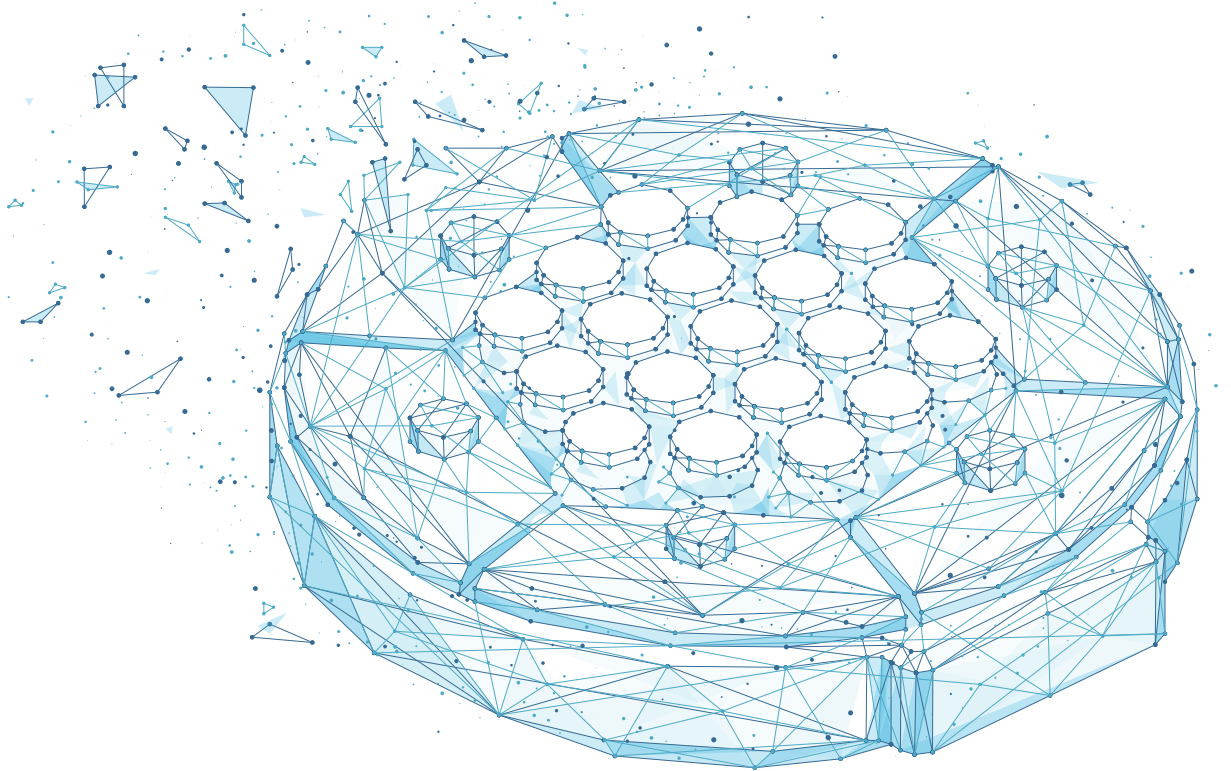


# A Revolution in Lyophilization

LESS TIME, LESS API, MORE DATA



MicroFD®

rev 1/19/2023

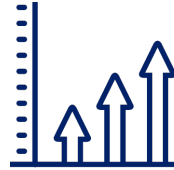
MILLROCK  
TECHNOLOGY 

# Are you ready for the revolution?

The MicroFD® from Millrock Technology changes freeze drying research, development, and cycle transfer forever—a small-scale lyophilizer that delivers more with less:



Total control over both the freezing and drying phases



Real-time data for analysis and optimization



Less of your valuable API, time, and costs

## Proven to Develop Transferable Protocols

The MicroFD delivers a R&D and Cycle Development freeze dryer that:

- Takes the guesswork out of protocol development
- Uses less of your valuable product for R&D
- Enables analysis and optimization with as few as 7 vials
- Determines  $K_v$ , Sublimation Rate,  $R_p$  and other critical process parameters

"Miniaturisation of freeze drying equipment provides the opportunity to gain useful product and process information by reduced consumption of material and time."

- "The importance of being small: miniaturisation of freeze drying equipment," *European Pharmaceutical Review*, August 2017

MicroFD®

MILLROCK  
TECHNOLOGY

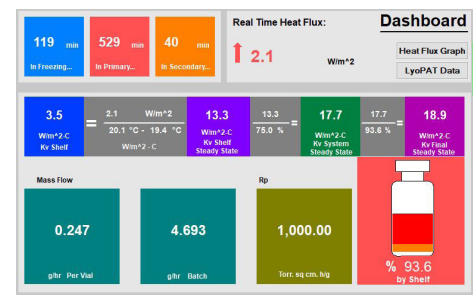
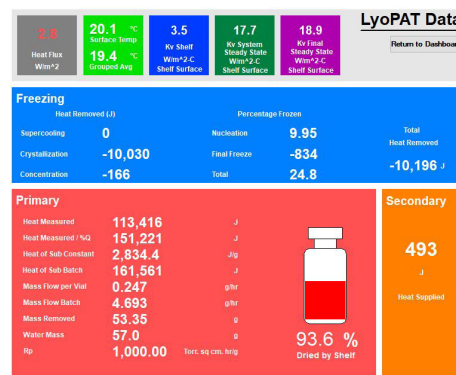
# Three Steps to Faster and Smarter Protocol Development

"The ability to develop lyophilization cycles on the MicroFD® that are representative of larger scales enables tremendous material and time savings, while supporting speed and convenience for current lyophilization development...[it] enables cycle development and optimization of at-scale lyophilization processes using only seven product vials."

- "Representative Scale-down Lyophilization Cycle Development using a Seven Vial Freeze Dryer (MicroFD®)," *The Journal of Pharmaceutical Sciences*, November 2018

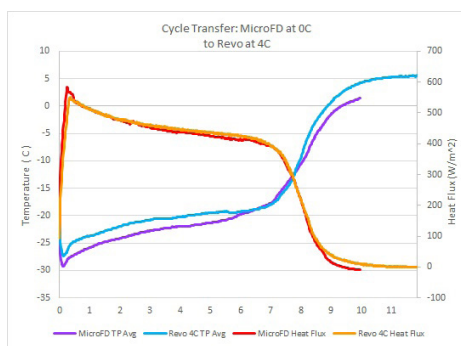
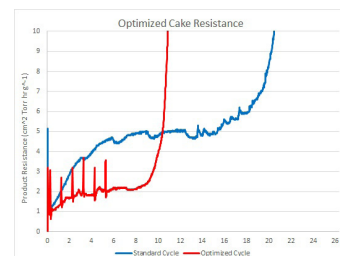
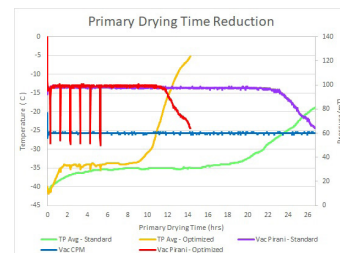
## Step 1 PROTOCOL ANALYSIS

Analyze your existing protocol by collecting the critical process parameter data for both the freeze drying and primary drying cycles, including Heat Flow, Product Temperature, Mass Flow, Kv, Rp, and more, determined by the most advanced Process Analytical Technologies. Why use outdated technologies that provide only intermittent monitoring and extensive calculations to predict critical process parameters? With the MicroFD, you get **real-time, continuous process measurement and unparalleled control.**



## Step 2 CYCLE OPTIMIZATION

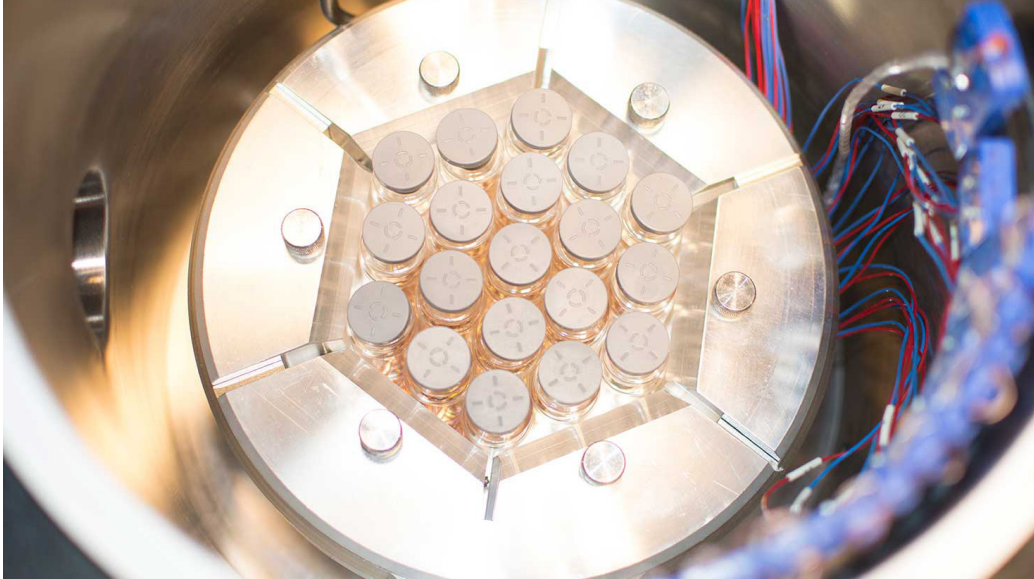
Save money and time by developing robust products with the shortest freeze drying cycle times. The MicroFD provides you with the tools to optimize both your freezing and primary drying cycles, in order to develop the shortest freeze drying time and critical process parameters for cycle transfer. The MicroFD is the first system of its kind to deliver this level of optimization and data to the freezing cycle.



## Step 3 CYCLE TRANSFER

Scale up, scale down...the future lies in both directions.

With the optimized critical process parameters, you can use the MicroFD for scale-up of new freeze drying protocols, or scale-down analysis and troubleshooting of existing protocols.



## Inside the MicroFD®

Millrock Technology's MicroFD has been refined and improved in partnership with industry experts who are passionate and driven to advance the products, processes, and performance of freeze drying technology. It requires no third-party hardware, and every feature you need is built-in.

**LyoPAT®** state-of-the-art control capabilities to monitor and control every possible aspect of the freezing and drying processes.

The **LyoSIM®** ring provides optimal process control via a closely coupled temperature source that can simulate center vials or the edge effect for process analysis. The close coupling of the LyoSIM ring results in far superior results than simply controlling the wall temperature.

**AccuFlux®**, the only technology that provides heat flow monitoring and control—including direct measurement of Kv and mass flow—throughout the entire freezing and primary drying processes.

**AutoDry®** totally automates primary drying by driving as much heat into the product as possible without exceeding the critical product temperature.

**FreezeBooster®** controlled nucleation enables the ability to study freezing approaches and its effect on the product and product cycle.

**Millrock Reporter** provides batch reporting in the format you design.

*Features in the MicroFD are patented and patent pending.*

## Experience the Millrock Difference

When you purchase a Millrock product, you get more than a freeze dryer. You get a long-term partner delivering industry-changing innovations, high-performing products, and on-call expert support.

**Contact us to learn more about how Millrock Technology can partner with your business to provide the highest-performance, advanced freeze drying services.**

**Sales: 845.339.5700 • [sales@millrocktech.com](mailto:sales@millrocktech.com) | Service: 845.331.1279 • [service@millrocktech.com](mailto:service@millrocktech.com)**

MicroFD®

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Visit our website at <https://www.millrocktech.com>