

## Objectives

The quality management of small volume (30-73L) LN<sub>2</sub> dewar cryostorage tanks has historically been maintained by weekly internal dipstick measurements and re-filling.

Meanwhile, alarm systems, if used, have been based on a designated internal temperature threshold (<-180°C) or LN<sub>2</sub> level set point (e.g., upper canister level).

❖ The aim of our investigation was to evaluate the prospective value of real-time pressure sensitive, weight measurements of mobile dewar tanks for operational and performance qualification (OQ/PQ).

## Design

Real-time weight measurements were correlated to changes in LN<sub>2</sub> volume and temperature under new tank validation (OQ) and standard tank use (PQ). Evaporation usage rates were calculated ( $t_0 - t_{1wk}$ ), based on weight ( $E_w$ ) or volume level ( $E_L$ ). An evaporation rate index ( $E_{vap}$ ) was calculated for in-use tanks (T) using new tanks as the control (C) group ( $E_{vap} = T0 - T1 / C0 - C1$ ). Differences in  $E_{vap}$  were compared among tanks to determine if an objective measure for cryotank retirement was possible?

Heavy duty mobile cart system design. Next-gen design will be fitted into existing roller bases, with a smaller USB connection box.

Wi Fi linked pressure sensors supported between steel base-plates



# Usefulness of Remote, Continuous Weight Determination for the Routine Quality Management (QM) of Cryo Dewar Tanks



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ASRM 2019  
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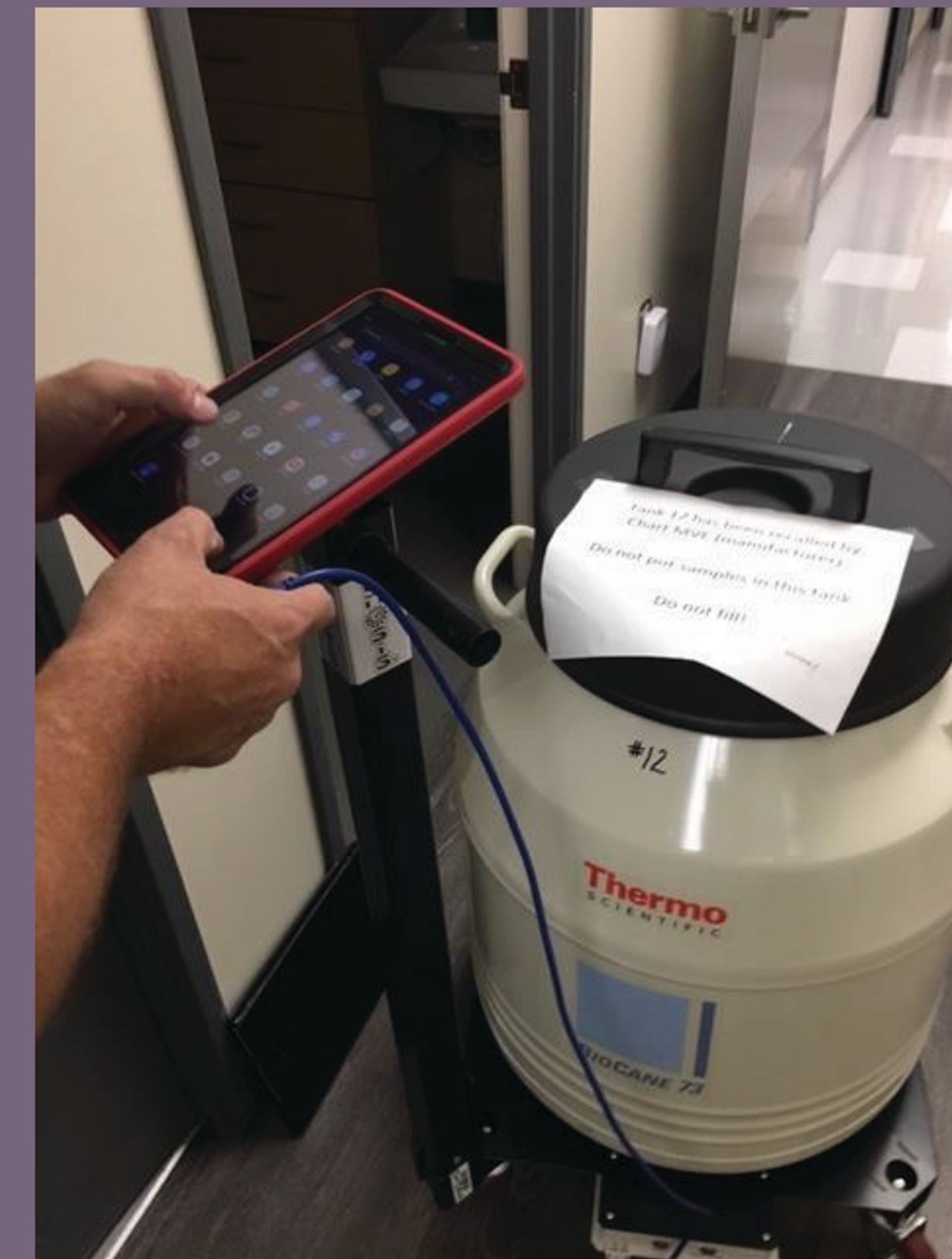
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## Methods

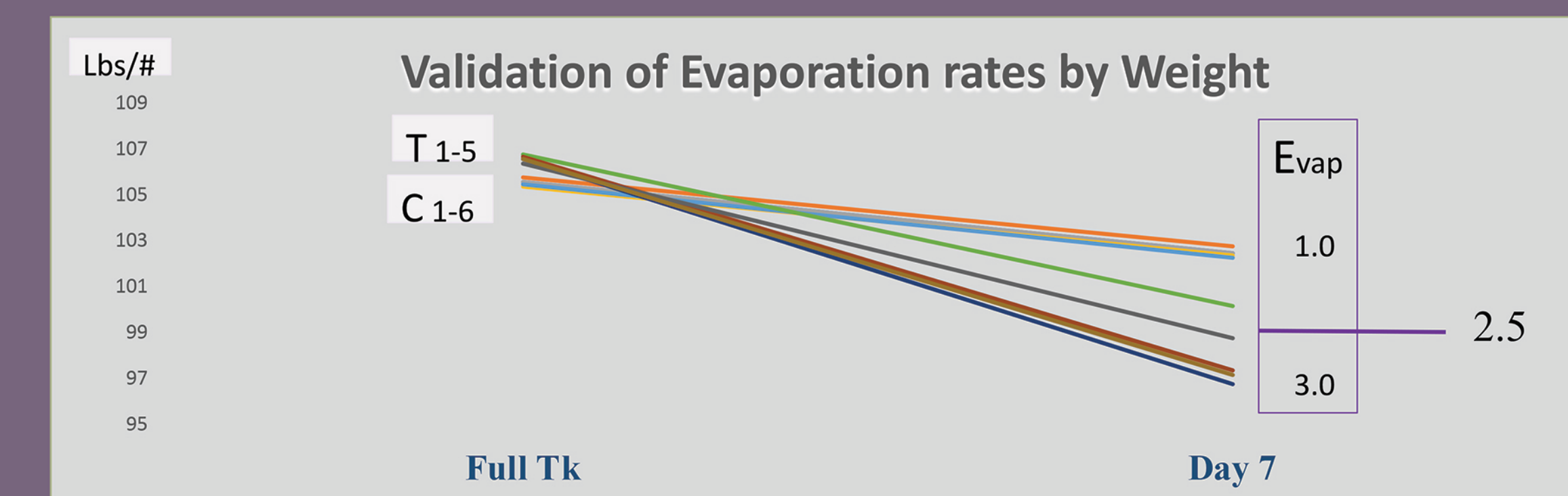
Using an i-Pad, each cart is calibrated to adjust for the empty weight of the LN<sub>2</sub> dewar tank.

Continuous monitoring was activated, with an option to measure with i-cloud based readings recorded every 10 sec or at 10 min intervals.



## Results

The mean LN<sub>2</sub> usage rate ( $E_{w/L}$ ) of new VHC-35 tanks was 3.1 lbs/3 cm (8.5 to 10%  $E_w$ /week), yielding a direct correlation of 1.0. In contrast, aged tanks varied in their  $E_w$  (6.4 to 9.8 lbs.; 19 to 27%  $E_w$ ) and  $E_L$  (4-10cm). The  $E_{vap}$  index of the aged tanks by levels ranged from 2.0 to 3.0. Greater ( $p < 0.05$ ) precision was verified using weight measurements ( $E_{vap}$  index=2.4-2.9).



## Conclusion

- Manual dipstick measures are subject to user error and complacency in QC practices, whereas remote weight measurements are a more precise method to measure daily and weekly usage/evaporization rates.
- Our data show that new tank validations (OQ) and weekly performance (PQ) can be objectively evaluated by weight, and formulate a useful threshold measure assessing dewar tank retirement.
- Overall, external quality measurements and device systems represent a promising future offering greater precision, labor efficiency, and improved specimen security and safety.