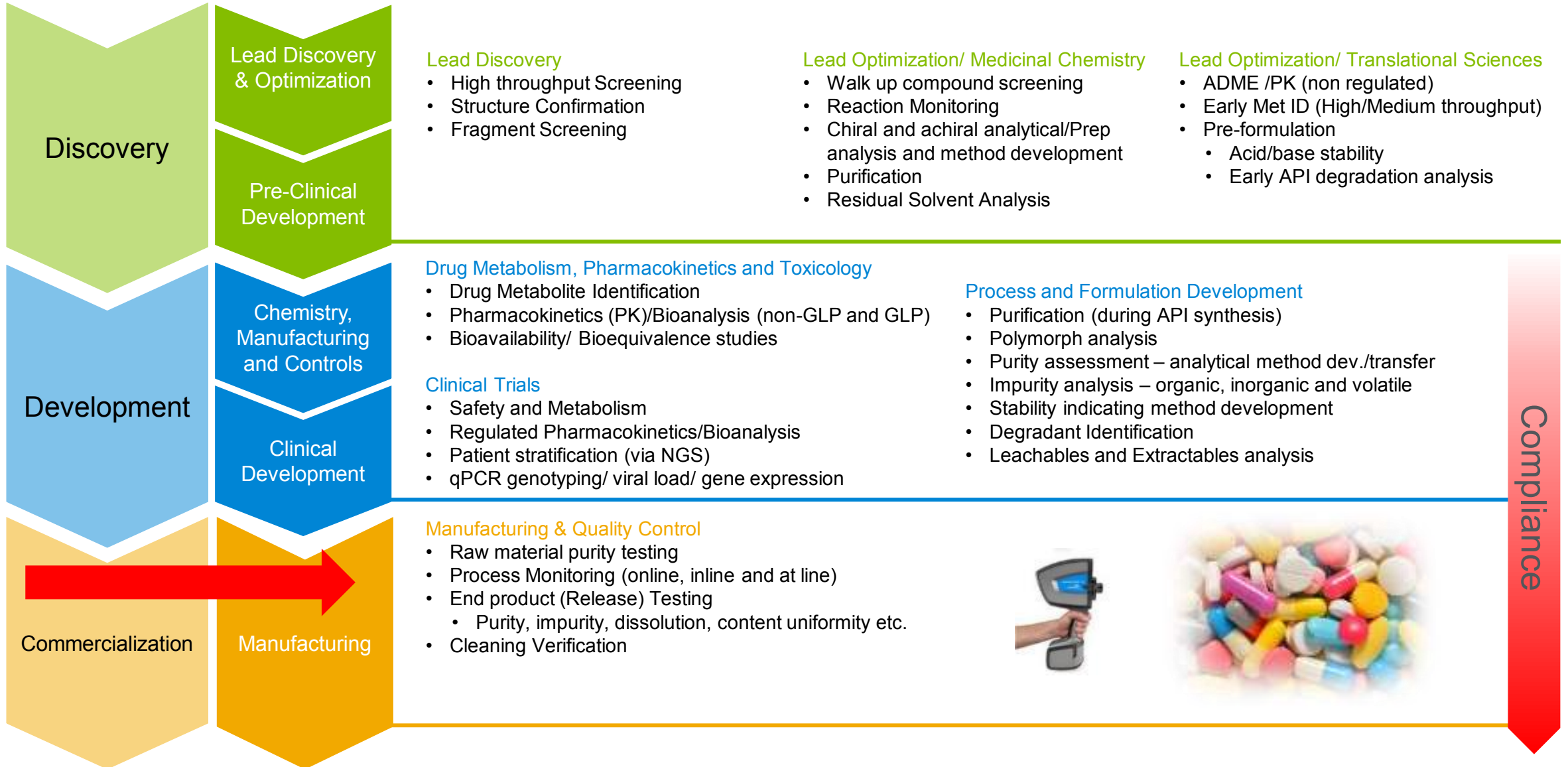


The adoption of **predictive technologies and AI** to power the smart connected laboratory of the future



Software rationalization to ensure laboratories continue to maximize and leverage the innovative capabilities of newer programs

Small Molecule Drugs Workflows



Centres of Excellence Melbourne & Oxford

- A strong commitment to innovation and Spectroscopy!
- Centres of Excellence for engineering and product development
- Focus Oxford site: Raman, Laser & Pharma/Biopharma
- State of the art Quality testing facilities to ensure safe, reliable, high performance and innovative products.



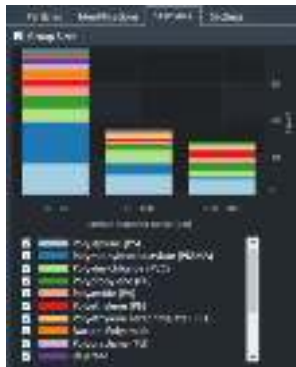
Molecular Spectroscopy Markets & Applications

Every laboratory has one (or more)

PHARMA



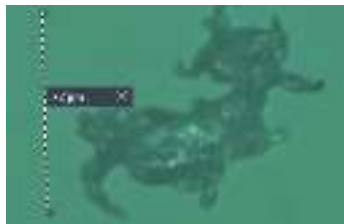
- Biopharma
- Drug discovery
- Drug development
- Manufacturing
- R&D, QC
- Raw Material ID



ACADEMIA & GVMT



- Microplastics
- Optics, Physics
- Chemistry
- Engineering
- Molecular Biology
- Teaching
- Biomed Imaging



Microplastics

MATERIALS



- Thin films/coatings
- Glass, Optics
- Polymers
- Composites, NDT



Biometrics

FORENSICS



- Security
- Safety
- Narcotics
- Counterfeits
- Airports
- First responders



Airport: liquid screening

FOOD



- Food Quality
- Food adulteration
- Packaging
- Pathogen detection
- Fat, moisture, protein
- Microplastics

CHEMICAL & ENERGY



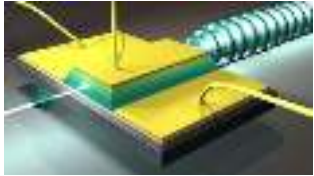
- Biofuels
- Renewable - Green energy
- Raw material ID
- QA/QC



QA/QC and Development of parabolic trough and fresnel reflectors.

Molecular Spectroscopy Core Technologies

Key attributes and potential applications



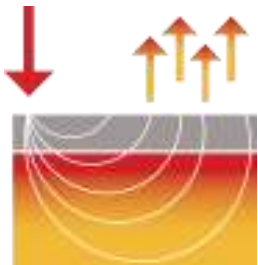
Quantum Cascade Lasers (QCL)

- Proprietary Agilent technology. High intensity IR source, robust and reliable
- Many potential application areas, currently looking at IR microscopy/imaging



Xe lamp UV/Vis/NIR & FLUO light source

- High intensity source, robust and extremely reliable (long lifetime, no replacements)
- Fast data acquisition rates, better data quality, simultaneously!
- Extend to higher absorbance levels (no dilutions, single source)



Spatially-Offset Raman Spectroscopy and Transmission Raman (TRS)

- SORS – Unique Raman analysis through opaque barriers
- TRS – Whole-dose analysis with high speed and precision, minimal handling



Miniaturized interferometers FTIR

- Bring the lab to the sample
- Small size, high performance

Compliance Software, based on OpenLab

- Instrument-agnostic software platform, across Agilent
- All solutions on the same Data Integrity solution

Innovation with Purpose

The 3500 UV-Vis, 8700 LDIR and Vaya instruments incorporate *'innovation with purpose'* addressing customers' lab challenges and pain points

- ✓ **Better productivity and higher throughput**
- ✓ **Less maintenance and downtime**
- ✓ **Improved workflows and system efficiencies**
- ✓ **Reduced complexity**
- ✓ **Reduced time-consuming sample preparation**



Pharma and BioPharma

Spectroscopy innovation in QA/QC applications

Introducing VAYA

Darren Andrews
Head of Strategy and Technology
Molecular Spectroscopy

April 6, 2020



PLMX Pharma and BioPharma

Innovation in Pharma workflows for QA/QC

Dedicated Products



TR5100



RapID



In-situ IR
Cleaning
Verification



Cary 3500 &
Mercury 1.1 s/w

Dedicated NPI Developments



Vaya



Fluorescence-Based
Aggregation Analysis



More in the pipeline

“Workhorse” Pharma instruments:



Cary 60 UV-Vis



Cary 630 FTIR



Eclipse



8700 LDIR

Software NPI Developments:

- Cross-Agilent common compliance and GUI software updates

Major Pain-Points in pharma manufacturing

Game-changing spectroscopy solutions

Raw materials inbound



Production and release



Cleaning plant



Delay in release to production

- Cost of ID testing
- Cost of inventory = \$millions



RapID



Vaya

Delay in release of finished product

- Cost of release testing
- Cost of inventory = \$billions



TRS100

Delay and costs of cleaning

- Cost of excessive cleaning
- Cost of downtime = \$ huge



FTIR cleaning
verification

Agilent Vaya Raman System



Agilent RapID
Raman System



Agilent Vaya
Raman System

A truly unique instrument for Pharma and Biopharma

- True through-Barrier handheld raw material identity verification instrument
- Most flexible for incoming goods testing
- Largest increase in productivity for customers
- Biggest return on investment for customers

...and also the coolest product



Vaya

The Instrument



Increase Your Throughput Without Increasing Your Costs

Fast ID through opaque and transparent containers in the warehouse

- No container opening/sampling
- Help achieve higher throughput or 100% ID
- QC lab no longer required

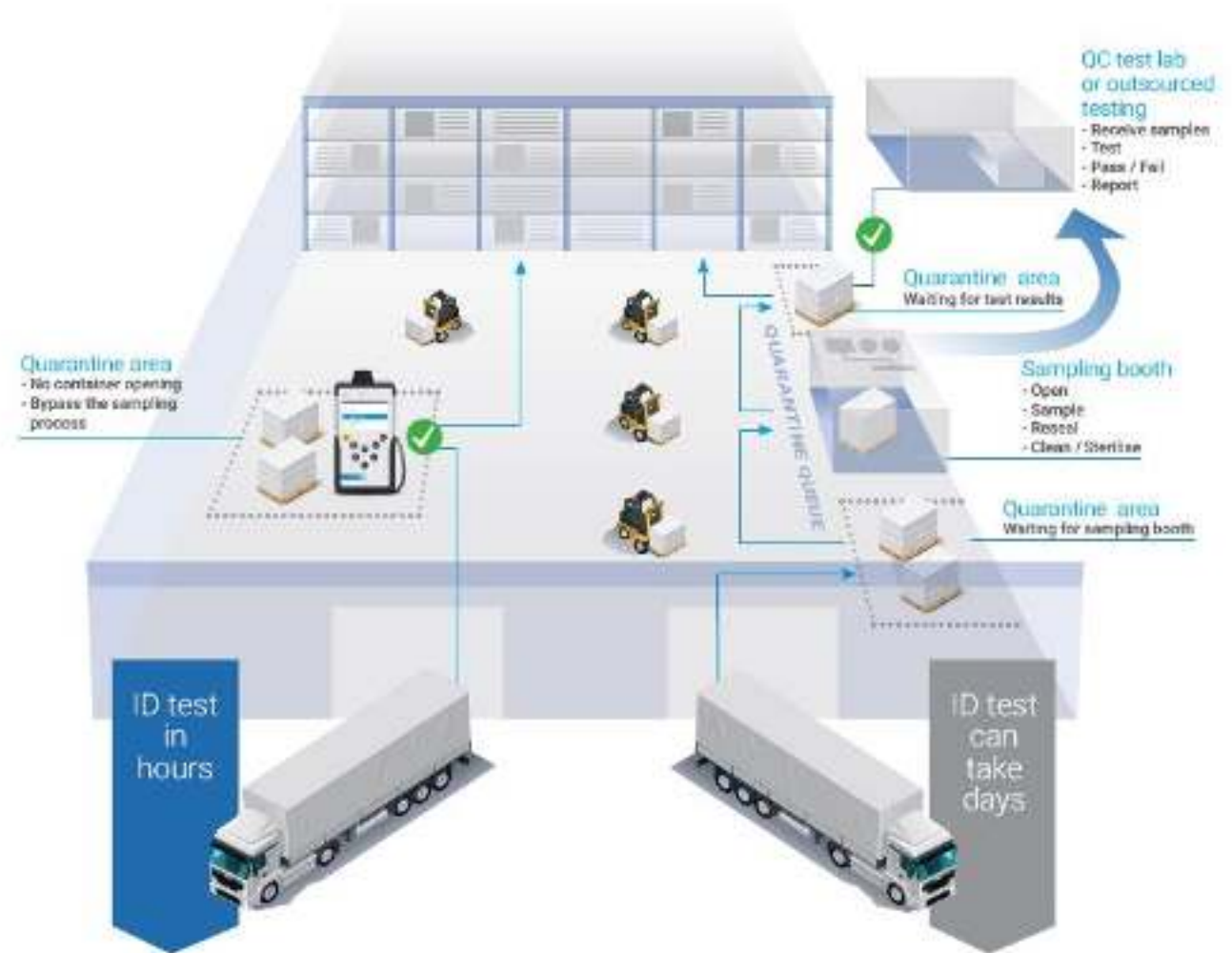
Reduce/Eliminate sampling booth and logistical costs

- No disposable sampling tools/garbs
- Reduced forklift movements
- No clean up or prep time

Improved operations

- Leaner stock
- No exposure to hazardous materials
- Fewer bottlenecks
- Limited product spoilage- packing conditions are preserved

Shorten the verification process—often from days to hours



Transparent Containers

Faster than conventional handheld Raman instruments



- Works robustly with traditionally difficult amber glass measurements, e.g., PS20 and PS80
- Easily take into account variation of primary containers (plastic liners) like opacity, thickness, folds...

True Through-Barrier Workflows – Avoid the Sampling Booth

Faster workflows compared with conventional handheld Raman



- Works with colored and opaque plastics, multi-layer paper sacks (white and brown), FIBCs (big bags)

Intuitive, Rigorous and Compliant RMID Dedicated Software

Batch mode



Compliance: Audit Trail, 21 CFR Part 11, USP 1120/EP 2.2.48

The screenshot shows the 'Approved Methods' screen with a tabbed interface. The 'Audit Trail' tab is selected, displaying a table of events.

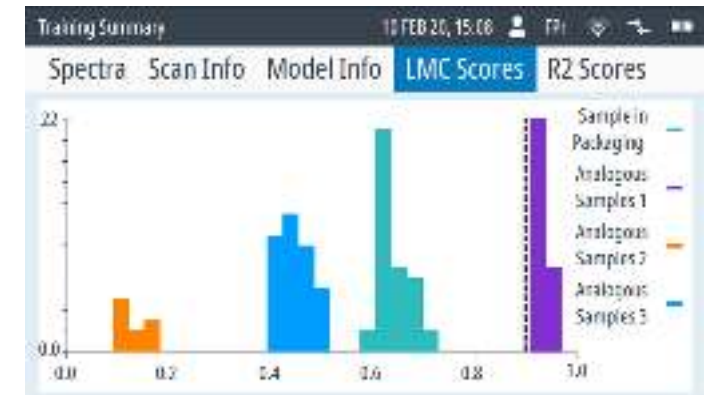
Date	Time	Event
18-JUL-19	19:23	New Batch Started
18-JUL-19	19:24	Batch Systemcheck Pass
19-JUL-19	19:25	Batch Scan Fail. Comment: I wasn't paying attention, slipped...
19-JUL-19	11:23	Batch Scan Pass
19-JUL-19	11:25	Batch Scan Pass
19-JUL-19	11:29	Batch Scan Pass



Instructions through animations



Wizard based method development



Vaya Raw Materials ID



Part of the Agilent Portfolio for Pharma QC Raw Material ID

Vaya



RapID



Cary 630 FTIR



5500 FTIR



	Vaya	RapID	Cary 630 FTIR	5500 FTIR
Technique	SORS	SORS	FTIR	FTIR
Form Factor	Handheld	Portable	Portable/ Small footprint	Portable/ small footprint
Analysis Capability	Through transparent and opaque containers	Through transparent and opaque containers	Require sampling	Require sampling
Accessories	Bottle adapters	Bottle adapters	Flexible Sampling Interfaces	N/A
Robustness	Rugged for warehouse use	Rugged for warehouse use		Rugged for warehouse/ sampling booth
Software/Workflow	Intuitive software/ Dedicated raw material verification workflow	Dedicated raw material verification workflow	Comparison against a library	Comparison against a library



Thank you for your attention