

# CONSTANT SYSTEMS

CELL DISRUPTION MADE EASY

# Introduction

Founded in 1989, Constant Systems Limited is now well into its fourth decade of operations and is still very much dedicated to the design, manufacturing and maintenance of high-pressure cell disruption equipment, which has built a reputation on **reliability, reproducibility, efficacy, and consistency.**

We take pride in providing the highest level of service to our clients. Our first-class service starts at the initial enquiry stage, all enquiries are detailed and documented, and the client is taken through the enquiry process so that all relevant information is captured. This ensures that the best fit equipment is recommended via a personalised Cell Disruption Solutions Proposal.

# Why choose Constant Systems

- We use high pressure, combined with our unique and proprietary hydraulic design and control system, which guarantees a consistent process throughout.
- This unique design and control allows the client's process to be both upward and downwardly scalable.
- 99% of the sample processed at the set pressure - in most cases avoiding multiple passes.
- 0.5mL single sample through to 150L/hour continuous fluid processing.
- Our products support leading academic, research and industrial facilities around the globe to process common expression systems such as *E. coli* and *S. cerevisiae* through to widely considered tough to break organisms *P. pastoris*, *S. aureus* and *L. lactis*.

# Technology

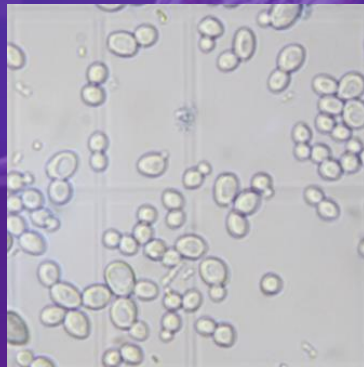
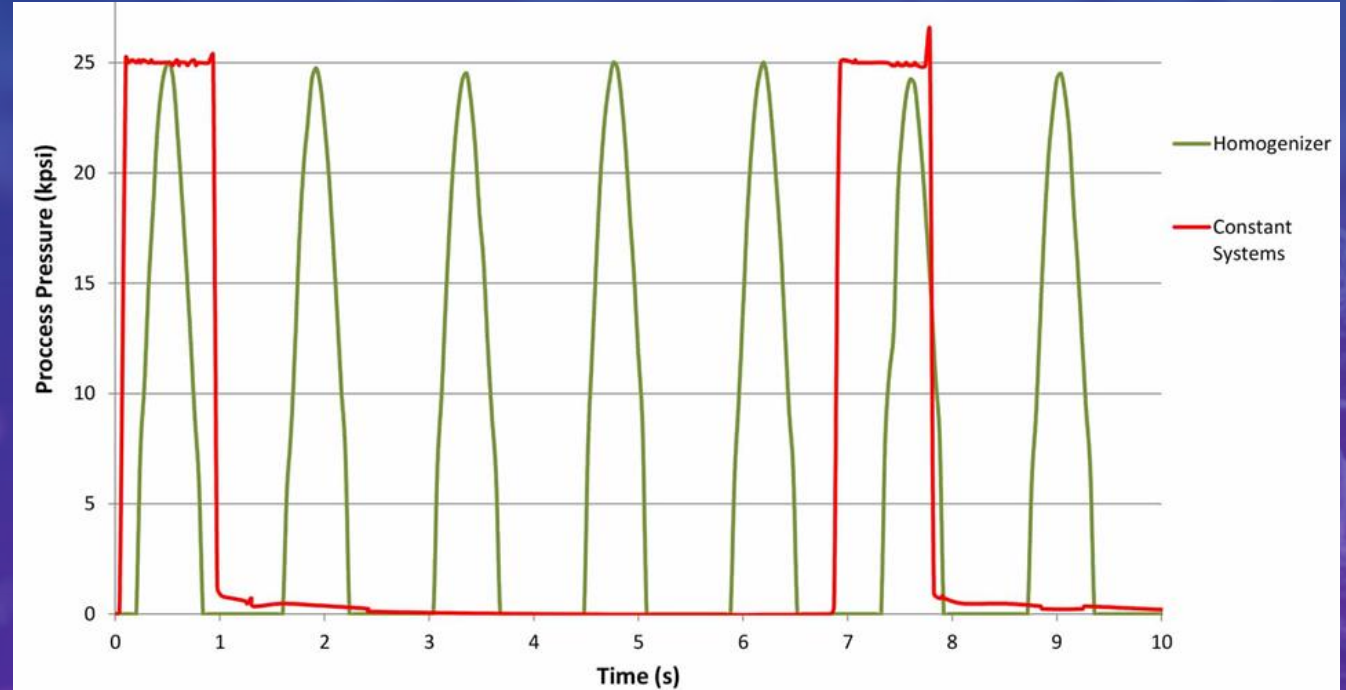
Our unique process is based on precise and consistent control of high pressure producing:

- **Instantaneous high pressure** – the sample is momentarily trapped in the high-pressure cylinder and acting pressures instantly move from ambient to the set pressure.
- **Shear stresses** – the sample rushes across the fixed orifice geometry and starts to enter the fixed orifice.
- **Acceleration** – the sample is accelerated through the orifice up to speeds of 650 metres per second.
- **Depressurisation** – once the sample has left the orifice acting pressures instantly return to ambient.
- **Impact** – the sample now collides with the cooled heat exchange surface (which can be as low as  $-15^{\circ}\text{C}$ ) in less than one second of the process beginning.

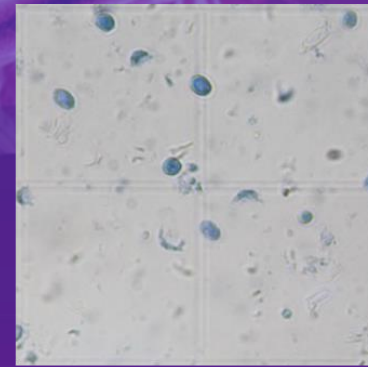
# Why Constant Pressure?

The data chart shows testing of Typical homogenizer processing < 30% of the sample within 10% of the set pressure. Compared to Constant Systems, 99% of the sample that was processed within 1% of the set pressure.

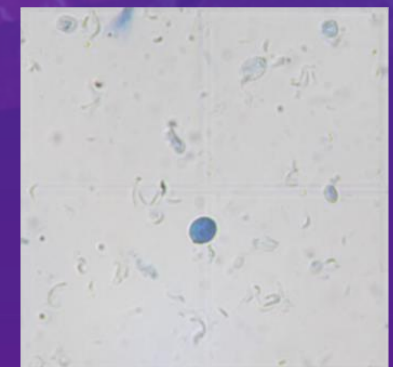
So, whether it's a 0.5mL single sample or 150L per hour continuous flow processing, Constant Systems gives you the control and accuracy that guarantees **repeatable**, **scalable**, and **highly efficient** cell lysis.



Prior to processing



Typical homogenizers



Constant Systems

# Product range

Our product range offer a complete and scalable solution for high efficient cell lysis from 0.5mL single sample through to 150L/hour continuous fluid processing.

**One Shot Cell Disruptor**  
**0.5mL – 8mL**  
**Solid & Fluid Samples**

**Multi Cycle Cell Disruptor**  
**0.5mL – 80mL**  
**Solid & Fluid Samples**

**CF1**  
**15mL – 10L**  
**100mL/min - 6L/hr**

**CF2**  
**15ml – 100L**  
**400mL/min – 24L/hr**

**HFR**  
**1,200L**  
**2.5L/min - 150L/hr**

# One Shot

The One Shot is recommended for volumes of up to 24mL which is ideal for users who wish to upgrade from small bench-top techniques such as **bead beating, sonication and chemical lysis.**

- The One Shot model can be utilised for processing
  - fluid
  - re-suspended
  - viscous
  - tissue & plant
  - frozen sample types – without the need to thaw.
- The One Shot is capable of processing volumes from 0.5mL to 8mL per process with a dead loss volume of < 0.1mL per process.

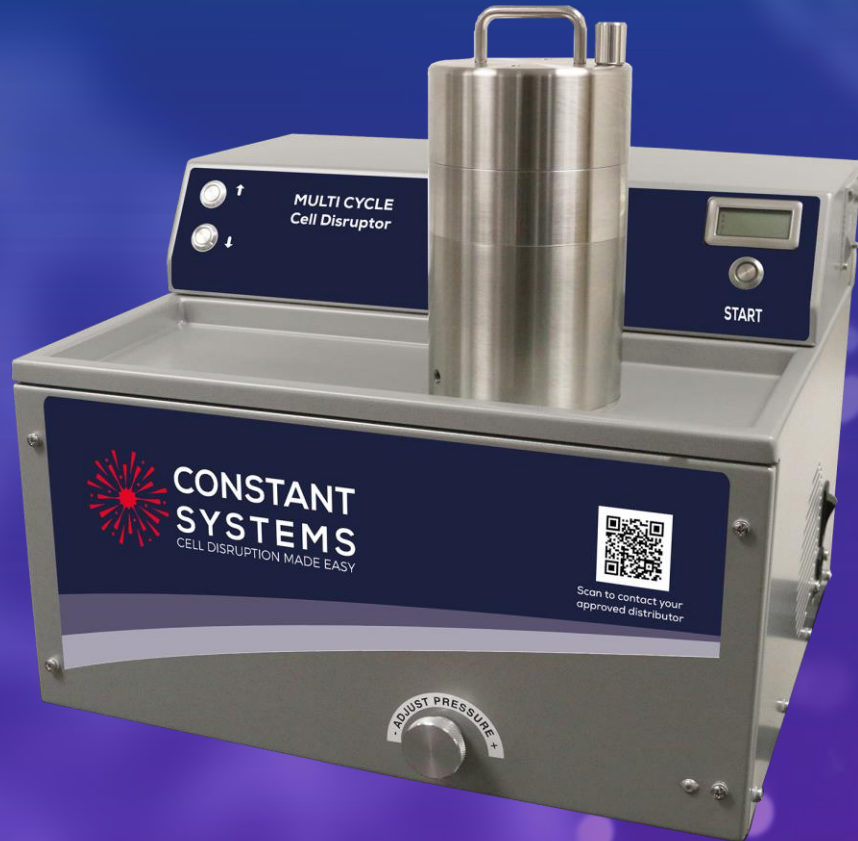


# Multi Cycle

The Multi Cycle Cell Disruptor is a **versatile** model, ideal for users who wish to upgrade from small bench-top techniques such as **bead beating, sonication and chemical lysis**.

**SC Mode** - a single cycle process and can be utilised for:

- 0.5mL – 8mL volumes of all sample types whether fluid, solid, frozen, tissue or plant.
- **MC Mode** – a multi cycle process can be utilised for:
  - 8mL volumes up to 40mL in each process
  - Total volume no greater than 80mL.
  - In MC mode all sample types that are fluid and re-suspended can be processed.
- **RC Mode** – a recycle process can be utilised for:
  - Multiple passes – best for tough sample types such as Gram-Positive Bacteria and some Fungi and Algae types.





# CF1

The CF1 Cell Disruptor offers Continuous Flow Processing offering up to 100mL/min - 6L per hour.



- Simple, quick and easy to use.
- No need to prime or purge the equipment.
- Integrated sample cooling jacket.
- No need for compressed air or bottled gas.
- Ability to process fluid, re-suspended, viscous sample types.
- Fully contained process.
- a maximum process pressure of 40ksi (2700 bar).
- HMI control.
- Auto shut down feature.
- Standard electrical supply required.

# CF2

The CF2 Cell Disruptor offers Continuous Flow Processing offering up to 400mL/min - 24L per hour.

- Simple, quick and easy to use.
- No need to prime or purge the equipment.
- Integrated sample cooling jacket.
- No need for compressed air or bottled gas.
- Ability to process fluid, re-suspended, viscous sample types.
- Fully contained process.
- a maximum process pressure of 40ksi (2700 bar).
- HMI control.
- Auto shut down feature.
- Standard electrical supply required.



# USP

- Simple, quick and easy to use.
- No need to prime or purge the equipment.
- Integrated sample cooling jacket.
- No need for compressed air or bottled gas.
- Fully contained process.
- Maximum process pressure of 40ksi (2700 bar).
- HMI control.
- Auto shut down feature.
- Standard electrical supply required.
- Industry standard product path materials
  - Stainless Steel 316L and F51 super duplex or equivalent
  - EPDM
  - GLFPTFE
  - PEEK 450G
- Compatible with industry standard cleaning media (Ethanol, Sodium Hydroxide, Virkon)

# Clients

- Universities
- Research facilities
- Biotechnology companies
- Pharmaceutical companies
  
- 75% of equipment sold to Universities and Research facilities
- 10 out of the top 10 Universities worldwide have Constant Systems equipment\*
- 16 out of the top 20 Universities worldwide have Constant Systems equipment\*
- 40 out of the top 50 Universities worldwide have Constant Systems equipment\*
  
- University of Cambridge 12 units
- University of Oxford 10 units
- University of Leeds 9 units

\*Source – using QS university rankings by Biological Sciences 2023

# Client requirements

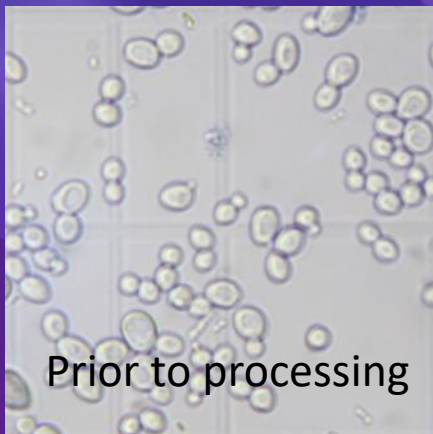
Ability to lyse various expression systems such as:

**Bacteria** (E. coli)   **Yeasts** (Pichia pastoris)   **Algae** (C. vulgaris)   **Fungi** (P. canescens)   **Mammalian** (BHK21)

Typical workflows:

**Protein Purification**   **Enzyme Release**   **Inclusion Bodies**   **DNA shearing.**

The microscope images below show more cells are lysed using Constant Systems equipment compared with other homogenizers, providing a higher and consistent yield highlighting Constant Systems' **efficient, accurate and repeatable** processes.





Constant Systems support leading academic, research and production facilities around the globe



# Academic Testimonials



THE UNIVERSITY OF  
MELBOURNE

*"I have nothing but good feedback, the Constant Systems engineer was brilliant. He arrived on time (despite Melbourne's terrible traffic!), thoroughly inspected and serviced the instrument, and completed the work within the timeframe he proposed. I also really appreciate the time he took at the end to take me through the report in detail".*

**Stephanie Neville – University of Melbourne**



UNSW  
THE UNIVERSITY OF NEW SOUTH WALES

*"Our CF1 was installed in Feb 2020, it is easy and quick to train people. Users can use it independently after one training session.*

*We process several different organisms for protein production- mostly E. coli, but algae and yeast used as well. All work well. We found cell disruption much more consistent between preps.*

*Cleaning is Easy, we haven't had any users leave the instrument in a mess yet. We haven't had any problems since our install, we haven't had any servicing requirements since our install, but previous experience at other employment locations indicates that the company and staff are helpful, knowledgeable, and quick at responding."*

**Dr Kate Michie – University of New South Wales**



University of  
BRISTOL

*"For the past 10 years, we have been using the CF1 Constant Systems Cell Disruptor in our Collinson Lab at the University of Bristol.*

*The cell disruptor is used widely across the School and Faculty, and it has become essential for many of the research groups. It is testament to the quality of the instrument and the service provision that we can deliver a heavy and uninterrupted cell lysis. Over the years the Cell Disruptor has provided consistent results, vital in our students work.*

*Regular servicing and training by the service team from Constant Systems has helped keep not only the Cell Disruptor running but ensured that our students are confident in using the equipment to its fullest potential."*

**Ian Collinson – Prof of Biochemistry – University of Bristol**



UNIVERSITY OF  
LIVERPOOL

*"The service and training was very good, the engineers were extremely friendly and the training was very thorough and explained well"*

**Alexandra Holme – University of Liverpool**



UNIVERSITY OF  
BATH

*"We use the CF1 – SN: 1436 cell disrupter for the lysis of both Yeast and E. coli cells. we find the equipment easy to use and maintain. On the odd occasion where we have needed to replace consumable parts ourselves, the guidance and support provided from Constant Systems has always been exceptional. This is an essential piece of equipment in our lab, we maintain a regular maintenance contract with Constant Systems and are always impressed by the level of service provided. When we have new members join the lab the engineers also offer some training during their service visit, which is useful for both staff and students."*

**Kyle S. Gregory – University of Bath**



UNIVERSITY OF  
COPENHAGEN

*"We've have had our Cell Disruptor MC for several years now and have been very pleased with it. After we got the MC Cell Disrupter, we have experienced higher yield of protein compared to our former ways of lysing cells and enzymes, that are more active. We use the machine mainly for E.coli and find the machine easy to use and clean, and it is easy to reproduce results. All contact with customer service and the technical assistance from Constant Systems has been very helpful and competent."*

**Signe Sjoerup – Structural Biology and NMR Laboratory,  
University of Copenhagen**

# Research Testimonials

The Harwell logo consists of the word "HARWELL" in a bold, black, sans-serif font, centered within a bright yellow rectangular background.

*"We are very pleased with the service provided by your team. Your engineers are a pleasure to work with, taking time to explain everything and offering advice from their experience working with other clients. Aftermarket support is also excellent, always fast to respond to messages and ensuring paperwork is sent over to us. I have no comments for improvement – you are all very friendly and helpful, so many thanks to everyone for helping me keep the equipment running smoothly."*

**Lauren Cater – Senior Technician at Research Complex at Harwell (RCaH)**

The NPL logo features the letters "NPL" in a large, bold, blue, sans-serif font. To the right of the letters is a circular emblem containing a detailed crest or coat of arms.

**National Physical Laboratory**

*"For the Protein Production team of the Biometrology group at the National Physical Laboratory, cell lysis is a crucial step in protein extraction before purification. We have a CF1 model with a 900 mL chilled reservoir, which was installed in October 2020. The equipment is straightforward to use, regardless of the sample we process (bacteria, yeast, archaea, insect, and mammalian cells). When cleaning the equipment, we follow the suggested cleaning protocol and find that it is adequate for our usage."*

**Ines Camacho, PhD, MSc – Higher Research Scientist,  
Laboratory Manager at National Physical Laboratory (NPL)**

The Diamond logo features a stylized yellow sunburst or starburst icon to the left of the word "diamond" in a bold, blue, sans-serif font.

*"Constant Systems is highly efficient, less time consuming, easy maintenance and quite user friendly. We are using it in various expression systems including bacterial, insect, mammalian, and yeast cells."*

**Dr Harish Cheruvara – Diamond Light Source Ltd**

The Rosalind Franklin Institute logo features a stylized sunburst icon to the left of the text "The Rosalind Franklin Institute" in a blue, sans-serif font.

*"I manage a structural biology lab in the Rosalind Franklin Institute RFI. We have purchased two cell disruptors CF1. We have been using those for over 2 years now with no issues at all. And I have been using them in other institutes, as well as the team I manage, for several years, that they were adamant we should only have Constant Systems cell disruptors in our new building.*

*I have one of the cell disruptors with a cooling jacket for a 900ml volume, and another one with a smaller cup of 200ml, with a processing pump attached to it.*

*They were quite easy to use, once a training has been conducted to the users (primarily by the company, who dedicated a whole day of training to the users, including consumables and maintenance training for those who are interested).*

*We use in our lab's mammalian, bacterial and yeast cells. We mainly process bacterial and yeast cells on the cell disruptors. The instructions given by the company were very clear and straight forward, in a way that every service the engineer finds minimal/traces of debris inside the machine.*

*They Constant Systems has a very nice, friendly, efficient, and highly knowledgeable team about their products. Whenever an issue is raised, their response is immediate and very useful. Never leave a client disappointed. "*

**Sheera Abdulla – Laboratory manager of the structural biology department in RFI.**



# Production Testimonials

## IMMUNOCORE

*"We currently have the CF1 (~2 years) and CF2 (>5 years). I've always found the equipment easy to use. Can be a bit intimidating for new users, so training is key. Some of the graphical interface can be a bit tricky to navigate when troubleshooting – much better on the newer machine. The sample types that we process are Bacterial slurries Constant Systems Cell disruptors are Integral to our defined small-scale manufacturing process.*

*Cleaning is straightforward and easy. We try to ensure this is performed routinely, so it is built into our SOP for the equipment. Constant Systems customer service level is always very good and efficient. The Constant Systems engineers are 1st class."*

**Alistair Brown, Ph.D – Immunocore**



*"I was very impressed with the Constant Systems engineer's explanation and demonstration on taking apart and servicing the instrument. I am a very hands-on person, and it was good to be reassured that we were using the instrument correctly.*

*More than happy to have your engineer back to service our instrument on Constant Systems next maintenance tour down under. We are very happy with our instrument and the service provided by Constant Systems."*

**William McKinstry – ZIP Diagnostics Pty Ltd**



*"We are very happy with our new CF2 system. We routinely use this to process large volumes of insect and E. coli cells. The system is extremely easy to use and maintain and even faster than our previous system.*

*We hugely appreciate all the help and support we've received from the Constant Systems customer service and engineer teams. They have responded to queries extremely quickly with all required information and gone above and beyond to help when required. When service engineers have attended site, they've been brilliant to work with and we hugely appreciate the additional training to all available members of staff when they visit.*

*Thank you for all your ongoing excellent service!"*

**Sarah Caswell – Associate Principal Scientist at AstraZeneca**



*"We operate both our TS Series 2.2kw and 1.1 kw on a weekly basis. Constant Systems after sales support is excellent and it is always a pleasure to deal with your staff. Thank you for the great service."*

**Nel De Wet – Kapa Biosystems**



*"We have had the CF1 for over a year now, using it to lyse several types of cells for protein purification. Due to its ease of use, speed, and reproducibility, the CF1 has become our main lysis method. In addition, it has improved our capacity, allowing faster processing of multiple samples or processing of larger samples. The machine developed a few faults initially. However, these were dealt with very quickly and effectively and resulted in minimal downtime. It worked perfectly since. We are very happy with the machine and service from Constant Systems."*

**Tomas Adomavicius – Senior Scientist at Sygnature Discovery**



*"Because of the efficiency and reliability demonstrated by the Constant Systems cell disruptor, it is our method of choice for bacterial cell lysis during routine, large-scale protein production."*

**Maryke Appel – Kapa Biosystems**

# Contact Us

We take pride in providing the highest level of service to the clients and our support starts at the initial enquiry stage.



Complete the [online form](#) for one of the team to get back to you or alternatively give us a call or drop us an email.

<https://constantsystems.com>