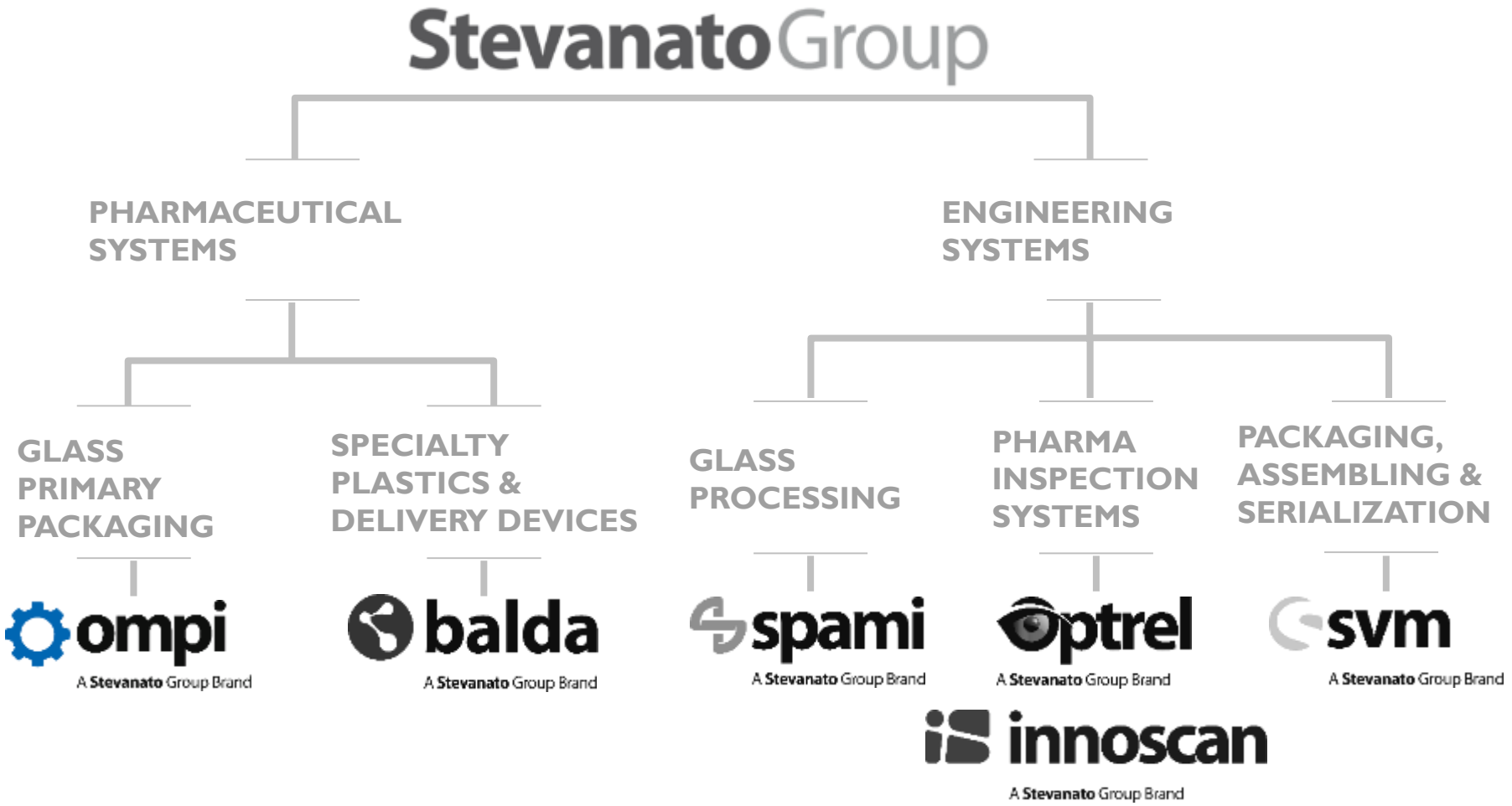
Glass Primary Packaging Trends

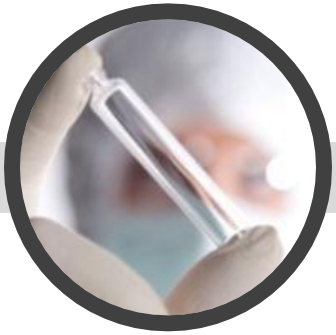
Carlos Navarro

Why glass?


Stevanato Group
PHARMACEUTICAL SYSTEMS
ENGINEERING SYSTEMS
GLASS PRIMARY PACKAGING
SPECIALTY PLASTICS & DELIVERY DEVICES
GLASS PROCESSING
PHARMA INSPECTION SYSTEMS
PACKAGING, ASSEMBLING & SERIALIZATION
ompi
A Stevanato Group Brand
balda
A Stevanato Group Brand
spami
A Stevanato Group Brand
optrel
A Stevanato Group Brand
svm
A Stevanato Group Brand
innoscan
A Stevanato Group Brand

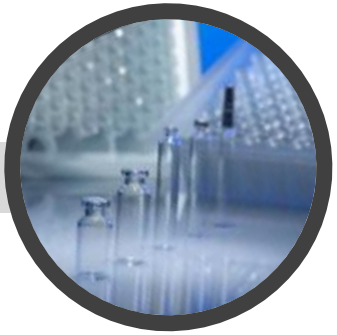
Expertise

Full portfolio (ampoules, cartridges, syringes, vials) from glass tubing



Expertise on manufacturing cartridges for insulin

Innovative solutions for Biotech



Full Range of Sterile products (vials, cartridges and syringes)

Leader in converting technology

100% Dimensional and Cosmetic Controls by Camera

Full range of Automatic Inspection Machines

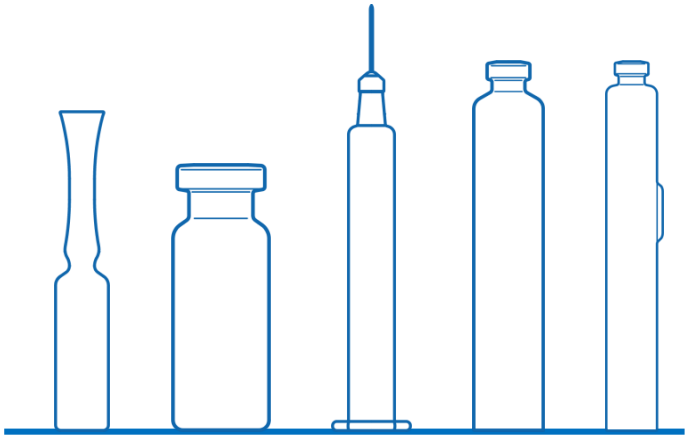
Assembly, Packaging and Process Equipment

OMPI do Brasil

- 30 milhoes de Euro de investimento
- 40 mil mq de terreno
- 12 mil mq de área construída
- 15 linhas de produção
- Cartuchos e Ampolas
- 200 Funcionarios

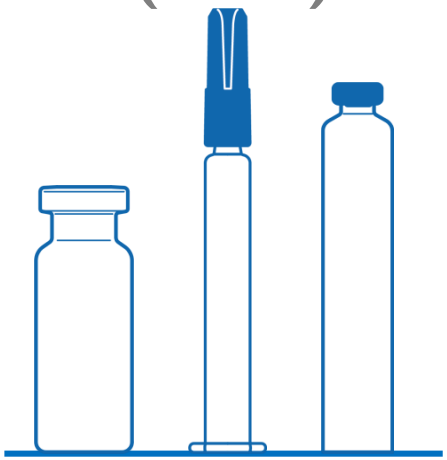
Range of Products today

Bulk Containers



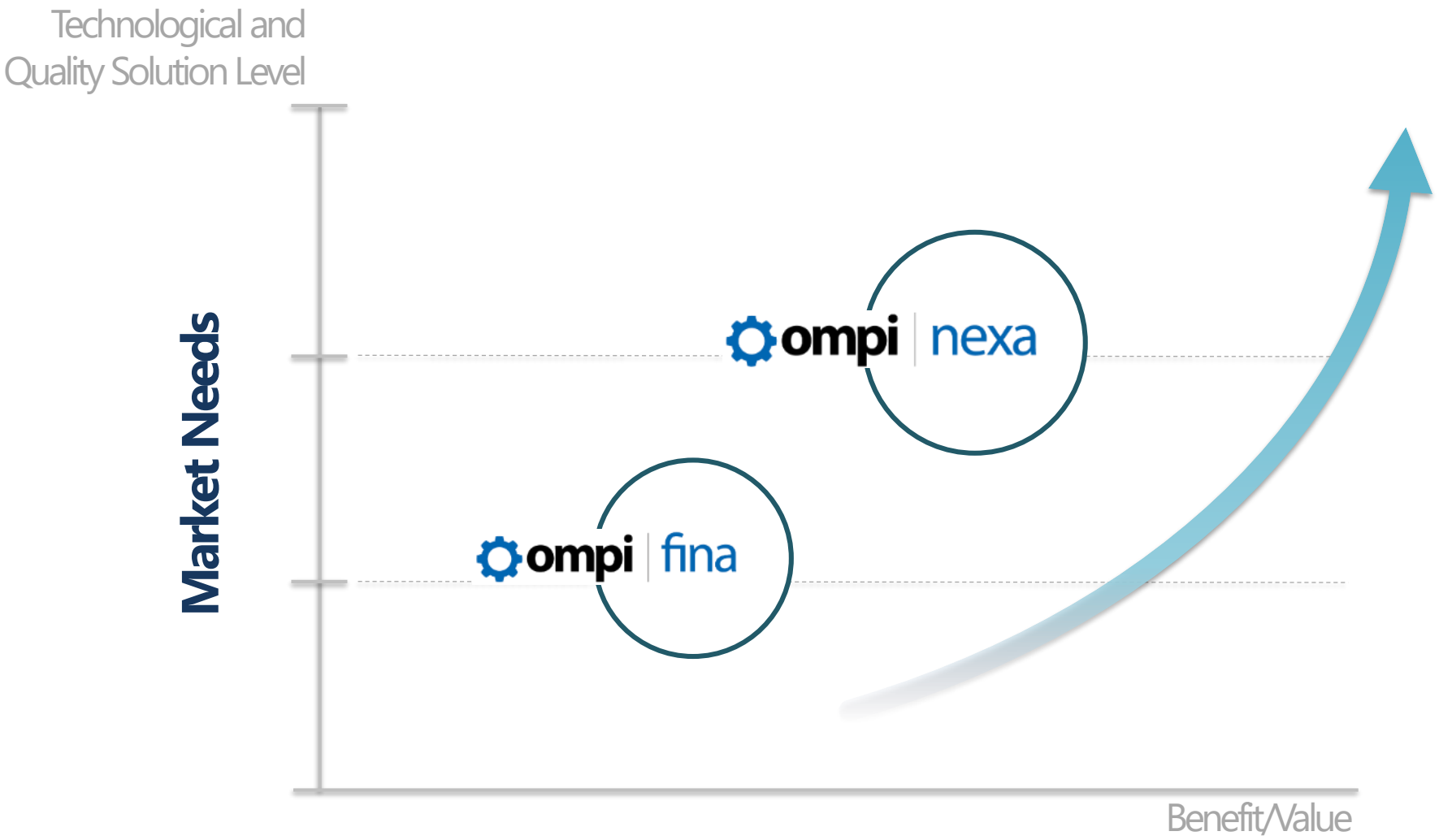
ampoules vials syringes cartridges Special devices

Ready-to-Use Containers (Sterile)

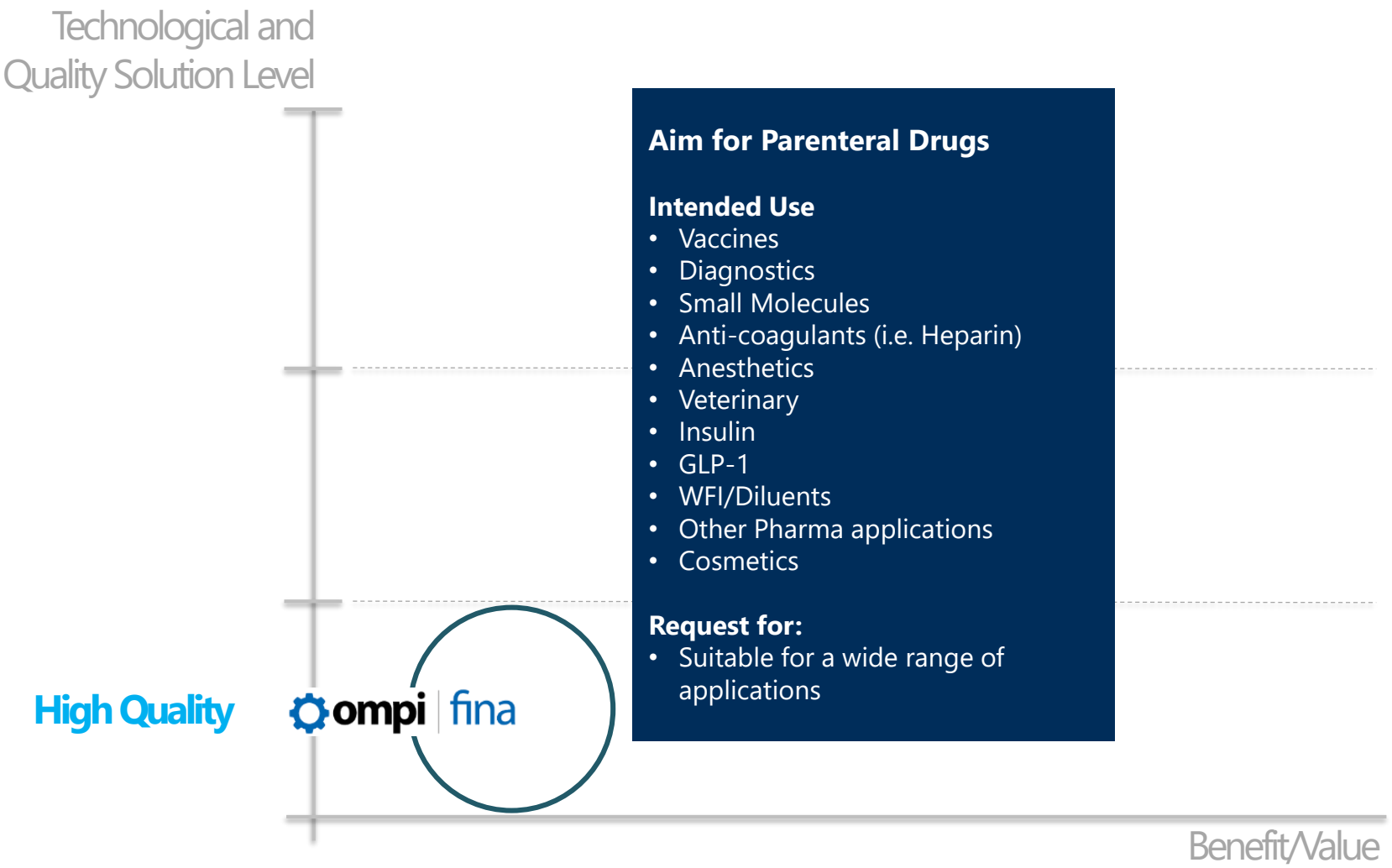


vials syringes cartridges

OMPI portafolio critical to Quality



OMPI Fina – Use & features



Aim for Parenteral Drugs

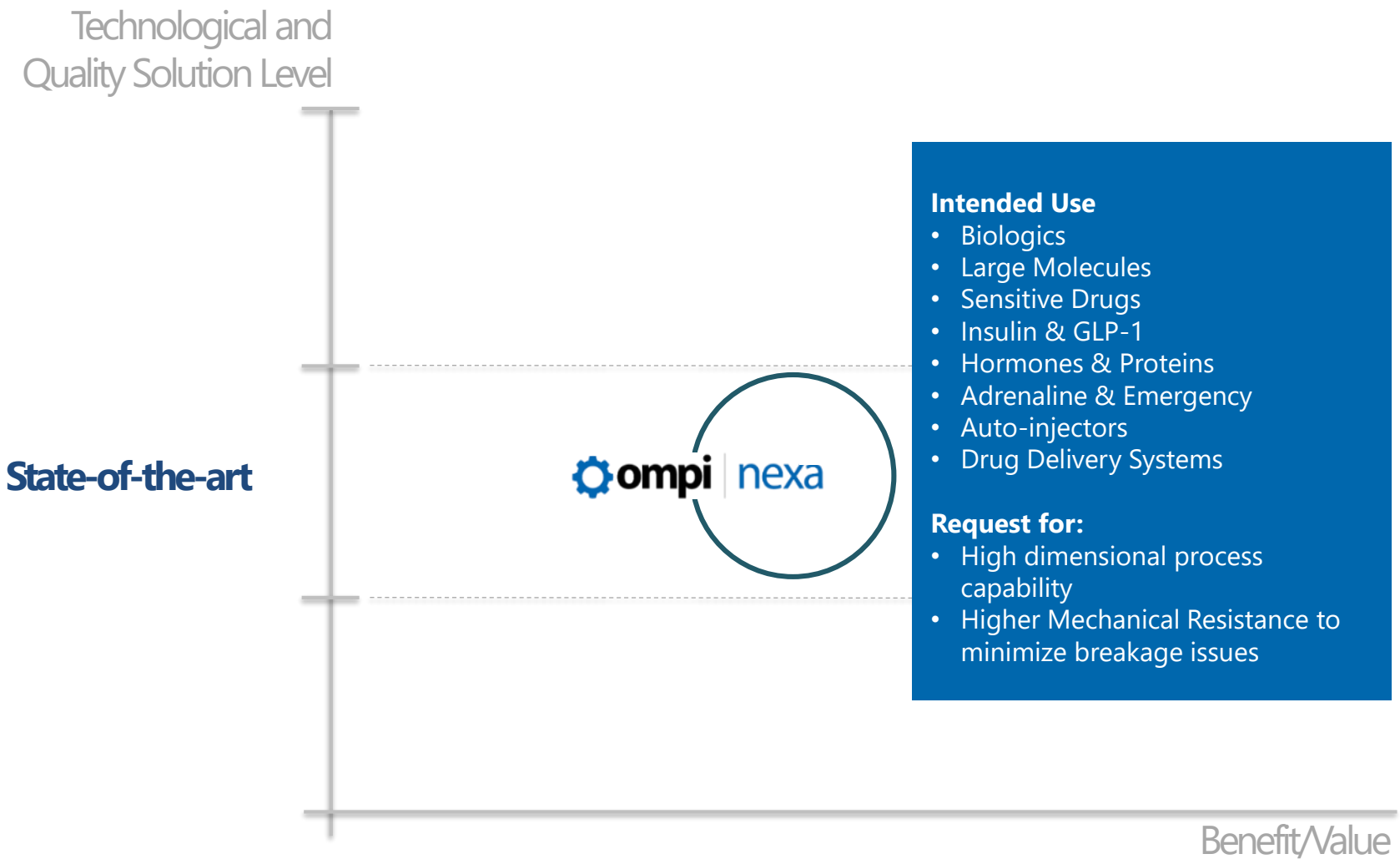
Intended Use

- Vaccines
- Diagnostics
- Small Molecules
- Anti-coagulants (i.e. Heparin)
- Anesthetics
- Veterinary
- Insulin
- GLP-1
- WFI/Diluents
- Other Pharma applications
- Cosmetics

Request for:

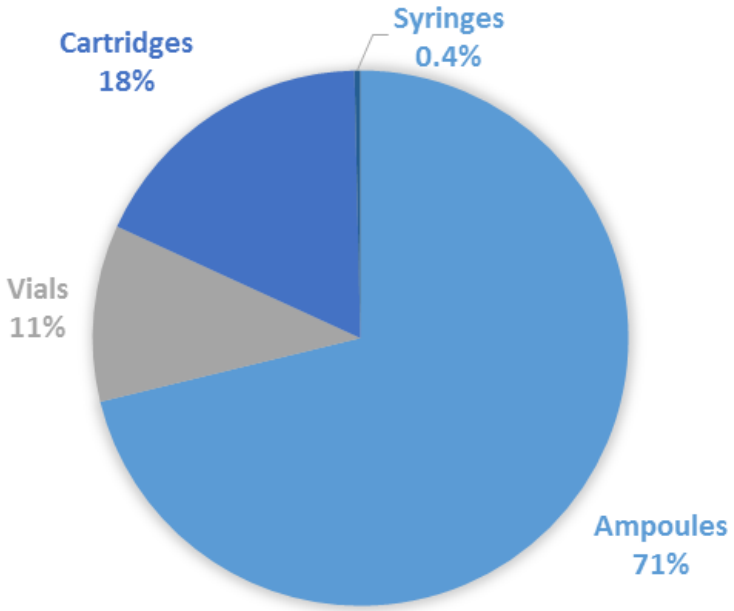
- Suitable for a wide range of applications

OMPI Nexa – Use, Features & Benefits



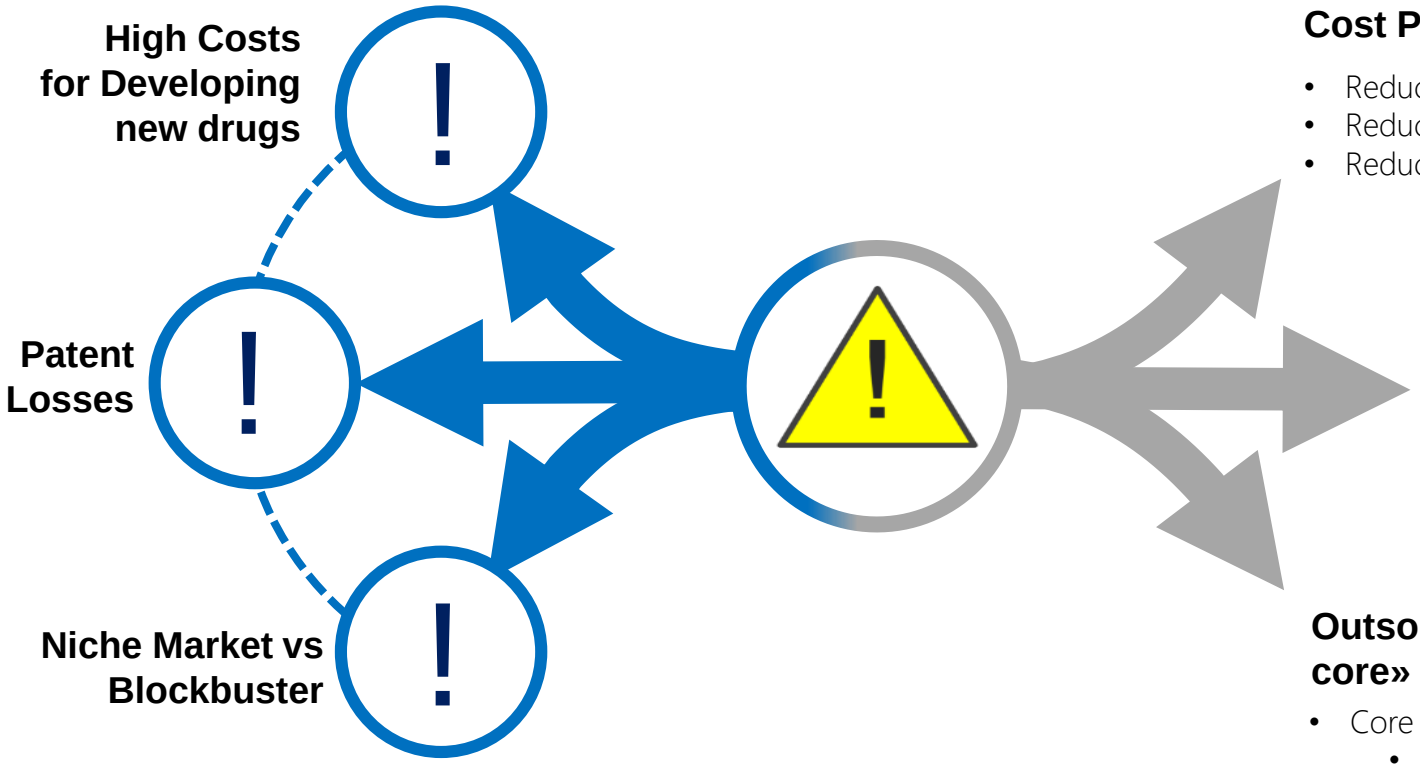
How the Pharma
Market is changing?

Market Segmentation – Brazil



Source: Stevanato Group Marketing & Business Intelligence

Market Scenario – Challenges and new needs



Cost Pressure

- Reducing capital investment,
- Reducing waste
- Reducing TCO

Increase Flexibility

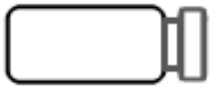
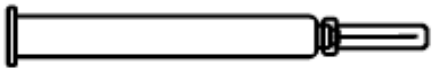
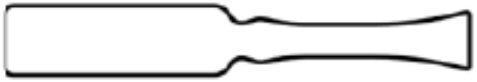
- Reducing time to market
- Increasing business opportunities
- Differentiation

Outsourcing of «non core» activities

- Core pharmaceutical activities:
  - Research
  - Fill/Finish
  - Marketing

Pharmaceutical Industry is looking for new manufacturing solutions to increase flexibility and reduce manufacturing costs

Global Market Growth Estimation 2013 - 2018
Small Volume Parenterals (up to 50 mL)

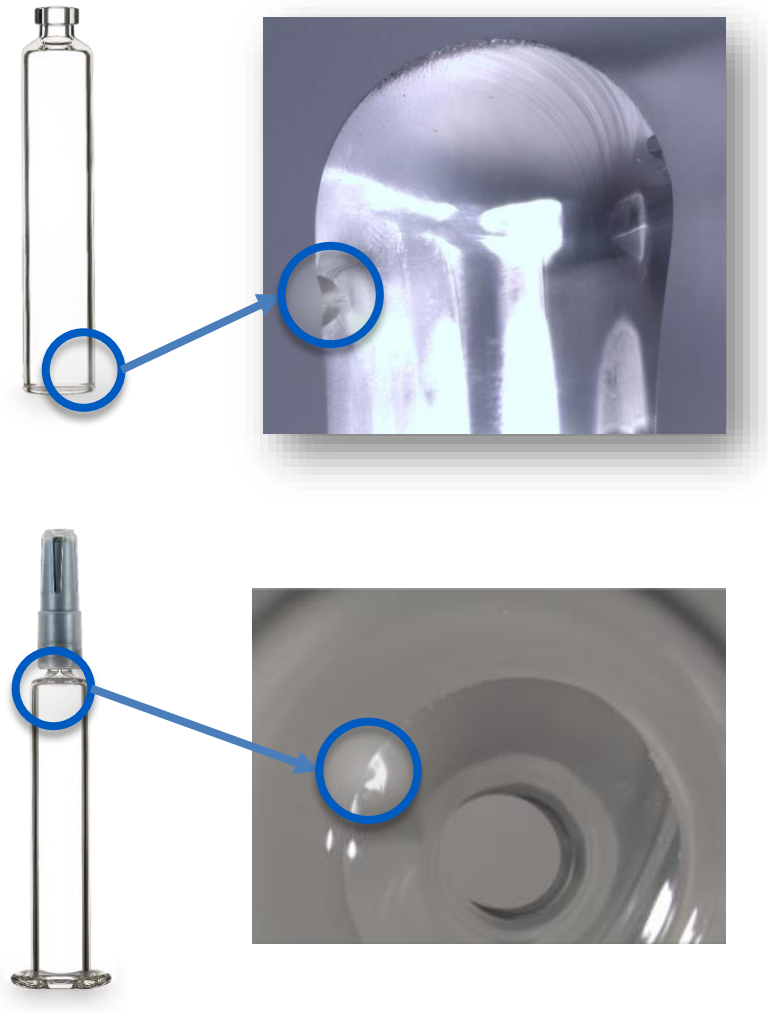
	**UNITS** +4-5%	• Anti-Diabetics • High Value Drugs in Valuable Markets • Rare Deseases • Vaccines in Emerging Markets
	+5-8%	• Anti-coagulants • Vaccines • Anti-infectives • Anti-inflammatory agents • Haematological agents • MS treatments • Human growth hormones • Obstetric agents • Cancer therapies • Pain relievers
	+8-10%	• Anti-Diabetics • Self-Injections • Human growth hormones
	+5%	• MS treatments • Vaccines • 1° Healthcare

Source: PDA Presentation of Dr. Friedrich Haefele, Boehringer Ingelheim Pharma GmbH & Co. KG

Glass is the ideal material for parenteral packaging; even if has some limitations these can be mitigated

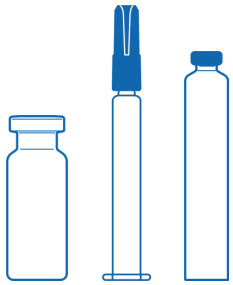
CHALLENGES	SOLUTIONS
 Breakage	• Use forming and converting best practices • No Glass-to-Glass and Glass-to-Metal contact to reduce flaws • Glass strengthening • Surface treatments
 Delamination	• Enhanced and optimized process techniques • Thermal cycle optimization with low heat/energy forming process • Test method to guarantee the quality and the stability of vials production
 Needle stick	• Integrated needlestick protection capability • Passive protection

Glass breakage



- Standard converting technology can induce **flaws**
- Flaws concentrate the stress locally, decreasing the overall **strength of the glass**
- When a load is applied, e.g. during the injection with a pen injector, the critical defect could trigger the failure in the glass leading to the **breakage of the whole component**

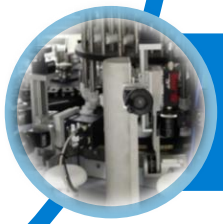
Platforms to improve product performances



Vials–Cartridges-Syringes

Use forming and converting best practices

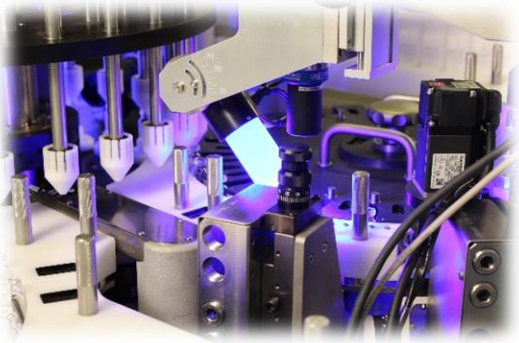
No Glass-to-Glass and Glass-to-Metal contact to reduce flaws

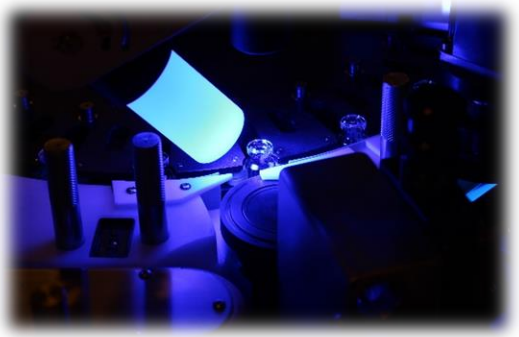


Improved Camera Inspection

Optimized containers manufacturing process with an higher cosmetic quality and stronger mechanical resistance

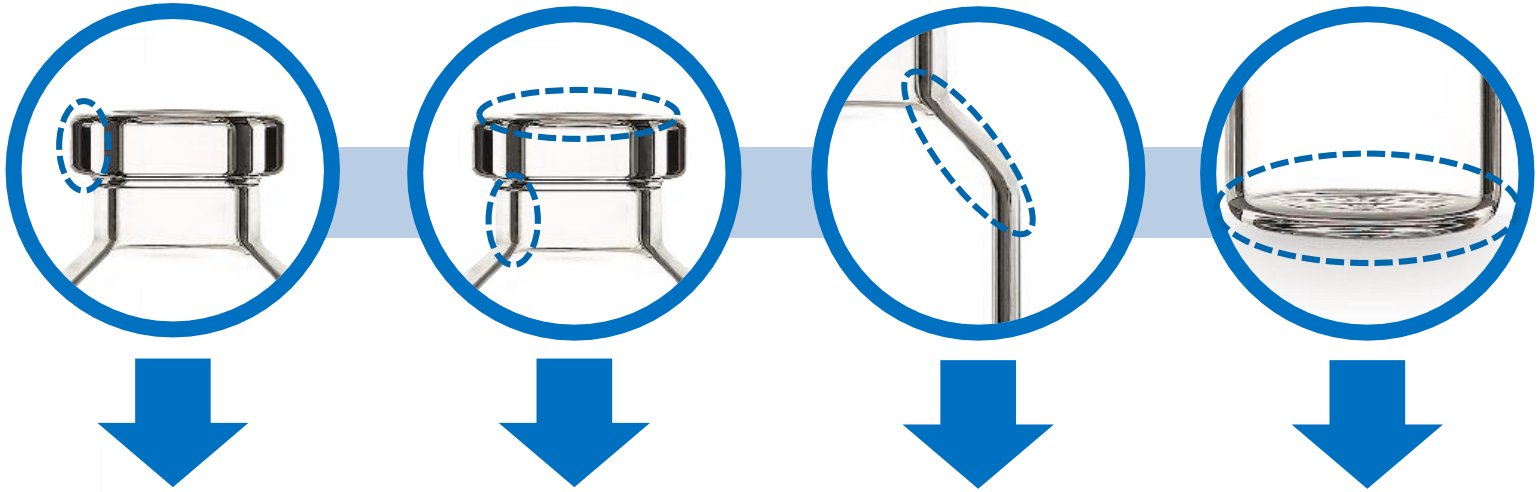
Vials – Critical Defects





CRITICAL DEFECTS	BODY	SHOULDER	COLLAR	NECK	MOUTH	BOTTOM
Contamination	X	X	X	X	X	X
Scratches	X	X	-	-	-	X
Folds / Deformations	-	X	X	X	X	X
Bubbles	-	X	X	-	-	-
Pressure marks	-	-	X	X	-	-
Airlines	X	-	-	-	-	-
Chips / Cracks	X	X	X	-	X	X

Have a high dimensional process capability



COLLAR

Compatibility with caps and filling lines

NECK/MOUTH

Blowback repeatibility

SHOULDER

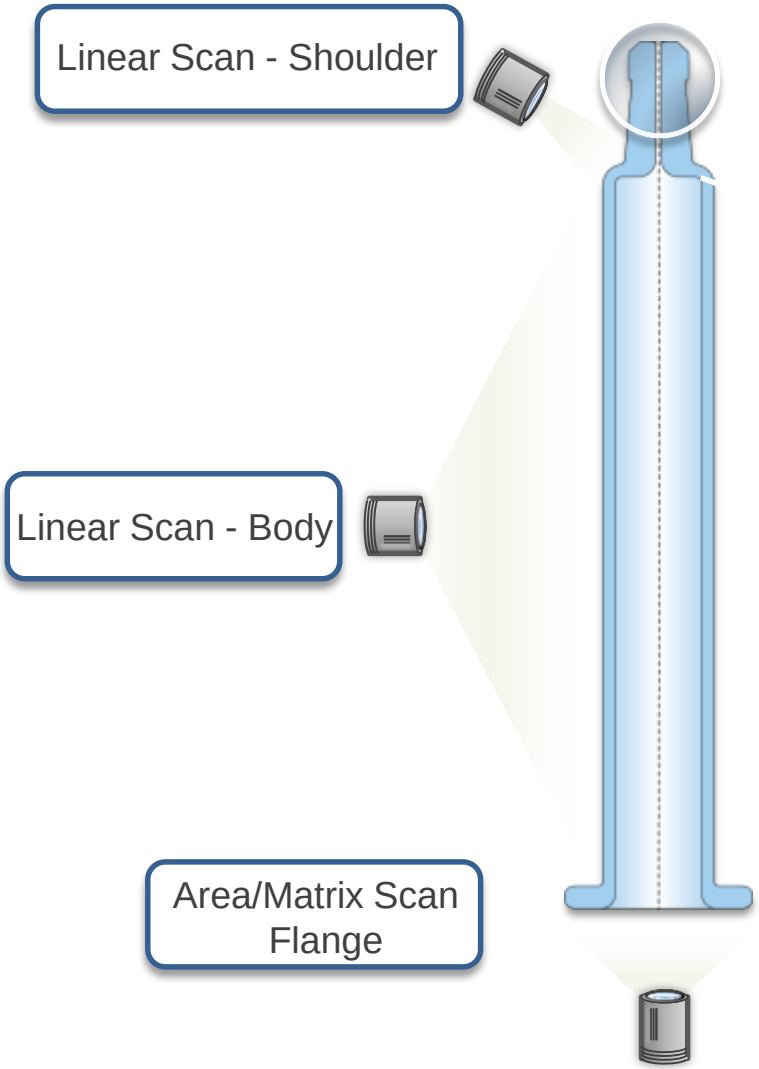
Optimized for Inspection, to reduce false rejects

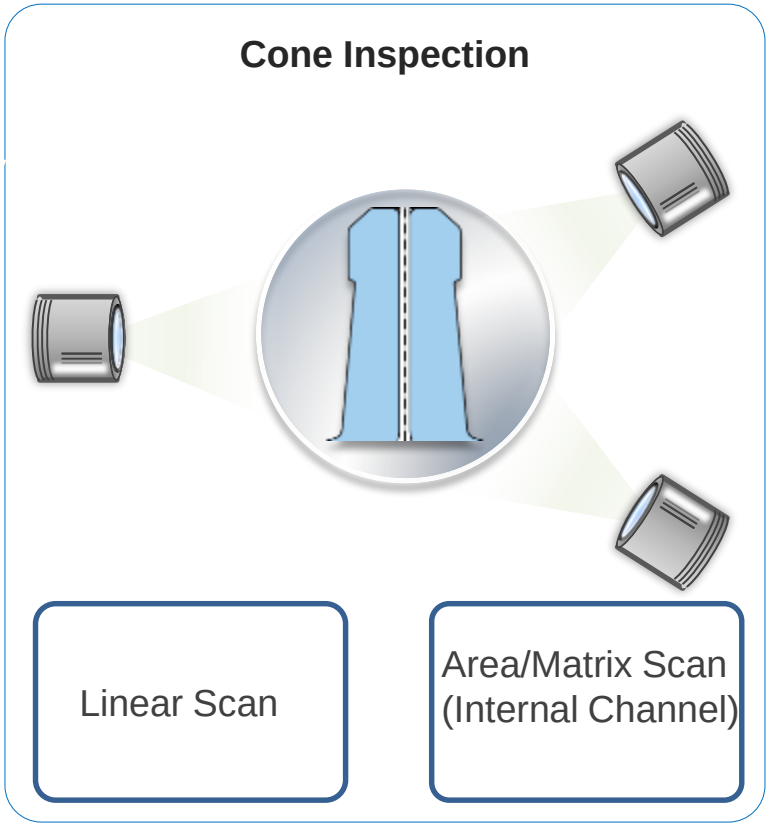
BOTTOM

High stability of the vials on the transport belts

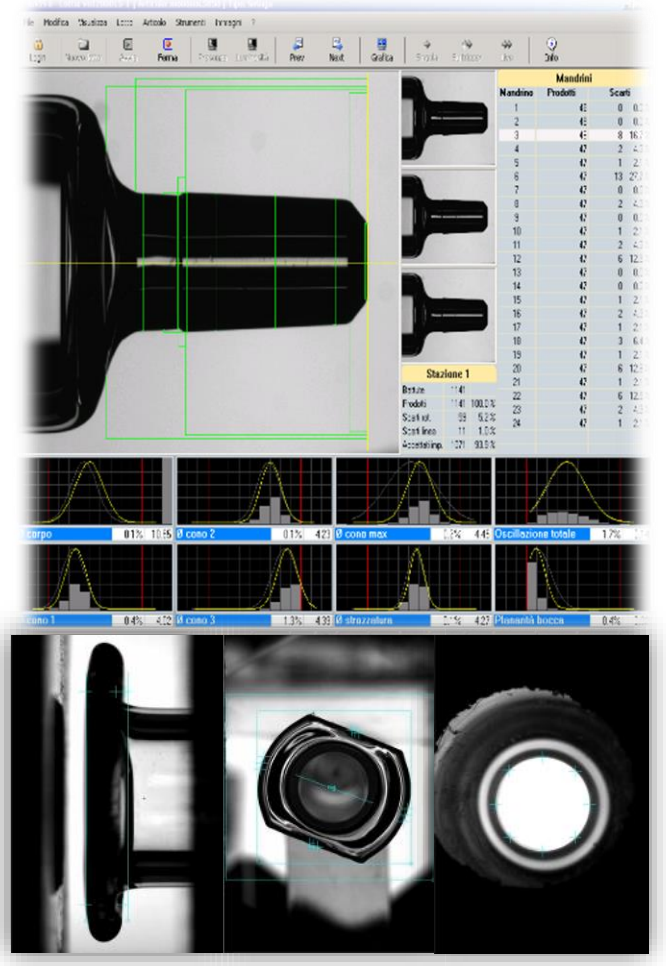
Freeze-dryed drugs

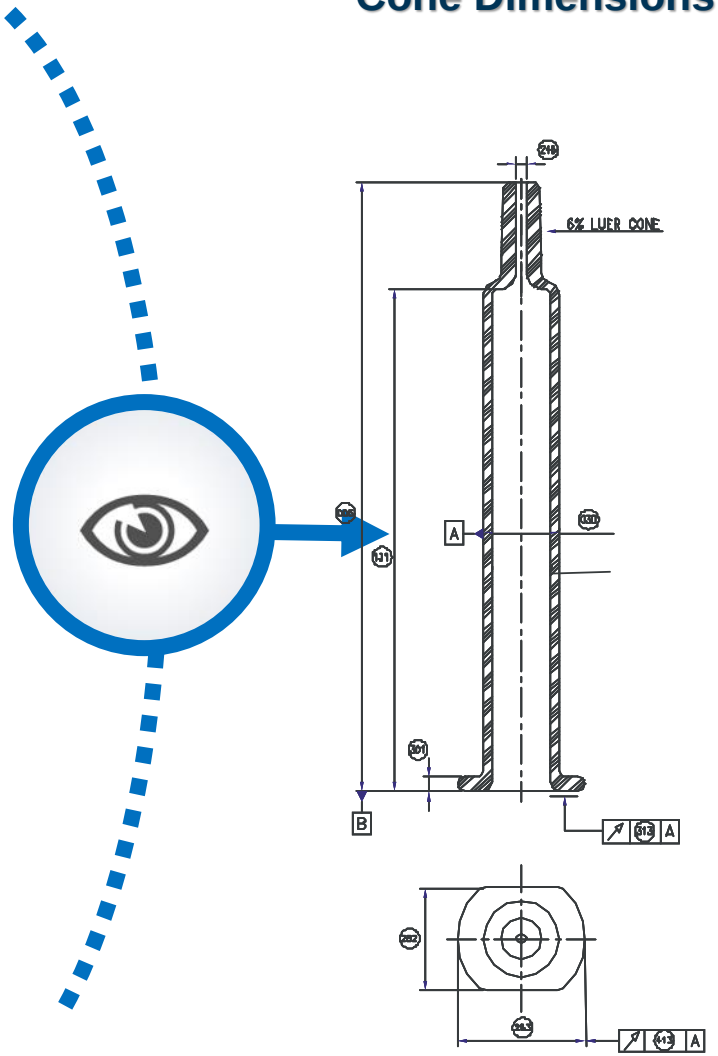
Syringes – Very High Cosmetic Quality



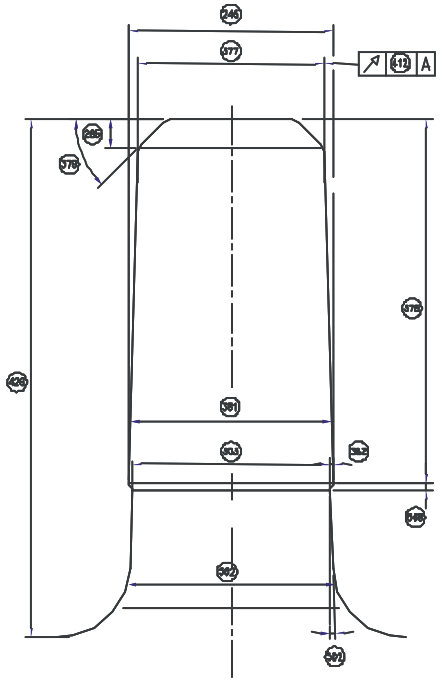


Syringes – High dimensional process capability





Cone Dimensions (Inside and Outside)
Flange Dimensions
Total Length



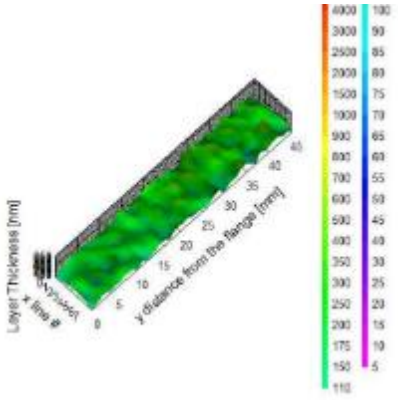
Syringe – Features needed

Low Tungsten

Optimized siliconization

UV Curing

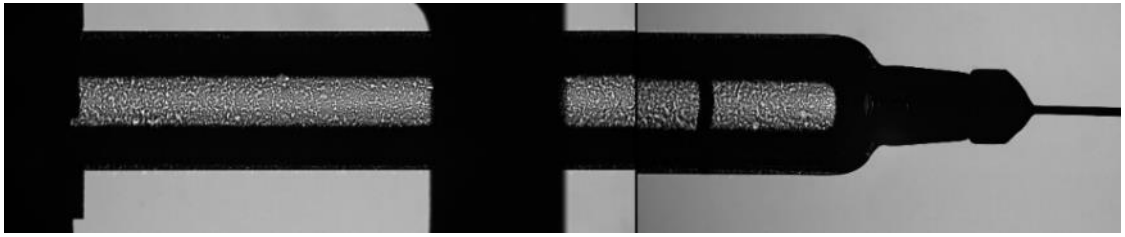
	OMPI MAX LIM [ppb]
Tungsten free	0
Low Tungsten	< 500

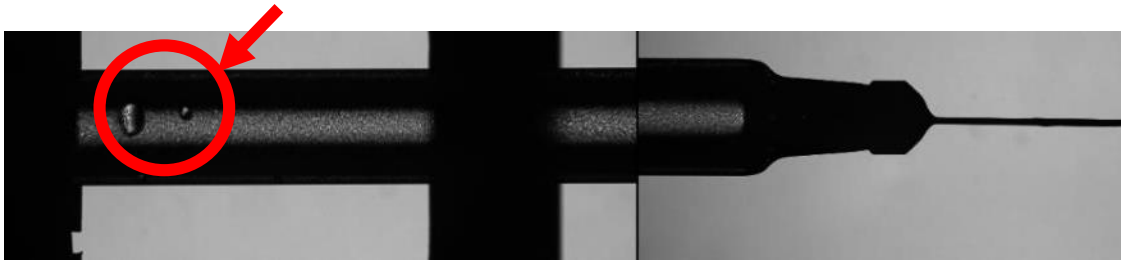


Syringe – Features needed

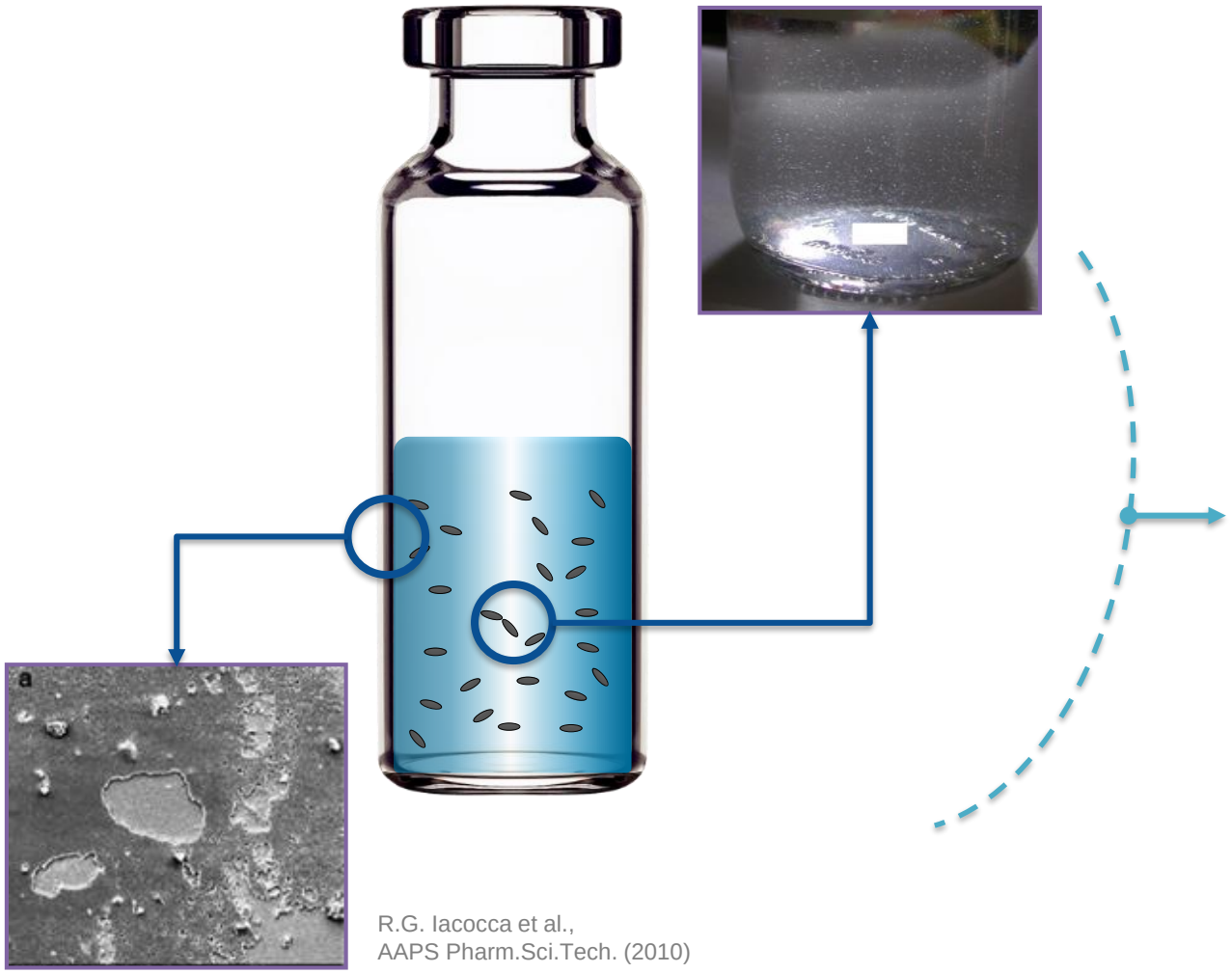
Siliconization Controls

- Presence of silicone inside the barrel
- Correct distribution inside the barrel





Glass Delamination



R.G. Iacocca et al.,
AAPS Pharm.Sci.Tech. (2010)

- **Separation of thin glass layers (lamellae)** that appear as shiny, needle shaped particles floating in the contact liquid
- The formation of a **silica-rich layer poorly bonded** to the substrate is the first stage of an extended delamination
- **Glass-liquid interactions** are responsible for the formation of an altered layer

The Answer for Glass Delamination

Low Delamination Propensity

Thermal cycle optimization with low heat/energy forming process

Qualitative test method to guarantee the quality and the stability of vials production fully aligned with USP 1660

Optimized vials manufacturing process with an higher quality product from chemical point of view

Needle stick injuries & evolution of needle safety devices

Early Devices

Manually Activated

User must manually activate the needle shield; additional movement and manipulation of device to activate the safety feature

1st Generation Devices (add-on)

Automatic Activation

Needle is shielded automatically; activation step required to deploy safety mechanism

2st Generation Devices (add-on)

Passively Activated

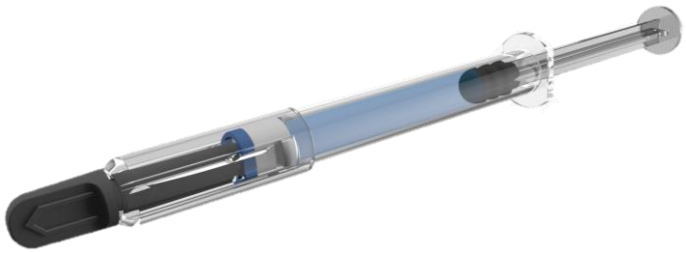
Requires no additional action by the user; safety mechanism activated activated upon administration of the injection

PFS Integrated Devices

Passively activated and preassembled

Provide added benefits preassembled in ready to use format

Safety Systems - (ISS) designed to meet the needs of all drugs (Biotech, Heparine, Vaccines)

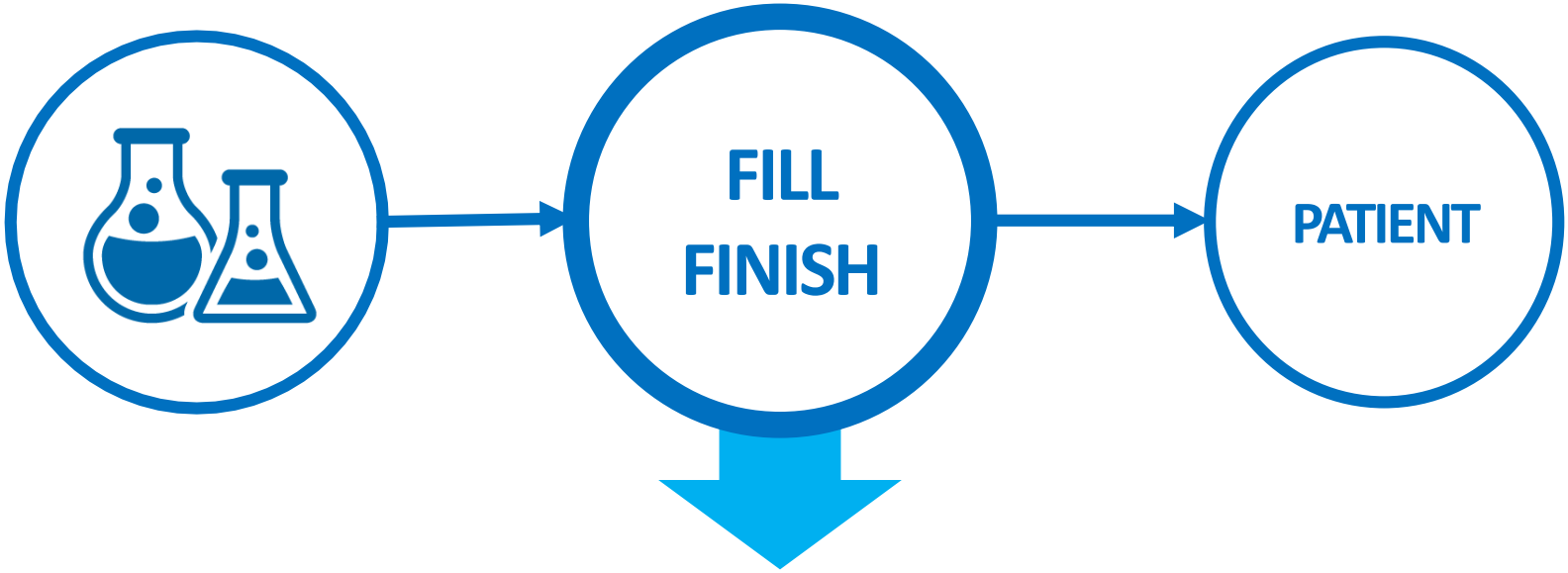


Standard primary packaging

Fully passive protection

A standard ready to fill syringe with integrated needlestick protection capability

How is the market changing

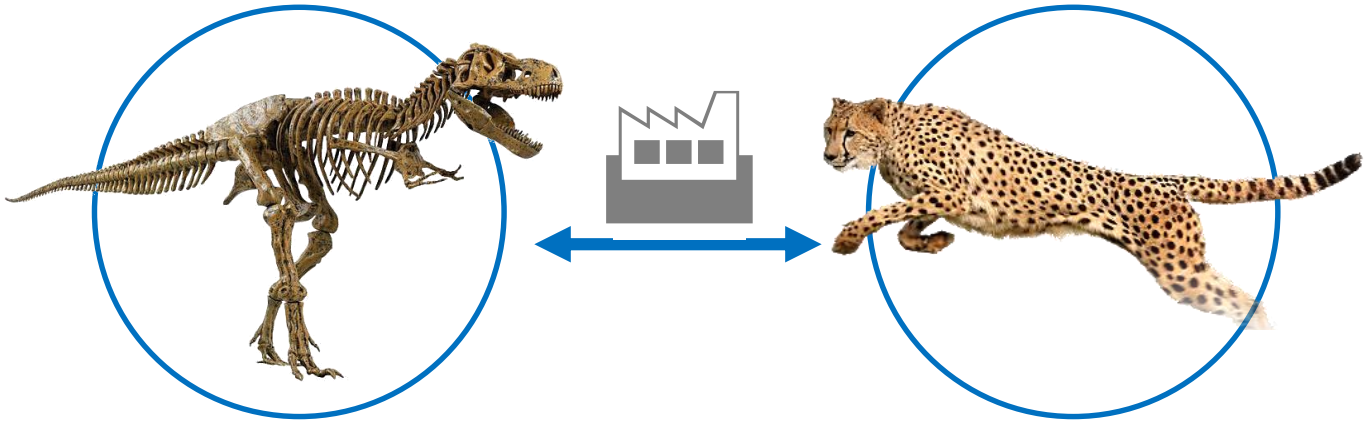


It is no longer about stable production alone.

Production facilities must be ready
for adaption to changes in corporate strategy,
in market dynamics and in short-term targets.

SOURCE: NNE PHARMAPLAN

Industry change as an opportunity to compete



"The success of a manufacturing site is moving

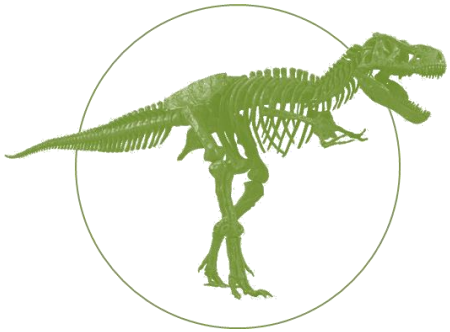
from site stability to site agility:

in addition to maintaining stable production, pharmaceutical sites are now required to accommodate more changes and deliver on unexpected targets"

SOURCE: NNE PHARMAPLAN

How to be faster?

SITE STABILITY

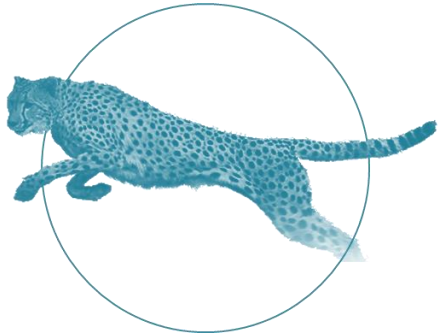


- Mono Product
- Core and Non core Activities
- High Capex
- High Running Costs

Big Size
Full Process

FILL FINISH

SITE AGILITY



- Multi Product
- Only Core Activities
- Very Limited Capex
- Reduced Running Costs

Flexibility
Fast Reaction

A Comprehensive Range of RTU Containers

Washing
(Siliconization)
Depyrogenation
Nesting (no G2G)
Final Sterilization

Nest & Tub

- Vials
- Cartridges
- Syringes

Tray

- Vials
- Cartridge Only Glass

ompi | ez-fill®

What the market is looking for?

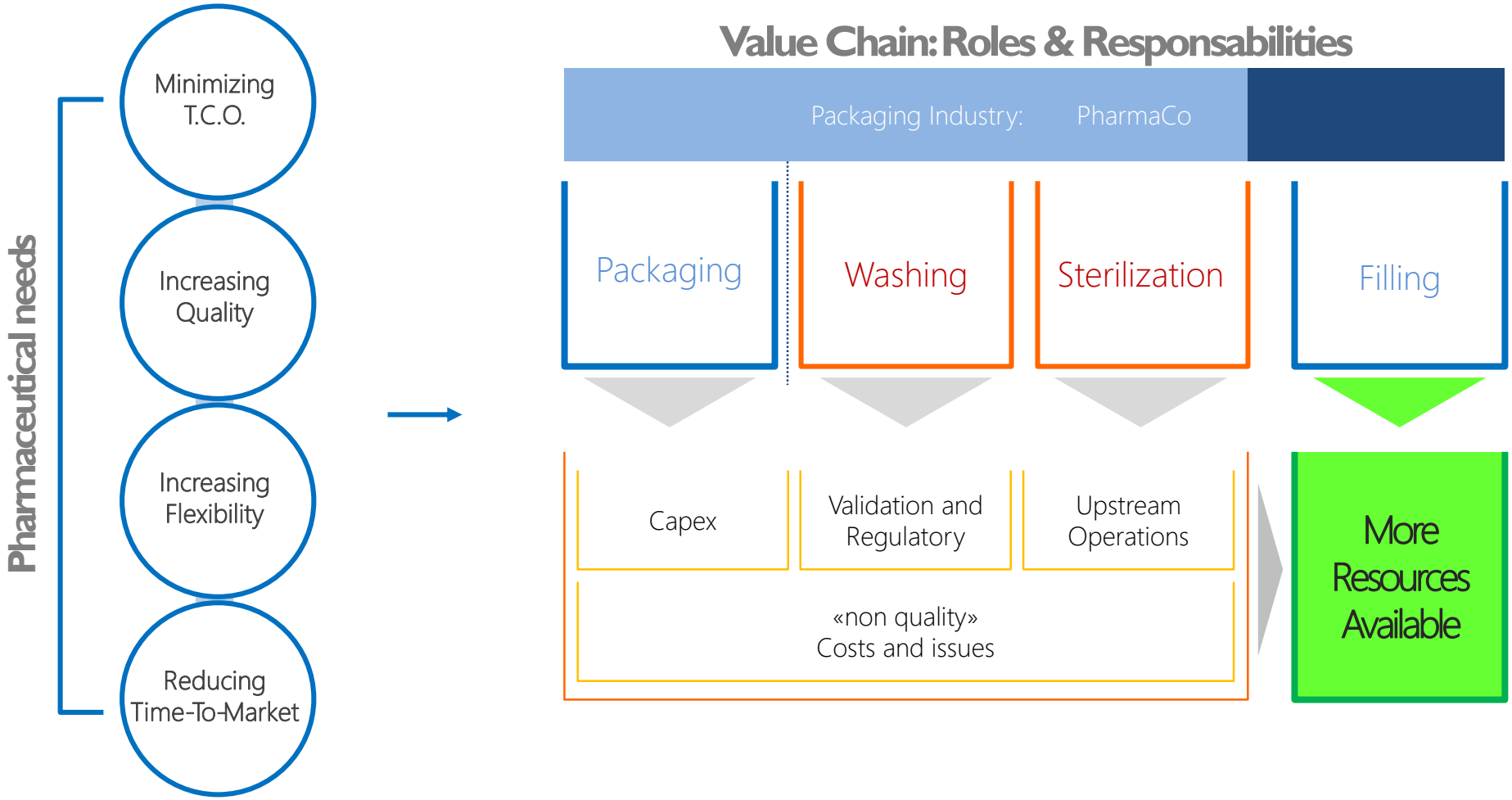
Productivity

flexibility

Tray for dedicated filling line

Nest&Tub for combo line

How PharmaCo Value Chain Changes



PharmaCo Value

Pharmaceutical needs

Minimizing T.C.O.

Reduction of initial investments on:
- Equipment (washing, WFI system, tunnel)
- Utilities (WFI, kWh,..)
- Workforce
- Validation
- Maintenance

Increasing Quality

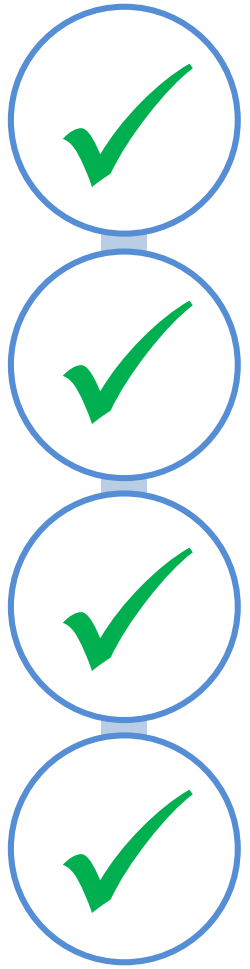
- No-glass-to-glass contact during transport
- Feeding, Washing, Depyrogenating Tunnel are very stressed phases for packaging

Increasing Flexibility

- A unique fill&finish equipment for different packaging
- Easy & fast change packaging/format in the same machine (combo line)

Reducing Time-To-Market

- Reduction of the time, using Ompi EZ-fill® from research to industrial scale



Cost Reduction for PharmaCo

Thank You for Your Attention!

Further information: **ez-fill@stevanatogroup.com**