



# **TELEDYNE HANSON RESEARCH**

## **Phoenix Diffusion System Design and Use**

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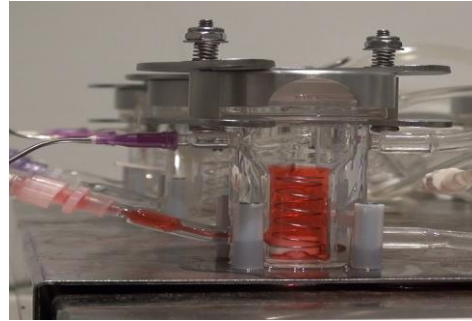


## Past two days

- Over the past two days we've all learned a lot on IVRT/IVPT
- The science, requirements and techniques behind diffusion
- In this presentation I have not included any theoretical aspects that were already discussed
- Equipment suppliers can innovate and bring improvements to test discrimination, increase efficiency, safety, etc.
- I would like show the features and new advancements from an equipment manufacturer's perspective, which will benefit end-users and the entire pharmaceutical industry

# Previous Design

- Vision Microette System –  
Discontinued



- Microette was the first automated, patented design by Hanson, However
- Difficult to measure membrane temperature prior to starting the test
- Time consumption in cell preparation
- Pre-wetting/conditioning of membrane needed to perform outside the cell body; perhaps other systems available in market today still have this requirement
- Dosage is applied on the membrane outside the cell body.
- Possible time differences between Cell 1 to Cell 6 from sample application and starting the test
- Stirring required to stop during sampling to avoid sample dilution.
- Mixing plays a vital role in homogeneity which can lead to inconsistencies in RSDs
- Due to the design, the exposed membrane orifice was inconsistently applied to each cell possibly causing alignment and surface area exposure inconsistency.





## Why and What have we improved?

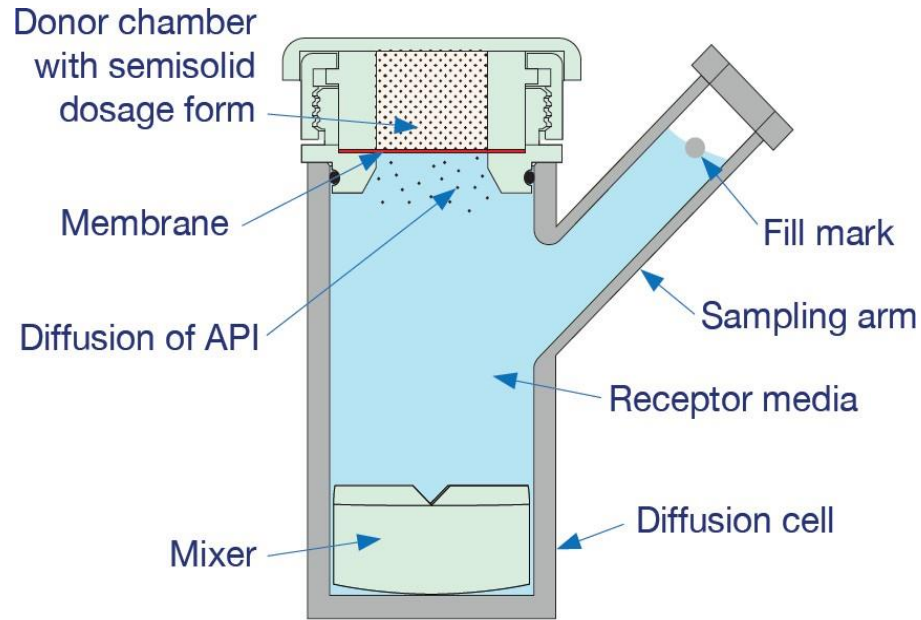
- Based on user's feedback and industry experts like Dr. Kailas Thakker and the Tergus Pharma IVRT team
- To meet regulatory requirements such as
  - Total system equilibration including membrane
  - Membrane temperature measurement prior to dosing
  - Accurate measurement and control of sample amount
  - Frequent temperature/speed recording throughout the study
  - Reduce variability, obtain consistent results with lower RSD
  - Better homogeneity of receptor solution with high efficiency mixers
  - Remove the need to stop stirring during sample collection
  - Create a user-friendly apparatus for ease-of-use
  - 21 CFR Part-11 compliant module
- Teledyne Hanson is always in a state of innovation - that's our business model.



# The results of our cell innovation

- Patented Phoenix Diffusion Cells
- *Works with synthetic or biological membrane (Skin)*
- Cell caps made on a CNC machine with uniform precision orifices
- Cell components can be easily customized upon request
- Exposed membrane surface area is perfectly mated with the cell body each time; no alignment issues.
- Outside of the cell is precisely made to ensure flush contact with the heat source
- Membrane wetting and system conditioning occurs directly on the cell body

# V D Cell Design – for Phoenix System



Precision bore cells made from syringe body, more accurate than hand blown

Wide sampling arm to ensure media in arm is homogeneous with the cell body

Small, medium, and large cells, combined with short or tall mixers allow for variable cell volumes

Enhanced mixer design



# Flexibility in Study Design



- Various component sizes allow for user customization to create best possible diffusional sink conditions
- Membrane: 25 mm diameter
- Cell Volumes: 10 to 30 mL
- Orifice Diameters: 9 mm to 20 mm
- Dosage Volumes: 0.25 mL to 6.2 mL
- Specially designed threaded caps for skin
- All Components are serialized for unique identification



# Choice of Cell and Components

Cell Type	Cell Volume mL	Orifice Size mm	Membrane area mm <sup>2</sup>	Dosage Height mm	Dosage volume mL
Small	10	9	64	4	0.25
				20	1.3
	14	11.3	100	4	0.4
				20	2.0
Medium	16	11.3	100	4	0.4
				20	2.0
	22	15	177	4	0.71
				20	3.5
Large	21	15	177	4	0.71
				20	3.5
	31	20	314	4	1.26
				20	6.3

**Exact cell volume for each cell to be measured in laboratory and use that volume in calculation like 10.04 mL instead of 10 mL**



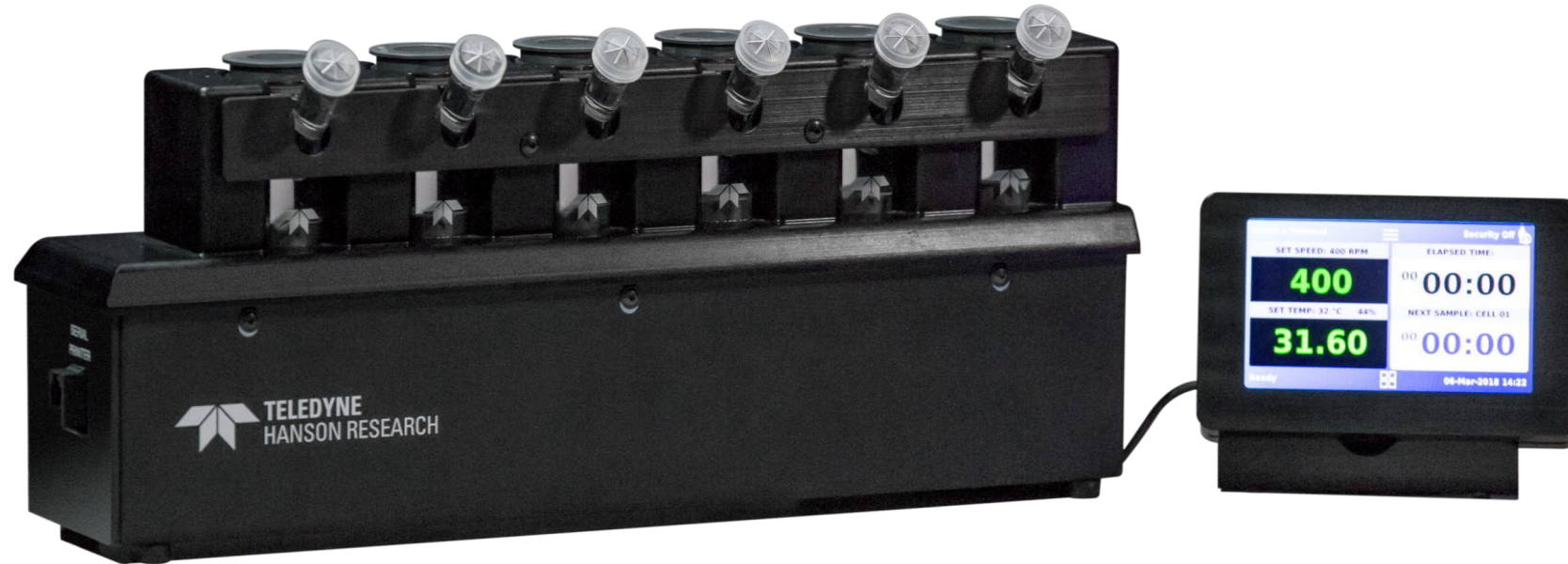


# Phoenix Dry Heat Systems

- Like Phoenix, Arizona – Dry Heat!
- Computer-controlled heating & stirring blocks for precise speed and temperature
- Temperature and Speed limits exceeds USP <1724> requirements (typically obtained  $\pm 0.5^{\circ}\text{C}$  vs  $\pm 1.0^{\circ}\text{C}$  and  $\pm 2\%$  vs  $\pm 10\%$ , respectively)
- 21 CFR Part 11 compliant software for data integrity
- Very easy to detect and remove bubbles from the cell prior to and during the study



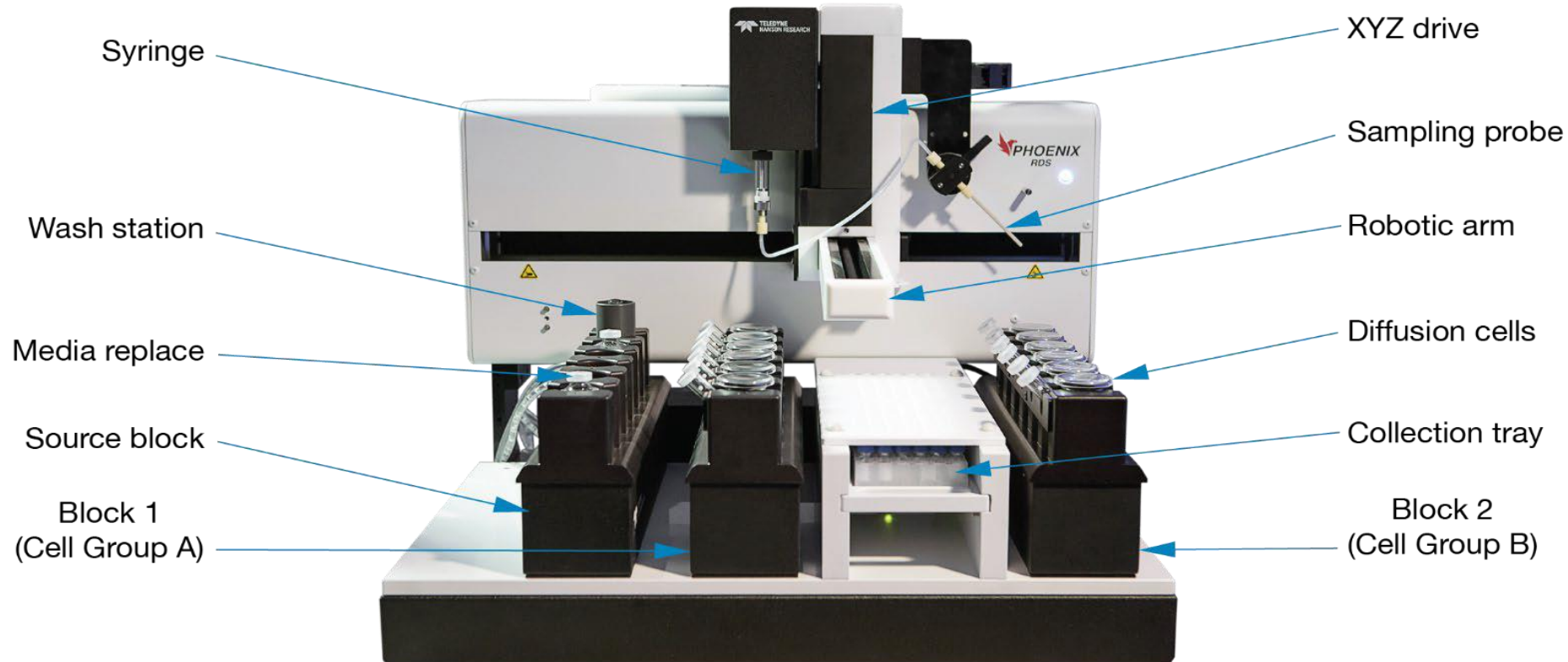
# Phoenix™ DB-6 – Six Cell Manual Sampling



- Very small footprint
- Easy angle for proper sampling and media replacement with pipettor
- Stirring speeds and cell temperatures regulated by a programmable stirring/heating block.
- The block is controlled by an onboard computer built into the color touch screen display.
- Ability to print test parameters as desired



# Phoenix RDS Automated Sampling



- Fully programmable system allows for unattended testing, often overnight.
- Automation eliminates variabilities associated with operators and manual techniques.
- Up to 12 cells per station, one PC controls two stations.



# Advantage for Users

- User-friendly systems to prepare and collect samples, either manually or automatically using the software.
- Membrane temperature can be measured using IR thermometers
- Staggered dosing, starting the test and sampling in a precisely timed fashion
- Wider sampling arm, creating a homogenous solution throughout cell body
- Bubble detection and elimination can be done very quickly and easily
- Easy to control dosing of product
- 21 CFR Part 11 compliant software to provide various level access with distinct privileges
- Test Methods (Protocols) can be saved, reviewed and archived
- At the end of test report can be printed and saved
- Anytime test history is available for verification and review
- All events and errors are recorded in electronic log



# Videos for Demonstration

- How to prepare a cell for IVRT
- How to prepare a cell for IVPT
- Overall system video



# Thank you

- On behalf of Teledyne Hanson Research, I want to thank organizers, the US FDA and all those who supported us for this opportunity to present on this webinar
- Thank you all for attending the session.
- Any Question?
- Send an email to [ashvin.patel@teledyne.com](mailto:ashvin.patel@teledyne.com)
- Or <https://hansonresearch.com/tech-support-request>
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