

1.

# THE ULTIMATE GUIDE TO POWER ULTRASOUND



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Sound into Performance

[www.altumtechnologies.com](http://www.altumtechnologies.com)

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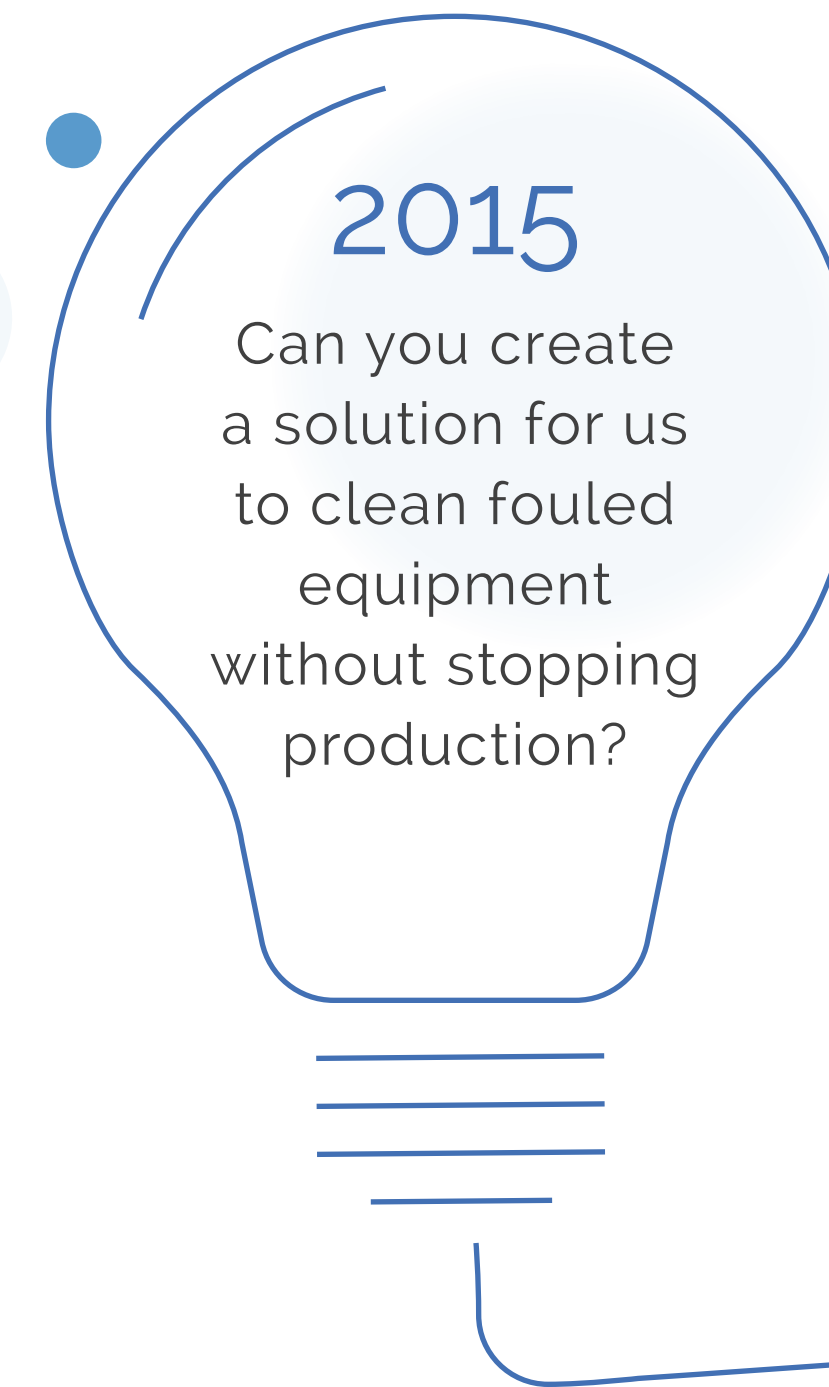


### 3. OUR STORY

"Finally someone has an industrial market need understanding. I have a world-class team that can develop a high-power ultrasonic solution such as the one your clients are asking."

PROF. EDWARD  
**HAEGGSTRÖM**

Altum Technologies,  
Senior Advisor



For several years, COO **Bo Malmberg** and CEO **Matias Tainela** had their own venture importing different sonic and ultrasonic cleantech solutions to help their clients clean fouling in industrial equipment. During this period, several of their customers asked: "Do you have a product that can clean our fouled equipment with ultrasound without the need to stop production?". Bo and Matias looked all over the world to import a solution that could do this but nothing was found. All the ultrasound technologies out there were just too weak and there was no way to control the power to totally clean an equipment.

The next question from their customers was: "Could you create one solution for us? We are ready to pay for it". Since Bo and Matias didn't know how to create this kind of ultrasonic solution they decided to research on who could be the best person to develop such a system.

After some days, all fingers pointed to professor **Edward Haeggström** from the University of Helsinki. As Matias says: "when talking to Edward about our idea it was clearly a match made in heaven". Edward came back saying that finally someone has an industrial market need understanding, he has a world-class team that can develop a high-power ultrasonic solution such as the one needed. This is the reason Edward brought **Timo Rauhala** (CTO) and **Petro Moilanen, PhD** (Chief Science Officer) to the team. With 5 co-founders Altum Technologies was born in May 2016.

4.

THE ENEMY: FOULING

# THE ENEMY: FOULING

**Stopping production** isn't the only problem fouling causes. There is so much behind this global industrial issue.



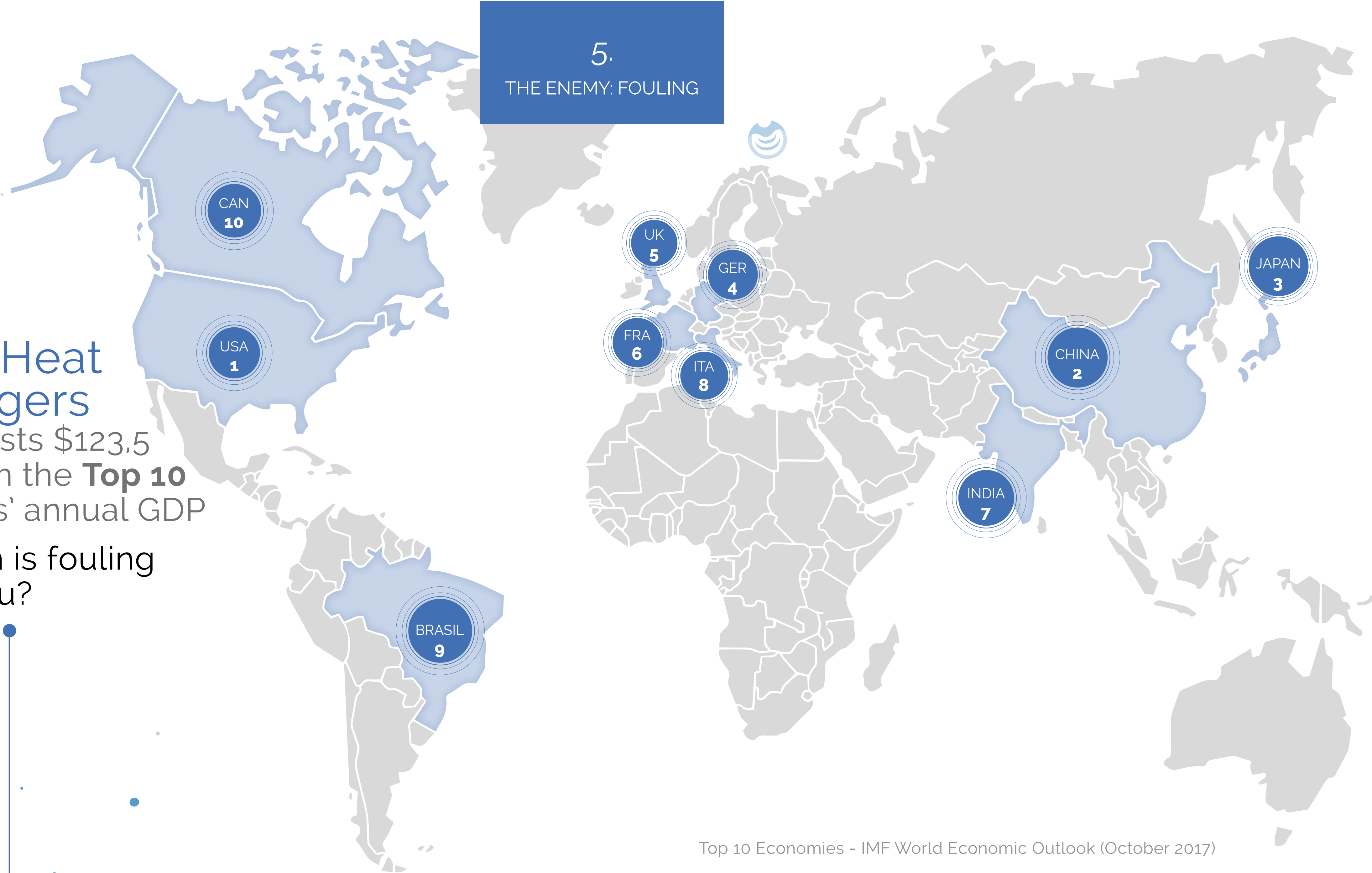
5.  
THE ENEMY: FOULING

EVERY  
INDUSTRY  
AND  
COUNTRY  
SUFFERS

# Only In Heat Exchangers

Fouling costs \$123.5 billion from the **Top 10** economies' annual GDP

How much is fouling costing you?



# THE SOLUTION: POWER ULTRASOUND



**than any other  
ultrasonic  
method**



## ULTRASOUND CONTROL

through software, allows focusing the power exactly where it is needed inside the equipment



## APPLICABLE TO

fluids and liquid-carrying equipment made of steel, other alloys and fiberglass

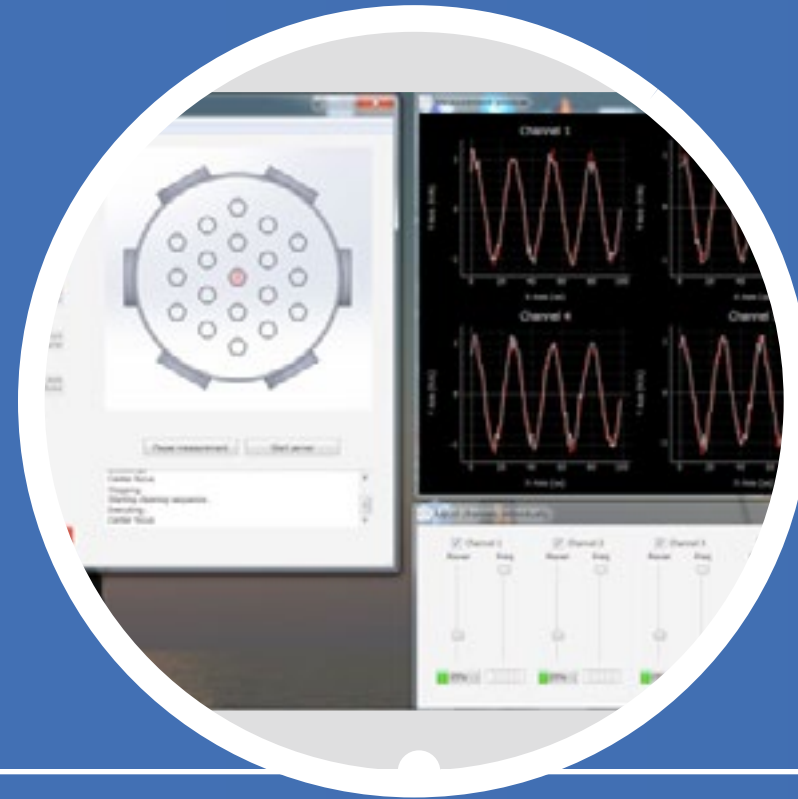


## EASY TO INSTALL

Anyone can attach the clamp-on and utilize Altum devices

# 7.

## THE SOLUTION: MODULARITY



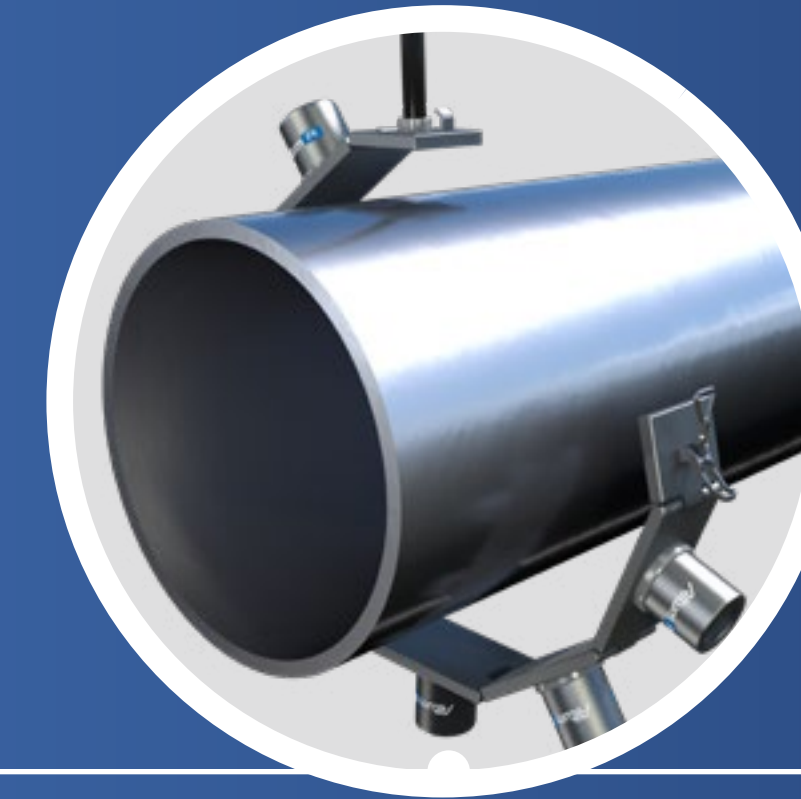
### SOFTWARE

Self-adjustable software without the need for the user to interact with it. All the cleaning programs are predefined by Altum. The cleaning cycles are monitored remotely via IoT.



### CENTRAL UNIT

Robust design to deal with harsh industrial environments.



### TRANSDUCERS

Clamp-on design for pipes and other cylindrical equipment like tubular heat exchangers. The attachment design may vary on a case by case.

1 transducer = 1 channel = ~5 kW

Pulsed sound = lower electricity consumption

# THE FOUNDATION OF OUR SOLUTION

Altum's high-power ultrasonic technology combines traditional ultrasound cleaning with proprietary beamforming software to focus power and effectively clean a pre-defined target point inside a structure.

This is the only power ultrasound system in the world that can be attached externally to any existing production environment without making changes to the production equipment.

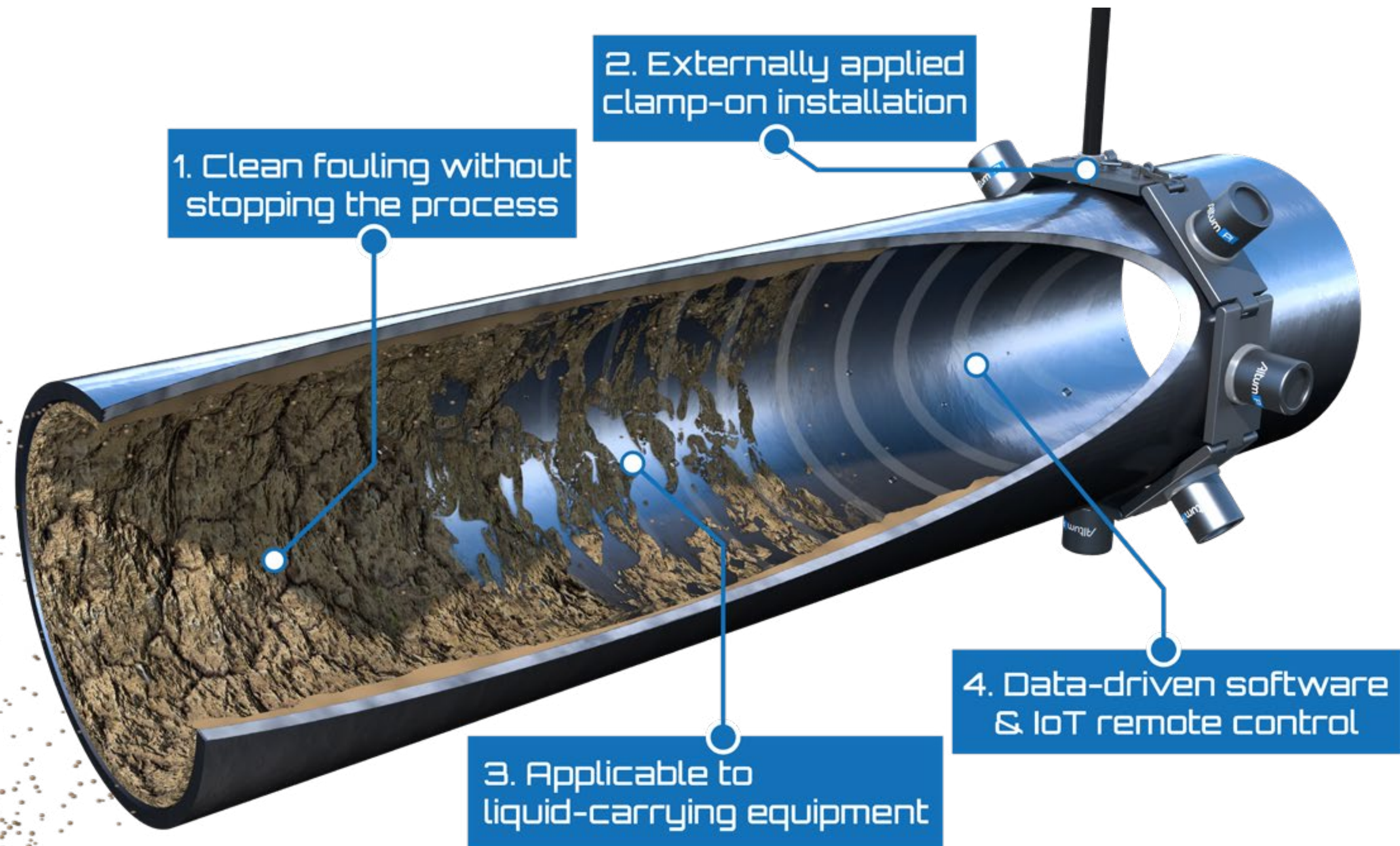
The solution can be remotely monitored and controlled via the internet (IoT). It also employs cutting-edge scientific research in the fields of FEM/BEM modelling and artificial intelligence (AI). Altum now uses this research in a practical situation for the first time in industrial cleaning.

Altum Technologies is set to release the AI feature during the year 2018. This will improve the cleaning effectiveness by omitting the need for manual adjustments in the cleaning parameters. Once the transducers are attached to the industrial equipment, Altum's device will automatically initiate, self-adjust and control the cleaning process.





# FEATURES



1. Clean fouling without stopping the process

2. Externally applied clamp-on installation

3. Applicable to liquid-carrying equipment

4. Data-driven software & IoT remote control

 **PREDEFINED CLEANING PROGRAMS**

 **MODULAR**

 **EASY TO INSTALL**

 **IN-LINE**

# COMPARISON

|                                | <br><b>POWER ULTRASOUND</b> | CHEMICAL CLEANING | MECHANICAL CLEANING |
|--------------------------------|--|-------------------|---------------------|
| <b>DOESN'T STOP PRODUCTION</b> | ✓  | ✗                 | ✗                   |
| <b>LOW OPEX</b>                | ✓  | ✗                 | ✓                   |
| <b>NO TOXIC CHEMICALS</b>      | ✓  | ✗                 | ✗                   |
| <b>NO LABOUR REQUIRED</b>      | ✓  | ✓                 | ✗                   |

✗ = applies depending on the case



# FAQ

## 11. FREQUENTLY ASKED QUESTIONS

### 1. How is Altum Series different from similar solutions?

Our technology is more powerful and not only prevents fouling, it is the only that cleans fouling inside a structure. Altum's founders have been previously promoting common ultrasound products and are well



aware in where those systems are applicable and what are the limits. Due to the limitations of existing systems our founders' customers requested them to build a system like Altum has today. If our founders would've found a solution like ours before, they wouldn't had gone to the trouble to develop one themselves.

### 2. How much more powerful Altum Series is, compared to other ultrasonic systems?

Common low-power ultrasound prevention systems range from 5 to 300 watts. Altum's cleaning and prevention system currently is capable of operating from 5000 watts upwards. Enough to clean pipes completely in just a few minutes.

### 3. Why are you better than competitors? Financial advantages?

None of the other existing ultrasonic technologies are capable of cleaning industrial equipment without the need of stopping the production process. There are a few ultrasound technology providers that can clean very small



pipes (up to 32mm) but e.g. Altum can clean pipes of up to 2000mm. In addition, Altum can clean not only pipes but different liquid-carrying equipment. Most of production stoppages are due to fouling. Depending on a client's process the yearly extra revenue can be millions to hundreds of millions.

### 4. Do you need to test before each application?

Our reference database/equipment library is constantly growing and this reduces the need for specific testing/adjusting per application.



## 12. FREQUENTLY ASKED QUESTIONS

### 5. Can you tackle slurries?

Altum Series works well with slurries. However, when the definition starts to be more like a paste, then the dry material content is so high that the capability of power ultrasound cleaning is lost.

### 6. What about insulation in equipment? Does it need to be removed for cleaning?

The insulation doesn't need to be fully removed but there should be the possibility to make holes to the insulation. The hole should have a diameter of approx. 70-100mm to enable the direct contact between the transducer and the equipment to be cleaned.

### 7. What is the cleaning distance reach?

It can be from meters to tens or to hundreds of meters. It highly depends on the material of the equipment, type of liquid, type of fouling, pressure, thickness of the wall and other criteria.



We are constantly gathering this data based on our cases and will be able to estimate the cleaning distance and effect more precisely in the near future.

### 8. What is the cleaning distance reach in underground pipelines?

This is still something we are working on. We haven't done any case to be able to design the implementation and measure the absolute reach of our cleaning in underground pipelines. If you have a case let us know!



# 13. FREQUENTLY ASKED QUESTIONS

9. Is AltumHX limited to heat exchangers with liquids?

Currently yes, at least the other side of the heat exchanger has to contain liquid. This is because ultrasound can only travel and have a cleaning effect through liquid.

10. Can you clean soft fouling?

Yes. E.g. biofouling, which is soft, it is really easy to clean with Altum Series. Some silicon-like build-ups which are sticky and elastic are harder to clean. We are now testing with paraffin and will be ready to disclose this information if you are interested in this topic.

11. How do you tackle potential downstream issues with removed fouling?

This can be tackled with the proper planning of how and how often the cleaning is done. Many of our clients have filters in place that help in this kind of situations.



Also when the cleaning is done more frequently, the loosened fouling is more dust-like than big flakes. In many installations fouling in pipes and heat exchangers is built from the same substances that are in the process and even though there would be bigger particles flowing after we clean, it doesn't affect the process negatively at all.

12. To which materials can you externally attach the transducer for cleaning?

The best materials to attach the transducers in order to clean are steel and other alloys and fiberglass. With plastics we need to create a special design.



14.  
FREQUENTLY  
ASKED QUESTIONS

13. Does your system work in dry processes?

At the moment, Altum's power ultrasound works only in liquid-carrying equipment. This is for the reason that ultrasound has the best cleaning effect through liquid.

14. Is there a temperature limit to attach the transducers to the fouled equipment?

There is no actual limitation in temperatures once our solution is designed correctly for your application.

We are currently working on a solution to work on temperatures that can reach up to 700-800C. Currently, our standard device is used on equipment that reaches up to 150C.

15. What do you mean by IoT (Internet of Things) integration to your lab?

Currently with our software, we want to monitor all Altum devices that we have in the field in order to optimize in real-time the cleaning

process. This is also related to quality assurance for a newly released system. In roughly 6 months we will be releasing a software version that can also function without the IoT integration to Altum Technologies' laboratory.

16. Is the Altum Series system design final?

We have finalized the system design for our Mark III, but of course we are responding to the customer demand and optimizing our system design accordingly.



15.  
FREQUENTLY  
ASKED QUESTIONS

17. What type of fouling have you treated and/or cleaned?

We have treated and/or cleaned: biofilms, biofouling, mineral scaling, slurries, fat fouling, chemical reaction fouling, among others.

18. Is there any vibration? Does it have an impact to pipe joints, welded joint and integrity of the system that needs to be cleaned?

The vibration is minimal or non-existent, hence not affecting in any way the equipment. A key feature of our solution is that we can guide the ultrasonic waves to a certain point inside the structure. This way we make sure ultrasound doesn't affect anything else than the specific area that needs to be cleaned.

19. Are you Ex (explosive zone) certified?

Altum Series has been designed to comply as well as possible to different requirements including Ex. The current standard Altum Series isn't Ex certified, but an specific Ex certified system can be built for a customer need in just 4 months.

20. Is Altum's technology really new?

Yes. There are about 6 low-power ultrasonic solutions out there that cause random cavitation into small pipelines (32mm). Altum Series is the only system with high-power focused ultrasound that not only keeps clean but cleans.

Why pharmaceuticals spend billions in R&D for targeted medicine? Because it is more effective and efficient. Think of Altum's tech as the targeted medicine for industrial needs. Increase power without control, and cavitation will have a negative impact, e.g. hole in the equipment. Altum's pending patents relate to controlling and focusing power ultrasound in way that the cleaning is done where needed.





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