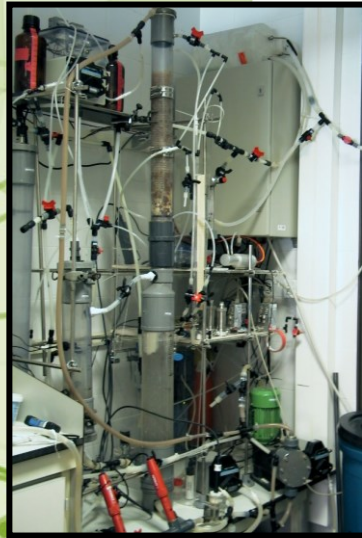
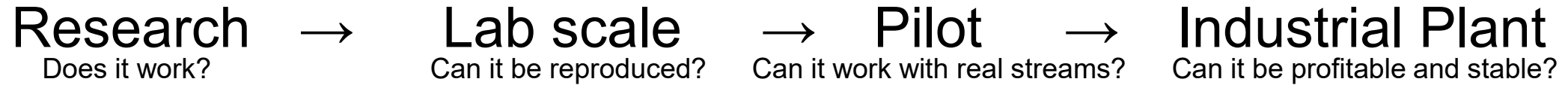


Scale up and design of bioprocesses



The Technology Transfer Gap



Most innovative bioprocesses work in the laboratory.

The challenge is achieving the same performance:

- At larger scale → Will biology remain stable?
- With real wastewater or emissions → Can performance be maintained?
- With reasonable costs → Is it economically viable?
- With minimal operator intervention → Can operators run it easily?



Many technologies fail in this transition

What Aeris Brings

Our role is to transform innovation into industrial reality

- Pilot plant design and construction
- Automation and control
- Demonstration projects
- Industrial engineering
- Commissioning and operation support



Research
Focus on Biology



Industry
Focus on
reliability,
simplicity and
economics



Case Study 1: Industrial Biotrickling Filters

Applications:

- H_2S removal
- Odour treatment
- NH_3 removal
- VOC treatment

Main scale-up challenges:

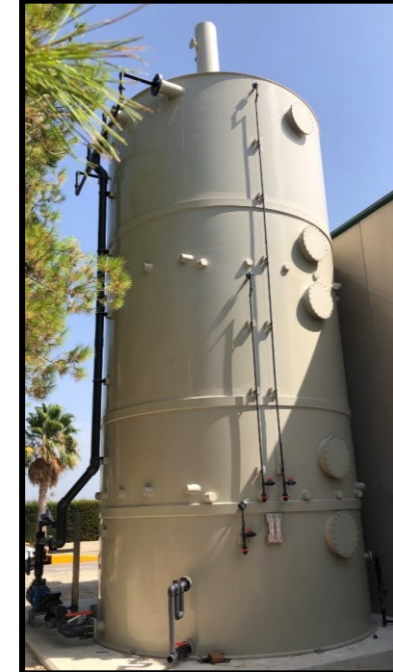
- Uniform irrigation
- Biomass accumulation

Lessons learned

- Hydraulic matters
- Simplicity wins



Pilot plant 150 L



Industrial plant 60 m³

Case Study 2: Bioscrubbers

Applications:

- High H_2S removal
- High NH_3 removal
- High VOC treatment

Main scale-up challenges:

- Pressure drop
- Chemical consumption
- Emission peaks
- Operational robustness



Pilot plant 1 m³



Industrial plant 600 m³

Lessons learned

- Real emissions change substantially
- Maintenance becomes critical
- Instrumentation is essential

Case Study 3: AnMBR

Applications:

- High COD in water
- Industrial water reuse
- Circular economy applications

Main scale-up challenges:

- Membrane fouling
- Gas management
- Start-up strategy
- Foam formation

Lessons learned

- Pilot plants are essential before full-scale investment



Lab scale 500 mL



Pilot plant 1 m³



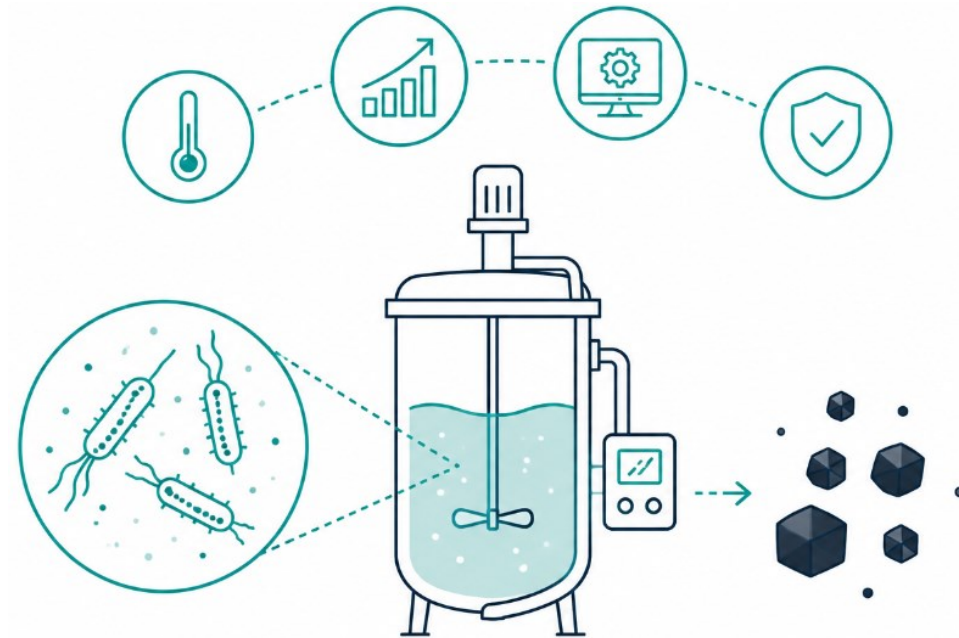
Industrial plant 70 m³

Magnetotactic Bacteria: A New Scale-Up Challenge

Natural producers of magnetic nanoparticles with high-value applications.

What Will Probably Be Difficult?

- Maintaining stable cultivation conditions.
- Monitoring productivity.
- Automation.
- Product consistency.



What Can We Learn from Previous Scale-Ups?

The challenges for magnetotactic bacteria are remarkably similar:

- Biological stability
- Oxygen management
- Monitoring
- Automation
- Product consistency

Existing bioprocess scale-up experience can accelerate deployment.

Where Aeris Can Contribute

- Pilot production systems.
- Automation.
- Monitoring.
- Demonstration plants.
- Industrial deployment.



Take-Home Messages

1. Scale-up is much more than increasing reactor size.
It is about creating robust biological systems that operate reliably in the real world.
2. Pilot validation reduces technical risk.
3. Operational simplicity is critical.
4. Bioscrubbers, biotrickling filters and AnMBRs provide valuable lessons.
5. Aeris helps transform innovation into industrial reality.





DR. JOSEP A. TORÀ SUÁREZ / PROJECT MANAGER
AERIS TECNOLOGÍAS AMBIENTALES SL.
BARCELONA, SPAIN

J.TORA@AERIS.ES