ERF 2021

Challenges and Requirements from the Laboratory Automation Perspective

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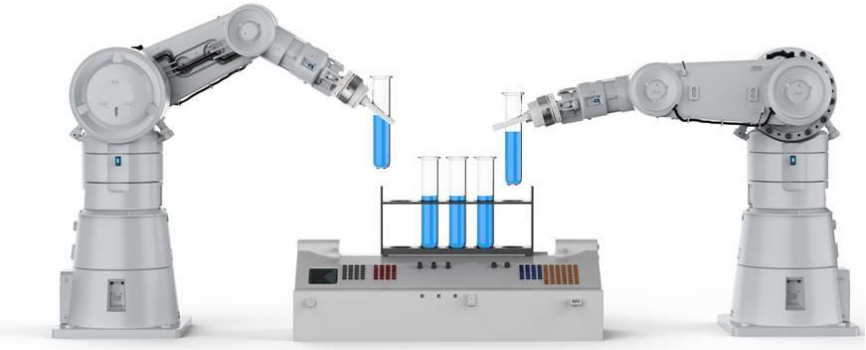
Wednesday 14.4 1405-1525

TG analytical laboratory robotics



Why the laboratory ?

1. What is the laboratory ?
2. Sample handling: liquids vs solids
3. Standard containers
4. Progress in perception for lab handling
5. Vision challenges
6. What next?

1.Typology of end-user laboratory

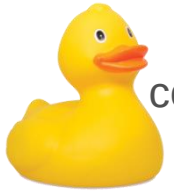
Life sciences

Physical sciences

food & drink

biomedical research

consumer goods



pharmaceutical

materials research

Industrial

clinical

forensics

environmental

petrochemicals

1.Typology of end-user laboratory

Life sciences

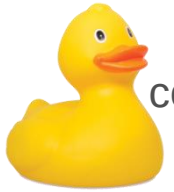
Physical sciences

Pharma R&D $50bn

biomedical research

food testing $11bn

food & drink



consumer goods

pharmaceutical

Lab instruments $67bn

materials research

Clinical Testing $60bn

clinical

forensic testing $20bn

forensics

environmental

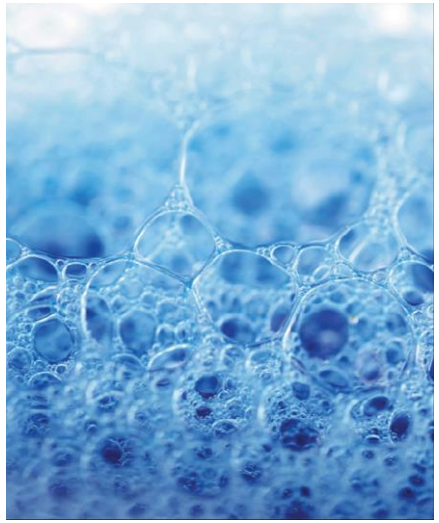
Industrial

petrochemicals

Robotics as €4bn industry
and mostly in Europe

2.Sample handling

Liquids: mobile to viscous / emulsions & colloids



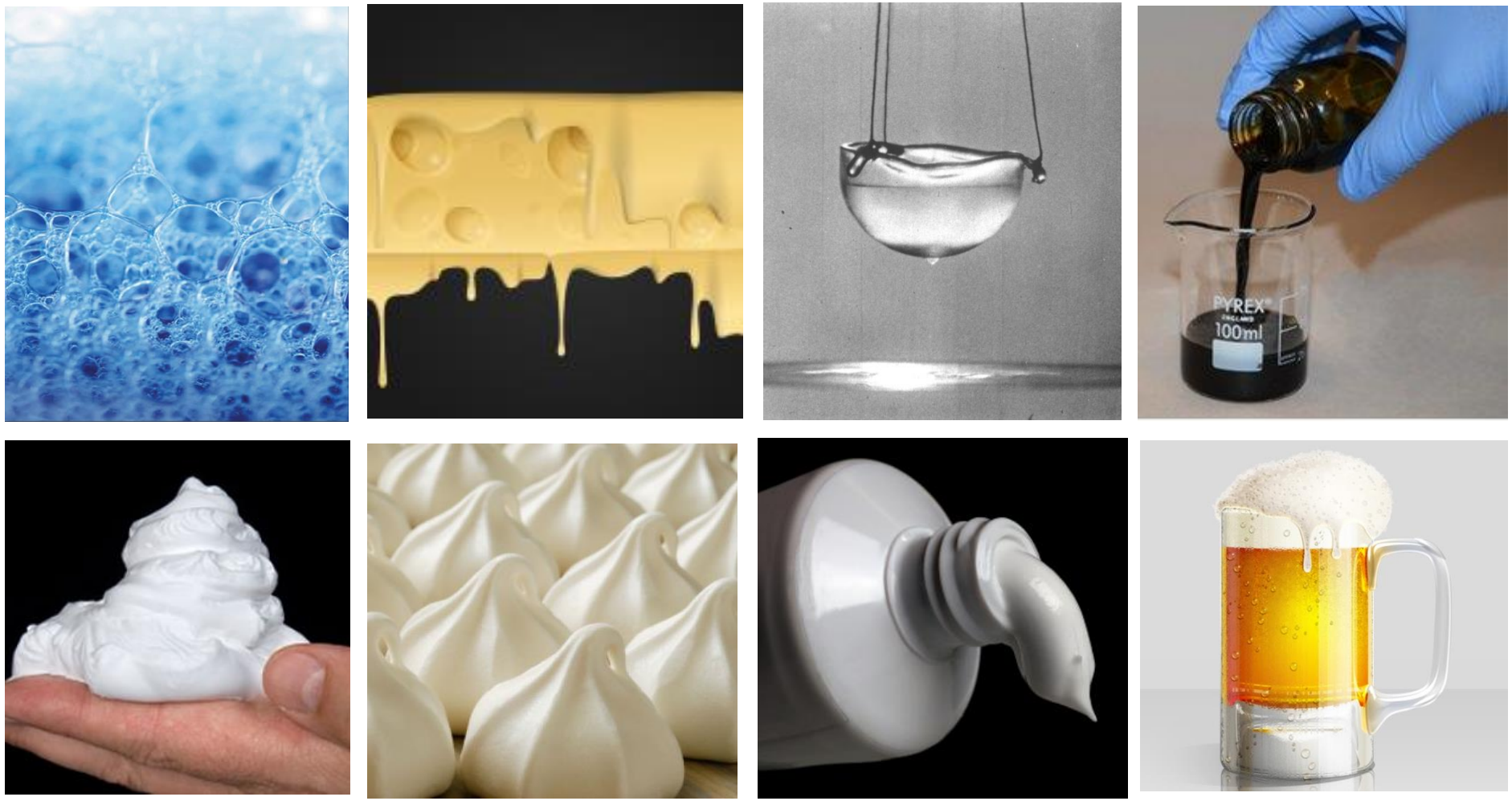
Handling samples

vs

Dealing with challenges

2.Sample handling

Liquids: mobile to viscous / emulsions & colloids

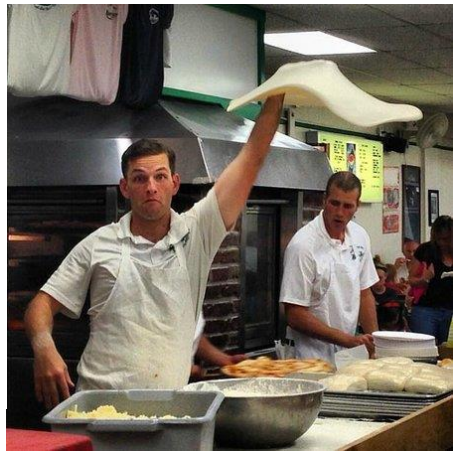


2.Sample handling

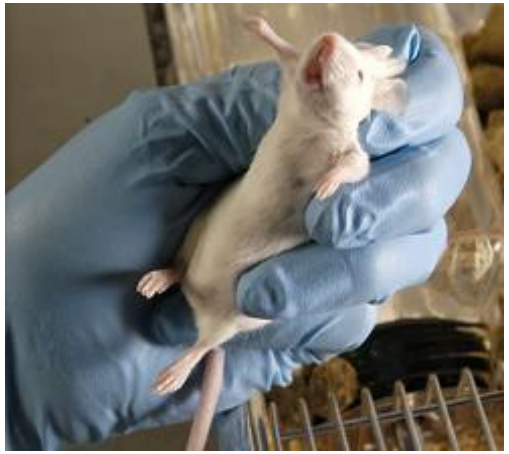
solids: from machined parts

complex

multi-phase



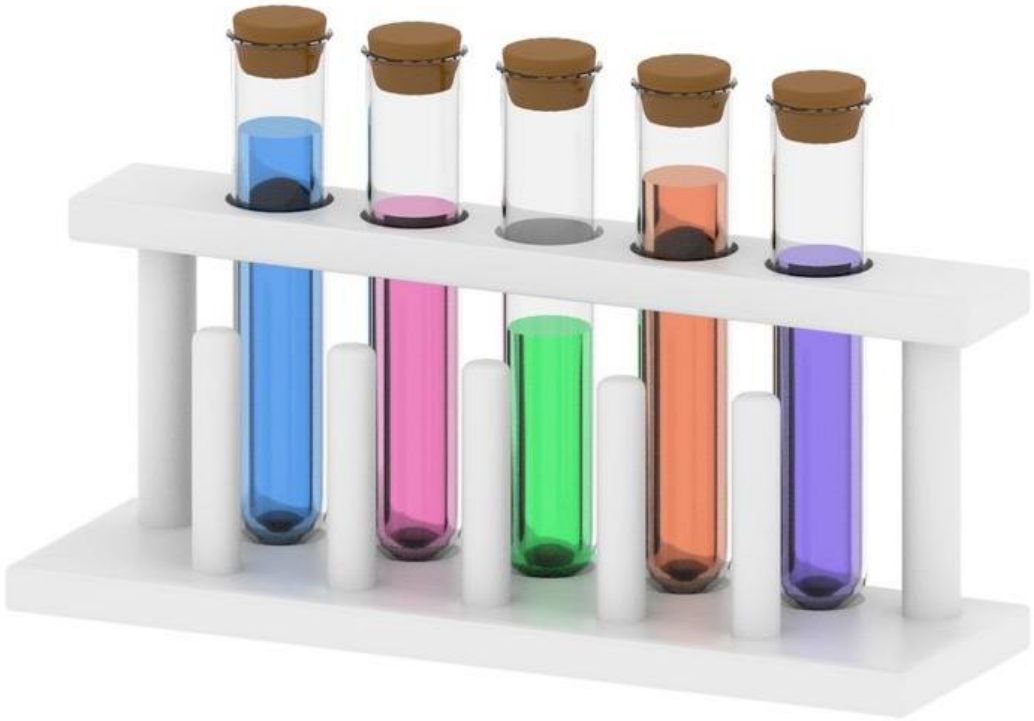
uncooperative



anti-cooperative

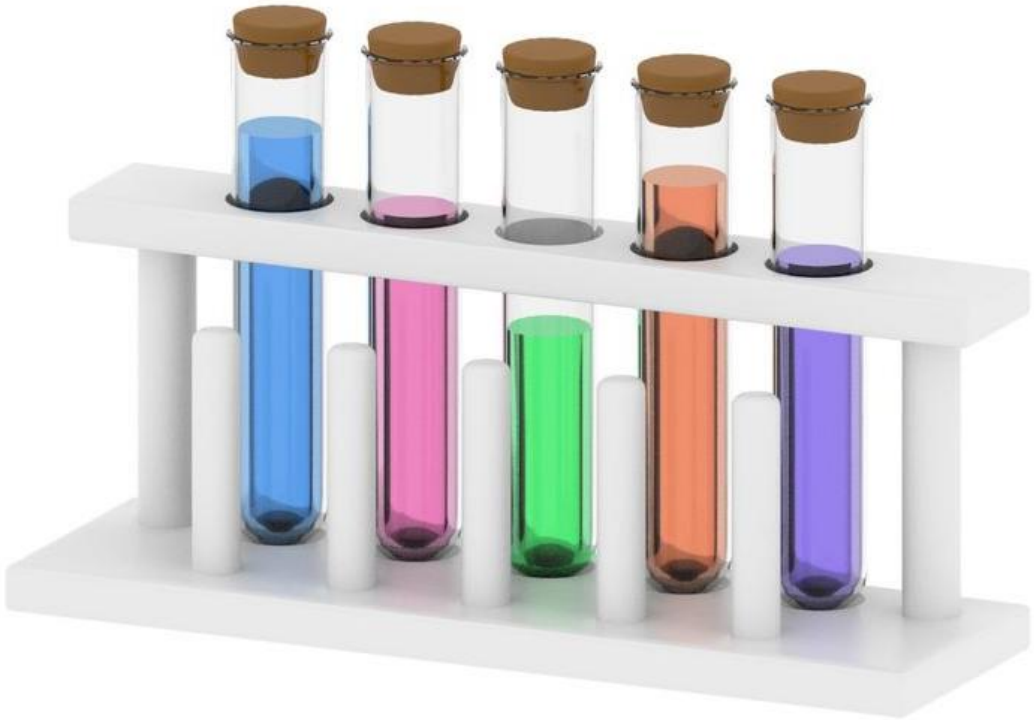
Current industrial robots are not suited to these samples

3.Standard containers



perception

3.Standard containers



perception and reality

Microtitre plates – role of standards, consumables

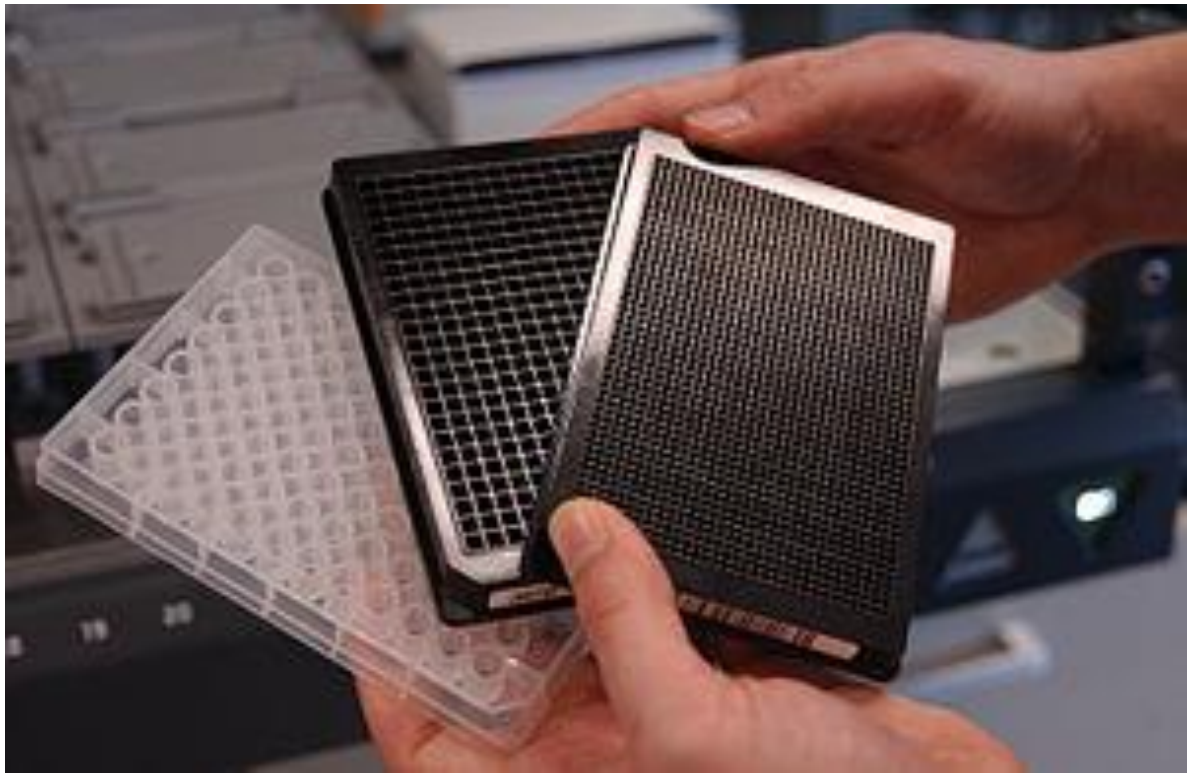
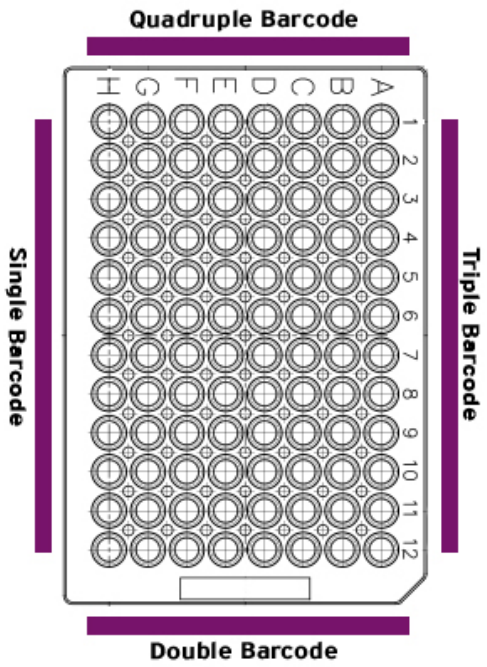
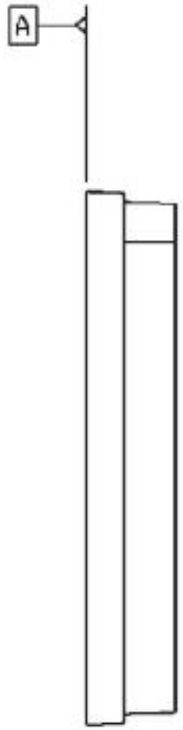


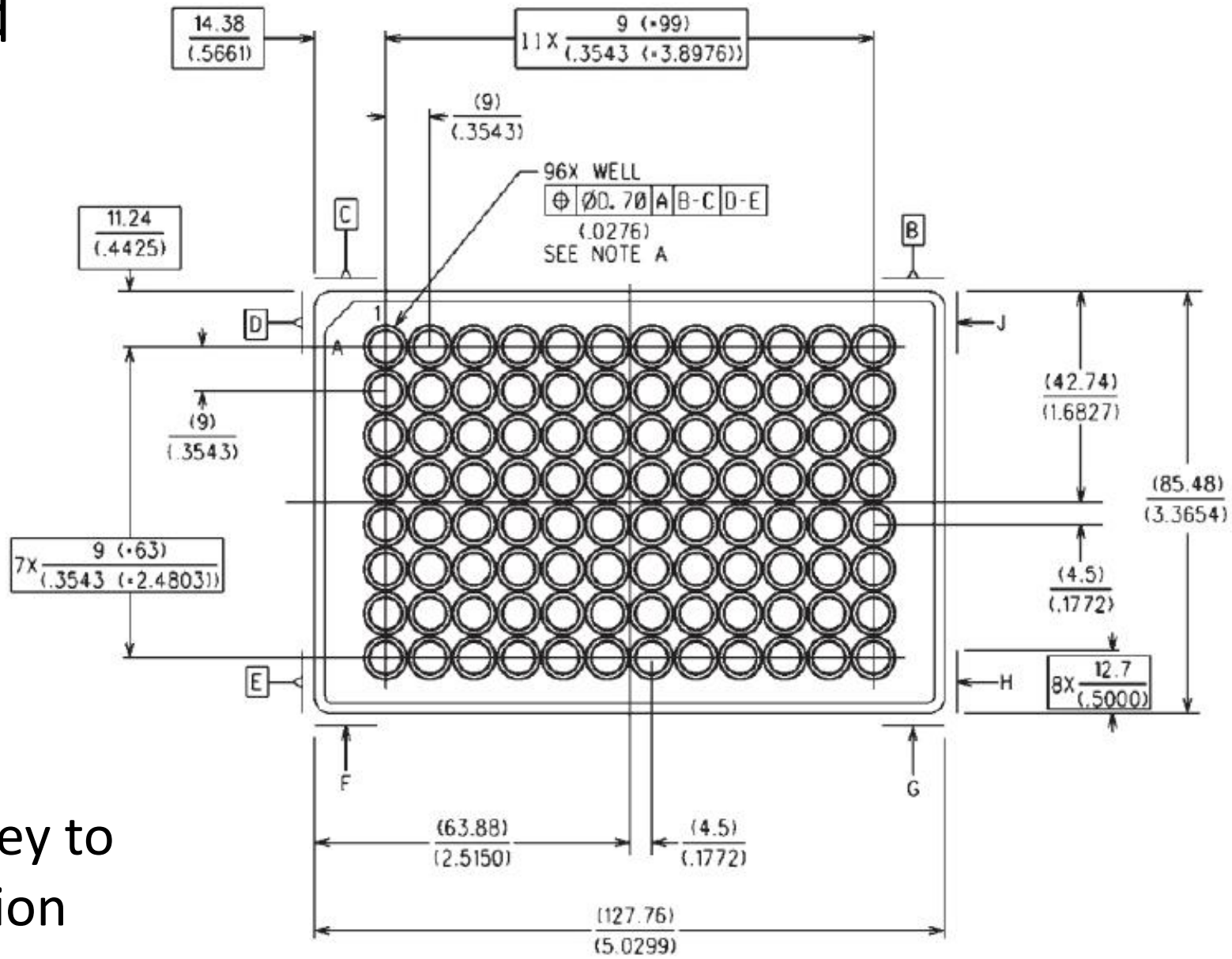
Image credit: SBS/SLAS, Hamilton

ANSI standard

1996 to 2003



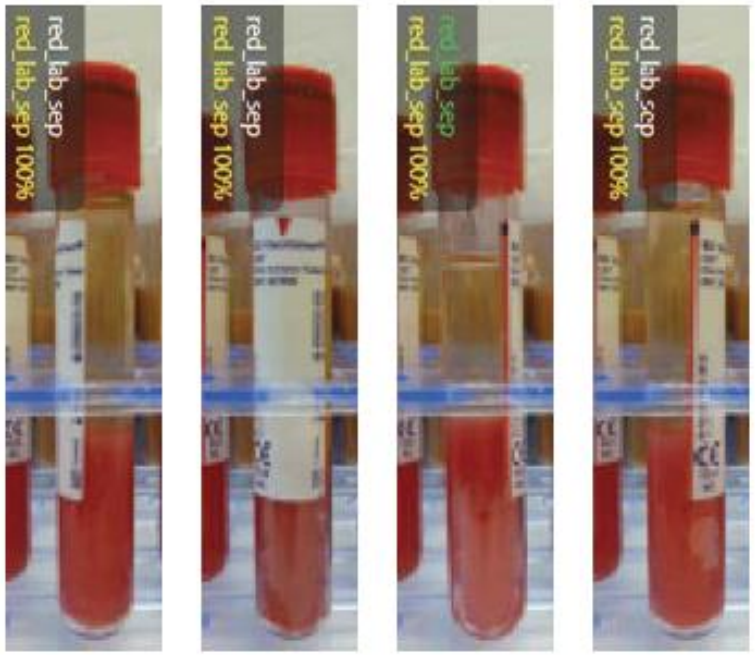




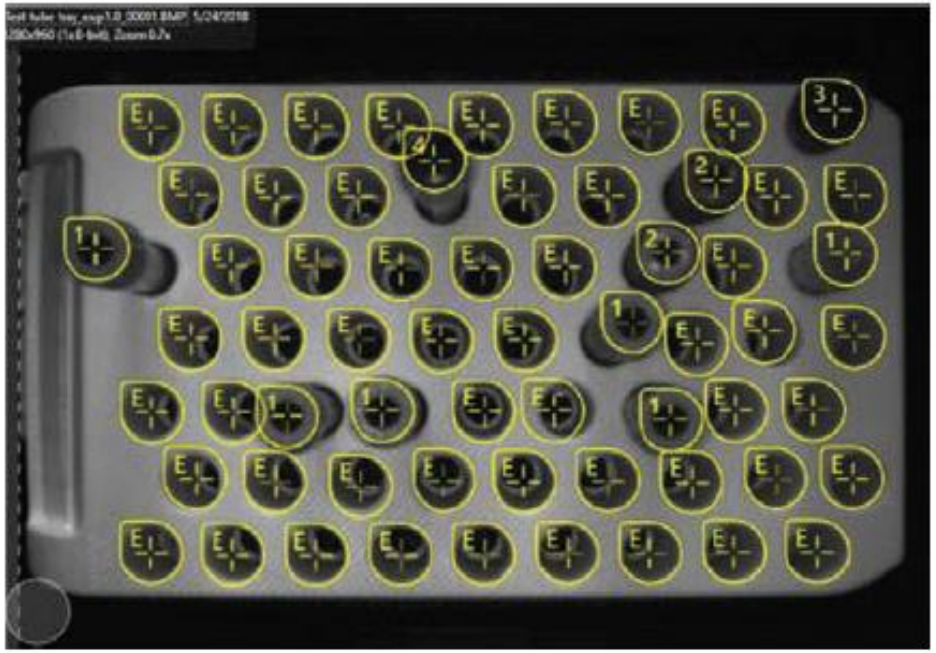
This has proved to be key to success of lab automation

ANSI SLAS 4-2004 (R2012) *(formerly recognized as ANSI/SBS 4-2004)*

4.Progress in perception for lab handling



Classify



Locate

Image credit: Cognex ViDi

5.Vision challenges

- Objects: size, shape, variety, material, surfaces

- Context: regulation/validation, sterile unpackaging

6.What next?

- Choice of a common user case: USP<71>

- A focussed project: TraceBot

Example USP<71>

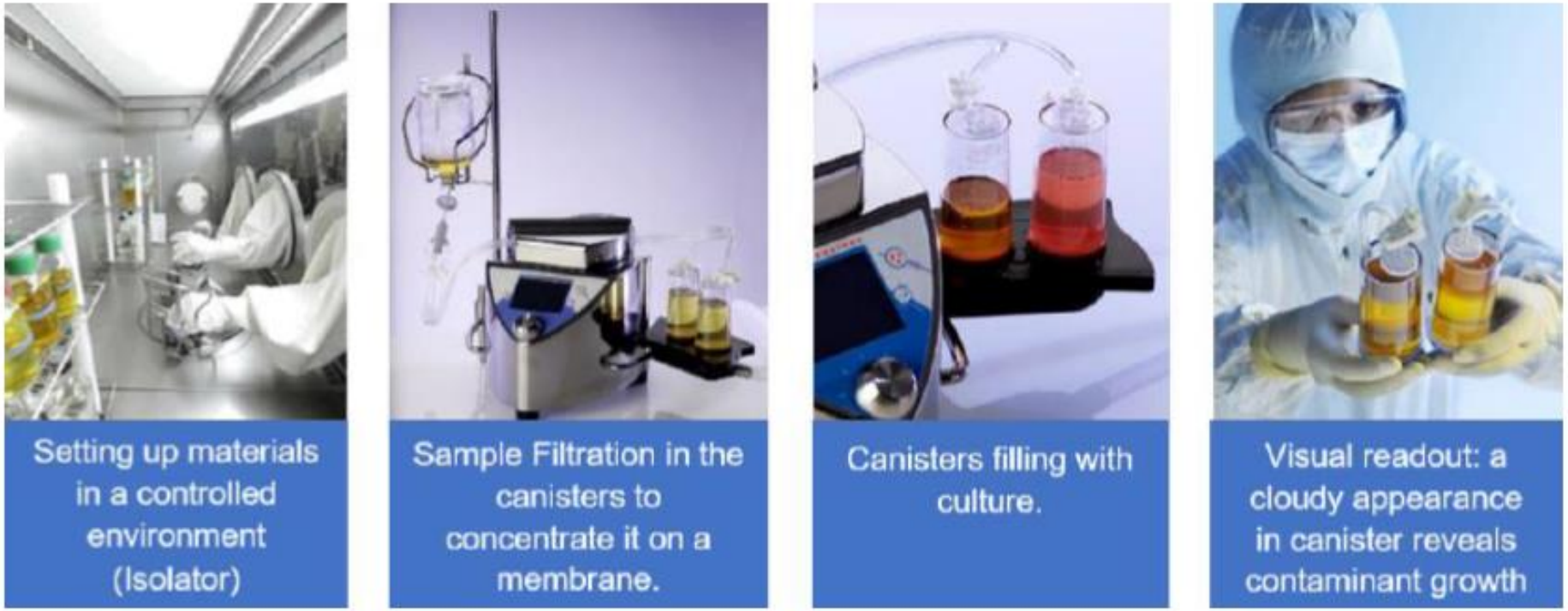


Image credit: Merck Millipore

Figure 1.1: The main steps of the sterility testing procedure, a key task in laboratory automation.

Example USP<71> and the TraceBot project

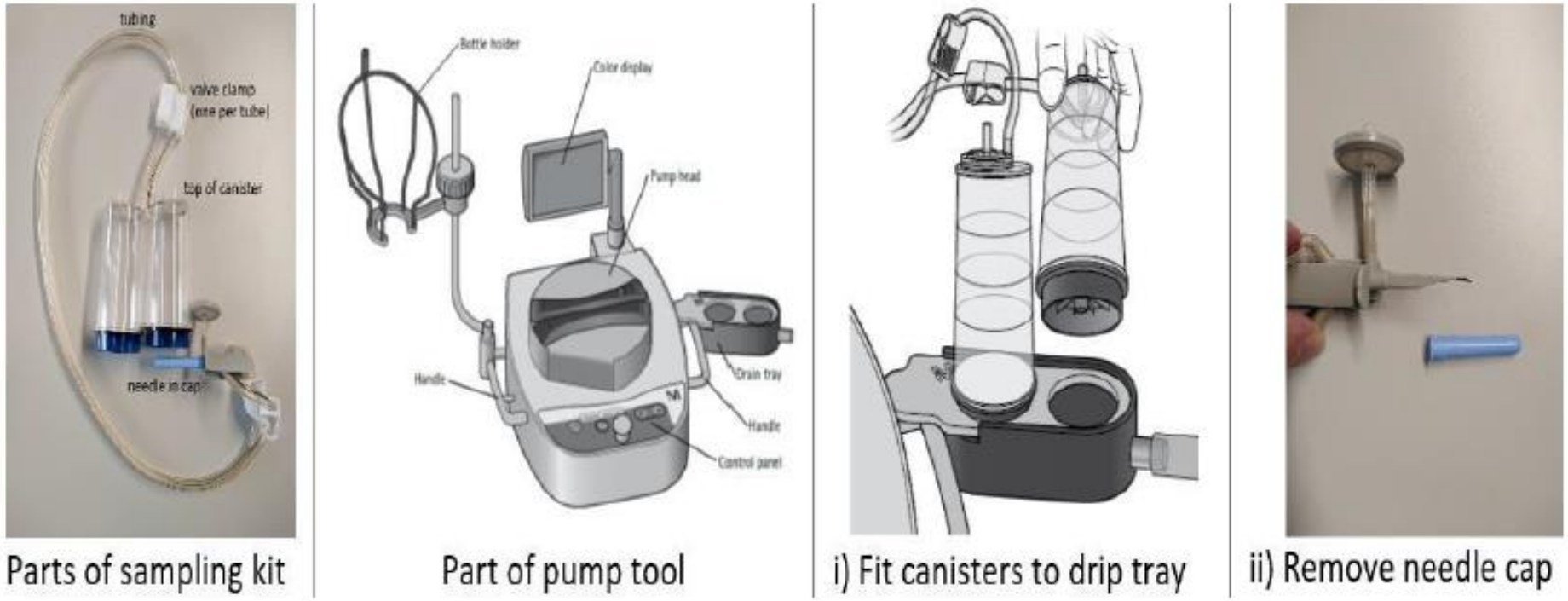


Figure 1.2: The samplekit (left) must be fitted to thepump. Two example steps (right).

Image credit: Merck Millipore

Example USP<71>

Unpacking in a sterile environment

Image credit: Sartorius

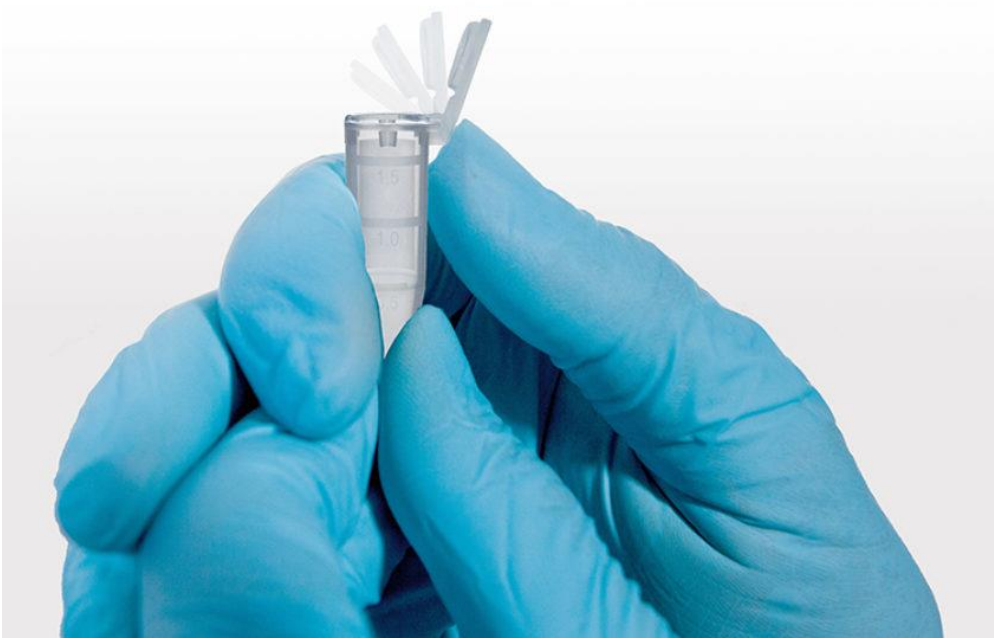
Image credit: Merck Millipore

Acknowledgements

- Robotics and AI topic group

- Analytical laboratory robotics topic group

- Cognex ViDi
- Hamilton
- Merck Millipore
- Sartorius
- TraceBot project consortium



1.5 mL FlipTube facilitates handling without risk of aerosol
Image credit: Hamilton

tec-connection