



Microbial Air Monitoring of Critical Processes

Gethin Jones

Background

- Pinpoint Scientific - Founder
- Small instrumentation company based in Bridgend
- Design Manager at Biotrace & **3M** (16 years)
- Technologies - **Microbial detection** products:
 - ATP Bioluminescence (instruments & swabs)
 - Military - liquid & airborne biodetection
 - **Pharmaceutical air samplers**
- Primary focus - rapid hygiene tests for food & beverage
- Biotrace acquired by **3M** in 2006
- Flagship product *CleanTrace NG* & swabs



History

- Biotrace – pharma air samplers by acquisition
- Mattson Garvin – 1960s design
- Developed the Airtrace
- GJ - Inherited Airtrace
- Stabilised design
- Fundamentally - design not 'ideal' for market
- Opportunity to develop a better product
- Left **3M** in 2011 – to focus on air samplers



Mattson Garvin Air Sampler



AirTrace Air Sampler



- Aim – to develop a range EM products for Pharma
- Key target - AstraZeneca
 - UK's biggest user of Airtrace
 - Monitoring over sampling
 - Looking for Airtrace alternative
 - Established relationship
- Many meetings – “the ideal air sampler”
- 2015 Pinpoint Scientific chosen for new \$200M SPP5 plant
- Pinpoint status at the time....
- Initial order 38 systems with 85 delivered to date.
- SPP5 now sterile with 3000+ runs to date
- SPP6 sanctioned - Pinpoint Scientific chosen again



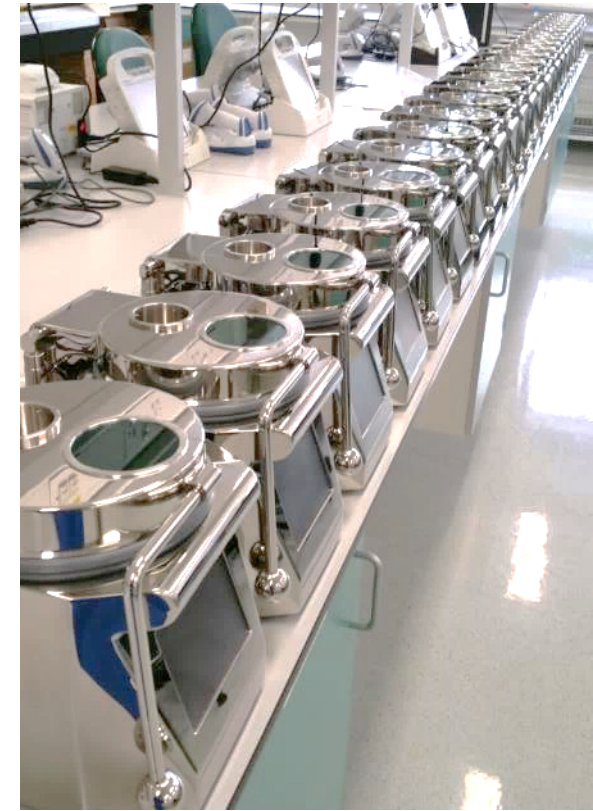
Concept to Reality



Chosen Concept



Delivered Product



Range of environmental monitoring products and accessories for use in cleanrooms and associated controlled environments

- Cleanroom monitors
- Isolators & RABS monitors
- Rapid air samplers
- Surface samplers
- Aseptic handling accessories



Cleanroom



Isolator & RABS



Surface Sampler



Aseptic Plate Handling

Microbial Air Sampling & Monitoring

Why do we do environmental monitoring (EM)?

Regulations....

Applicable regulations for Sterile Manufacturing in the EU market and Monitoring of Operating Theatres in Hospitals:

1. Annex 1 of the EU Guide to Good Manufacturing Practice (Orange Guide)
2. UNI-EN-ISO 14644/1-2-3 for cleanroom classification and testing.
3. UNI-EN-ISO 14698/1-2 for bio-contamination control in cleanrooms.
4. Pharmacopoeias: USP, JP, EP
5. HTM 03-01 referring to Microbiological Commissioning and Monitoring of Operating Theatre Suites

Microbial Air Sampling & Monitoring

The E.C. Guideline to cGMP recommends limits for Environmental Monitoring of clean areas during operation (ties in with the FDA guideline on the previous slide)

GRADE OF CLEAN AREA	AIR SAMPLES (90mm or 140mm PLATE) cfu/cu m	SETTLE PLATES (90mm PLATE) cfu/4 hrs	CONTACT PLATES (RODAC 55mm CONTACT PLATE) cfu/plate	FINGERDAB PLATES (90mm PLATE) cfu/glove
A	<1	<1	<1	<1
B	10	5	5	5
C	100	50	25	N/A
D	200	100	50	N/A

Microbial Air Sampling & Monitoring Methods

Passive Monitoring

- Settle plates
 - Microorganisms settle onto the media
 - Air to agar
 - Capture → Grow → Identify

Active Sampling & Monitoring

- Slit-to-agar
 - Air drawn through narrow slit
 - Air to agar
 - Capture → Grow → Identify
- Sieve
 - Air drawn through perforated plate
 - Air to agar
 - Capture → Grow → Identify

Enhanced Particle Counters - Real time & Monitoring

- Laser based particle counter
- Continuous & real time
- No consumable
- Advanced algorithms
- Auto-fluorescence = probability of organism
- **No identification**

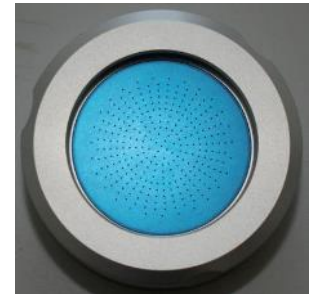
Settle Plate



Slit-to-Agar



Sieve



Enhanced Particle Counter

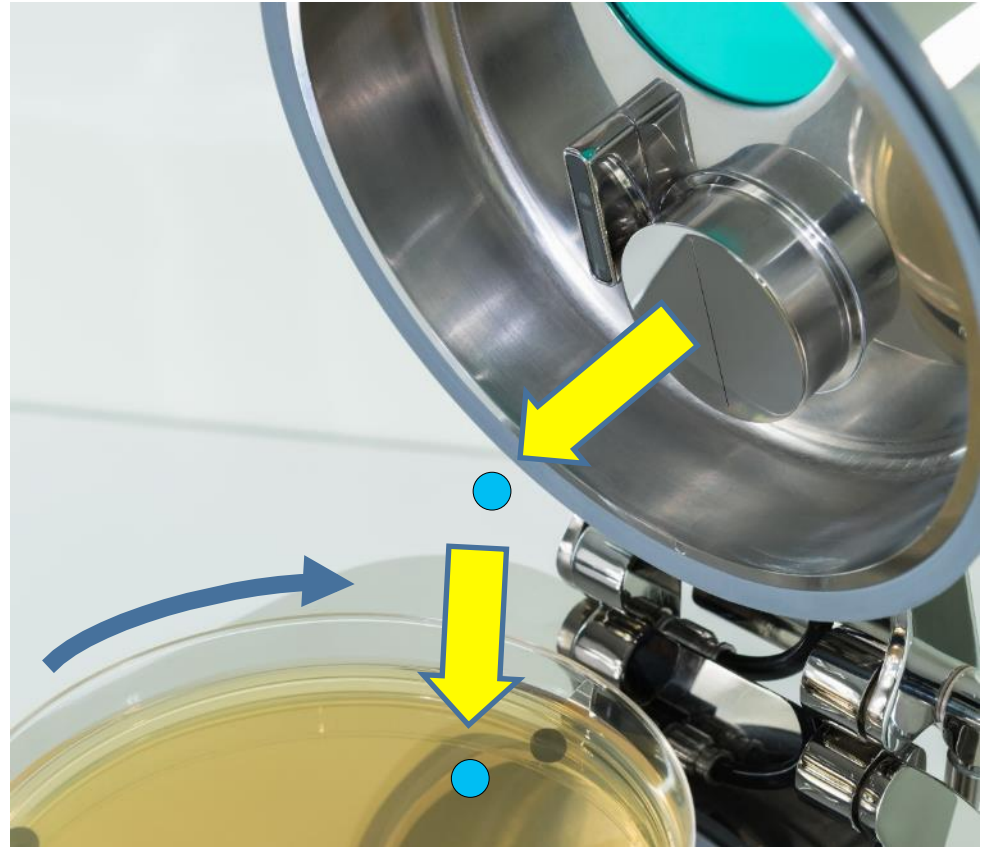


Microbial Air Sampling & Monitoring – Agar Based

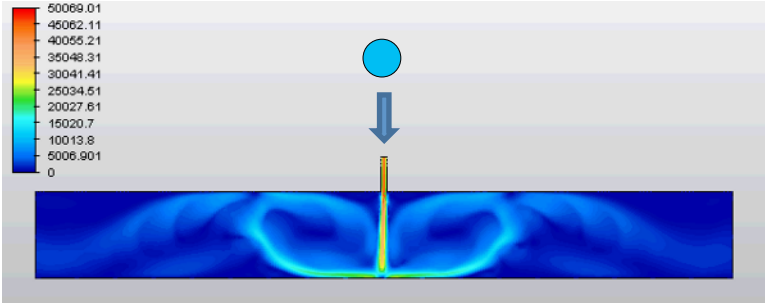
Key air sampler requirements to meet regulations

- Physical efficiency (Theoretical & test) - sample down to **less than 1 μ m** particles (**D50 <1**)
- Biological efficiency (By test – PHE) - **Viability** of organism to grow and identify
- Sample minimum **1m³** - without drying out of media
- Identify organism
- Appropriate separation of colonies in high contamination areas
- Does not shed particles (contaminate the environment)

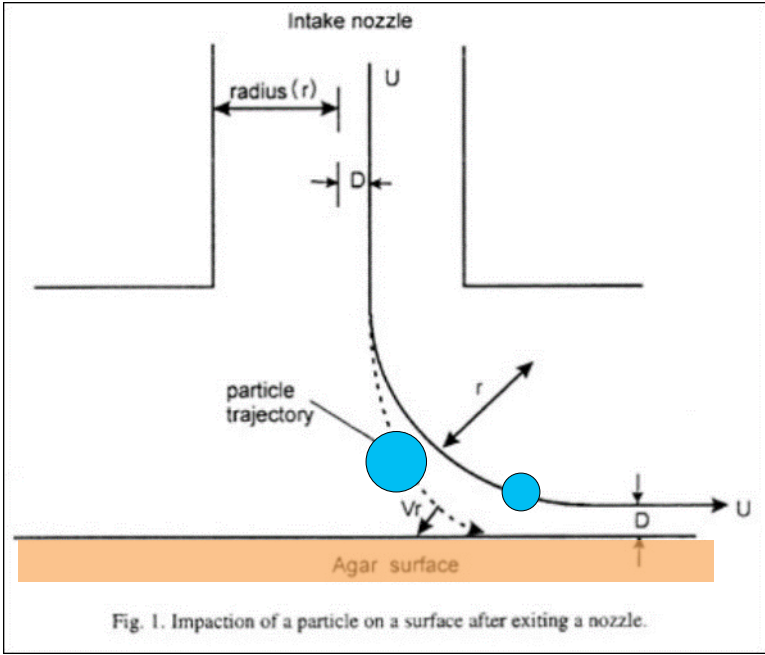
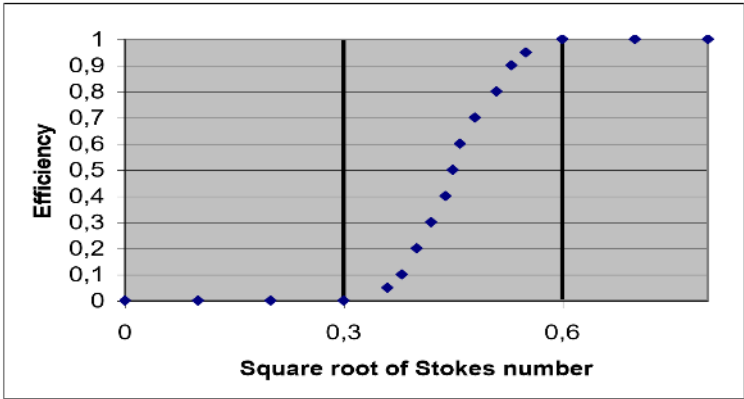
Active Air Sampler - Principle



Microbial Air Sampling & Monitoring – Agar Based



D_{50} = The dimension of the particle with a 50% of probability to be captured

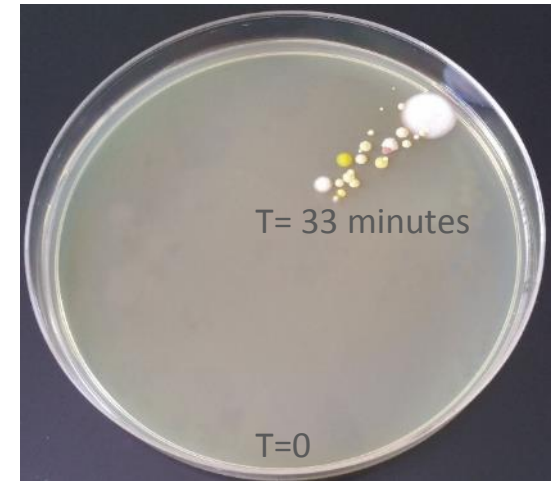


What is the D50 on your sampler?

Sampling (sieve) vs Monitoring (slit)

- Slit-to-agar
 - Air drawn through narrow slit
 - D50 < 0.5 μ
 - Rotating agar plate
 - Larger 140mm Agar plate
 - Up to 4 hours on one plate = monitoring
 - Low dehydration of media
 - Excellent separation of colonies
 - Time correlated results
- Sieve
 - Air drawn through perforated plate
 - D50 (best 0.8 but generally >1.1)
 - Fixed agar plate
 - Smaller 6cm or 9cm plate
 - Typically 10 minutes sample time
 - Sample over short periods only
 - Media dehydration
 - Poor colony separation (look up table)
 - 'Twin impingement'

Slit



Sieve



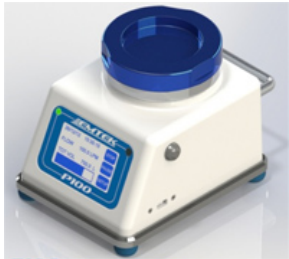
Overview - *ImpactAir*®

- *ImpactAir* – Air Sampler & **Monitor**
- Fully validated for ISO 14698-1
- Class leading D50 <0.5µ
- Unique dynamic height adjustment*
- Constant D50 throughout run*
- 140mm Agar plate
- Robust stainless Steel construction
- Proven Technology
- Does not shed particles
- Ultra low vibration
- Low power (<60 watts)
- Optional remote control
- Flexible deployment options
- 50% footprint compared to Airtrace
- HEPA Filtered Exhaust



*IP protected

Sieve – Do they comply?



Isolators & RABS

- Humans = main contamination source
- Industry move towards “separative barrier” RABS & Isolators
- Is monitoring required at all?
- Governed by same rules & regulations
- Restricted space
- Monitors too large – fuels sieve sampler market
- Challenge to create small monitor



Regulation Changes

Regulations are changing: (Cleanroom Technology Conference Sept 2017)

- More emphasis on continuous biological monitoring
- Evidence based data
- 'Control Strategy' required (new PHSS requirement)
- Grade A = <1 CFU – cannot trend ZERO - therefore current methods are reactive at best
- Contamination 'walked in' – D→C→B→A
- Trending, mapping & deviation emphasis across all areas
- Predictive & preventative emphasis
- Allow the use of enhanced particle detectors (CFU→ Bio-Event)
- Growth in biologically active drugs
 - Cannot be terminally sterilised
 - In-situ sterilisation can damage product
- Still need to identify organism species
- Need for a smaller monitoring solution – but isolators generally custom design

Anything is Possible.....

ImpactAir 140-ISO

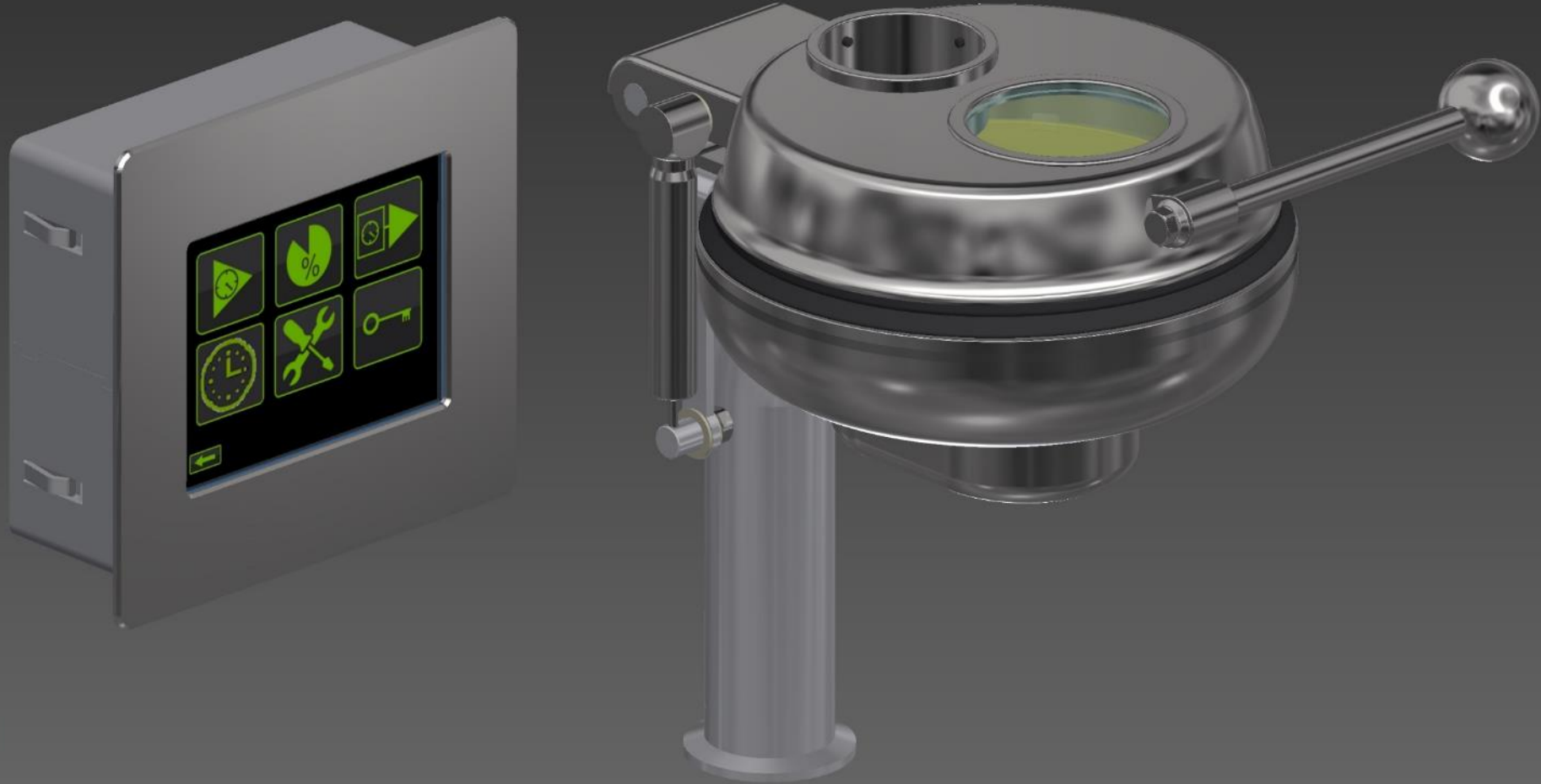
Flexible RABS & Isolator solutions

for

Continuous Microbial Monitoring

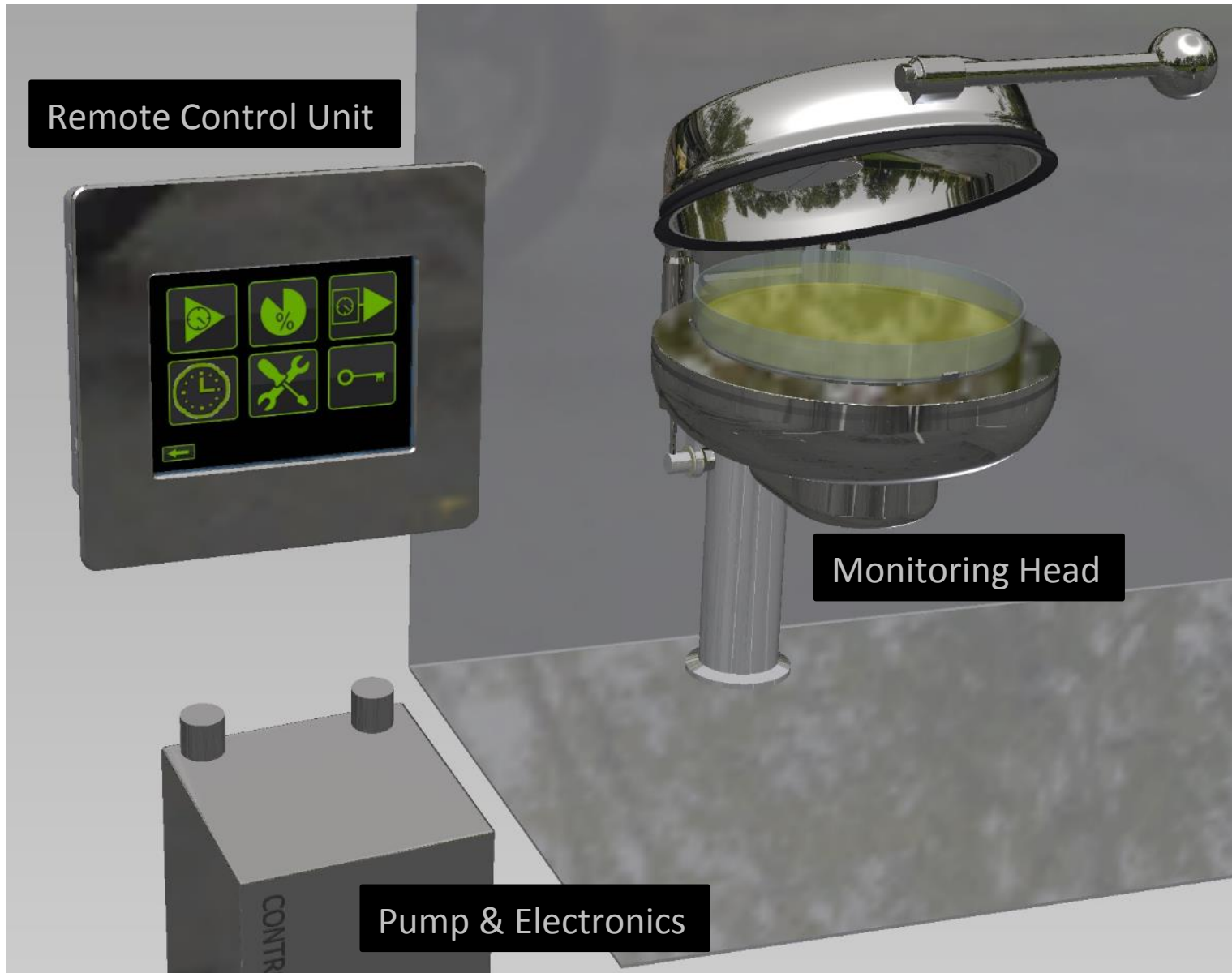
Slightly Confidential!





ImpactAir 140-ISO

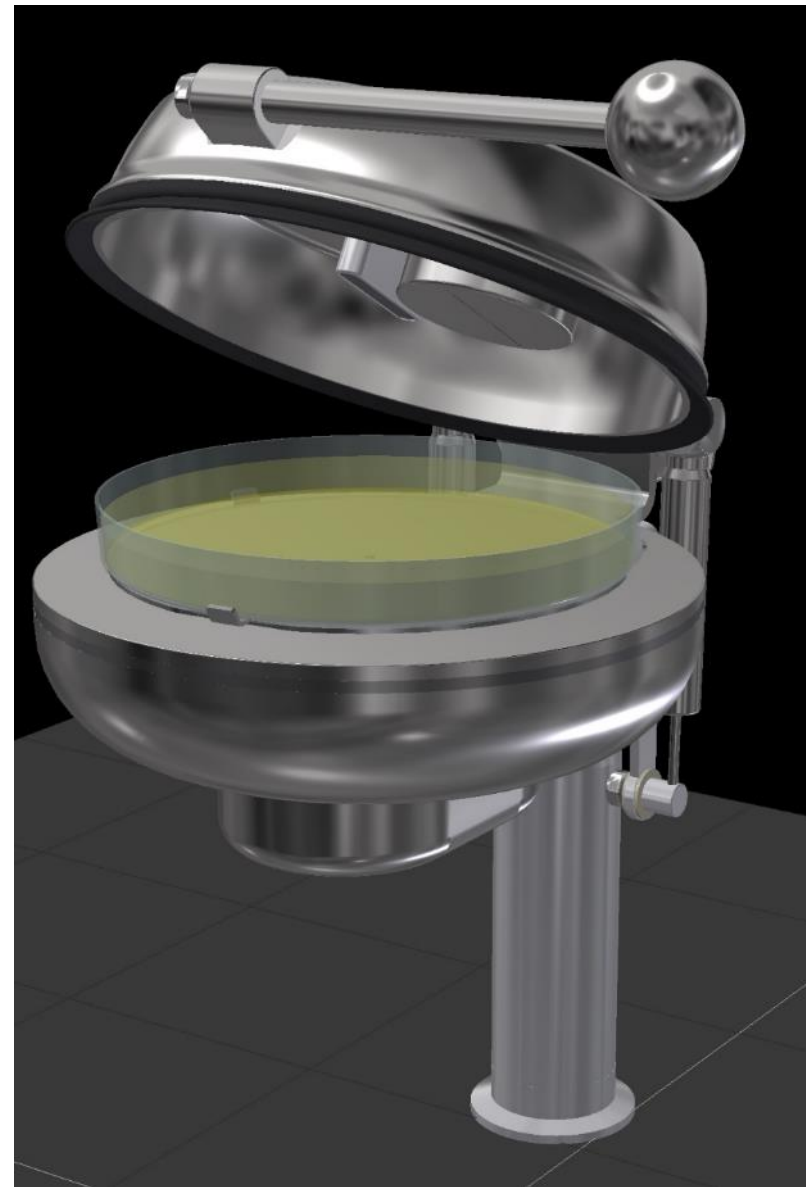




ImpactAir 140-ISO

ImpactAir 140-ISO

- ***ImpactAir*** – Air Sampler & **Monitor**
- Fully validated for ISO 14698
- Class leading D50 <0.5 μ
- Unique dynamic height adjustment*
- Constant D50 throughout run*
- 140mm Agar plate
- Robust stainless Steel construction
- Proven Technology
- Does not shed particles
- No vibration
- Low power (<60 watts)
- Remote control
- **Flexible deployment options**
- Low and Zero footprint
- Soft Close chamber



*IP protected

ImpactAir Size Comparison



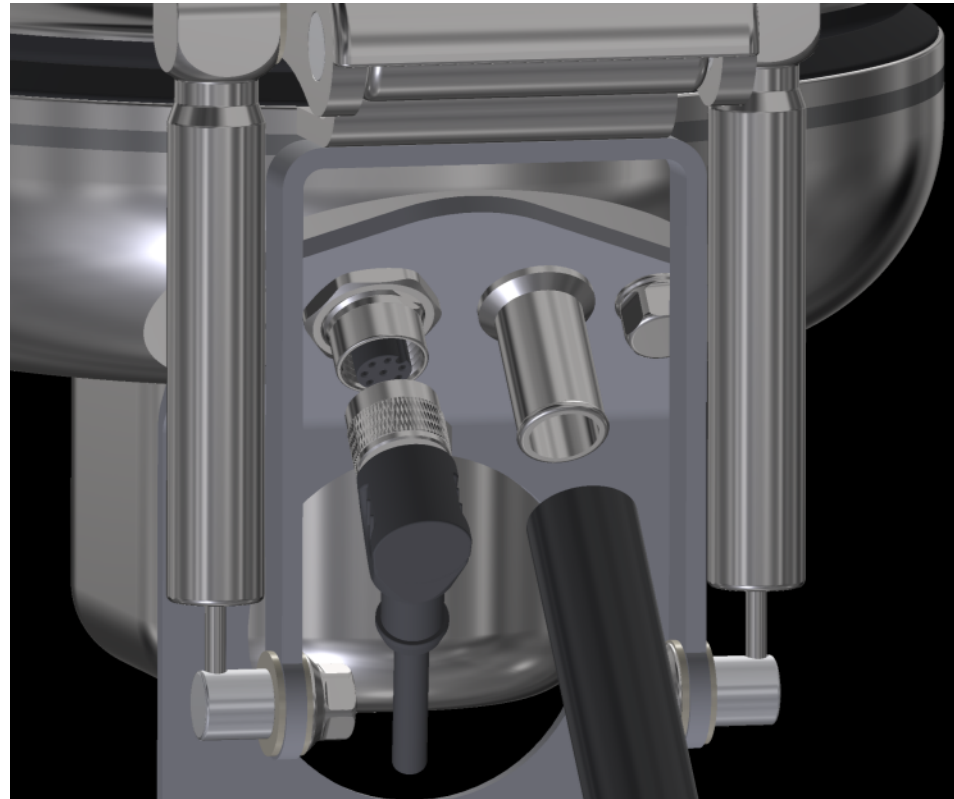
ImpactAir Size Comparison



Flexible Design - Mounting Boss



'Soft Connection' – Direct Hose & Cable



Floor Mount (Prefabricated 1½ Tube & fittings)



Wall Mount (1½ Clamp Fittings)



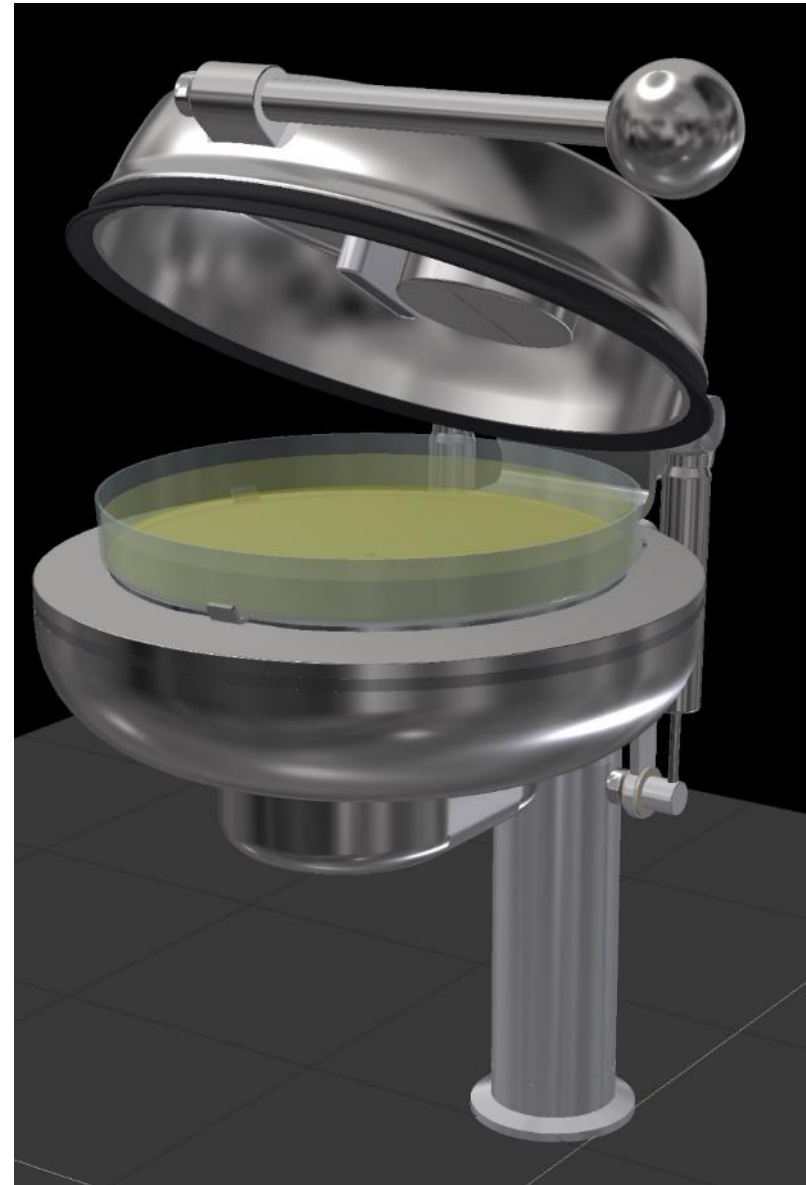
Bespoke or DIY



Anything is Possible.....

ImpactAir 140-ISO

- 'Game changer' in RABS/isolator monitoring
- Design at advanced stage
- Commitment for 20 already
- Order for 35 competitor systems halted
- In production 2nd QTR 2018
- Member's of standards committee like it!
- Think twice before buying a sieve sampler!



Thank You

