



CASTIUM
Expert Decontamination



SERVICES INFORMATION

Castium Expert Decontamination

THE TEAM

Senior Management



Castium senior consultants have over 200 years of combined experience in the management of biopharma and life science facilities.



Ross Meggison
CEO & Managing Director



Pete C. Willan
Senior Consultant - Life Sciences Specialist



Diane Woodcock
Head of Operations



Graham Smith
Head of Quality and Compliance



Linda Green
Client Relations Manager



Stuart Paterson
Senior Consultant - VHP Specialist



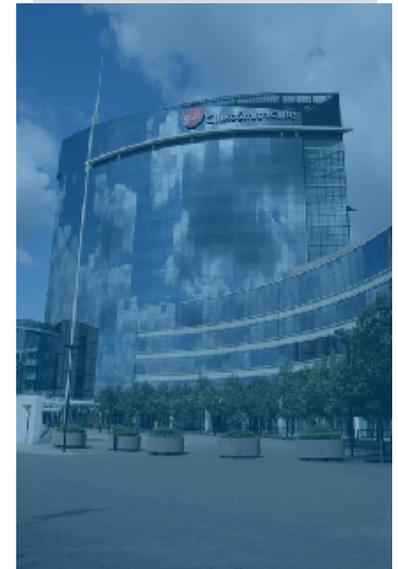
Douglas Griebenouw
Business Development Manager

OUR CLIENTS

Global Support Network

Castium have an extensive client base spanning the globe, below are some of the organisations that we are approved suppliers too;

- | | |
|----------------------------------|---------------------------------------|
| GlaxoSmithKline | NHS |
| Reckitt Benckiser | University of Cambridge |
| PsiOxus Therapeutics | University of Leicester |
| The Francis Crick Institute | University of Exeter |
| Cancer Research UK | University of Plymouth |
| PCI Pharma Services | UCL - University College London |
| Bioquell | ICL - Imperial College London |
| MRC - Medical Research Council | RVC - Royal Veterinary College |
| WH Partnership | AstraZeneca |
| Walter Lilly | Cardiff University |
| SPC Technical Services | University of Liverpool |
| Rolls Royce | University of Manchester |
| Sainsbury Wellcome Centre | University of Leeds |
| Babraham Bioscience Technologies | Lundbeck A/S |
| TSL Projects | Pharmaterials |
| Biocity Scotland | FujiFilms |
| Smith&Nephew | Quorn Foods |
| MSD | Glasgow University |
| Laing O'Rourke | Discovery Park |
| Envigo | Cambridge Biomedical Campus |
| Biopark | Velindre Cancer Centre |
| Gurdon Institute | Clean Air Technologies |
| Bilfinger | Multiple MOD facilities across the UK |
| Hamad Medical Corporation (HMC) | and many more... |



Castium have endeavoured to provide a comprehensive array of quality decontamination solutions under a single provider. This has resulted in the creation of long term working partnerships with a number of prestigious organisations that include GSK, Cancer Research, Universities, NHS and government MOD facilities.

Through a wealth of experience Castium's Senior Consultant team are able to provide clients with assurance that the proposed decontamination process is best suited to their individual requirement.



University of Cambridge

Castium successfully secured the tender to provide a start-up decontamination programme of all critically controlled areas including the VHP fumigation of 35 Class II Safety Cabinets



The Francis Crick Institute

Following an extensive 18 month tender process Castium were awarded the honour of implementing a turn key commissioning programme in 2016.

Head office:

+44 (0) 345 900 37 67

Emergency line:

+44 (0) 800 30 29 999

Email: enquiries@castium.co.uk

Web: www.castium.co.uk

CLEANING SERVICES

Castium are established experts in the fields of; specialist cleaning, bio-security, decontamination, pharmaceutical hygiene, GMP cleanroom maintenance and commissioning.

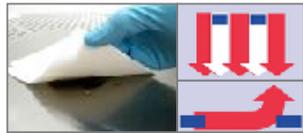
Castium have built their reputation through the provision of start-up sterilisation programmes for some of the UK and Europe's leading production, research and development facilities. In doing so we appreciate that the most important phase of any hygiene programme is the 'Deep Clean stage'

DEEP CLEAN

Without a comprehensive deep clean the efficiency of any gaseous sterilisation process can be seriously compromised resulting in failure to achieve the level of biological reduction and requiring processes to be repeated. Through the use of contaminant specific chemicals, applied through the utilisation of GMP and ISO cleaning techniques Castium ensure that the level of deep clean completed has been accomplished to an exacting standard for the microbiological burden or pathogenic contamination targeted and to ensure that the room/facility barrier is both best suited and fully effective upon commission. Castium's validation process is designed as a bespoke programme to give each client the assurance that the desired standard has been achieved.

Cleaning Techniques

Pull and lift & Overlapping strokes



Cloth Folding Technique



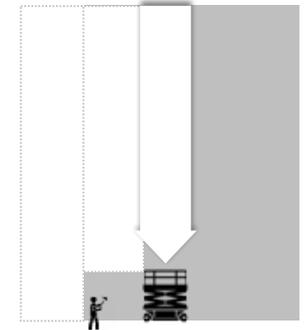
CLEANING SERVICES

Due to the exigencies of individual building design and layout, it isn't always possible to utilise certain access methods for the purposes of cleaning. In such circumstances we draw on the full range of our skill sets and expertise to ensure that our teams can undertake their work safely, using appropriate equipment, and following strict guidelines and procedures, ensuring the project is completed to the highest possible standard.

We have fully qualified IPAF and PASMA team members.



Castium cleaning and fumigation technicians are qualified under the CSCS (Construction Skills Certification Scheme) that allows our teams to work under construction site rules. This often helps with timelines and allows identification of any area's of concern whilst construction is still active.



CONTRACT CLEANING

Castium are able to manage their clients cleaning requirements on a daily, weekly or monthly contract, delivering consistent levels of hygiene across all levels of facility whilst adhering to client Standard Operating Procedures. We are able to provide consumables, PPE and cleaning equipment best suited to the specific challenges, and deliver the service out of normal work hours to reduce any interference to the daily routine.

All Castium technicians are specifically trained in a range of techniques that are documented in their training records. Castium are insured up to £15 million for contract cleaning services. We have a number of service vehicles operating around the UK with rapid response service if required.



CHEMICAL ROTATION



CHEMICAL ROTATION

Castium are approved by the British Institute of cleaning sciences.



UVC DECONTAMINATION

Castium's specialist UVC Autonomous Robotic System carries out a disinfection using UVC light. The wavelength of the UVC light is 254 nm, which is considered to be the optimal germicidal level. UV Light Disinfection is an environmentally friendly method of killing bacteria, mould, fungi, and viruses without the use of harmful chemicals.

Past studies have proven that bacteria are able to survive on dead skin cells circulating in the air and even after a chemical surface disinfection took place, bacteria on particles in the air settled on to those surfaces and were able to form colonies in a short period of time. Therefore, the disinfection of the air is an important part of the disinfection plan.

Ultraviolet light in the UV-C band (200–280 nm) is also known as ultraviolet germicidal radiation and is widely used for sterilising equipment and creating sterile environments, as well as in the food and the water industry to inactivate microorganisms. UV-C radiation has been used to treat water since 1909 and offers a safe and effective disinfection process.

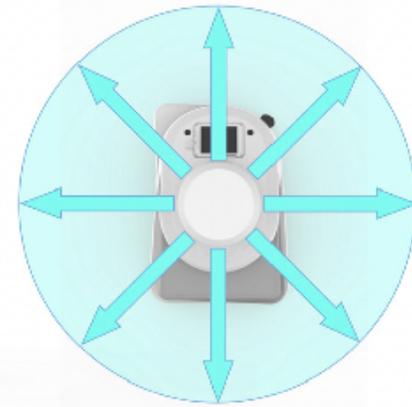
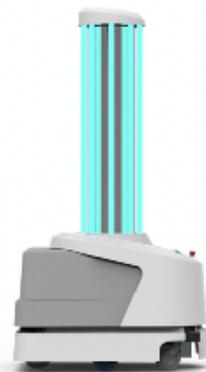
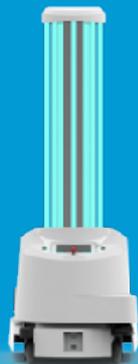


The UVC robot uses a total of 8 UV-C lamps, each delivering a power consumption of 180 Watts and a power output of 5 Watts of UV-C measured at 1m distance. The measured UV-C power output can be converted into energy and intensity.

ADVANTAGES

The introduction of a fully autonomous UV-C disinfection robot opens new opportunities. The ability to deploy a robot in to the facility significantly reduces the risk of inadvertently spreading a contamination.

The low operational costs, rapid cycle times and chemical-free disinfection make UVC disinfection the perfect solution for biosecurity control. The average decontamination cycle time for a 25 square metre room would be 20mins, with immediate re-entry.



Similar to UVA and UVB, UVC is produced by the sun but is unable to penetrate the Earth's atmosphere.

This characteristic of UVC light means that organisms are not exposed to UVC light in their natural environment and therefore, have not evolved a natural defence against UVC.

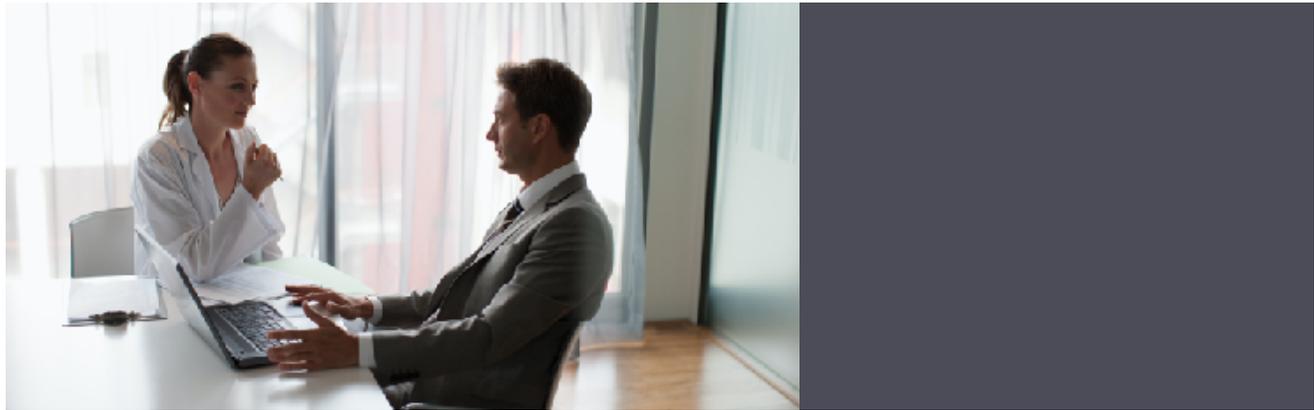
UVC light does not actually kill organisms. The UVC light damages the DNA structure of the organism leaving it unable to perform normal cellular functions such as cell division. This renders the organism inactive and unable to infect.



DISINFECTION DOSAGES

The amount of UV-C required to inactivate an organism varies. Bacterial spores are also in general, more difficult to inactivate than their bacteria counterparts. The table below, identifies the required UV-C intensity in Joules/m² to inactivate certain bacteria and bacterial spores. The final column shows the exposure time required at 1 metre to inactivate the bacteria.

	90% 1 log	99% 2 log	99.9% 3 log	99.99% 4 log	Dose in seconds
Bacillus anthracis – Anthrax	45.2	90.40	135.60	180.80	12
Bacillus anthracis spores – Anthrax spores	243.2	486.40	729.60	972.80	65
Bacillus magaterium sp. (spores)	27.3	54.60	81.90	109.20	8
Bacillus magaterium sp. (veg.)	13.0	26.0	39.0	52.0	4
Bacillus paratyphus	32.0	64.0	96.0	128.0	9
Bacillus subtilis spores	116.0	232.0	348.0	464.0	31
Bacillus subtilis	58.0	116.0	174.0	232.0	16
Clostridium difficile (C. difficile or C. diff)	60.0	120.0	180.0	240.0	16
Clostridium tetani	130.0	260.0	390.0	520.0	35
Corynebacterium diphtheriae	33.7	67.4	101.1	134.80	9
Ebertella typhosa	21.4	42.80	64.2	85.60	6
Escherichia coli	30.0	60.0	90.0	120.0	8
Leptospirocanicola – infectious jaundice	31.5	63.0	94.5	126.0	9
Micrococcus candidus	60.5	121.0	181.5	242.0	16
Micrococcus sphaeroides	10.0	20.0	30.0	40.0	3
MRSA	32.0	64.0	96.0	128.0	9
Mycobacterium tuberculosis	62.0	124.0	186.0	248.0	16
Neisseria catarrhalis	44.0	88.0	132.0	176.0	12
Phytomonas tumefaciens	44.0	88.0	132.0	176.0	12
Proteus vulgaris	30.0	60.0	90.0	120.0	8
Pseudomonas aeruginosa	55.0	110.0	165.0	220.0	15
Pseudomonas fluorescens	35.0	70.0	105.0	140.0	10
Salmonella enteritidis	40.0	80.0	120.0	160.0	11
Salmonella paratyphi – Enteric fever	32.0	64.0	96.0	128.0	9
Salmonella typhosa – Typhoid fever	21.5	43.0	64.5	86.0	6
Salmonella typhimurium	80.0	160.0	240.0	320.0	21
Sarcina lutea	197.0	394.0	591.0	788.0	53
Serratia marcescens	24.2	48.4	72.6	96.8	7
Shigella dysenteriae – Dysentery	22.0	44.0	66.0	88.0	6
Shigella flexneri – Dysentery	17.0	34.0	51.0	68.0	5
Shigella paradysenteriae	16.8	33.6	50.4	67.2	5
Spirillum rubrum	44.0	88.0	132.0	176.0	12
Staphylococcus albus	18.4	36.8	55.2	73.6	5
Staphylococcus aureus	26.0	52.0	78.0	104.0	7
Staphylococcus hemolyticus	21.6	43.2	64.8	86.4	6
Staphylococcus lactis	61.5	123.0	184.5	246.0	16
Streptococcus viridans	20.0	40.0	60.0	80.0	6
Vibrio comma – Cholera	33.75	67.5	101.25	135.0	9

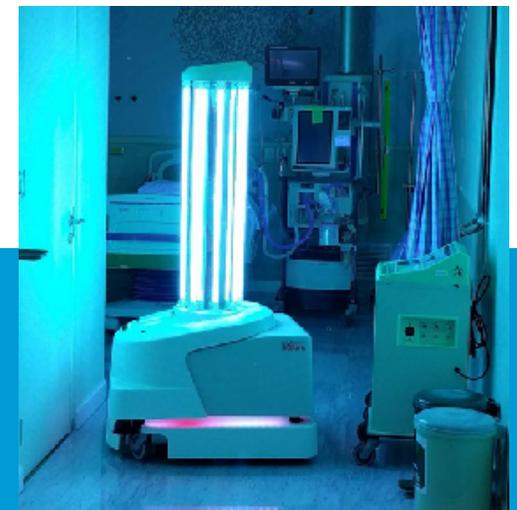
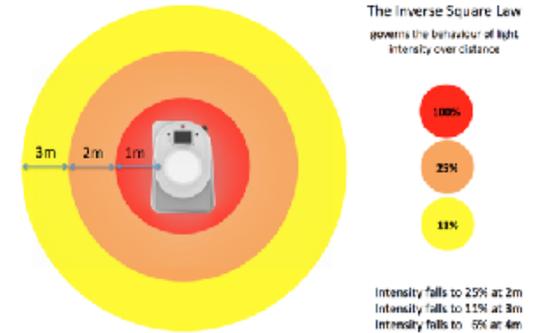


CRITICAL FACTOR

In line with fundamental physics law governing light (the inverse square law), distance between light source and surface is a critical factor affecting intensity.

The intensity of light is not directly proportional to distance (i.e. double the distance, half the intensity). The intensity of light is the inverse square of the distance (i.e. double the distance equals a quarter of the intensity).

Fig 3 (below) shows how light intensity is affected by distance.



HYDROGEN PEROXIDE DECONTAMINATION

Hydrogen peroxide vapour is well established as a bio-decontamination agent due to its broad spectrum efficacy and its ability to rapidly inactivate the most resilient microorganisms. The residue-free nature of hydrogen peroxide vapour (breaks down to oxygen and water vapour) and low temperature, vapour-phase application increases the practicality of the process.

Hydrogen Peroxide Vapour systems and services eliminate 99.9999% of pathogens for a 6-log kill via application of a 30-35% hydrogen peroxide solution. Achieving complete coverage of every exposed surface in an enclosed area, the process is residue free, proven safe on sensitive electronics and has demonstrated a kill of a wide range of microorganisms including bacteria, viruses, fungi, spores and more.

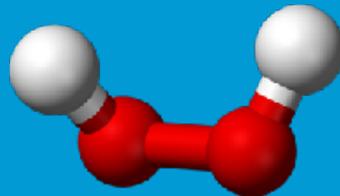
At Castium we use prequalified Bioquell Hydrogen peroxide vapour technology which has proven efficacy in over 70 publications.

Castium offer a range of solution HPV fumigation services including, individual rooms, full facilities, biosafety cabinets, isolators and small enclosures.



SUPPORT SERVICE

To achieve a successful H₂O₂ decontamination it is important that all surfaces are exposed to the vapour, thus making it imperative that all the surfaces are free from debris and dust. For the complete package Castium offer validated specialist deep cleaning via their Cleaning Service Team.



INDUSTRIES



RESEARCH



MOD



HEALTHCARE



LABORATORIES



CLEANROOMS



BIOPHARMA

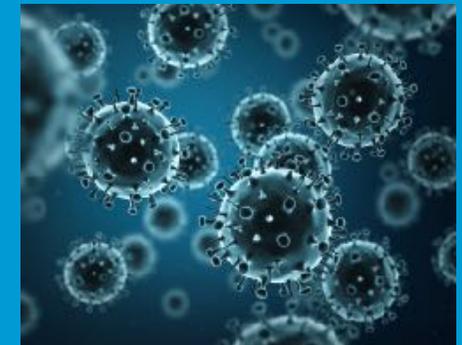


OIL & GAS



INDUSTRIAL

Hydrogen peroxide vapour has been shown to kill a wide range of microorganisms including bacteria, mycobacteria, spores, yeasts, fungi, viruses and phage. The efficacy of hydrogen peroxide vapour has been repeatedly demonstrated against bacterial endospores, which are highly resistant organisms commonly found on environmental surfaces and are positioned at the top of the Spaulding classification.



TECHNICAL INFORMATION

Castium 'Hydrogen Peroxide Bio-decontamination service' uses pre-qualified mobile bio-decontamination equipment that meets all of the new EU regulatory standards including the current BPR regulations and set up on a temporary basis to undertake a high level disinfection, anti-microbial gassing process.

Hydrogen peroxide (H₂O₂) 30–35% w/W disinfection solution is vaporised in a gas generator and distributed within the room (s) to be bio decontaminated by dynamic gas distribution nozzles and oscillating stirring fans.

THE TECHNOLOGY

HPV is produced from a solution of liquid H₂O₂ and water, via generators specifically designed for the purpose. These generators initially dehumidify the ambient air, then produce HPV by passing aqueous hydrogen peroxide over a vaporiser, and circulating the vapour at a programmed concentration in the air, typically from 140 ppm to 1400 ppm, depending on the infectious agent to be eradicated. After the HPV has been circulated in the enclosed space for a pre-defined period of time, it is circulated back through the generator, where it is broken down into water and oxygen by a catalytic converter, until concentrations of HVP fall to safe levels (typically <1 ppm). Alternatively, the HPV is vented to the outside air, in cases where recapturing of the HPV is not essential.

Low temperature: The hydrogen peroxide vapour is produced in an air stream at approximately 65 oC and introduced into an environment which does not require humidity or temperature pre-conditioning.

Residue-Free: Hydrogen peroxide breaks down in contact with UV light and organic material to its constituent components - water (humidity) and oxygen - hence there is no need for any post- decontamination clean up.



"Absolutely fantastic business progress all earned by delivering a superb professional and customer focussed service."

Castium have an extensive portfolio of references from various organisations

SAFETY CABINET DECONTAMINATION

Castium use the Clarus S that consists of three individual pieces of equipment which when linked and controlled together by the control panel carry out a complete bio-decontamination cycle.



The Clarus S system has been specifically designed to produce a more efficient and accurate HPV decontamination of safety cabinets and other items of equipment.



KEY BENEFITS

- Safe to use on all sensitive electrical equipment.
- Specially designed self sanitising equipment.
- High level 6-Log Biological Indicators (BI's) verification (*Geobacillus stearothermophilus*)
- Instant verification using chemical indicators (CI's) tuned to react with 6-log BI's with an immediate result.

KEY BENEFITS

- Rapid & residue free decontamination cycles.
- Safe to use on all sensitive electrical equipment.
- Specially designed self sanitising equipment.
- Proven and published efficacy against a wide range of micro-organisms.
- Carried out by specialist, highly trained engineers.

FOGGING AND FUMIGATION SYSTEMS

Castium specialise in the eradication of specific contaminations including biological pathogens, insect and chemical contamination. To combat these challenges Castium operate various systems including; Exothermic Fumigation, Ultrasonic DryFogging, Thermostatic Piezoelectric Vapour Dispersion. Providing both warm and cold cycle options.

The wide range of services available at Castium allow us to tailor bespoke decontamination programmes best suited to the environmental considerations and the contamination in question. Castium technicians are able to provide solutions to a vast number of contaminations within an ever increasing number of scenarios and locations.



Castium's experienced senior management team has an extensive knowledge of pathogen control, the Spaulding Classification and use of disinfectants. Working along our in house research team and UKAS accredited partner in microbiology and validation Castium provide an extensive support service



NEW CHALLENGES

Castium's reputation was built on providing decontamination services to pharmaceutical, government and medical facilities, over recent years we have seen the demand for our services in new industries increase, thus creating new challenges.



ENVIRONMENTAL CHALLENGES

- Factories
- Supermarkets
- Offices
- Interstitial areas
- Tanks
- Vehicles
- Food facilities
- Equipment
- Agricultural
- HVAC Systems

Our highly experienced senior management team allows Castium to extensively research and develop the best possible service for the environment in question.

The Spaulding classification, originally proposed in 1957, is a widely used system for matching the disinfection and sterilisation of surfaces, particularly those of re-usable medical/surgical devices, with available processes



ULTRASONIC FOGGING

Castium bespoke designed Ultrasonic Fogging System operate by converting high frequency sound waves into mechanical energy that is transferred into a liquid, creating standing waves. As the liquid exits the atomising surface of the nozzle, it is broken into a fine mist of uniform micron sized droplets.

The Castium fogging decontamination process includes a dry aerosol disinfection using a broad spectrum chemical agent, our dry fogging process using a specially modified compressed air system that delivers a consistent sub 2.5 to 4.2 micron fog dispersing the chemical agent. Once the chemical agent has been applied, it requires a contact time of approximately 30 minutes. The facility would be left for up to 1 hour before allowing personnel back into the area.

Castium's procedures, cleaning methods, PPE, consumables and good general codes of practice provide the best solution when dealing with this environmental threat or potential threat.

FUMIGATION

MICROANIMAL & INSECTS

Micro-animals are animals so small that they can only be visually observed under a microscope. Microscopic arthropods include dust mites, spider mites, rust mite and some crustaceans such as copepods and the cladocera. Some nematode species are microscopic also classifying them as 'Micro-animals'.



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TECHNOLOGY FEATURES

Eliminates dust, mould, bacteria and virus.



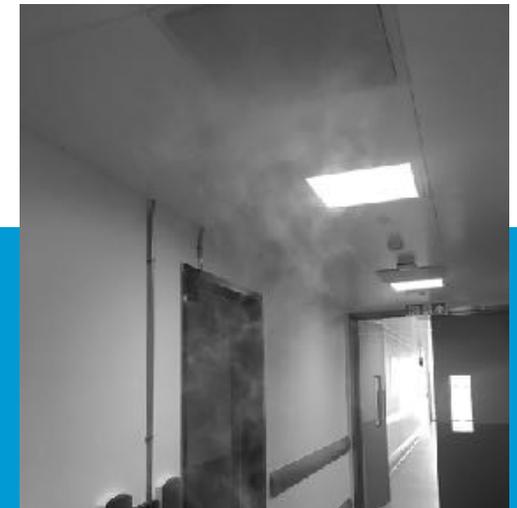
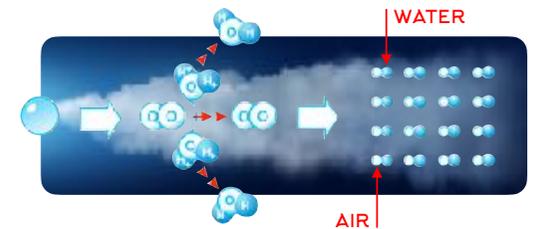
Droplet below 5 microns

Dust and airborne diseases, bacteria, viruses particles and spores are attracted to a sub 5 micron droplets and oxidised



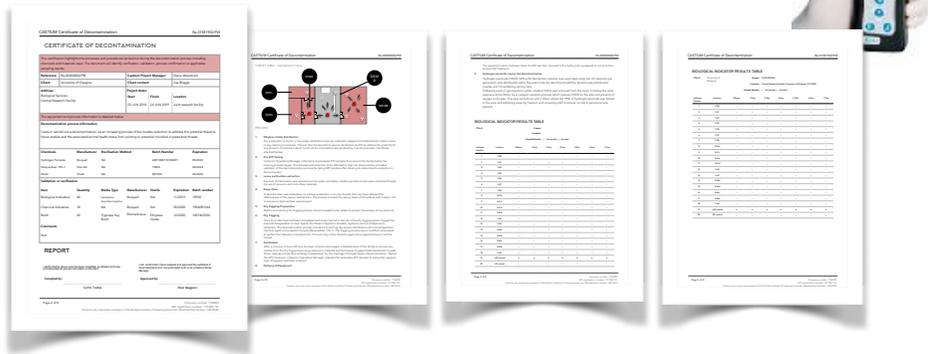
Droplet over 5 microns

Droplets of 5 microns or larger retract air particles.



MONITORING & VALIDATION

A bespoke validation programme can be compiled to verify burden reduction, hygiene and levels of disinfection achieved. This is documented in a specific 'Certificate of Decontamination'.



Some the techniques used include;

ACTIVE AIR SAMPLING

In active monitoring a microbiological air sampler physically draws a known volume of air through or over a particle collection device which can be a liquid or a solid culture media or a nitrocellulose membrane and the quantity of microorganisms present is measured in CFU (colony forming units)/m3 of air.

ATP SAMPLES - What is ATP?

It is a key component in the "energy transfer system" within cells.

Adenosine TriPhosphate (ATP) is a universal compound found in all organisms and organic matter. ATP monitoring systems utilise ATP as a useful indicator of poor or post cleaning contamination. When ATP is present, a biochemical luciferase (firefly) reaction takes place and an amount of light is emitted. This light is measured in a luminometer and provides a quantitative result within seconds.

ATP is an energy molecule found in all plant, animal and microbial cells. It fuels metabolic processes such as cellular reproduction, muscle contraction, plant photosynthesis, and respiration in fungi and fermentation in yeast. All organic matter (living or once-living) contains ATP, including food, bacteria, mould and other microorganisms.



ATP bioluminescence provides a reliable and rapid alternative to traditional microbiological techniques. The use of this technique for monitoring allows information to be provided in time for corrective action to be taken. Any area that indicates the reduction has not been achieved is revisited and further cleaning procedures employed before re-swabbing and

MONITORING & VALIDATION

AIR SAMPLING

By taking air quality samples Castium are able to show the following levels before during and after the cleaning programme.

Particle counting

Measuring channels: 6

Channel sizes: 0.3 µm, 0.5 µm, 1.0 µm, 2.5 µm, 5.0 µm, 10.0 µm

Air temperature

Measuring range: 0°C to 50°C (32°F to 122°F)

Accuracy: ±0.5°C (0.9°F) at 10°C to 40°C (50°F to 104°F), ±1.0°C (1.8°F) at other temperature ranges

Humidity

Measuring range: 0 to 100% RH

Accuracy: ±3% at 40% to 60%, ±3.5% at 20% to 40% and 60% to 80%, ±5% at 0% to 20% and 80% to 100%

Dew point temperature

Measuring range: -30°C to 100°C (-22°F to 199°F)

Accuracy: ±0.5°C (0.9°F) at 10°C to 40°C (50°F to 104°F), ±1.0°C (1.8°F) at other temperature ranges

Wet-bulb temperature

Measuring range: 0°C to 80°C (32°F to 176°F)

Accuracy: ±1.0°C (1.8°F)

CHEMICAL RESIDUE TESTING

Our chemical residue analysis and testing provides detection to trace residue levels using innovative and in-depth techniques.

Chemical residue analysis testing is performed by our skilled staff on a wide range of materials, using advanced analytical techniques. We offer fast turnaround times, providing services to GLP, GMP pharmaceutical and biomedical facilities.

Samples are analysed independently through a UKAS registered laboratories.

Residue trace analysis identification techniques include mass spectrometry, surface science, chromatography, NMR, IR spectroscopy and other advanced instrumentation.

Chemical residue testing (Specific compound Investigation): A Sterile swab can be used to swab an area/product where the residual chemical levels need to be established. The analysis will look at volatile organic compounds and semi-volatile organic compounds using mass spectrometry methodology.

